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Impact of education and training

Third report on vocational
training research in Europe
Background report



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Third report on vocational training research in Europe: background report

Pascaline Descy,
Manfred Tessaring (eds)

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Preface

The series of reports on vocational education and training (VET) research have been published by Cedefop since 1998 ⁽¹⁾. The reports provide a comprehensive review of current research in initial and continuing VET in Europe, research results and their implications for policy, practice and future research. Attention is also paid to the theoretical and methodological foundations and due reference given to relations with institutional, economic, social, demographic, and other fields of social action.

Each research report consists of a background report of several volumes with contributions from renowned researchers (this publication), and a synthesis report developed by Cedefop experts.

Third research report: evaluation and impact of education and training

This third report informs on current research on evaluation and the impact of VET on individuals, enterprises and society and economy in general, including:

- (a) the assessment of education and training systems;
- (b) the implementation and outcomes of programmes and reforms with a VET component;
- (c) the costs and benefits of skills, qualifications and competences which accrue to different actors at different levels;
- (d) impact research, quantifying the contribution of education, training and skills on, for example, earnings, economic growth, employment and social inclusion.

The report thus serves both to inform and improve policy and practice, and further develop research methodologies. It contributes to achieving the overall European goals expressed by the European Council at its Lisbon and follow-up summits.

To demonstrate the contribution of education and training towards achieving a knowledge-based

society and to specify the diverse benefits at all levels – such as done by ‘summative evaluation’ or impact research – is as important as indicating ways to improve the design and implementation of education and training programmes or measures by ‘formative evaluation’.

The background report

The background report gathers contributions from renowned experts and researchers. They allow the reader to approach evaluation and impact research from various angles: individual, enterprise and macro-system level by also considering essential basics on the foundation, approaches, standards – and limits – of evaluation and impact research.

Contributions have been regrouped into three broad themes, published in separate volumes:

- (a) impact of education and training;
- (b) the foundations of evaluation and impact research;
- (c) evaluation of systems and programmes.

Impact of education and training

The present volume addresses research work to assess the material and non-material impact of education, training and skills at macroeconomic and regional levels, and the impact on enterprises and individuals. The picture is completed by case studies on the impact of active labour-market policies (ALMP) with training components, in both effects for the economy and social integration.

At the macro level, R. Wilson and G. Briscoe discuss the contribution of education, training and skills to economic growth and productivity. H. Izushi and R. Huggins complement this by measuring the impact of education and training at regional level. A. Green, J. Preston and L. Malmberg review research on the non-material benefits of education and training such as on citizenship, health, crime, trust and political participation.

⁽¹⁾ Tessaring, 1998; Cedefop, 1998; Descy and Tessaring, 2001a and b.

From a company perspective, B. Hansson, U. Johanson and K.-H. Leitner discuss the impact of training on company performance, in terms of production growth, productivity and competitiveness, particularly in the knowledge-intensive sectors of the economy.

Finally, M. Heise and W. Meyer review research work that investigates the influence of education and training in the life course of individuals, on their biographies and working careers.

The volume is completed by studies on active policies, including active labour-market policies (ALMP) which include a training component. K. Walsh and D. J. Parsons discuss their impact on integration into the labour market, while R. Hujer, M. Caliendo and C. Zeiss present a case study on macroeconomic evaluation of ALMP in Germany.

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Stavrou**

**Manfred
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Descy**

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The impact of human capital on economic growth: a review

Rob A. Wilson, Geoff Briscoe

Abstract

This review provides an in-depth appraisal of a wide body of international research that examines the links between education and training in a country and its macroeconomic growth. An initial analysis of broad statistics for all EU Member States suggests a loose correlation between investment in human resources and growth in gross national product (GNP), but clear causal relationships are difficult to establish. Increased investment in education is shown to lead to higher productivity and earnings for the individual and similarly, such investment results in significant social rates of return. The returns on investment in vocational training are more difficult to demonstrate. This study reviews a large number of growth models that attempt to specify and quantify the GNP and human resource relationship. Wide differences are found in the model specifications, the quality of the data inputs and the results obtained. Other links between investment in human capital and economic performance are reviewed using diverse literature sources on human resource management, corporate market value, company size and industry structure. The indirect impact of education on non-economic benefits is also examined in the context of the technological, spatial and environmental gains to society. It is concluded that, overall, the impact of investment in education and training on national economic growth is positive and significant. Some policy conclusions are drawn and directions for future research in this area are suggested.

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1. Executive summary: key findings

1.1. Background

Various conceptual approaches have been used to explore the links between education and training and economic performance. The aim of the present review is to provide a critical assessment of this work, focusing primarily on the macroeconomic level. In order to reach a macro overview, it is necessary to consider many other branches of literature than those just concerned with macroeconomic growth models.

The study, therefore, presents an extensive international review into a number of strands of literature that focus on the link between investment in education, training and skills and economic performance at the macro level. This includes some micro level research, where training and education conducted by firms and industries is deemed to be an important contributor to overall economic growth. While a majority of the publications examined are in English, much European research is also incorporated in the form of empirical studies using European data and European authors publishing in UK and US publications.

All of the European Union (EU) 15 Member States have experienced significant growth over the past 30-year period. However, there is variation between countries, especially in the short term. Educational expenditure as a percentage of gross national product (GNP) has been maintained at roughly constant levels across all the Member States over the long term. This has ensured increased investment in human resources throughout the EU. Other data show a strong growth trend in the percentage of the eligible population entering tertiary education over the three decades. Consistent statistics on trends in EU vocational training prove more difficult to obtain, but there is evidence of significant vocational training inputs in a number of EU countries. A simple reading of these statistics indicates that increases in economic growth across the EU are associated with increases in both education and training. However, more detailed comparisons also illustrate the difficulties in establishing a causal link between educational and training

inputs on the one hand and economic outputs (in form of growth in gross domestic product – GDP) on the other. Similar patterns are observed in other developed economies.

1.2. Rates of return on investment in human capital

A key body of literature relates to the rates of return for the individual (and for society in general) of investment in human capital, in the form of education and training. Much of this research draws on the seminal work by Becker (1964), Mincer (1974) and many others. This body of work is founded on a microeconomic approach. Nevertheless the results have important macroeconomic implications. They highlight the strong links observed between education, productivity and output levels. Although some have questioned the direction of causality and argued that much education simply acts as a screening device to help employers to identify more able individuals, the general consensus seems to be that education does result in higher individual productivity and earnings. On balance, the results suggest a strong and positive causal link between investment in education and training and earnings. This applies both at the level of the individual and also to the broader social returns on such investments, the evidence suggesting substantial social as well as private benefits. The implication is that what is good for the individual is also good for society at large at a macro level.

Evidence on social rates of return concentrates on the benefits to the economy arising from increased education by calculating all the costs of schooling and education compared to the relative pre-tax earnings of individuals in receipt of such education. Many qualifying assumptions need to be made in arriving at a quantifiable estimate, but several studies suggest a social rate of return in the range 6 to 12 %. This compares well with rates of return on other capital. Comparable studies to establish the social rate of return for

vocational training are hard to find, although there is some evidence that such training has a significant positive impact on productivity.

1.3. Skills and organisational performance

Another key focus of recent research has been the use and deployment of human resources and skills at an organisational level and how this is linked to the economic performance of organisations and economies more broadly. While much of this research lies outside main economic literature, research on the management of human resources suggests a range of results concerning various aspects of human capital and firm performance. This is not really surprising, as there is a widely held belief that people are a key source of an organisation's competitive advantage. It is the quality of the human resources that determines organisational performance. There are a number of different emphases in this research, including the role played by human resource management (HRM) in promoting such resources, and the role of management itself – particularly top managers. One important theme is the role of leadership, with a focus on the role of managers, especially top executives, in influencing company performance. Their skills, education and training are important in what are often very complex processes.

1.4. Macroeconomic performance and education

Literature on economic growth models explores directly the quantitative relationship between investments in education and training and the level and growth of per capita GDP. There are a large number of studies, beginning with the classical growth models first developed in the 1950s, through to the so-called endogenous growth models that are still widely applied in many current empirical studies. Both data sets and econometric modelling techniques have developed extensively over recent years and many different model specifications have been proposed and empirically tested. Typically, these models use data drawn from a cross-section of

countries, sometimes only for developed countries but often for a wider set. Data difficulties commonly mean that consistent series of educational variables are hard to obtain over sufficiently long periods to facilitate econometric time series analyses. For developed countries over more recent years, cross-sectional and time series data are combined into panel sets to enable a more comprehensive testing of the relationship between human resources and economic growth.

This body of research can be divided up into a number of subsections. The so-called 'growth accounting' literature emphasises the importance of measuring changes in the quality of labour, as indicated by improved qualifications and higher skills, when trying to account for economic growth over the long term. The impact of the accumulation of knowledge through the undertaking of research and development (R&D) has also been a key feature of this body of research.

Other subsections focus on technical research into production and related functions, which are concerned with the relationships between factor inputs (both tangible and intangible, such as knowledge) and economic outputs. The so-called 'new growth theories' are also very relevant here. These highlight the determinants of economic growth in the broadest sense, concentrating on human capital inputs. There are a number of distinguishing features of the new growth models, but, essentially, they extend the existing models by endogenising technological change (hence, they are also sometimes referred to as endogenous growth theories). This contrasts with traditional neoclassical models, where economic growth is driven by the increase in factor inputs (i.e. population growth) and by the exogenous rate of (labour augmenting) technological change. The newer models often allow for increasing returns to scale, where growth is unbounded and in which growth rates can continue to increase indefinitely over time.

1.5. Other links between investment in human capital and performance

There are a number of other areas of research that have a bearing on economic growth issues. Further important evidence comes from market

value literature which is concerned with how intangible assets, such as technical knowledge, influence potential performance and net worth.

While macro growth models have developed the production function approach to explain macroeconomic growth, market valuation has developed the same approach to explain the growth of individual companies. This also has important macroeconomic consequences. Research studies in market value are concerned with how intangible assets, such as technical knowledge, influence potential performance and net worth. These are intimately tied up with investment in education and training as well as skills, which may often be necessary, if not sufficient, to improve such intangible assets. Research and development, patents and intellectual capital are identified as key determinants of corporate market value. These same variables were also found to be important contributors to macroeconomic growth in the new growth theory literature.

Other research has emphasised the importance of knowledge, intellectual capital and other intangible assets, in influencing the performance of companies at a micro level and economies at a macro level. The role of firm size, including insights from the structure-conduct-performance literature (which highlights the importance of size and monopoly power in exploiting new knowledge) and also the role of qualifications and quality of management in the performance of smaller firms, need to be considered. Work in this area has been carried out for some time and many of the studies emphasise the role of the small firm in economic growth. Such small firms are an extremely heterogeneous group, that have markedly different training needs from those of their larger counterparts. There is found to be far less emphasis on educational and training qualifications in small firm environments. Empirical studies suggest that conventional theories of company behaviour are far too simplistic for explaining the goals and aspirations of these smaller organisations.

1.6. Spill-over, external effects and non-economic benefits

The final strands of literature considered here detail some of the indirect effects of investment in human resources that are not normally captured in measured national economic growth. Such spill-overs and externalities can be technological, spatial or environmental and economic and non-economic. Each contributes significant social gains. Many of these effects are related to other areas of the literature covered in this review. The spatial externalities, that embrace city dynamics, demonstrate how geographical clustering of businesses employing highly qualified workers produces high productivity and strong local economic growth. Other significant spill-overs relate to health and life expectancy, which typically increases as a consequence of higher levels of education.

Such spill-over and related external effects are potentially very important. In making a training investment, an individual firm takes into account the impact of the training on its performance, given the current total stock of human capital in the economy. The higher the human capital in the economy, the greater is the firm's own performance. However, it does not take into account the effect of its own investment on the total human capital stock. As far as the individual firm is concerned, the impact of that investment is minuscule and need not be considered. However, from the perspective of the economy as a whole, the totality of training investments by firms can further increase economic output and economy-wide performance. These external effects can add considerably to the macroeconomic consequences of any initial investment in human capital.

External benefits are often not economic. They also include improvements to the environment, better health and reduced crime rates. Serious attempts are now being made to quantify these in economic terms. These are major areas of study in their own right and are only touched on here.

2. Introduction

2.1. Aims of the study

The main objective of this study is to provide a comprehensive and critical overview of the impact of education and training on economic performance, and, by implication, employment opportunities, at the macro level. In this context the term 'macro' is defined quite widely to incorporate firms and industries, as well as the general economy. It is argued that there is a wide range of different studies that have a bearing on the link between investment in human capital and economic growth. These studies need to be synthesised in order to obtain a comprehensive view of the many ways in which education, training and the accumulation and appropriate deployment of skills influence economic performance.

The review considers the implications for policy and practice, drawing general lessons for further improvement in the economies of member countries. While attention is given to the role of vocational education and training, it is much more difficult to find relevant evidence in this area than for more general education.

2.2. Content of the study

The expansion of formal education and training in developed economies in recent years has had substantial and easily observed implications for the skill levels and skill structures of the populations and employed workforces of these countries. However, the contribution of education and training to economic growth and other measures of performance is less clear.

Simple statistics can be produced to demonstrate a well-established correlation between investment in human capital and economic indicators such as GDP. However, the direction of causality remains the subject of heated debate. The implications for future education and training policies are the subject of continuing research and are addressed by this study.

A number of key areas can be identified, each

of which has an important bearing on the issues considered here. The main ones include:

- (a) rates of return on investment in human capital and the link between private rates of return from education and training and social returns for society at large;
- (b) links between the use and deployment of human resources and economic performance, including literature on management skills and organisational performance and general literature on HRM, policy and performance;
- (c) literature on the causes of economic growth, including the growth accounting studies, production and knowledge functions relating GDP to various determinants and the new growth theories which endogenise the sources of economic growth;
- (d) literature on market valuation of companies and the role of R&D (a proxy for education and training in higher level skills) and intellectual capital;
- (e) the role of firm size and structure-conduct-performance theories of growth, with an implied role for education and training;
- (f) the spill-over effects and externalities that result from higher investments in human capital.

A key objective is to draw together these disparate strands and to identify the common messages about the links between education, training and skills and various indicators of performance.

2.3. Approach

The approach adopted is to conduct a series of extensive international literature reviews of research in each of these areas, covering economic, econometric, business organisation and other related disciplines. These each focus on different aspects of the relationship between investment in education, training and skills and economic performance. It is argued that it is also necessary to consider some micro level research, which has a bearing on outcomes at a broader macro level. In particular, research into firms and

industries is considered very important in understanding the contribution of education and training to overall economic growth. The paper builds upon and extends the analysis presented in the two previous Cedefop reports edited by Tessaring (1998) and Descy and Tessaring (2001).

The aim was to include as much material as possible from non-English speaking countries, as well as to provide a greater focus on VET as opposed to more general education. However, this proved much easier said than done and the present draft is heavily reliant on English language material (particularly American research) and the effects of more general education. This reflects the balance of studies currently available. In the country comparative analyses that are reported in the section on economic growth modelling, much of the analysis focuses on international comparisons, often based on OECD statistics. Although many of the authors emanate from non-English speaking countries, they publish in English.

2.4. Limitations of the study

The research explores the many diverse studies which touch upon the relationship between education, training and skills and performance in all its aspects. A variety of variables are used as indicators of investment in skills and investment in human capital. Measures of performance at a macroeconomic level are equally varied. The diversity of skills-performance literature is caused, in part, by the range of both performance and input measures used. These include differences in the level of aggregation and whether the focus of the research is concerned with private or social returns. The latter are potentially very wide, encompassing all kinds of spill-over and external effects, including impacts on the general environment. Many of these effects are especially difficult to quantify. The associated study by Green et al. (2003) into the non-material benefits of education, training and skills focuses more directly on these issues.

In investigating the relationships between economic performance and education, economists have focused on a range of measures such as the rate of economic growth, the level and rate of growth in income and wealth, the level and

change in unemployment, export performance, and the like. At an individual level more emphasis is usually placed on the link with earnings. Empirical investigations have been undertaken at both micro and macro levels, including individual, establishment, firm, industry and economy-wide level studies. The present study covers all of these.

Education and training are key contributors to the development of skills and knowledge. Typically, but not always, the latter are reflected in the award of some form of qualification or credential. It is these measured qualifications that are normally used to capture the human resource input into the production and growth process. Where such measures are not available, years of completed schooling are often used instead.

At the organisational level, more complex indicators are often deployed. Higher levels of competences should result in superior performance by the individual and, other things being equal, by the organisation in which the individual works. When such organisations are aggregated together, the higher competences should be reflected in higher national growth. Campbell (2001) has recently argued, for example, that, for the UK, long-term studies show a considerable contribution by education to economic growth at a local level.

Most studies of economic performance at the level of individual establishments have been of private sector companies. While there are examples of economic studies of public organisations and institutions, these are relatively rare and it is usually necessary to go to other disciplines, such as HRM, to find more information. There are also other, more holistic, approaches to performance that focus mainly on geographical areas. For example, city dynamics forms a very large and growing area of research undertaken by economic geographers. This is given brief coverage in the present review, but the associated study by Izushi and Huggins (2003) analyses the impact of investment in human capital on regional growth across the EU.

It is important to emphasise that the present review does not attempt to assess the precise values of the parameters reported, although it is concerned with the direction and strength of the relationships. The focus is more on the nature of the key indicators and the variables used in studies and the general nature of the relationships established.

2.5. Structure of the present report

The remainder of this paper is divided into seven main sections, each dealing with a particular area of literature.

Chapter 3 presents a brief overview of statistics on economic growth, employment, unemployment and various measures of investment in education and training. While this highlights the strong correlation between some of these indicators, it also emphasises the difficulties in identifying and establishing causal relationships between the two.

Chapter 4 examines evidence of such links, focussing on the conventional rate of return on education and training. Although much of this literature is now based on the use of micro level, individual data sets on earnings, its conclusions have very important macroeconomic consequences. This includes the aggregate effects of investments by individuals as well as the wider social returns.

Chapter 5 concentrates on the links between investment in skills and performance at the level of the organisation or firm. This has focussed on the use and deployment of human resources in the broadest sense. While much of this research has a micro focus, in terms of the units of observation examined, it has crucial macro implications for the performance of economies at much broader sectoral and national levels.

Chapter 6 focuses more directly on macroeco-

omic literature. It highlights the increasing range of evidence of the links between investment in education and training and economic growth. This covers a range of different approaches from the classical growth models of the 1950s and 1960s, through growth accounting methods to the new endogenous growth theories, which place education and training and other forms of investment in human capital at the centre of things.

There are a number of other areas of research which have focussed on the link between investment in human capital and economic performance. These are covered in Chapter 7, which highlights, in particular, some of the insights from market value literature. It also covers other studies concerned with the value of intangible assets, much of which is tied up in some form of human capital.

Chapter 8 covers a further series of research areas, all of which have some bearing on this topic, including structure conduct performance literature. Chapter 9 provides a round-up of work that has emphasised the externalities and spill-over effects of investment in human capital. These encompass a large range of both economic and non-economic benefits. In total, these constitute very significant macro effects of many individual investments in education and training by individuals, companies and other organisations.

Chapter 10 gives an overall summary of the findings, draws some implications for policy and makes suggestions for possible future work.

3. Statistics of growth, education and training

Many international agencies collate data on GDP, employment and unemployment. Others provide a wide array of statistics on educational spending and qualifications within different countries. Generally there is good availability of this type of data for the Member States of the EU, covering the period after 1970. Some problems arise with consistency and comparability of the data sets through time. Quantitative measures of vocational training in Member States are much more difficult to obtain and, most commonly, such data are only available for a limited number of countries, and then only for more recent years.

3.1. Economic growth

Table 1 presents estimated annual GDP per capita growth rates ⁽¹⁾ for the 15 Member States for various 5-year periods between 1970 and the year 2000. These data are based on the main economic indicators series published by OECD; the growth rates are based on GDP per capita estimates, all expressed in 1995 constant prices and using USD exchange rates for the same year. The average annual growth rate for the 30-year period is given in the right-hand column of Table 1. This shows how all countries have experienced significant

Table 1: **Estimated growth rates of GDP per capita**

EU Member States	1970-75	1975-80	1980-85	1985-90	1990-95	1995-2000	1970-2000
Belgium	3.46	2.91	0.08	2.99	0.90	2.81	2.18
Denmark	2.19	2.50	0.47	1.41	1.63	2.85	1.84
Germany*	2.25	3.34	0.68	2.91	-3.28	1.91	1.28
Greece	5.07	4.41	0.07	1.72	0.59	3.42	2.53
Spain	5.52	1.96	1.08	4.49	0.91	3.80	2.95
France	4.00	3.27	0.35	3.20	0.38	2.68	2.30
Ireland	4.93	4.48	0.27	4.48	3.56	9.90	4.56
Italy	2.41	3.85	0.81	3.03	1.08	0.11	1.87
Luxembourg	3.23	2.61	1.18	4.69	1.59	6.33	3.26
Netherlands	3.22	2.61	-0.54	3.11	0.93	3.68	2.16
Austria	3.94	3.41	1.05	3.00	1.50	2.57	2.58
Portugal	4.73	5.27	0.75	5.11	0.98	3.82	3.43
Finland	4.09	3.20	1.87	3.39	-1.51	2.07	2.17
Sweden	2.57	1.33	1.01	2.29	-0.54	2.96	1.60
United Kingdom	2.17	1.64	1.30	3.28	0.85	2.85	2.01
EU-15 (average)	3.28	2.93	0.73	3.18	0.48	3.51	2.34
* Discontinuity in German series between 1990 and 1995 is attributable to Unification. Source: OECD main economic indicators							

⁽¹⁾ GDP per capita is the most widely adopted measure of economic growth, as it standardises for the size of country. Alternative growth measures, such as the growth of GDP without any adjustment for population size, may well show a different picture.

economic growth in recent decades, with an EU annual average growth rate of about 2.3 %. The average for Germany turns out to be artificially low as a result of much slower growth (decline) in the period after unification. Ireland, a relatively small country, has the highest growth rate of all the 15 Member States. There is significant variation around the EU long-term average. Sweden shows one of the lowest growth rates over this period.

Over time, economic growth rates differ across the respective five-year periods shown in Table 1. For most of these EU countries growth was relatively strong in the 1970s, but the period from 1980 to 1985 produced a marked slowdown for all countries, with average growth rates below 1 %. The second half of the 1980s resulted in much stronger economic growth, but the early 1990s produced relative stagnation for most Member States, with some countries experiencing GDP per capita declines. There was a return to significant growth in the most recent five-year period, although while Ireland averaged annual growth rates approaching 10 %, the comparable figure for Italy was only about 1 %.

3.2. Employment and unemployment

Associated with the growth in GDP are changes in national employment levels. Table 2, based on statistics provided by Eurostat, shows longer-term trends in average annual rates of growth in total national employment. Most of the Member States have experienced positive growth in employment over each of the past four decades, despite the variation in economic growth rates. Across all the Member States employment has grown over the longer term, although individual rates of growth show some variability. Table 3, using consistent Eurostat definitions, presents estimates of unemployment rates also averaged over decades. These show a significant upward trend, especially in the period after 1980. Lower rates of economic growth have brought about higher unemployment levels across the EU, as job creation has failed to keep pace with the numbers in the labour market. The difference in unemployment rates between Member States is very marked, especially in the 1990s.

Table 2: **Growth in total employment – average annual percentage changes**

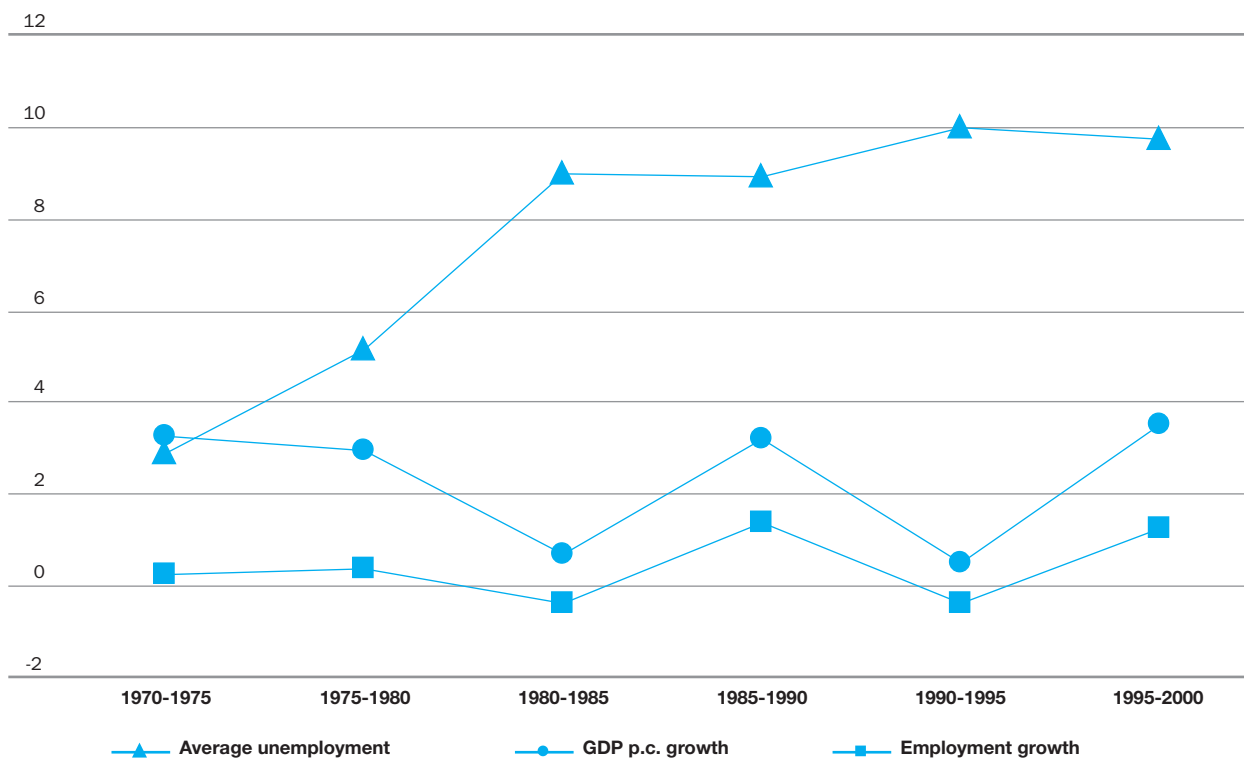
Country	1961-70	1971-80	1981-90	1991-2000
Belgium	0.5	0.2	0.1	0.5
Denmark	1.1	0.3	0.3	0.4
Germany	0.2	0.2	0.5	0.3
Greece	-0.8	0.7	1.0	0.4
Spain	0.6	-0.6	0.8	1.2
France	0.6	0.5	0.3	0.5
Ireland	0.0	0.9	-0.2	3.7
Italy	-0.5	0.7	0.6	0.2
Luxembourg	0.6	1.2	1.7	3.4
Netherlands	1.9	0.7	1.1	1.9
Austria	-0.4	0.7	0.1	0.3
Portugal	0.2	0.1	0.2	-0.1
Finland	0.4	0.3	0.5	-0.8
Sweden	0.7	0.8	0.7	-0.7
United Kingdom	0.3	0.3	0.5	0.2
EU-15 (average)	0.3	0.3	0.5	0.4

Source: Eurostat - European economy: 2001 review

Table 3: **Unemployment rates – average percentages**

Country	1961-70	1971-80	1981-90	1991-2000
Belgium	1.9	4.6	9.7	8.7
Denmark	1.0	3.7	8.4	7.1
Germany	0.7	2.2	6.0	8.1
Greece	5.0	2.2	6.4	9.5
Spain	2.5	5.4	18.5	19.6
France	1.8	4.1	9.2	11.3
Ireland	5.4	7.7	14.7	11.1
Italy	4.8	6.1	8.7	10.7
Luxembourg	0.0	0.6	2.5	2.6
Netherlands	0.9	4.4	8.5	5.4
Austria	2.5	1.8	3.3	3.9
Portugal	2.5	5.1	7.3	5.6
Finland	2.3	4.0	4.7	12.5
Sweden	1.7	2.1	2.6	7.7
United Kingdom	1.7	3.8	9.8	8.1
EU-15 (average)	2.2	4.0	9.0	9.9

Source: Eurostat - European economy: 2001 review

Figure 1: **Average growth and employment rates in EU**

Source: Eurostat statistics

Figure 1 provides a simple comparison of GDP per capita growth rates, total employment average annual growth rates and unemployment average percentages for the 15 Member States across six time intervals over the period 1970-2000. The graph shows how GDP and employment growth move closely together. Unemployment has risen steadily over the longer term.

3.3. Educational participation

International education statistics tend to be less readily comparable than economic growth data and employment data, but organisations such as Unesco and OECD have long published figures measuring educational variables. More recently, results from various European labour surveys have supplemented these sources of information. Unfortunately, in this area, different surveys often seem to produce statistics that can be significantly at odds with one another; see for example the discussion in Barro (2000). Table 4 reproduces data measuring total expenditure on education as a percentage of GNP; this is mainly

derived from various Unesco Statistical Yearbooks. Since the statistics in Table 4 are only concerned with the 15 Member States, these data are considered to be relatively comparable.

Table 4 shows how, overall, EU countries have maintained educational expenditure as a more or less constant percentage of GNP. Given that these economies have been growing steadily over the period since 1970, educational investment has also been increasing in line with economic growth. Some Member States significantly increased their educational expenditures (as percentage of GNP) over the 30-year period; Greece, Spain, Ireland and Portugal are the best examples. The average percentage levels were consistently higher in Denmark, Finland and Sweden than in the other Member States. The data in Table 4 suggest some variability in education budgets over the five-year observation periods. This may be as a result of political policy changes or it could simply be a reflection of changing measurement practices in the different countries. International time series of education variables can sometimes be rather inaccurate and most studies, such as those described in Chapter 6 below, use broad average

Table 4: **Total expenditure on education as percentage of GNP**[illegible]

observations in cross-sectional comparisons, rather than time series analyses.

Comparison of the data in Tables 1 and 4 illustrates immediately some of the difficulties in establishing links between indicators of education and economic growth. There are no obvious patterns. Sweden, which has one of the highest percentages of expenditure on education, has one of the lowest growth rates. Ireland, the fastest growing country, cannot attribute this to a higher than average proportion of spending on education or growth in the percentage. The links between these variables are often complex and difficult to identify.

Educational expenditure provides only a very broad measure of investment in human resources. Other statistics are available on the percentage of those of eligible age in the population enrolled in various categories of education. For most Member States, primary and secondary education participation is virtually 100 % and trends over time have very little significance. However, the percentage of the eligible population in tertiary education shows marked variability between EU countries and changes over time are

very apparent. Table 5 summarises this data, as derived from various Unesco statistical year-books. All the Member States show very significant increases in the percentages entering tertiary education over the 25-year period covered by the data. By 1995, the EU average was approaching 50 %, showing a strong trend growth, especially in the period since 1985. Again, there is no obvious link between these indicators and performance in terms of GDP growth.

Other indicators of educational investment are also available, such as statistics on the average number of years of education completed by members of the working population in different countries. Some detailed studies are available comparing qualification rates in particular areas of study, such as mathematics, sciences and foreign languages; see, for example, some of the data reproduced in Prais (1995). Further statistics that try to provide some measure of the quality of educational input detail the qualifications of those who carry out the teaching in schools and related educational establishments.

Virtually all published education statistics show

Table 5: **Percentage of population aged 18-22* entering tertiary education**

[illegible]

increasing levels of investment over time across all the Member States. These increasing trends are correlated with economic growth statistics. However, the direction of causality remains to be established. Is increased educational investment a prime factor determining growth in GDP per capita or is this observed increase in education a result of continuing economic growth? The literature on economic growth reviewed in Chapter 6 of this paper suggests that there is a growing weight of evidence that it is the former, although

there is also important feedback in the other direction.

3.4. Educational qualifications of the workforce

The OECD has adopted the international standard classification of education (ISCED) system to facilitate comparisons of educational attain-

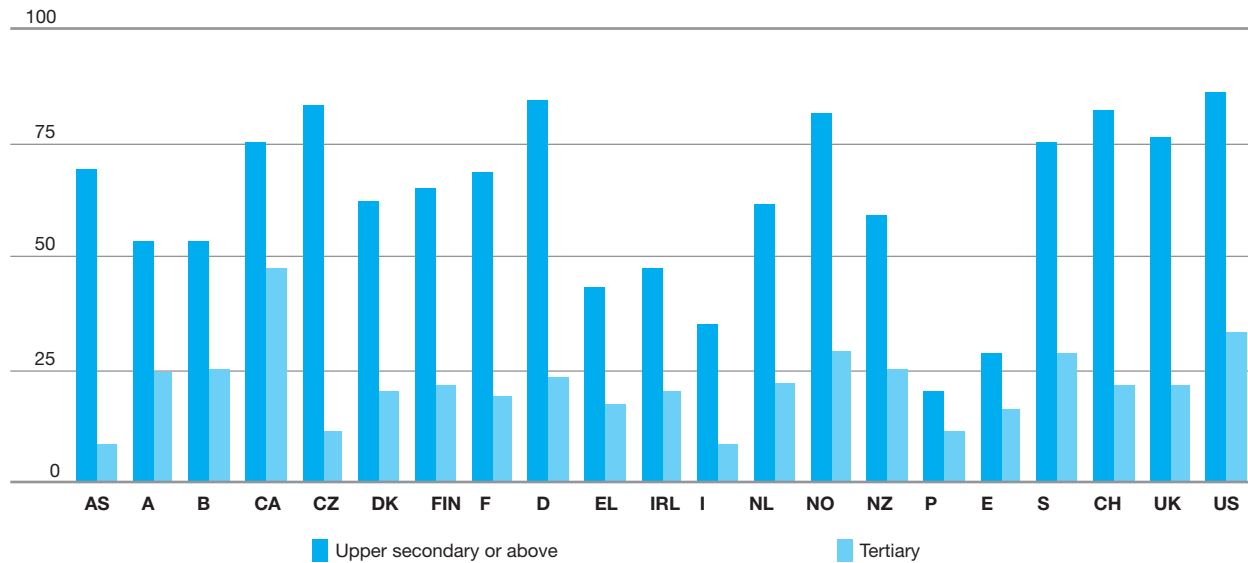
Table 6: **Educational attainment of the adult population.**

	Highest completed level of education		Average years of schooling
	Upper secondary or above (%)	Tertiary (%)	
Australia	53	24	11.9
Austria	69	8	11.9
Belgium	53	25	11.7
Canada	75	47	13.2
Czech Republic	83	11	12.4
Denmark	62	20	12.4
Finland	65	21	11.6
France	68	19	11.2
Germany	84	23	13.4
Greece	43	17	10.9
Ireland	47	20	10.8
Italy	35	8	10.0
Netherlands	61	22	12.7
New Zealand	59	25	11.4
Norway	81	29	12.4
Portugal	20	11	10.0
Spain	28	16	11.2
Sweden	75	28	12.1
Switzerland	82	21	12.6
United Kingdom	76	21	12.1
United States	86	33	13.5
OECD average	62	21	11.9
NB: The estimates of average years of schooling relate to total cumulative time spent in formal education over all ISCED levels from the beginning of primary level (ISCED 1) to tertiary level. These estimates are obtained by using data on educational attainment of each age group from the labour force survey and applying an estimated average cumulative duration for each level of education. Where there are programmes of different duration at the same ISCED level, a weighted average is taken based on weights corresponding to the number of persons in each broad educational programme. Source: Education at a glance – OECD indicators (OECD, 2001a), indicator A2.1, p. 38 (using data on educational attainment of individuals from labour force survey sources, or in the case of Denmark, the register of educational attainment of the population).			

ment between countries ⁽²⁾. ISCED was originally designed to serve as an instrument suitable for assembling, compiling and presenting statistics of education both within individual countries and internationally. The ISCED typology is described

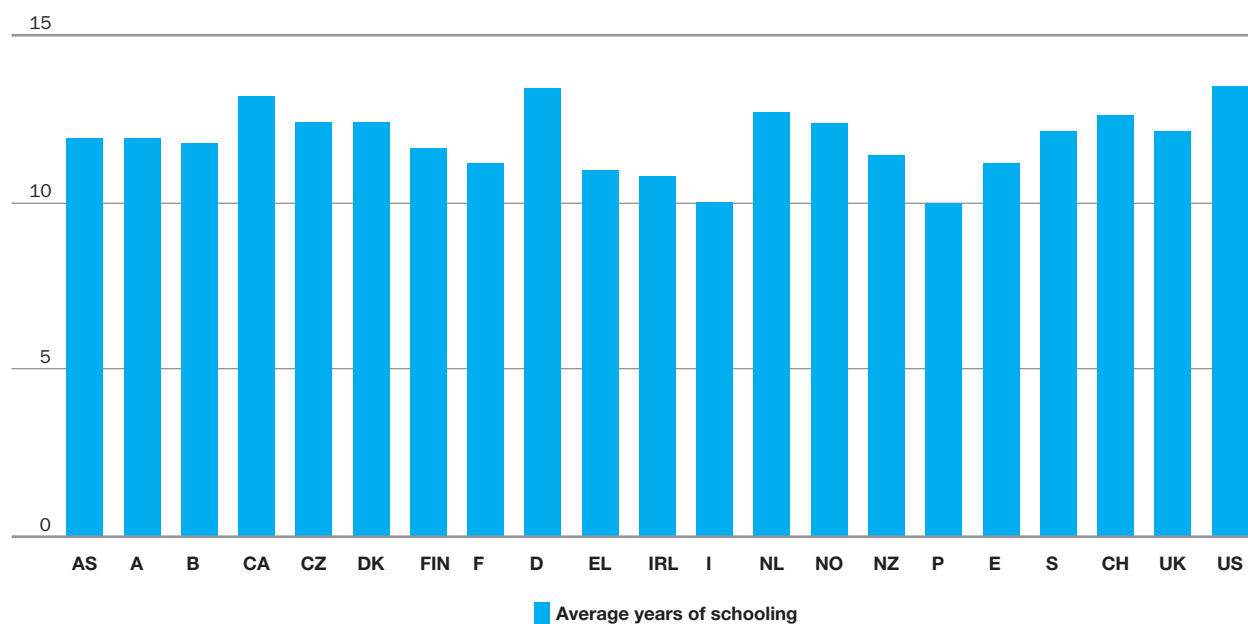
in further detail in Annex 1. This classification system forms the basis for much of the comparative evidence emanating from the OECD on education systems (e.g. OECD, 2001a; Steedman and McIntosh, 2001). International comparisons

Figure 2: **Highest educational attainment of the adult population**



Source: OECD (1998)

Figure 3: **Average years of schooling**



Source: OECD (1998)

⁽²⁾ OECD has adopted ISCED, but Unesco remains responsible. Unesco revised ISCED in 1997 with the aim of reflecting evolution in education-training systems and increasing comparability of data. The new ISCED distinguishes between programme orientation (general education, pre- and vocational education and training) and programme destination (further studies, labour market). This means that there exist consistent and comparable data on education and training (but the potential of new ISCED is still unexplored).

Table 7: **Average schooling and no schooling rates 1970-2000**

	Mean school years				% with no education (age 15+)			
	1970	1980	1990	2000	1970	1980	1990	2000
Middle East/North Africa	2.07	3.29	4.38	5.44	69.8	55.5	42.8	32.0
South Asia	2.05	2.97	3.85	4.57	69.3	66.9	55.2	45.2
Sub-Saharan Africa	2.07	2.39	3.14	3.52	63.8	56.8	45.9	42.8
East Asia and Pacific	3.80	5.10	5.84	6.71	35.4	22.6	26.4	19.8
Latin American and Caribbean	3.82	4.43	5.32	6.06	31.2	23.8	17.2	14.6
Advanced countries	7.56	8.86	9.19	9.76	5.1	4.8	4.5	3.7
Transitional	8.47	8.90	9.97	9.68	3.1	2.8	1.7	2.2
World	5.16	5.92	6.43	6.66	31.4	29.5	26.4	24.2
Source: Barro and Lee (2001)								

of education are typically based on years of schooling, and/or the highest educational level achieved.

A comparison between OECD countries of educational attainment is provided in Table 6 and Figures 2 and 3. Two measures are provided – the proportions of the working age population whose highest attainment level is upper-secondary or tertiary (primary level attainment is now almost universal in the OECD) and the average number of years of schooling. As can be seen, there are only relatively small differences between countries in terms of average years of schooling across the OECD.

Recent work by Barro and Lee (1993, 1996, 2001) has also focused on comparisons of educational attainment between countries. However, given the wider set of countries they consider – including many developing and transition countries – and the paucity of detailed data (such as household surveys), especially for their historical series, they simply focus on average years of schooling and a broad measure of education level attained. Table 7 and Figures 4 and 5 provide some details for a range of country groups.

In general, there have been increasing average levels of participation in education over the last three decades, in all regions, but growth has been particularly strong in the Middle East and North Africa. Mean school years have increased in developed countries too, with the net result that there has been a substantial increase in the world stock of educated people, although little convergence between regions. South Asia and

Sub-Saharan Africa still have substantial proportions of their populations with very little or no education.

A simple comparison of these data with those on economic growth rates does not reveal any obvious and immediate links. Teasing out the causal links between the two is a complex problem, as the discussion in subsequent sections makes clear.

3.5. Vocational training

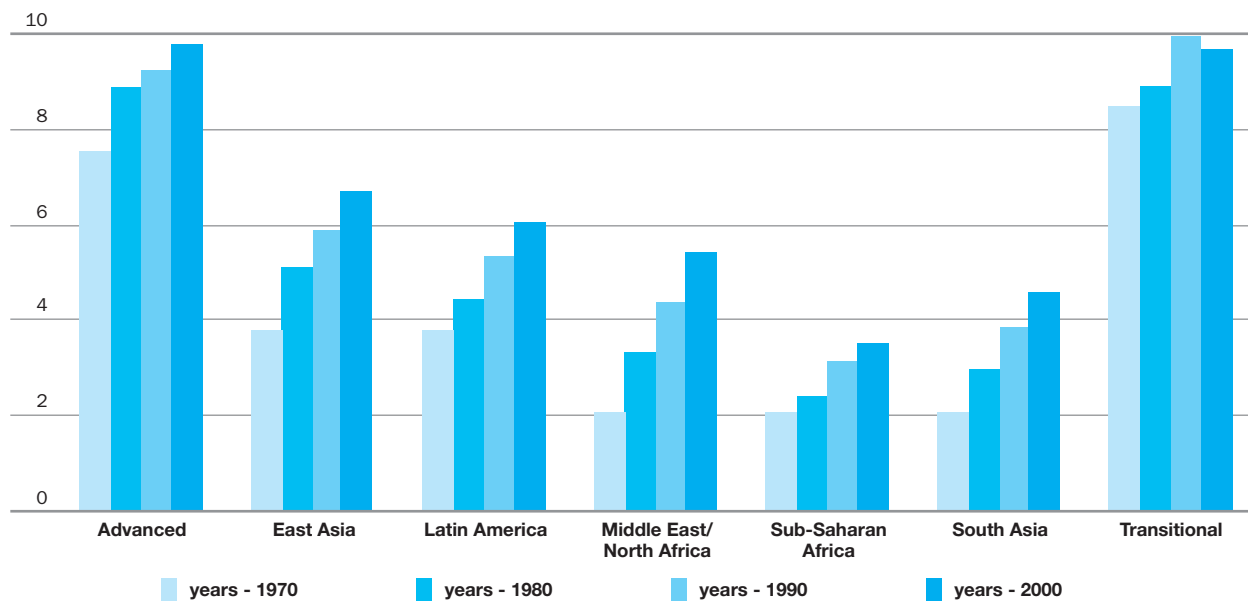
Consistent statistics detailing trends in vocational training across EU countries are often more difficult to obtain, although more recent OECD statistics and European labour force surveys (ELFS) provide much useful comparable information in this area. Table 8 shows some comparative data for selected Member States for one particular survey period. While consistent definitions were agreed for the ELFS, exactly what sorts of training are included and which are excluded by the survey questions is not at all obvious. McIntosh (1999) has detailed a whole range of difficulties in trying to use these data to draw quantitative comparisons about levels of vocational training across the EU. Questionnaires used to collect this information are often revised and modified between successive surveys, so that discontinuities in the data sets over time are commonplace.

Table 8 appears to show some marked discrepancies across countries between the percentages of individuals receiving training in the month prior

to the survey; while Sweden has just over 10 %, France and Portugal have less than 1 %. However, much of this variation is explainable in terms of how the training question is interpreted in different countries, rather than real observable

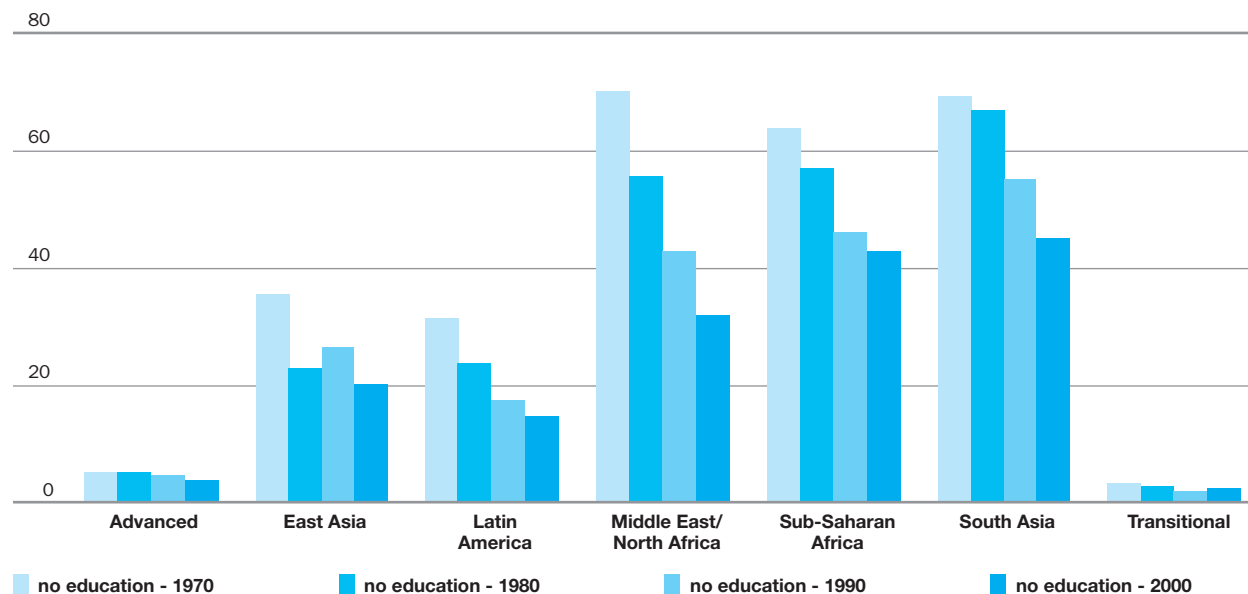
differences. Much of Table 8 is concerned with how the incidence of training is distributed across the characteristics of individuals, their job tenures and their places of work. In most Member States, training is concentrated on those in the younger

Figure 4: **Schooling attainment 1970-2000: average years of schooling**



Source: Barro and Lee (2001)

Figure 5: **Schooling attainment 1970-2000: percentage of population 15+ with no schooling**



Source: Barro and Lee (2001)

age groups, although Sweden is a significant exception. While in the Sweden and the UK vocational training is aimed more towards those employees with higher prior education levels (ISCEDs), in Germany the opposite is the case, with the least qualified employees being those most likely to receive training. Workers who have been in the job for the shortest period of time receive more training in France and the UK than longer-term employees, whereas in Sweden the pattern is reversed with training increasing with length of job tenure. Table 8 also shows how in Germany, France and the UK training incidence is highest in smaller enterprises that employ fewer workers, while in the Netherlands training is highest in the largest enterprises.

It is clear that these training statistics are complex and difficult to interpret, given the significant differences that underlie the national voca-

tional training systems. There is good reason to suppose that vocational training, like its educational counterpart, has been on an increasing trend in all Member States over recent decades. However, measurement problems mean that vocational training data are unlikely to be suitable for inclusion in models of the kind described later in this study. In an earlier Cedefop report, Luttringer (1998) has detailed some of the difficulties in defining precisely investment in continuing vocational training and also in relating it to productivity gains, both at the micro and macro levels.

A proxy measure of skill levels in populations is provided by the OECD's international adult literacy survey (IALS). However this survey only covers a limited number of EU countries over the period 1994 to 1998. It is very likely that increases in adult literacy are associated with economic growth.

Table 8: **Comparisons of vocational training based on European labour force survey**

Category	Germany	France	Netherlands	Portugal	Sweden	UK
All employees	4.9	0.5	5.3	0.1	10.5	7.3
Females	4.8	0.3	4.4	0.1	10.8	6.7
Males	5.0	0.6	5.8	0.1	10.2	7.8
Age 15-20	65.1	26.5	8.0	0.2	3.4	25.6
Age 21-30	3.5	0.5	6.7	0.1	9.0	6.6
Age 31-40	0.8	0.1	5.4	0.1	12.1	6.2
ISCED high	1.0	0.2	3.7	0.3	14.7	10.5
ISCED medium	1.9	0.2	5.8	0.2	10.1	6.0
ISCED low	24.6	1.1	5.1	0.1	6.0	6.5
Tenure +6 years	0.5	0.1	4.6	0.2	11.7	5.6
Tenure 1-5 years	9.8	0.1	8.5	0.1	10.0	6.7
Tenure <1 year	6.2	2.5	3.4	0.1	7.7	8.1
< 11 employees	5.5	1.4	3.5	0.1	-	9.3
11-19 employees	5.5	1.3	4.4	0.2	-	6.6
20-49 employees	4.4	0	3.9	0	-	6.9
50 > employees	3.4	0	5.9	0.4	-	7.0

4. Rates of return on education and training

4.1. General literature strands

There is extensive and detailed literature on rates of return on education and training, based on human capital theory. Much of this literature relates to the rates of return for the individual and society in general of investment in human capital, in the form of education and training. Most of this microeconomic research draws on work by Becker (1964), Mincer (1974) and many others. Measuring the benefits of education and training is complex and can be considered at various levels and from differing perspectives:

- (a) at an individual level, examining the impact of education or training on the chances of being employed or unemployed or, most commonly, earnings;
- (b) from an organisational perspective, examining the impact of education and training on organisational performance. The extent to which employers engage in training their staff and provide employees with transferable skills in the labour market is critical (Stevens, 1999);
- (c) at a macro level, examining the role of education and training, typically using qualifications as a measure of activity, and their impact on productivity, output growth and employment.

The discussion in this section briefly focuses on certain aspects of the first of these, while the second and third form the subject matter of Chapter 5 and 6 respectively.

4.2. Rates of return on investment in human capital

A number of reviews on the rates of return on general education and training have been undertaken; most recently both Harmon and Walker (2001) and Blundell et al. (2001). A review of the most significant literature on rates of return on continuous vocational training in companies has been carried out by Barrett (2001), in an earlier Cedefop report. Sianesi and Van Reenen (2000)

have carried out a review of the macroeconomic returns on education, but this largely deals with research considered in subsequent sections of the present document.

General literature on the subject demonstrates most directly the links between education and training and performance at an individual level. However, it is important to appreciate how some of the microeconomic theory and analysis carries implications for the macroeconomic level which, (subject to certain concerns about the extent to which qualifications act as a signalling device rather than actually enhancing productivity), can be regarded as the sum of the individual parts. While much of the evidence relates to the benefits to the individual, it is clear that this has direct implications at a more macro level.

The main emphasis of most of this research is on the returns on higher education (e.g. a first degree), although there is fairly extensive literature on the returns on training, particularly in the US. The prime focus of most of this literature is also upon the benefit to individuals, although some explicit efforts have also been made to assess wider benefits to society as a whole that effectively represents a macro effect, which is the principle concern of this study.

The key concept here is the notion of the rate of return on the investment in human capital that education and training represents. Rates of return are typically estimated in two ways:

- (a) early studies used a discounted cash flow, accounting framework;
- (b) more recently researchers have adopted an earnings function approach.

The effects on employment, productivity and earnings can be expressed in terms of the rate of return on education and training.

Typically, rates of return are computed for various qualifications or for the length of time spent in education or on training courses. The rate of return expresses the value of an additional year of education (or the value of a particular qualification) in terms of the associated increase in earnings or income. The issues addressed in the wide variety of studies that have estimated

rates of return on education and training include variations in rates of return according to type of qualification, gender, age and ability; the screening impact of additional education to filter individuals into well-paid jobs; the effects of over-education and the direct impact of education and training (including government training schemes) on the probability of employment.

The discounted cash flow accounting approach compares income or earnings streams of individuals with and without the education or training programme (i.e. they compare graduate income streams with those whose highest qualification is A level ⁽³⁾). The calculation generates an internal rate of return on the investment that can be compared to the going rate of interest. It is possible to distinguish between two substrands: *ex post* rates of return (which generally compare actual incomes of individuals of different ages, with and without the education or training) and *ex ante* rates of return (which generally compare an individual's perceptions of future income streams over future years with and without the education or training).

The earnings function approach, involves estimating an earnings function based on data on the earnings of large samples of individual workers, together with information about their personal and other characteristics, including their investments in education and training. Estimates of rates of return on years of schooling or on individual qualifications can be obtained from such an analysis using a method pioneered by Mincer (1974). Although it has been refined in various respects, this basic approach has become the accepted standard, allowing for problems of endogeneity and spurious correlation to be directly addressed. Although the discounted cash flow approach still has some adherents and is still useful in situations where the large cross-Sectional data sets on individual earnings are not available, the earnings function model is now by far the most popular.

In effect, both approaches attribute the difference in income between individuals or groups of individuals to the education or training programme. This is only true if the individuals being compared (i.e. those with and without the education or training) are identical in every important respect. Finally, this approach makes no

allowance for selection biases (i.e. that the individuals most likely to benefit select themselves/are selected onto the programme). Some researchers have tried to address the issue of selection as well as testing the biases resulting from ability. Their results suggest that the major part of the benefits that accrue to individuals as a result of investment in education or training reflect enhanced productivity. Hujer et al. (2003), in an associated study, discuss some of the methods and limitations of evaluation and impact research.

Despite this, there have been continuing concerns about over-education, qualification inflation and graduate unemployment, see for example, Büchel (2001). In the UK, two papers by Brynin, (2002a and b) focus on these concerns. They examine first, the impact of graduate densities on wages, and second, the impact of over qualification on returns on first and second jobs. Graduate density is defined as the proportion of graduates in employment defined by both occupation and industry. Together with other variables, including average education, these measures are then used as potential explanations of wage outcomes.

The results suggest some evidence of graduate overcrowding but also gender-based job segregation that appears to operate in favour of women. For men, there are diminishing returns from expansion in graduate numbers overall. Brynin also examines the extent and impact of over qualification for a job. Normally this is assessed by asking about the level of education required for the job and comparing this to actual qualifications. This often indicates that a large proportion of people have some excess education, although typically they earn more compared to other people doing the same kind of work. Normally such individuals earn less than those doing the kind of job for which they consider they are appropriately educated. The results indicate that for younger cohorts, having excess education brings diminishing returns in their first job, but this does not apply to the older cohorts. These points were originally raised in the Cedefop second research report, Part 4.

Brynin reports that, as average qualification levels have increased over time (as measured by

⁽³⁾ The General Certificate of Education (GCE) Advanced (A) level is normally taken at the end of secondary school in the UK. A levels are the main standard for entrance to higher education.

average O-level/GCSE ⁽⁴⁾ results), the status of second as well as first jobs (as measured by the 'Hope-Goldthorpe scale' of occupational status) has been declining. This does not necessarily imply the need to put the brakes on the expansion of education but does demonstrate that not everyone will benefit uniformly from further expansion of education.

4.3. Private versus social rates of return

An important feature of this micro literature, carrying implications for macro studies, is the key distinction between private and social rates of return. In effect, the private rates relate only to the costs and benefits experienced by the individual undertaking the education or training. In particular, the costs of education would only involve those elements paid for by the individual (i.e. they would not include fees if these were paid by the government) and higher future incomes would be assessed net of tax. The social rate of return, on the other hand, takes into account all costs and benefits. Private and social returns are generally always different for the types of reasons set out above. An Austrian empirical study by Fersterer and Winter-Ebmer (1999) demonstrates some of the differences in the rates of return on various levels of education for Austria.

In addition, there is the issue of spill-over effects and externalities from education and training, which may also have a distinct spatial aspect. An example relates to poaching. If, for example, few firms train, then the trained workers can be offered higher salaries by firms that do not undertake training. The firms which train lose in this process and the firms that do not train benefit, although, increasingly, firms ask for a repayment of training costs if workers leave a firm. This undermines the incentive to train. If, however, all firms train (to the same standard), then, ignoring differences in types of skills, there is no incentive to poach and, when individuals do move, those lost can be replaced by others of

equal skill level. There are other aspects of social returns, however, linked to new growth theories, which are developed in Chapter 9 below. In particular, the bridging concept is that education spills-over from the educated to the non-educated group. The original idea was proposed many years ago by Blaug (1972).

Mingat and Tan (1996) produced estimates of social returns on education, to incorporate externalities and non-economic effects, for a wide range of countries over the period 1960-85. They used the overall economic performance of the various countries to capture these externalities. Their results confirm the social profitability of investing in education, but they suggest that the results are sensitive to the stage of economic development achieved by the individual country. The best returns for low-income countries came from investing in primary education, in secondary education for middle-income countries, and for the highest-income countries the optimal social return was from higher education. Despite this, there is evidence from some countries, including the UK, that there are still significant benefits to be obtained by investing in basic literacy and numeracy among those segments of the population that have, for one reason or another, missed out on education, Dearden et al. (2002)

Harmon and Walker (2001), in their recent review of evidence and issues relating to the returns on an individual's education, indicate a considerable degree of consensus on estimates of the rate of return for an additional year's education. Basic specifications suggest a return for a year of schooling of between 7 and 9 %. Most studies suggest that women gain more from additional education than men, that those in the top part of the income distribution gain higher returns per year of education than those in the bottom part, and that the effect of underlying ability on earnings is small compared with the effect of education. The impact of such education on overall national output and productivity is not considered by such studies.

Much of the analytical debate regarding the need for greater public investment in education and training has rested on the social rate of return relative to the private one. Evidence on social rates

⁽⁴⁾ The Ordinary (O) level is the main examination taken by secondary school pupils in the UK leading to the General Certificate of Secondary Education (GCSE). They are usually taken after four or five years of secondary schooling and can lead to more advanced education and training.

of return looks at the benefits to the economy from increased years of education, typically by calculating the costs of education/schooling compared to pre-tax earnings. From a methodological perspective this is contentious due to the need to make many assumptions, but available evidence indicates returns are around 6-12 % (Chevalier et al., 2001) (Steel and Sausmann, 1997). A new study by Trostel et al. (2002), uses broadly comparable data covering a number of countries to show that recent rates of return on schooling vary significantly across the 28 countries in the sample set but are still generally positive and large.

The present study is as much concerned with vocational training as with general education. The most obvious and direct effect of training by employers is to provide additional skills and to raise productivity. This is the central notion of the human capital model of training. Barrett (2001) reviewed a number of empirical studies across several countries, examining the links between

returns on continuing vocational training and company performance. The main results suggest that strict rates of return, equivalent to those used in the higher education studies, have rarely been used in the evaluation of continuing vocational training. Such training is usually found to have a positive effect on both productivity and wages, but there have been few attempts to demonstrate whether these are sufficient to guarantee a good rate of return. Specific training has the greatest impact by raising the productivity of the employee within the firm providing the training. General training, which can be used by all companies, is still beneficial, but it tends to have less impact on company performance, although it may have important benefits for the individual and for society at large. There remain important differences in the perception of the value of training between the individual, the company investing in the training and society as a whole. These issues are more fully investigated in the associated study by Hansson et al. (2003).

5. Human resources and performance

5.1. Links between human resources and performance at company level

Most of the studies on rates of return discussed in the previous section are concerned with issues of appropriate measurement and analysis of the factors that lead to variation in the measured rates for the individual. Generally, there is no attempt to relate such rates of return specifically to more general corporate performance. It can be assumed from human capital literature that greater education leads, *ceteris paribus*, to higher productivity, which will be reflected in economic growth or other kinds of improved performance for the individual company or organisation.

Outside mainstream economic literature, studies in the management of human resources report a range of results concerning the impact of human capital on firm and industry performance. Such literature bridges the gap between rate of return analysis and macro level studies. It suggests that companies employing managers, professional and other staff with higher qualifications can expect to achieve better commercial performance. This literature is briefly reviewed here.

There has long existed a widely held belief that people are a key source of an organisation's competitive advantage (Prahalad, 1983) (Pfeffer, 1994) (Wright et al., 1994). By implication, it may be argued that it is the quality of the management of human resources that determines organisational performance (Adler, 1988) (Reich, 1991) (Youndt et al., 1996). There appear to be a number of different emphases in this literature, including the role played by managers, as well as the extent and nature of human resources themselves.

5.2. Management skills and organisational performance

A key theme in the economics and broader management literature has been the important role that managers (and administrators) play in

determining organisational performance. Amongst trading companies, for example, it has generally been assumed that the capacity of the chief executive officer (CEO) or the management team forms the ultimate limit to the rate of sustainable growth (Bosworth and Jacobs, 1989).

The way in which this line of thinking developed was to look at the goals of the large owner-managed firms and the manner in which these impacted upon company behaviour. The empirical counterpart to this was structure-conduct-performance literature, where firm size and market power were key components. This section focuses on more recent literature concerned with the level and discipline of qualifications of the workforce and, in particular, the CEO or management team. (Bosworth, 1999).

There is no real underpinning theoretical literature, although there are clearly links with the theories relating to individual rate of return, human capital and the value of intangible assets. Empirical modelling usually attempts to relate P , some measure of company performance to Q , a vector of qualification and skill-related variables, and X , a vector of other variables influencing company performance.

A further issue is the use of qualifications as a measure of the quality of workers or managers. Certainly education and training impart a variety of knowledge and skills that may raise the productivity of the individual in the job in which they are employed. However, these are input and not output measures. There is no indication as to how good or relevant the education or training is or, indeed, the capacity of the individual to absorb the knowledge. In some ways this can be seen as an empirical issue. It is possible simply to estimate an equation where P is determined by Q and X , to see whether qualifications are significant or not, in the presence of other determinants. It should be noted that measurable qualifications are not the same as actual skills or quality of competence.

The role of leadership has been defined in several ways. The first is 'stewardship', which is typically represented as a dummy variable for a

specific CEO in a particular company (Lieberson and O'Connor, 1972) (Weiner and Mahoney, 1981). A dummy variable is defined D_{ijt} as taking a value of 1 when the i th CEO is heading company j at time t . An alternative way is to attempt to quantify CEO 'strategy' by observing key variables over which the individual has control, such as capital structure and retained earnings (i.e. two financial strategy variables). It can be seen that the first variable is a crude proxy, and the second echoes the Tobin's Q type specifications discussed in Chapter 7 below.

HRM literature is mixed in its views about the impact of leadership. One strand argues that the evolution of formal and informal organisational structures in large corporations means that they largely run themselves, so effectively limiting the influence of any single individual, even the CEO. Hall (1977) argues that leadership is important in times of growth, development and crisis, but not in times when the organisation is roughly maintaining a *status quo*. Weiner and Mahoney (1981) point out that while the presence of a leader remains essential, the particular leader that is chosen may be of little importance. Lieberson and O'Connor (1972) found that situational and organisational factors were of greater importance than leadership.

5.3. Empirical studies at company level

Issues of HRM at company level were discussed earlier in Cedefop's second research report, Part 3 and they are also reviewed in the parallel study by Hansson et al. (2003). A key theme of HRM literature is the link between HRM strategy employed by the organisation and performance. Youndt et al. (1996), for example, distinguish between universal and contingency strategies ⁽⁶⁾. The authors report that their empirical study largely supports the contingency approach. More importantly, from the perspective of the present study, the authors conclude that HRM systems, which focus on human capital enhancement, are directly related to multiple dimensions of organi-

sational performance, in particular to employee productivity, machine efficiency, and consumer alignment. However, in line with their conclusions about the contingency approach, Youndt et al. report that fuller analysis reveals that enhanced performance is predominantly the result of linking human-capital-enhancing HRM systems with quality manufacturing strategies. There is a link between HRM strategy and the quality of management decisions.

An earlier survey of over 700 UK production companies revealed the relatively low levels of qualifications of both the boards of directors and their CEOs (Bosworth et al., 1992). However there was strong confirmation of a link between the existence of a R&D culture and the ability and willingness to innovate, particularly when graduates were employed to carry out R&D. Regression analysis of the extent of the introduction of new technologies by companies in the sample (a performance indicator) revealed a positive correlation between the probability of innovation and the presence of graduates in the workforce. Firms that utilised these advanced technologies tended to outperform non-users in a number of respects. In particular they worked closer to full capacity and had higher growth in turnover and market share. However, one consequence of working closer to full capacity and being more dynamic was that such companies tended to experience more acute skill shortages. The study reported both direct and indirect (i.e. *via* innovation) links between qualifications and performance. Two of the main conclusions drawn from the study, were '[...] the presence of graduates [...] improves general economic performance' and '[...] the differential impact of graduates (generally) on company performance [...] is much more clear-cut than the differential performance that could be attributed to the employment of professional scientists and engineers *vis-à-vis* graduates from other discipline areas.'

Barry et al. (1997) update and extend the earlier results of Bosworth et al. (1992) and compare them with a study by Wood (1992), who linked a profit-based measure of performance to qualifications. Wood found that manufacturing companies run by CEOs possessing any kind of degree/profes-

⁽⁶⁾ 'The universal, or "best practices" perspective implies a direct relationship between particular approaches to human resources and performance, and the contingency perspective posits that an organisation's strategic posture either augments or diminishes the impact of HR practice on performance.' (*op cit.* p. 837).

sional qualifications were more likely to achieve superior levels of profitability. However, there was no evidence that the precise type of degree/professional qualification held by the CEO made a great deal of difference to the level of profitability.

The Barry et al. (1997) study focused more simply on the top executives of the companies, rather than the earlier approach that had incorporated both non-executive and executive directors. A key conclusion on the role of qualifications was that companies headed by qualified top executives tended to outperform those with unqualified top executives and many of the latter companies exhibited significant under-performance in the market-place. A further conclusion concerned the contribution of the discipline background of the top executive, whereby companies headed by top executives with non-technical qualifications – particularly accounting – outperformed companies with top executives who were qualified engineers or scientists.

A key question relates to what the measure of company performance should be. Earlier conceptual literature suggested that growth might be a key performance indicator, but there is little in empirical literature that has tested such a relationship. There are some models in structure-conduct-performance literature that have explored the influences on growth, but these have not usually incorporated the human capital variables. There are, however, some studies that test alternative goals, such as profits. Here, however, it is not possible to use, for example, private rates of return theory as an underpinning, as this is based upon the idea that individuals are paid the value of their marginal product (or some equivalent dynamic concept). However, it is fairly easy to think of a rationale from the more institutional/contracting literature that suggests, for example, more qualified individuals are offered contracts that induce them to generate a surplus. This surplus is then shared between shareholders and qualified workers in the form of both higher profits and higher wages.

A study by Ballot et al. (2001) examined the impact of human and technological capital on productivity in a panel sample of large French and Swedish firms. Specifically, measures of a firm's human capital stock were constructed on the basis of past and present training expenditures. The results confirm that such firm-sponsored training, together with R&D, are key inputs

to the market performance of firms in both countries. Another study by Blechinger and Pfeiffer (1998) used survey data for the German manufacturing sector to explore the links between employment growth, technological change and labour force skill structures. Innovative firms experienced the highest growth rates and such firms tended to employ more highly skilled workers. An HRM study by Papalexandris and Nikandrou (2000) into Greek firms found that, where training was treated as a continuous, life-long learning process, it had considerable impact on the growth of firms.

5.4. Empirical studies at the industry and sector level

A different approach to exploring the links between investment in human resources and productivity in organisations is that developed over the last 20 years by researchers at the national institute of economic and social research (NIESR) in the UK. Much of this work is summarised in Prais (1995) and all the relevant papers have been published in full in various editions of the *National Institute Economic Review*. The research approach consists of carrying out empirical international comparisons of productivity and associated schooling and vocational training investments between Germany, France, the Netherlands, the UK and other selected countries. Often matched samples of plants and firms from specific industrial sectors have been used to explore the productivity and human capital relationship.

It should be noted that this body of research draws on statistics and information from several EU countries. Moreover, this research is noteworthy in utilising vocational training data, as well as the more commonly adopted years of schooling measures. The concern is not so much with the statistical impact of an extra year of training or schooling on productivity, but rather with the results of different kinds and qualities of human resource investment.

Prais (1995) summarises broad statistical estimates from various national labour force surveys carried out in the period 1988 to 1991. This data shows marked differences in intermediate vocational training qualifications between selected EU countries. While in the UK only 25 % of all

economically active persons achieved such qualifications, the comparable figure for France was 40 % and for Germany it was 63 %. The main difference was found in craft training rather than technician training. Conversely, some 64 % of the UK workforce were found to have no vocational qualifications of any sort, whereas the comparable figure for France was 53 % and for Germany only 26 %. Prais concluded that the UK was anomalous in the relatively low proportion of its workforce that has received systematically organised vocational preparation and attained formally examined vocational qualifications. During the ensuing decade, investments in vocational training across the Member States have changed these percentages but the differentials between countries still persist and this has implications for comparative productivity.

Various studies carried out by researchers at the NIESR have sought to demonstrate the link between a better educated and better trained workforce and realised higher output per worker. Investigations were made into manufacturing plants in the UK and their counterparts in other EU countries. The studies looked into the metal-working, woodworking, clothing and food manufacturing industries, as well as selected service sector trades. It was found that across all these industries the acquisition of skills amongst the workforce was a critical factor in raising productivity, as measured by output per worker. Recent

studies of this kind have been carried out by Mason et al. (1999) into banking services and by Jarvis et al. (2002) into the ceramic tableware industries. Commonly, plants in Germany, France and the Netherlands, where the percentage of vocational qualifications was much higher, return significantly higher output per worker than their UK counterparts.

Steedman (2001) has recently compared systems of apprenticeship training across various European countries (from a UK perspective) and drawn implications for productivity. This study identified significant shortcomings in the UK approach that have resulted in an inferior quality of vocational training for young workers.

Another study by O'Mahony and de Boer (2002) confirms that the UK continues to lag behind both Germany and France in terms of labour productivity, and this gap is primarily explained by differential rates of investment in both human and physical capital. This predominantly statistical study compared labour productivity not only across the aggregate economy but also over some 10 broad industrial sectors. It applied education and training statistics, divided into higher, intermediate and lower level qualifications, to quantify comparative workforce skills in the different countries. It identified a significant association between labour productivity and measured workforce skills across the different industrial sectors of the comparator countries.

6. The role of education and training in economic growth

6.1. General literature strands

Over the last three decades a large body of literature has been produced examining the role of human capital in determining the level and growth of GDP per capita. Much of the earlier work is mainly theoretical and deals with different growth model specifications and their associated economic properties; for a summary, see Aghion and Howitt (1998). More recent work seeks to test empirically the different model specifications, most commonly using cross sectional data for a large number of countries. Some researchers have attempted time series analyses for smaller groups of countries, such as those in the OECD area, where the quality of educational data are both more frequent and perceived to be more reliable. A few studies have combined cross sectional data with time series information to produce panel data sets in which allowances can be made for country-specific effects. Two recent papers by Sianesi and Van Reenen (2000) and Temple (2000) provide useful overviews of the various empirical studies. The former paper looks at the links between formal education and economic growth across all countries, while the latter is concerned with the impact on growth in OECD countries of both education and more widely defined social capital. The present paper draws on both these studies.

From a comparative international perspective, attempts to identify the extent to which education and qualifications affect relative economic performance, including employment levels, have begun to reveal the importance of human capital. Macroeconomic models incorporate human capital into growth specifications either through extensions of the Solow neoclassical growth model (Solow, 1957) or through endogenous growth equations, as developed by Romer (1986), Lucas (1988) and others. A current application of such a model is shown in the associated study by Izushi and Huggins (2003). Fundamentally, neoclassical models imply that a one-off increase

in the stock of human capital leads to an associated one-off increase in productivity growth, whereas endogenous growth models suggest that the same one-off increase in human capital can lead to a permanent increase in productivity growth. In the short term, both models produce broadly similar results, each dependent on the precise specification, but, over the longer term, the newer growth models imply significantly higher returns on investments in human capital.

Regardless of the precise model that is adopted, there is strong evidence that higher educational inputs increase productivity and so produce higher levels of national growth. After surveying the empirical results from a wide range of model specifications, Sianesi and Van Reenen (2000) concluded that an overall 1 % increase in school enrolment rates leads to an increase in GDP per capita growth of between 1 and 3 %. An additional year of secondary education which increases the stock of human capital, rather than just the flow into education, leads to more than a 1 % increase in economic growth each year. The results vary dependent on the model specifications and the data sets in use. Sylwester (2000) has suggested that current educational expenditure leads to future economic growth, so there is a significant time lag in the causal relationship.

Aside from concerns relating to the preferred model specification, other methodological issues concentrate on the most appropriate variables for inclusion and their methods of measurement. A very important strand in the literature concerns the definition of human capital and how far human capital can be practically measured. This issue was originally addressed in an earlier Cedefop report (Westphalen, 2001), where human capital was widely defined to include knowledge, skills, competences and similar attributes. For the most part, empirical growth models adopt a much narrower interpretation of human capital and usually some measure of flow or stock of secondary education is used to proxy human capital. Typically, no attempt is made to incorpo-

rate vocational training data into growth models. Koch and Reuling (1998) pointed out some of the difficulties of measuring training investments with any degree of consistency across different countries. Recently, other authors have suggested that it is social capital as well as human capital which contributes significantly to growth (Woolcock, 2000), but given the measurement difficulties, social capital type variables have not, to date, been much used in growth models.

Another strand in the literature is concerned with the selection of appropriate data for measuring economic growth across countries and through time, on a consistent basis. A majority of studies make use of the Penn World Table series produced by Summers and Heston (1991) and this comprehensive data set has been updated and extended by Barro and Lee (1996). Some authors, such as Osberg and Sharpe (2000), have argued that GDP per capita is an inadequate indicator of the overall economic well-being of a nation and they maintain that the link between human or social capital and economic well-being is much stronger than is often implied when simple GDP measures are used in growth models. Such analyses lead towards the literature that links investments in human capital, and education in particular, to externalities in economic growth. Higher levels of education are typically associated with better environment, higher levels of public health and greater social cohesion, all of which would be expected to feed back into faster economic growth measured in the wider sense. This strand of literature has recently been surveyed in OECD (1998).

Most of the literature produced on this topic has appeared in English language publications. A majority of the studies are by UK and US authors; European authors have produced some of the OECD publications. However, the empirical studies use international data sets and EU and OECD countries are widely analysed within much of the published research.

6.2. Growth accounting literature

Growth accounting literature is deemed to be sufficiently well known to warrant only brief treatment here. Griliches (1997) has provided a useful survey of literature on applied growth accounting

exercises. This has much in common with general rates of return on education and training, although it focuses much more explicitly on macroeconomic issues with the measured effects of education and training in the form of higher output or sales rather than earnings. Growth accounting literature has a long pedigree, which can be traced back to Solow (1957). In essence, this assumes a Cobb-Douglas production function:

$$Y_t = A_t K_t^a L_t^b M_t^c \quad (1)$$

Where Y is gross output (e.g. sales turnover), K is physical capital, L is labour stock (employment) and M is materials and intermediate inputs. A_t reflects efficiency, so that the higher A_t , for any given values of the inputs, the higher is output. The units of measurement of the inputs affect the level of A_t . This can be avoided by writing the equation in growth form (i.e. differentiating with respect to time),

$$\Delta Y_t = \Delta A_t + a \Delta K_t + b \Delta L_t + c \Delta M_t \quad (2)$$

where the Δ associated with each variable reflects the rate of growth. It can be seen, by rearranging equation (2), that ΔA_t is the rate of change in total factor productivity.

$$\Delta A_t = \Delta Y_t - a \Delta K_t - b \Delta L_t - c \Delta M_t \quad (3)$$

In other words, it represents the output growth that cannot be explained by changes in the growth of physical inputs. Hence A_t was christened the 'residual factor'. In the original Solow study this residual component accounted for some 85 % of output growth. A follow-up study by Jorgenson and Griliches (1967) attempted to explain this residual factor.

Further extensions of the framework to allow explicitly for quality change and control over input and output prices are reported in Bosworth and Gharneh (1996), using a pure accounting tautology in a dynamic context. This literature is shown to have evolved through many phases, which can be categorised as three different generations. First generation models are of the form described in equation (1), using highly aggregate measures of the inputs (i.e. all physical capital, all employees and the total real expenditure on materials and intermediate inputs). Second gener-

ation models are basically the same functional form, but utilise a much more disaggregated set of variables, many different types of capital and a large variety of different types of hours worked. Third generation models not only disaggregate the inputs in detail, but also begin to disaggregate the sectors of the economy, separately distinguishing between the production sectors of the economy and the educational sector.

Jorgenson and Fraumeni (1992) use growth accounting methodology in a third generation framework to demonstrate that investment in human and physical capital accounts for a very high proportion of growth in both the education and production sectors of the US economy over the post-war period. Specifically, growth in labour input is held to account for just over 60 % of overall economic growth and increases in labour quality (education and training) explain some 42 % of this labour contribution. As usual in the growth accounting approach, the contributions of the various inputs to output growth are obtained by weighting the input growth rates by their shares in the sector's value added. The contributions of capital and labour inputs are then decomposed into separate components of capital stock and quality, and of hours worked and labour quality.

Hall and Jones (1999) adopt a growth accounting framework to explore differences in output per worker across different countries. They use the Summers and Heston (1991) database, augmented by educational attainment statistics as produced by Barro and Lee (1996). Their findings suggest that differences in physical capital and educational attainment explain only a small amount of the differences in output per worker. International output differences are predominantly accounted for by differences in productivity and differences in growth rates derive almost entirely from differences in the growth of A in equation (2). This result is at odds with the results of Jorgenson and Fraumeni (1992).

It is important not to read too much into the empirical estimates based upon the growth accounting type of model because this approach entails imposing many assumptions rather than testing them empirically. The methodology typi-

cally involves constructing the estimates using an accounting tautology. The rate of change of each input is weighted by the share of that input within the total. The validity of this depends crucially on the assumption that each factor is paid the value of its marginal physical product. The growth accounting approach only reveals the sources of economic growth, if, amongst other things, there are competitive factor markets. The apportionment of output growth to measured and residual inputs provides no real insight into the process that determines such contributions. While human capital has a significant role to play in explaining output growth in this type of model, the measurement of this human capital is usually a complex mix of educational, demographic and labour market variables.

6.3. Neoclassical growth models

Although growth accounting exercises are useful for exploring the links between human capital and economic growth, they are limited by their basic assumptions. As Griliches (1997) recognised in his survey, the true test of the importance of education to growth is to include such a variable in an estimated production function. The starting point for such an approach is the Solow (1957) or neoclassical model. This growth model has previously been described in detail in an earlier Cedefop report (Barrett, 2001), so only an outline is provided here.

The production function can be written in the form where some measure of output is related to the relevant inputs (as in equation (1) above) ⁽⁶⁾. Using the Cobb-Douglas form:

$$Y_t = A e^{gt} K_t^a L_t^b M_t^c \quad (4)$$

where Y is gross output or sales, K is the physical capital stock, L denotes labour and M is the materials and intermediate input variable (all variables are in real or volume measures) ⁽⁷⁾. This is supposedly a technical relationship between inputs and outputs. The link with the growth accounting approach is obvious, as (4) is almost

⁽⁶⁾ Gross output is preferred. This is related to capital, labour, materials and fuels (often called the KLEM models). Net output (or value added) is sometimes used, which is related only to capital and labour.

⁽⁷⁾ The A term is now a constant.

identical to (1). There are two main differences. First there is an extra term, e^{gt} , which attempts to pick up the effects of technological change (i.e. an exponential time trend in times series estimation). Second, the function is now estimated directly using regression techniques, rather than imposing accounting values. The parameters a , b and c are still interpreted as factor shares.

This basic model can be augmented, in approximation to second generation growth accounting models, by the inclusion of different types (or vintages) of capital, $K_{t1}^{a1} \dots K_{nt}^{an}$, and similarly, different types of labour (i.e. different lengths of schooling, qualifications, occupations, etc.). Assuming that the homogeneous nature of the variables, as in equation (4) is maintained, but representing their changing quality by some measure or vector of measures, H , a model is derived:

$$Y_t = A K_t^a L_t^b M_t^c H_t^d \quad (5)$$

where H is an indicator of the changing quality of inputs and represents some weighted average of education or qualifications ⁽⁸⁾.

It is now fairly easy to develop a link to the literature of knowledge production functions. The basic idea of this approach is to regress some measure of output, preferably gross output, on tangible and intangible inputs. Thus:

$$Y_t = A K_t^a L_t^b M_t^c R_t^d \dots R_{t-n}^e \quad (6)$$

where the R variables denote current and past investments in knowledge and are virtually identical to H in equation (5). One way of looking at this relationship is that current and past knowledge generates current output (or sales), holding tangible inputs constant. An alternative interpretation is to note that $\{Y_t/AK_t^aL_t^bM_t^c\}$ is a measure of total factor productivity, and that current and past knowledge is driving total factor productivity.

Although their endogenous counterparts have, to some extent, superseded these neoclassical models, they continue to be empirically tested and Sianesi and Van Reenen (2000) were led to conclude that the neoclassical approach produces results that are more consistent with the established microeconomic evidence. One of the better known and most influential contributions to growth

literature is the study by Mankiw et al. (1992), who use an augmented Solow model to explain cross country differences in income levels from 1960 to 1985. This model of equation type (5), but without the materials input variable, explains over 70 % of the variation in income per capita across a large sample of countries. Human capital, as proxied by secondary school enrolment ratios, accounts for almost half the difference in per capita incomes. For non-oil countries, a 1 % increase in the average percentage of the working-age population in secondary school is estimated to lead to a 0.66 % increase in long-term income per capita.

Koman and Marin (1999) applied an augmented Solow model, in a time series framework, to explain recent economic growth trends in Germany and Austria. The results obtained did not support this type of specification and the incorporation of a variable measuring the accumulation of broadly-defined human capital led to insignificant estimates. Temple (1998) has shown that the estimated parameters and convergence rates in this type of model are highly sensitive to measurement errors, and the obtained results are not always statistically robust.

Neoclassical models remain restricted by their underlying assumptions of perfect competition and constant returns to scale. A critical property of the basic production function, equation (4), is that there are diminishing returns on the accumulation of capital. In the absence of any technological change, diminishing returns will eventually choke off any economic growth. The inclusion of human capital accumulation in the model, equation (5), increases the impact of physical investment on the steady state level of output and it can then account for a very slow rate of convergence in income levels across countries. However the problem of exogenous technological change remains and Romer (1994), amongst others, has stressed the need to make technological advances explainable within the model framework.

6.4. Endogenous growth models

In contrast to neoclassical models, endogenous growth models explicitly incorporate technology

⁽⁸⁾ Some models use stock or levels of education and training, while others use flow or accumulation of the same variable. The preferred specification is usually empirically determined.

(the A term in equations (4) through (6)) and attempt to recognise that technological change depends on economic decisions in the same way as capital accumulation. In particular, technological change is most commonly related to the stock of human capital, which is explicitly modelled in terms of educational investments in these endogenous specifications ⁽⁹⁾. The inclusion of technological change and knowledge dissemination into the neoclassical framework is rendered difficult because of the underlying competitive assumptions, which do not allow for the possibility of increasing returns to scale. In the endogenous models, economic growth can continue indefinitely because the returns on investment in a broad class of both physical and human capital goods do not necessarily diminish through time. Spill-overs of knowledge across producers and external benefits from improvements in human capital are part of this process because they offset tendencies to diminishing returns. Growth frameworks have also incorporated R&D concepts, as well as imperfect competition (Romer, 1986) (Barro and Sala-i-Martin, 1995).

A large number of endogenous growth specifications have been put forward. A typical specification for analysing growth across several countries follows Barro (1997):

$$\Delta y = f(y, y^*) \quad (7a)$$

$$y^* = f(Z) \quad (7b)$$

where Δy is the growth rate of per capita output, y is the current level of per capita output and y^* is the long-term or steady state level of per capita output. For a given value of y , the growth rate rises with y^* , which is determined by a wide set of economic, policy and environmental variables. These variables differ between studies, but typically Z in equation (7b) contains variables measuring population (fertility and life expectancy), labour supply, government expenditure and investment, terms of trade, inflation and, most significant for present purposes, educational variables. Measurement issues associated with the educational variables are discussed below.

Barro (2000) maintains that in this model any

increase in the steady-state level y^* will raise the per capita growth rate, y , over a transition interval. So if, for example, government improves the business climate by increasing its expenditure or if they decide to increase their investment in education by increasing enrolment rates in secondary education, this will increase the target level y^* and raise Δy . As actual per capita output increases, diminishing returns will eventually restore the growth rate to a level determined by the long-term rate of technological progress. In the very long term, the impact of improved policy is on the level of per capita output rather than just its growth rate. However, transitions to the long term tend to be lengthy and the growth effects from shifts in government policy tend to persist for a significantly long period.

6.5. Empirical growth regressions

Following the early work of Barro and his collaborators (Barro, 1991) (Barro and Sala-i-Martin, 1995) (Barro and Lee, 1996), a large number of growth regressions containing human capital variables in the set of regressors have appeared. Temple (2000) has distinguished two main groups of model specification, those that link output growth to some initial level or stock of educational attainment, such as secondary school enrolment rates, and those that relate growth to the flow of educational attainment rather than its level. The first group assume that the stock of human capital is the engine of economic growth whereas the second group attribute such growth to the accumulation of education and training in a given period. This distinction is more fully developed in the associated paper by Izushi and Huggins (2003), where empirical tests are carried out on both model forms.

Most empirical models combine data from a large group of countries, both developed and developing, often using dummy variables to distinguish geographical or economic groupings of countries. The aim of these studies is to identify statistically significant and robust relationships between the various factors (the Z variables in equation (7a) above) and economic growth

⁽⁹⁾ Applied examples of such models are provided in Sections 6.5 and 6.6 below. The methods of incorporating technological change and human resource investments into the models are discussed in these parts of the paper.

across the full sample of countries. The estimates seek to determine causal relationships and so establish the sources of economic growth.

Barro's original 1991 study used data for 98 countries from 1960 to 1985 and related the real growth rate of GDP per capita to initial human capital, as proxied by school enrolment rates for 1960, and a large set of other potential determining variables. It found that output growth was significantly positively determined by both primary and secondary school enrolment, in the presence of other determinants. A one percentage point increase in primary school enrolment was associated with a 2.5 % increase in GDP growth and a similar increase in secondary school enrolment produced 3 % growth. When attempts were made to control for measurement error, the results became weaker in magnitude but still significant. When 1950 school enrolment rates were added to the model they become insignificant, as became a variable measuring the student-teacher ratio. This study also revealed how human capital variables were significantly correlated with lower levels of net fertility and larger levels of physical capital investment.

There followed several papers in the Barro tradition; see Sianesi and Van Reenen (2000) for a more complete overview. Different data sets and measured variables were applied in an attempt to replicate and establish the robustness of the Barro results. Englander and Gurney (1994) re-estimated some of the early growth regressions using only OECD data, which are regarded as a more homogeneous and superior quality data set. Secondary school enrolment rates were confirmed as one of only three significant determinants of labour productivity growth, alongside growth in the labour force and increases in the capital to labour ratio. However, this study found that these significant regressors provided much less explanatory power when estimated for the narrower group of OECD countries than for the original wide sample. Englander and Gurney acknowledged difficulties with the education proxy variables, measurement reliability issues and problems in ensuring strict international comparability: all these issues cast doubt on the robustness of the results.

Gemmell (1996) also worked on OECD data sets and his original contribution involved the construction of some alternative measures of

human capital based on both stocks and annual average growth rates at primary, secondary and tertiary education levels. He found that a 1 % increase in initial tertiary human stock was associated with a 1.1 % increase in per capita GDP growth, while a 1 % increase in subsequent growth in tertiary education (flow) was associated with almost 6 % output growth. While the direct growth effects come through tertiary education, secondary education was found to have an indirect impact through its positive significant association with physical investment. When these OECD results were compared to a wider sample of countries, it was found that primary human capital had the most impact in the poorest group of the less developed countries and secondary human capital was the most significant variable for the intermediate group of less developed countries.

Benhabib and Spiegel (1994) use a new set of country comparative data on human capital stock initially to test the augmented neoclassical model, given as equation (5) above and later to modify the specification to allow human capital to enter directly into productivity in an endogenous growth specification. The neoclassical model yields insignificant and generally negative coefficients on the human capital stock variables, a result which holds when other regressors are added into the model and alternative proxies for human capital are applied. In contrast, the endogenous specification produces human capital levels that are positive, but not always significant, determinants of per capita income growth. These results suggest a distinct role for human capital in enabling foreign technology in developing countries and the creation of new domestic technologies in more highly developed countries, rather than entering the model on its own as a conventional factor of production.

Barro and Lee (1993) add comprehensive new educational data sets to the Summers and Heston data and test endogenous specifications of equation type (7) using a much wider set of potential regressors. In particular, the average years of secondary schooling of the adult population at the beginning of the data period are introduced as a key explanatory variable. Barro and Lee's results suggest that an extra year of male secondary schooling is associated with a 1.4 % increase in GDP growth per worker. In comparison, an addi-

tional year of female schooling seemingly has a negative impact on a country's growth rate. Female education is significant in reducing national fertility and hence population growth. Barro (1997), using modified data in panel format and applying more sophisticated estimating techniques, produces a similar set of findings to the earlier paper. An extra year of male upper-level schooling is associated with a 1.2 % increase in per capita GDP growth rate. Male primary schooling is found to have no significant impact on growth and, again, female schooling at various levels have negative but insignificant coefficients in the various equations that are reported.

Krueger and Lindahl (1998) criticise the findings of both Benhabib and Spiegel (1994) and Barro (1997). In particular, they focus on the results which identify only the initial level or stock of educational attainment as the determinant of GDP growth and the failure to find growth in such attainment (the flow of educational investment) as a key determinant. Krueger and Lindahl show the spurious results of the earlier two papers to be attributable to the extremely high and unaccountable measurement error in first-differenced country comparative education data. In a simplified version of equation (7), with only levels of schooling and changes in schooling variables on the right hand side ⁽¹⁰⁾, the increase in education as the key determining variable of GDP growth is shown. The initial level of education is not positively related to future economic growth for the average country when assumptions on linearity and homogeneity of parameters for education are relaxed. Unfortunately, the estimates of the impact of changes in educational attainment on income growth turn out to be implausibly large when set against findings from microeconomic studies into private returns and the authors identify endogeneity bias (richer countries tend to expand their educational infrastructure) as the likely cause of the problem.

A study by Judson (1998) attempts not only to substantiate the role of increasing investment in education in promoting growth, but also to examine the importance of the allocation of this investment in the growth context. In addition to

the familiar Summers and Heston data, and the Barro and Lee human capital stock statistics, Judson uses Unesco data on educational enrolments and spending to estimate the efficiency of existing educational allocations within countries. Overall, a 1 % increase in human capital growth is found to be associated with an 11 % increase in GDP growth rate ⁽¹¹⁾. Judson applies a country comparative growth decomposition regression to show that the correlation of human capital accumulation is not significant in countries with poor allocations but it is strongly significant and positive in countries with better allocations (predominantly richer countries). This finding that the contribution to growth of human capital depends on the efficiency with which it is accumulated has important policy implications in terms of the exact allocation of educational and training resources.

Graff (1995) examined the role of human capital in explaining economic growth in some 114 countries from 1965 to 1985. Generally, the results showed the accumulation of human capital, physical capital and technological progress all to be significant determinants of the growth process. In a related study, Graff (1996) investigated the importance of higher levels of education for a subset of poorer countries. This variable was found to be important for growth, so long as the investment in higher education did not lead to imbalances elsewhere in education provision, especially to the detriment of elementary levels of education.

While most empirical growth studies use country comparative data, either averaged across a sample of years or taken over several years in panel data format, a few studies attempt time series analysis within an individual country. The major problem with the time series approach is obtaining adequately long series on consistent bases; this is a particular problem for education and training variables. One example of the time series approach is provided by Jenkins (1995) for the UK. This paper uses annual data from 1971 to 1992 and it proxies the stock of human capital by three series measuring workforce qualifications. These series are used as key determinants of

⁽¹⁰⁾ Some of these variables are lagged and both time and geographic-regional dummies are also included.

⁽¹¹⁾ This implausibly large elasticity impact is a common finding in studies of this kind and it has led Sianesi and Van Reenen (2000) to conclude that the effect is seriously overstated due to a number of methodological problems.

aggregate output, alongside physical capital, total workforce, capacity utilisation and a time trend. The overall result confirms the finding that investment in human capital increases productivity. Highly-qualified workers are found to contribute almost twice as much to productive efficiency as those with no qualifications at all. The relatively small number of observations ⁽¹²⁾ mean that the unrestricted estimates are imprecisely determined and such results cannot be regarded as robust.

Another example of time series modelling is Asteriou and Agiomirgianakis (2001), who use cointegrated regressions to explore the long-term relationship between formal education and GDP in the Greek economy. This study finds a significant relationship between primary, secondary and higher education enrolments and GDP per capita. The main direction of causality runs through the education variables to economic growth, but in the case of higher education, there exists reverse causality. This problem is more fully discussed in Section 6.10 below.

6.6. A recent example of growth modelling

One of the more recent papers in the Barro tradition reports empirical results for the country comparative data set updated to 1995 (Barro, 2000). The paper shows the results of using panel data for more than 80 countries over 3 decades; the sample is disaggregated into three 10-year time periods and the countries are grouped according to various development criteria. The growth rate of real per capita GDP is regressed against a large group of potential determinants, as outlined in equation (7) above. Several of these determining variables are only available, at best, at five-year intervals and some less frequently, so either average values are used for each decade or, in the case of the key education variables, their level at the beginning of each period is applied. The main education variable is one favoured by Barro from earlier empirical exercises. It measures the average years of school attainment at the upper (secondary and tertiary) levels for males aged 25 and over. Subsequent

analysis introduces several alternative educational measures into the model: primary school attainment, attainment by females and results on internationally comparable examinations. It should be noted that due to lack of data availability at the country comparative level, no measures of growth in education (flows) are incorporated, only stock levels at the beginning of each period.

The model is estimated by three-stage least squares, using instrumental variables. Some basic results are reproduced as Table 9. In the overall sample, the education variable turns out significantly positive, in the presence of many other policy variables. The estimated coefficient implies that an additional year of schooling raises the growth rate on impact by 0.44 % per year. Barro maintains that a possible interpretation of this effect is that a work force educated at secondary and tertiary levels facilitates the absorption of technologies from more advanced countries. In this model, the effect from an additional year of schooling impacts on the growth rate of GDP and only feeds back onto the level of GDP slowly over time (higher levels of GDP have a negative impact on the growth rate). Using further assumptions on national convergence rates and the average costs of providing an additional year of schooling, Barro suggests that the coefficient value of 0.0044 implies a real social rate of return on schooling of the order of 7 % per year; a figure within the range of typical microeconomic estimates of returns on education.

Column 2 in Table 9 shows how results change, using a slightly more restricted version of the model, when the sample is based only on OECD countries. The result for this group of countries is much less satisfactory in terms of the significance of the regressors, very few of which are significant. In particular, the key education variable takes a value of zero. When other wealthier, non-OECD, countries are added to the OECD set to form the rich country sample (column 4), there is some improvement in the results and the additional year of schooling impact is now significant, but its effect on economic growth is only about half as strong as was the case for the full sample. Results for the poor country sample are better in terms of significant regressors, although the

⁽¹²⁾ This is the main restraint on time series analysis in growth studies.

overall coefficients of determination are relatively much lower for this group (below 50 %). The impact of the additional year of schooling on growth turns out to be almost four times greater for the poor countries compared to the rich group.

Barro (2000) considers additional dimensions to the years of schooling, beyond those reported in Table 9. Female attainment in secondary and higher levels of education become insignificant when added to the basic model for the overall sample. The same insignificant results apply to variables measuring average years of primary schooling for males and females separately, although it is clear that primary schooling is critical as a prerequisite for secondary education. Problems of colinearity are present between some education variables and other potential growth determinants; most obviously between female education and fertility rates.

Barro also attempts within the model framework to introduce measures of quality of education as represented by international examination scores, where available. Such indicators of the quality of schooling capital have been claimed by Hanushek and Kimko (2000) to be more impor-

tant for subsequent economic growth than years of educational attainment. Predominantly, data are only available for richer countries and only for recent years. Results suggest that science scores (as a measure of quality of education) are significantly positive for growth, mathematics scores are also positive, but of less significant impact than science, while reading scores apparently have no significant impact. Given the dubious quality of some of these data, it would be wrong to read very much into the results.

It is clear that modelling exercises in the Barro tradition do not produce results that can be regarded as robust. Modifications in specifications and changes in data sets can lead to large differences in estimated coefficient values, as exemplified in Table 9. It might have been expected that the superior quality data available for the more homogeneous group of countries within the OECD would have yielded better results than those for the full sample, but this was not the case. Such findings have prompted some researchers to carry out tests of robustness on the model results (Temple, 1998). Others have introduced more complex model specifications to accommodate full sets of panel data (Islam,

Table 9: Barro growth regressions

Independent variable	Overall sample		OECD sample		Rich-country sample		Poor-country sample	
Log GDP	0.107*		-0.034*		-0.0343*		-0.0190*	
Log (GDP)squared	-0.0084*							
Years of upper school for males over 25	0.0044*		0.000		0.0023*		0.0084*	
Govt consumption/GDP	-0.157*		0.015		-0.014		-0.167*	
Rule of law index	0.0138*		0.0115		0.0116*		0.0196*	
Exports + imports/GDP (Openness ratio)	0.0133*		0.0148*		0.0112*		0.0361*	
(Openness ratio)* Log GDP	-0.0142*							
Inflation rate	-0.0137*		-0.0228		-0.0051		0.0033	
Log fertility rate	-0.0275*		-0.0209*		-0.0174*		-0.0212*	
Investment/GDP	0.033		0.045*		0.029		0.053	
Growth rate terms of trade	0.110		-0.010		-0.008		0.0134*	
Observations & R squared								
1965-75	81,	0.62	23,	0.85	32,	0.77	49,	0.48
1975-85	84,	0.50	23,	0.65	32,	0.62	52,	0.39
1985-95	81,	0.47	23,	0.50	31,	0.52	50,	0.44
NB: * indicates coefficient is statistically significant at 5 % level Source: Adapted from Barro (2000, Table 1, p. 19)								

1995), while a further group have explored the differences that data quality makes to the results (De La Fuente and Doménech, 2000). Some of the results obtained from growth modelling imply some improbably large impacts of initial human stock (education) on growth and these results are sometimes at odds with findings from microeconomic studies (Topel, 1999). One of the issues which has not been resolved is the extent to which some of the results based on the broader groups of countries reflect greater variability in the data (which helps to establish the parameters of the relationships being tested) or whether it is a consequence of including extreme outlier observations, which bias the outcomes and cause spurious results based on poor quality data.

6.7. The influence of data quality on results

The issue of data quality is a common theme in many of the studies reported above; both Sianesi and Reenen (2000) and Temple (2000) raise problems with data quality and suggest that empirical relationships between human capital and growth may be compromised by measurement errors. De La Fuente and Doménech (2000) suggest that some of the insignificant relationships are attributable to some of the educational data that are commonly used in growth regressions. Results that rely on time series variation in the data are especially prone to error. When data adjustments are applied in a preferred growth specification, a much more significant relationship between educational attainment and economic growth is identified.

De La Fuente and Doménech review the various data sets on educational attainment that have been constructed on the basis of Unesco enrolment statistics; the best known of these is the Barro and Lee (1996) series. Enrolment data are transformed into attainment stock figures through a perpetual inventory method and interpolations between census observations. The various authors apply different assumptions and estimating procedures to produce series that exhibit inconsistencies, one to another, across countries. Beyond this problem, there remain accuracy and consistency concerns about the base Unesco enrolment data. Some

schooling levels reported for some countries do not appear to be very plausible, while others display extremely large changes in attainment levels over short time periods or extremely unlikely trends; see the discussion in Behrman and Rosenzweig (1994).

While De La Fuente and Doménech (2000) conclude that the Barro and Lee series are probably the most accurate source of data on human capital stocks, these data still contain a large amount of noise that can be traced largely to inconsistencies in the underlying primary statistics. De La Fuente and Doménech revise the educational attainment data for 21 OECD countries during the period 1960-90, using detailed statistics from national sources within each country. In general, the resulting series are held to be much smoother through time and, as a result, much more plausible. The new data are then compared to the original in various growth specifications (variants of equation (5)), using average years of schooling of the adult population as the measure of human capital stock. The size and significance of the coefficient on this newly constructed human capital variable shows an appreciable improvement over the original Barro and Lee variable. When the estimates are repeated with data in first differences, the gain is even more noticeable and only the revised data produce a significant coefficient. Further tests using other growth specifications confirm this result and the equations with the revised data meet the appropriate tests for robustness.

Bassanini and Scarpetta (2001) apply the De La Fuente and Doménech human capital series in panel regressions over the period 1971-98. This study follows Islam (1995) in making full use of both the time series and cross-sectional dimensions of the data. Country comparative studies that fail to use the time dimension produce results which are an average for heterogeneous countries and therefore hard to interpret in the context of a single country policy (Lee et al., 1997). The estimation method used by Bassanini and Scarpetta employs pooled mean group techniques that allow short-term coefficients, speed of adjustment and error variances to differ across countries, but imposes homogeneity on long-term coefficients. Various specifications are estimated, but the empirical results favour an endogenous growth model with broad constant returns on human and physical capital. The results indicate a significant and posi-

tive impact of human capital accumulation on per capita output growth. One additional year of education produces 6 % growth in output in the long term, a result held to be consistent with microeconomic evidence. The findings survived a number of checks for robustness using modified specifications and country comparative samples. The empirical results were sensitive to the use of more reliable data and the choice of estimating approach.

6.8. Human capital externalities

It has long been recognised that the benefits of investing in human capital are not restricted to the direct recipient but spill over to others in society. A better-educated and trained workforce may well improve the productivity of their less educated work colleagues. Acemoglu (1996) argues that an increase in the average level of human capital will often cause firms to anticipate growth and make greater investments in physical capital and research and development. Given an imperfect matching process, firms that invest more will not necessarily be associated with the workers who have invested more in education. However, other workers will benefit, as firms using more physical capital than before employ them. Increases in the average level of human capital clearly create external benefits, but growth models may not be capable of capturing all these external effects.

McMahon (2000) has argued that the direct effect of education on economic growth is separable from the indirect effect or externalities. Of these externalities, probably about 75 % are non-market outcomes which feed back into economic growth, but are not readily measurable in the same way as GNP. The main non-market externalities are: health, including longevity, infant mortality and fertility; environmental impact, including various forms of pollution and deforestation; crime, including rule of law, crimes against the person as well as property crime; better income distribution and the issue of poverty; and democratisation, including human rights and political stability. These issues are dealt with more fully in Chapter 9 of this paper and in the fuller treatment in the associated paper by Green et al. (2003). It will be recalled how Barro regressions, such as those in Table 9, attempt to capture some of these impacts on

growth, but measurement limitations prevent models capturing most of these influences. There is also likely to be much interaction between the different non-market social outcomes.

It is clear that human capital externalities are much more than just a spill-over effect from education in the economy. They are a whole series of net outcomes, most of which are only partially realised after initial impact and many take full effect over a very long time span. These externalities, along with investment in human capital, are important in offsetting diminishing returns on physical capital and so determining positive future per capita growth rates. Investment in education and training is important, not only for its direct contribution to growth but also for the indirect externalities that it creates, as these eventually feed back into the growth process.

6.9. Social capital and economic growth

Most of the literature reviewed in this section is concerned with the link between human capital and measured per capita output or productivity growth. As such, human capital is narrowly defined to be some measure of education, usually average years of schooling at primary, secondary or tertiary levels. Temple (2000) recognises that the failure to incorporate measures of vocational training is a serious omission from the definition of human capital. Broadberry and Wagner (1996) have shown that vocational training is closely connected with corporate production strategies and also national output growth. However, the extreme variability in vocational training approaches across countries makes it difficult to measure and quantify to facilitate inclusion in country comparative growth modelling. McIntosh (1999) demonstrates some of the problems involved in making comparisons of vocational training between six EU countries. A wide spectrum of training exists in most countries and often a large amount of training is informal, on-the-job training that may not be recorded and so cannot be systematically measured. It is unlikely in the near future that country comparative growth models, which constitute the core of this growth literature, will be able to incorporate measured training variables.

Despite measurement difficulties, a number of research papers have recently appeared linking economic growth to social capital (e.g. Temple, 2000; Osberg and Sharpe, 2000; Woolcock, 2000 and the literature reviews in these papers). Social capital is a difficult concept to define precisely, but, most simply, it refers to the social norms and networks that facilitate collective action. It embraces the nature of social ties within communities, the relationship between civil society and the state and the quality of governing institutions. The development of social capital is likely to prove highly significant for improvements in economic well-being; a wider concept than simply growth in per capita GDP.

While literature on social capital lies mostly outside mainstream economics, there has, in recent years, been an increasing body of material on social capital published by organisations such as OECD. The majority of this literature is still to be found predominantly in social science and political publications. Two studies have attempted to construct quantitative indicators of social capital and relate them to other economic variables, including productivity. La Porta et al. (1997), Knack and Keefer (1997) and, most recently, Green et al. (2003) used an index of trust, derived from a *World values survey*, carried out across some 28 market economies. La Porta et al. found the trust index to be weakly associated with country comparative growth from 1970 to 1993, but the explanatory power was low and measurement concerns serve to limit the usefulness of these findings. Knack and Keefer report a strong correlation between trust and average years of schooling. Education is argued as strengthening trust and civic norms, thus producing another external effect from investment in human capital. Literature on social capital and growth remains at a relatively early stage and until better methods of measuring the social variables can be devised, social capital, together with vocational training variables, are likely to have a only marginal role in quantitative growth analyses.

6.10. Possible endogeneity and simultaneity bias

Sianesi and Van Reenen (2000) have identified possible problems of reverse causality (i.e. growth stimulates education and training) in the links

between investment in human capital and economic growth. As per capita income increases, so educational inputs, both in terms of quantity and quality, also grow, but it is not obvious that this economic growth is caused by the rising educational standards. Income growth is likely to induce a higher demand for education and training and much of this demand will be income elastic. In countries experiencing significant economic growth, governments are more able to increase public spending on education and training, and to ensure better access to such education for more of the population.

A review of international literature on the demand for higher education shows that one of the key determinants is real income per capita (Briscoe and Wilson, 1998). In an empirical study of entrants into UK higher educational institutions, real income was identified as one of the more consistently significant determinants, drawn from a wide list of potential explanatory variables. Literature on education also suggests a similar link between demand for both primary and secondary education and the level of, or growth in, national income.

For the growth models discussed in the present paper, the issue is whether growth in the economy is brought about by the accumulation of human capital or whether the stimulus of growth induces the workforce to seek after higher educational and training standards. Bils and Klenow (2000) have challenged the findings of Barro and others (Section 6.6) on the grounds of reverse causality, whereby it is shown that faster economic growth induces greater schooling opportunities by raising private returns.

Sianesi and Van Reenen (2000) maintain that the most plausible answer to the causality problem is that both processes are at work simultaneously, so that there is a bi-directional causality between investment in human capital and economic growth. Such considerations suggest that growth models ideally should recognise the endogenous nature of human capital and control for the simultaneity bias. Unfortunately, endogeneity problems apply to other right-hand side variables in the growth equations, such as physical capital accumulation. There would seem to be a shortage of plausible instruments to ensure robust empirical estimating.

Aghion and Howitt (1998) have pointed out some of the potential difficulties in relating economic growth to the initial value of an

explanatory variable, such as school enrolments at the start of the data period (Section 6.5 above). There exists the possibility that both the growth and the enrolment variable are jointly determined by some external factor, such as the prevailing political regime, that plays no specific part in the model. There is also a strong likelihood that expectations of future economic growth may spur many workers to invest in education and training

now, in anticipation of future economic opportunities. Where time series data are available on a sufficiently long basis, lagged values of these endogenous variables may be used as instruments in the estimating equations. However, even then, the exogeneity of such lagged estimators may be questioned for, as Temple (1999) has shown, there may be long and delayed impacts of human capital accumulation on growth.

7. Market value and related literature

7.1. Literature strands

Market valuation literature has much in common with the production function approach on which the growth models discussed above are based. However, much of it is concerned with individual companies, although their effects can have important macroeconomic consequences. There are two main market valuation literature substrands. The archetypal market value models examine the role of the stocks of intangible assets, including human capital investments, in determining market value ⁽¹³⁾. The estimated coefficients effectively provide a measure of the market's valuation of these intangibles. A second substrand examines the different impacts of the expected and unexpected changes in intangible assets, for example, an unanticipated increase in the company's R&D expenditure or a new invention that is reflected in a patent grant. A further emerging theme concerns the distribution of values of intangibles, for example, linked to the risky nature of R&D investment.

The market value of a company is taken to be a measure of the firm's (potential) dynamic performance. In essence, the rationale for the model is that the market value of the firm is higher the greater the future profit flows of the firm and, thereby, the higher the future dividend payment to shareholders. On the assumption that intangible assets are the main source of abnormal profits, then market values will reflect the perceived returns on R&D and other intangible capital, such as goodwill built up through advertising. Market value is, therefore, a forward-looking indicator of company performance, in other words, it is a dynamic measure of performance. In the long run, the market value is equal to the discounted sum of expected profits (although it may be higher than this, given that the holding of any share is an option).

The so-called Tobin's Q form of this relationship is set out in a number of places (e.g. Hall, 1999), which also describes the potential bias of

the linear approximation that is usually adopted prior to estimating. This can be written as,

$$\log MV = \log Q + a \log K + a \log (1 + c \{R/K\}) \quad (8)$$

where K denotes (the replacement value of) tangible assets and R refers to intangible assets; MV/Q is analogous to Tobin's Q (and identical to Tobin's Q where $a=1$ and there is only one type of asset, a tangible asset, K); the coefficient 'a' describes the overall scale effect and should be equal to unity under constant returns to scale. The specification may disaggregate K and/or R into various components.

The link to the models outlined in Section 6.3 is fairly easy to establish. Clearly, the higher the contribution of current and past R&D to future total factor productivity, other things being equal, the higher profits and growth are likely to be. It has been demonstrated elsewhere that the market value approach and the production function when applied to individual companies are broadly consistent from a theoretical perspective. Under (fairly heroic) assumptions regarding perfect information and efficient operation of capital markets, in principle, they will yield identical results (Bosworth and Gharneh, 1996). Certainly, the empirical results from the two approaches available for the US look broadly consistent. A key distinctive feature of market valuation literature is that it has, to date, only been investigated for quoted companies, using financial accounting and stock market price data.

7.2. Some empirical results on market value models

This work has recently been reviewed by Toivanen et al. (1998) and others. Studies are usually based on large-scale panel data sets of individual companies. Most of the literature focuses on the role of R&D, rather than human capital *per se*, and

⁽¹³⁾ A minor offshoot of this literature is the work that attempts to look at the explanation of share prices. For the purposes of the present paper, we treat these as broadly equivalent approaches.

the principal result is that the R&D has a significant positive effect on market value. In general, it makes little difference whether the R&D flow or stock is used, as the flow is relatively constant for each company. However, in those studies which distinguish between R&D anticipated, e.g. by investors, and unanticipated R&D, it is normally the latter that plays a significant role.

The second variable that has been extensively investigated is the number of patents, although there is a small amount of work emerging now on the quality of patents as measured by citation counts. Market valuation literature suggests a strong positive relationship between patents and market value, especially when patents are used in place of R&D.

Patents represent an outcome of the R&D process. Carrying out R&D and obtaining patents requires the deployment of high level skills. However, such activity involves a certain level of risk, so for any particular project there is no definite link between employment of skilled labour and such outcomes. Nevertheless, the evidence suggests that, on average, they are important. When the two variables are entered together, they tend to do broadly the same job, although patents are somewhat more noisy and the R&D variable tends to dominate. Patents also have the disadvantage that they are less relevant outside of certain key manufacturing sectors, and also in the case of small companies. New intellectual property variables have recently been tested, including trademark data. Anecdotal evidence suggests that, on average, trademarks are at least as valuable as patents.

7.3. Knowledge, intellectual capital and intangible asset literature

The growing interest in knowledge and intellectual capital forms one of the most exciting developments in recent economics and management studies. It builds upon a number of the earlier discussions described above, including the role of R&D knowledge, intellectual property and intangible assets. However, it should be noted that work in this area, particularly empirical testing of the emerging models, is in its infancy and research seeking to identify various indicators or proxies is somewhat speculative.

The literature points to important distinctions between information, knowledge, intellectual capital and the broader range of intangible assets (Nonaka and Takeuchi, 1995). These distinctions are important insofar as information and knowledge are only inputs into the production of intellectual capital, where the latter can be defined as all of the knowledge that has produced or is capable of producing value for the company. In other words, intellectual capital is intellectual material that has been formalised, captured and leveraged to produce a higher value asset. The principal focus is the efficiency with which companies access information and transform it into intellectual capital and other valuable intangible assets, thereby determining competitive advantage and improvements in performance.

The growth in the importance of intellectual capital is a result of the shift towards knowledge-based, rather than manufacturing-based production, with the implications that this has for the focus on intangible rather than tangible assets. Lynn (1998) has claimed that there has been a metamorphosis from a resource and manufacturing-based economy to one in which knowledge and services are the key drivers of economic growth. Evidence of the importance of the broader range of intangible assets abounds. For example, a number of pharmaceutical companies are sold at many times the book value of their tangible assets. Similarly, the market valuation of many companies is significantly higher than their balance sheet valuations. In addition, it is argued that organisations have restructured in order to cope, increasing their agility, by eliminating hierarchies and decentralising, in some cases creating 'spider web' or 'fish net' organisations (Bartlett and Ghoshal, 1993) (Hedlund, 1994).

Applying a process perspective, it is possible to distinguish at least eight categories of knowledge focused activities:

- (a) generating new knowledge;
- (b) accessing valuable knowledge from outside sources;
- (c) using accessible knowledge in decision making;
- (d) embedding knowledge in processes, products and services;
- (e) representing knowledge in documents, databases and software;

- (f) facilitating knowledge growth through culture and incentives;
- (g) transferring existing knowledge into other parts of the organisation;
- (h) measuring the value of knowledge assets and/or impact of knowledge management (Ruggles, 1998).

Much of this knowledge is created through investment in human capital, with high levels of education and training inputs.

The importance of the management of intellectual capital has been pointed out by a number of commentators. For example, it has been argued that intellectual capital is the invisible skeleton of the corporation; that it is, in fact, an economic operating system, widely viewed as the company's single most valuable asset (Darling, 1996). It is only by formal systems of human

capital reporting that intellectual capital can be made visible; see the discussion in Cedefop second research report, Part 3. At the present time, the management of intellectual capital is still an experimental exercise for most organisations, although a number of key companies (e.g. Hewlett-Packard and Dow Chemicals) are recognised to be leading the process. The Society of Management Accountants of Canada is at the forefront of the promotion of measurement and reporting of intellectual capital. Currently, no company is likely to have a comprehensive intellectual capital management system in place; many will actively manage parts of their intellectual capital, such as their patent portfolios or brands, or parts of their human capital through their HRM systems. There is a strong link here to the discussion in Chapter 5.

8. Further links between education and training and company performance

8.1. Literature strands

This section draws together a number of more disparate areas of literature that have some bearing on the links between education, training, skills and economic performance. The concern here is mainly with company performance because, when companies are aggregated together, the macroeconomy emerges. The key issues are to do with company size, including the problems of small firms, and with work on structure conduct and performance. These are considered in turn. As with some of the other areas of research previously discussed, the importance of the links between investments in human capital (in various forms) and economic success are highlighted.

8.2. Company size and the problems of small firms

There is a significant amount of literature on various aspects of company size and aspects of performance, such as growth, with important links to the structure-conduct-performance hypotheses. The material can be traced back at least to Gibrat's law of proportionate effect. However, this literature has become increasingly less mechanistic and more behavioural as it has evolved over time, branching off in many directions, some of which have already been discussed in other sections of this report. In this section, the focus is wholly on the rather mechanistic Gibrat's law. Structure-conduct-performance and the small firm elements are examined in the following subsection.

In essence, Gibrat's law is concerned with whether company growth is related to size. Thus, if the following relationship is estimated:

$$(S_{t+1}/S_t) = aS_t^{b-1} \quad (9)$$

using data on firm size, S (where t denotes the year), it is possible to test whether large firms

grow faster than small firms ($b > 1$) or whether small firms grow faster than large firms ($b < 1$). Simple tests of the law involve no other variables, but more recent tests have included a variety of other right-hand side variables to control for other influences on growth, including human capital.

There are a number of reviews reporting estimates of Gibrat's relationship (Hay and Morris, 1979). The results indicate that the simple formulation of Gibrat's law does not generally hold, although it is accepted that there are some industries in which company growth is significantly related to size (both positively and negatively). A general finding is that variance in growth rate is negatively related to size; in other words, there is a greater diversity of performance among small firms. For example, in the small firm sector in the UK, approximately half the growth in the sector comes from a very small percentage of firms. One early, yet still valid observation, from Singh and Whittington (1968) was that of the serial correlation of growth rates; in other words, firms that tended to grow fast over one period would grow faster in other periods. This links to the company-fixed effects literature to be found, for example, in the market value based studies of performance.

A recent paper in this tradition, but focusing on growth in company size in the service sector, is Johnson et al. (1999). It estimates an equation on growth in employment, using existing size as one of the explanatory variables. It finds a non-linear relationship between growth and size, with growth decreasing with size up to five employees, then rising with size from five to 15 employees, before falling again. They note that the higher profit maximising scale of around 17 employees is in the middle of the range at which salaried managerial appointments tend to be made by small firms. The other variables included, however, give counterintuitive results, with both the education level of the owner and the number of professionals employed having a negative impact on growth rates. There are clearly important differences between small and large firms in a number of respects.

8.3. Small and medium size enterprises and the qualifications of managers

Bosworth (1999) has shown how there has been a major growth in interest in the performance of small and medium sized enterprises in recent years. Interest arises for a number of reasons, including the large proportion of total employment accounted for by the small firms' sector and also the high failure rate among small firms, particularly those that are newly established. Two potentially relevant areas of analysis are identifiable in literature on small firms', the role of qualifications and the quality of management within small firms. This has tended to be a more qualitative literature, often descriptive or case study in nature.

There are several important problems in coming to any firm conclusions about small businesses, including the general paucity of the data, and, in particular, the coverage of the very smallest, often owner-managed firms (i.e. micro-firms). A second problem is that both the data and case study evidence indicate the extreme heterogeneity of firms in the small business group.

While there is little dispute about the hypothesis that small firms would perform better if management quality were to be increased, it is clear that this may not carry the same implications for the role of qualifications leading to improved performance. It appears to be the case that the distinction between qualifications and skills/quality is the greatest for small firms. Small firms have quite different management needs and, with the exception of certain professional and related services, qualifications *per se* are not seen as important, at least for the owner-manager. Qualifications may be more important for non-owner managers and other employees of small firms, in order to gain flexibility in the job market.

Studies suggests that a number of qualifications available in the UK, such as MBAs, do not appear to be at all relevant to the small firm. Even those which are potentially relevant, such as NVQs and GVNQs, do not appear to be wholly useful for many small firms. Other countries' experiences suggest that one possible way

forward is to link the training provided to the development of the business, for example, to provide training implicitly or explicitly when providing help to the business to overcome problems. Demonstrating the usefulness of training to the development of the business can encourage small firms to take further education and training subsequently. This is often best taken forward on a regional or local basis ⁽¹⁴⁾.

8.4. Structure-conduct-performance models

The bulk of structure-conduct-performance literature is now somewhat dated, although there continue to be articles published in this area. An overview of this literature suggests that there are essentially two main strands of investigation:

- (a) static models, which focus on the impact of company size and market power on profits (or other current performance measures);
- (b) dynamic models, which focus on the impact of company size and market power on invention and innovation and, thereby, by implication, on company growth and performance.

The key importance of the dynamic models is the role that they ascribe to managers (including their skills and qualifications) and the importance they attach to intangible assets (including knowledge and skills) in determining company performance.

Managerial theories, first seen in the 1960s and 1970s, were primarily concerned with company goals in large, professionally managed companies, as opposed to the small owner-managed companies. In general, the former were argued to be sales revenue, utility or growth maximisers and the latter were depicted as profit maximisers. This strand of the literature involves some form of optimisation and the rationale for this literature was that professional managers would act in their own best interests. The main theoretical predictions are that, in the main, managerial models suggest higher levels of labour demand than the profit maximising case. In addition, a number of these models suggest a skewing of demand towards higher-level skills and occupations.

⁽¹⁴⁾ The examples of Emilia Romagna in Italy and the small firm hubs in India and Pakistan, in particular, are examples of local small firm synergies.

Behavioural theories, which developed a few years after their managerial counterparts, discussed firms as 'satisfiers', rather than optimising units, operating under uncertainty and imperfect information. These behavioural theories said little about labour demands *per se*, but suggest that all firms operate with some degree of inefficiency (i.e. X-inefficiency), only part of which it is economic to remove.

In practice, most empirical literature is based upon fairly *ad hoc* tests of relationships between performance, company size and market structure. Bosworth (1983) has argued that there are various categories of model that are potentially relevant. In those which have the longest pedigree, causality runs from company size to performance:

$$P = f(S, C, X) \quad (10)$$

where P is a measure of performance, such as profitability or sales growth, S refers to size, C denotes the degree of concentration in the market and X is a vector of other explanatory variables, which often have included factors such as advertising expenditure. This is of some interest, as size is purported to affect performance, and size is almost certainly a proxy for other things such as skills, knowledge and R&D.

If different sizes of companies had different goals, this would have direct implications for their performance and for their labour demands, including the demand for skills.

In the case of dynamic structure-conduct-performance models, while it is true to say that increases in size give rise to greater R&D, it is less clear whether the increase in R&D is just proportionate, more than proportionate or less than proportionate with size. In addition, the finding that formal R&D only begins above a certain size threshold is muddled by the fact that small firms may still undertake R&D, but this is not a separate function and tends to be more informal in nature than in larger firms. This is made even less clear by the fact that there is fairly strong evidence that many major inventions have been made by individuals rather than by

large corporations. In addition, as noted above, changes in R&D expenditure (an input measure of invention and innovation) with company size says nothing about the relationship between R&D outputs and size. This issue does not appear to have been resolved. However, the empirical evidence seems to support the hypothesis that larger firms are better innovators than small ones, and that R&D expenditures and associated investments in human capital help in the scale and success of innovation activities.

The stylised views of management behaviour set out in managerial and behavioural theories have proved to be far too simplistic. While profit maximisation seems a reasonable first approximation of the likely goal of an owner-manager, in practice, even here there appears to be a much more complex picture. Bosworth and Jacobs (1989) reviewed the various literatures about management goals and behaviour. They found a wide range of goals, including the maximisation of profits. Equally, however, they included the maximisation of the owner's utility (which was influenced by time spent working, by the rewards gained from extra work and by the status and power conferred by self-employment and the control of others). Other managers purported to minimise their risk, growth often being associated not only with high risk, but also with personal and social (family) costs.

There were some characteristics that helped to determine which goal would be set. It was often the older small business, rather than the newer, that tended to adopt more conservative and less dynamic goals. Owner-managers themselves tended to be divided between the artisan and the entrepreneurial, an almost cultural difference between individuals. In addition, psychological make-up of the individual was also important; often the individual's need to maintain control constrained the willingness to grow. Where control was important, the manager often exhibited a reluctance to employ more highly qualified individuals, as the latter might deploy reasoning and knowledge that the managers would not understand, thereby leading to a loss of control.

9. Spill-over effects and externalities

9.1. Literature strands

Evidence of the positive influence of education, training and skills on performance is most apparent at the level of the individual. Comment has a tendency to focus on private rather than social performance. Some, although by no means all, of these benefits can also be expected to accrue at a macro level. Some of the benefits may, of course, be dissipated in competition between individuals or companies, with no overall social gain.

Several literature strands indicate that there may be important additional spill-over effects and externalities. Spill-overs include technological, spatial and environmental aspects. Some references have already been made to externalities in Section 6.8 above.

9.2. Technological spill-overs

It is neither necessary nor appropriate to dwell on technological spill-overs, as they are a natural extension of both endogenous growth theories (Chapter 6) and the market valuation approach, in which the performance of a particular company is influenced by the R&D or patents of other companies (Chapter 7). In the case of patents, for example, the publication of the patent specification discloses information that may be of use to competitors or to companies in other product areas which use (or might use) related technologies. In practice, many of the market value studies that have investigated the role of spill-overs have found that they appear to be statistically more important than the firm's own R&D or patents. There are a number of existing reviews (Griliches, 1981 and 1992). The key variables are R&D and/or patent flows and/or stocks, although, in this case, the focus is on the general pool of intellectual property generated by other companies. There are clearly potentially important links with the knowledge management area, including the sources and management of infor-

mation, and the most appropriate organisational structure to maximise the benefits to the company of the intellectual capital pool.

9.3. Spatial and city dynamics

Spatial literature considers the synergies that stem from a particular location. One particular theme has been the dynamics of small firm clusters, stimulated originally by the dynamics of small firms in the Emilia Romagna region of Italy (Goodman and Bamford, 1989). However, there has been similar work in developing countries, including India and Pakistan (Nadvi, 1998). In the case of the small firm surgical instruments cluster in Sialkot, Pakistan, for example, 'Clustering has allowed small businesses to become highly specialised, and to benefit from external economies and joint action.' The evidence suggests that such clusters benefit from both vertical and horizontal synergies, from cooperation and other forms of spill-overs, as well as from intense competition between rivals. Such clusters also benefit from the presence of external institutions, such as the Metal Industries Development Centre, in Pakistan, which is widely used by local small and medium size enterprises. External agents form the principal sources of information and technical know-how.

Spatial literature resides primarily with economic geographers and a comprehensive survey of UK urban labour markets was carried out by Turok (1999). Some 20 cities with a population size above 250 000 are identifiable from the 1991 census and of these, 8 are deemed to be conurbations, while 12 are free-standing. These 20 cities accounted for more than 40 % of all national jobs and so they exhibit a high concentration of both skills and companies.

During the 1980s and 1990s these cities continued to suffer from a relative decline in job availability, especially for full-time males in the local population. In consequence, there was a slow outward migration of skills from the urban centres and reduction in male activity rates

(Turok, 1999). The long-term trend out of manufacturing and into service sector activity continued and its impact was most strongly felt in the cities. Although government provided a range of training schemes for the unemployed, some key skills were eroded, as the jobs were lost, especially in the recession of the early 1990s. When the economy began to recover later in the decade, companies found problems with skill shortages and deficiencies in the cities.

For the highly qualified workforce, the city has increasingly become a magnet for job opportunities. Warf (1995) has noted the geographic repercussions of the growth of telecommunications on the development of world cities, of which London is one of the foremost. There has been an agglomeration of professional jobs on offer as telecommunications offices have mushroomed across the city. Graham (1999) has noted how 'a host of value-added and consultancy firms are also concentrated in the city, supporting state-of-the-art innovation, financial telecoms services and corporate telematics applications'. It is clear that synergies of all kinds stem from city location.

As the knowledge economy gathers strength, so cities become ever more important. It has been claimed that trends towards decentralisation, which were observable from 1960 to 1980, are now in the process of being reversed (Amin and Graham, 1997), although in some parts of the EU there remains statistical evidence of withdrawal of firms and people from large agglomerations to rural areas. Large cities at the end of the twentieth century have become the national economic motor, acting as powerhouses for the personal interaction which drives the teamwork and creativity that is essential for good corporate performance. Skill training which concentrates on city professional workers is likely to produce the highest social benefits, even where labour turnover is significantly high for individual companies. A key feature of much of the literature in this area is the emphasis on professionalisation of employment in many cities and at the same time the polarisation of employment structure with many low skilled and low paying jobs being created (e.g. Hamnett, 1996).

A recent study by OECD (2001b) provides evidence of links between skills acquisition and economic growth in 180 regions across

15 Member States. Correlations were made between primary, secondary and tertiary education levels and regional GDP per capita. Whilst tertiary education was important, the strongest significant association was with secondary education. The former level of education is critical for R&D and related innovations, but it is secondary education that provides the intermediate skills that are critical to industrial know-how and learning-by-doing. Correlations at the regional level are blurred by the mobility of labour between regions.

Moretti (1999) used US census data to try to estimate the external returns on education by comparing wages for otherwise similar individuals who work in cities with differential levels of education. Estimating problems arose in trying to isolate the causal impact on individual wages of the average level of city-specific education. The main finding was that a one-year increase in higher education in a city raised average wages by between 8 and 15 %, after controlling for the private return on education. However, this result does not necessarily point to an external effect, as it may simply be caused by complementarities between well and poorly educated workers. There are significant econometric difficulties in achieving robust results in this type of study.

9.4. Environmental externalities

Investment in education produces environmental spill-overs in many different ways. One obvious area is through health and life-expectancy. Higher levels of investment in human capital create greater awareness of the potential causes of illness and promote increasingly healthier life-styles. A more highly educated workforce choose safer occupations and societies with higher relative education bring in health and safety laws to protect the employees. Grossman and Kaestner (1997), after controlling for per capita income, found that people with more education simply live longer. One particular manifestation of the external impact of education on health is in the reduction in infant mortality rates in developing countries. Women with higher levels of education are more aware of the dangers to their children's health and they are more likely to take the steps that lead to lower infant mortality. Wolfe and Zuvekas (1997)

demonstrate that better education also prompts lower fertility rates and smaller family sizes give the children better health and survival prospects.

McMahon (2000) has argued that higher levels of education will lead to the creation of more sustainable environments, as greater awareness of physical environmental damage becomes apparent. Initially, faster economic growth is associated with global warming, deforestation

and many forms of pollution, but education enables populations to take steps to rectify some of this damage without sacrificing the growth gains. Most developed societies, with relatively higher human capital investments, have environmental protection laws. The spill-over of education on the physical environment is an expanding area of specialist study that lies beyond the reaches of the present paper.

10. Conclusions

This section contains an overview of the key findings in the paper. It also attempts to draw together the implications for policy and to identify possible directions for future research.

Some of the material presented in this section also appears in the executive summary.

10.1. Summary of key points

This paper has presented an extensive international review into the various strands of literature that bear on the links between investment in education, training and skills and economic performance at the level of the macroeconomy. Where training and education conducted by firms and industries was identified as contributing to overall economic growth, this was also reviewed. It was not possible to segregate macro from micro studies, as the amount of overlap was found to be considerable.

An initial examination of recent EU statistics measuring GNP, employment, unemployment and various educational and vocational training investments suggested that economic growth across the 15 Member States is associated with increases in both education and training. However, a fuller appraisal of the data revealed the difficulties in demonstrating significant causal links between growth and investment in human resources. The amount of literature in this area underscored the complexity of this relationship.

Studies on the general rate of return were found to demonstrate strong links between education and training and economic performance, not only for the individual, but for society as a whole. Evidence on social rates of return has concentrated on the benefits to the economy arising from increased education, calculating all the costs of schooling and education compared to the relative pre-tax earnings of individuals in receipt of such education. Many qualifying assumptions needed to be made in arriving at a quantifiable estimate, but several studies have suggested a social rate of return in the range 6 to 12 %. Comparable studies to establish the social

rate of return for vocational training proved hard to find, although there was some evidence that such training has a significant positive impact on productivity.

Literature on the management of human resources at both company and industry level exists in both micro and macro level studies. This research stresses the belief that individual workers are a key source of an organisation's competitive advantage. It is the quality of these human resources that determines organisational performance. There appeared to be a number of different emphases, including the role played by HRM in promoting such resources, and the role of management itself, particularly top managers. One important theme was the role of leadership. Another theme stressed the importance of workforce skill qualifications in contributing to higher levels of productivity across different industrial sectors. This literature emphasised the importance of education and training in often very complex industrial processes.

Economic growth models directly explore the quantitative relationship between investments in education and training and the level and growth of per capita GDP at national level. This covers a large number of studies, beginning with the growth accounting models, through to the endogenous growth models that are widely applied in many recent empirical studies. Both data sets and econometric modelling techniques have developed extensively over recent years and many different model specifications have been proposed and empirically tested. Typically, these models use data drawn from a cross-section of different countries, sometimes only for developed countries but often for a wider set of nations. Data difficulties commonly mean that consistent series of educational variables are hard to obtain over sufficiently long time periods to facilitate econometric time series analyses. For developed countries over more recent years, cross-sectional and time series data have been combined into panel sets to enable a more comprehensive testing of the relationship between human resources and economic growth.

Overall, these growth models demonstrate that higher educational investments have had a significant impact on national economic growth. Broadly, the weight of evidence suggests that a 1 % increase in school enrolment rates has led to an increase in GDP per capita growth of between 1 and 3 %. An additional year of secondary education, which increases the stock of human capital, rather than simply the flow into education, has led to a more than 1 % increase in economic growth each year. The results vary considerably, depending upon details of model specification and the precise data sets in use. Issues dealing with the robustness of such results are widely discussed. Almost all these growth models use only a limited set of educational variables to proxy human resource input and they do not incorporate any vocational training or social capital variables.

Market valuation literature is an area concerned with the factors that determine the growth of individual companies and so, indirectly, the overall economy. Research studies in this area are concerned with how intangible assets, such as technical knowledge, influence potential performance and net worth. These are intimately tied to investment in education and training, as well as skills, which may often be a necessary, if not sufficient, condition for improving such intangible assets. Research and development, patents and intellectual capital are key determinants of corporate market value.

Further studies relate to the links between education, training, skills and economic performance. This is concerned with company size and the structure, conduct and performance. Many studies have emphasised the role of the small firm in economic growth. Such small firms are an extremely heterogeneous group that have markedly different training needs from those of their larger counterparts. There is often far less emphasis on educational and training qualifications in small firm environments. Empirical research studies suggest that conventional theories of company behaviour were far too simplistic for explaining the goals and aspirations of these smaller organisations.

The final strand of literature deals with some of the indirect effects of investment in human resources that are not normally captured in measured national economic growth. Such

spill-overs and externalities can be technological, spatial or environmental. Each can contribute significant social gain. Many of these effects are found to be related to other areas covered in this review. The spatial externalities, that embrace city dynamics, demonstrate how geographical clustering of businesses employing highly qualified workers can produce high productivity and strong local economic growth. Environmental spill-overs are often related to health and life expectancy, which typically increase in consequence of higher levels of education.

10.2. Some policy implications

The overall conclusion from this body of work is that the impact of investment in education and training on national economic growth is positive and significant. However, its total effect is difficult to measure with any precision, as many of the influencing mechanisms are indirect and complex. Education is certainly a key determinant of economic growth for both developed and developing countries: its impact is probably more marked in developing nations. The link between vocational training and economic growth is more difficult to demonstrate at the macro level, mainly because of measurement difficulties associated with training investments. It is easier to see a positive impact from vocational training at company and industry levels, although again these are difficult to quantify precisely.

Despite the qualifying assumptions and computational difficulties, evidence suggests a very significant return for both the individual and society as a whole from investments in higher education in developed countries. Computed social rates of return vary between countries and over different time periods, but most are positive and they provide justification for government continuing investment in higher education. However, there are emerging concerns of graduate overcrowding, as the percentage of graduates in the labour market continues to increase, and this trend needs careful monitoring to ensure that social returns are not diminished through overqualification.

The computation of social rates of return on vocational training, equivalent to that for higher education, is very difficult to achieve because of the inconsistent data usually available on such training

investments. Research supports the claim that vocational training improves the performance of the individual in the workplace and so raises the productivity of the employing organisation. Studies on HRM argue that the skill of the individual worker is often a critical factor in an organisation's competitive advantage. Comparative international studies emphasise the key importance of skills training in raising productivity. Despite this, employers in many countries have a rather negative attitude towards investment in skills and training. Unless the institutional and legal infrastructure encourages employers to invest (as in Germany) there is a tendency to rely on others to carry out the investment (as is often the case in the UK). It seems clear that governments should provide every incentive to companies, either through tax allowances or direct grants, as well as through reforms to institutional structures, etc., to encourage them to increase their investment in training. Such training can provide strong spill-over effects for the whole of society.

The weight of research evidence suggests that where governments manage to increase the stock of the educated workforce, through additional years of secondary or tertiary education, rather than simply enhancing the flow into education in any given year, the impact on economic growth is more significant. Such a finding directs government policy towards changes to improve the quality of education rather than just the numbers passing through the system in the short term. For most Member States the emphasis is on access to tertiary education and the quality of the graduates produced by universities. For less developed countries the critical factor is secondary school enrolment rates and the need to extend the number of years in such education. It is difficult to measure the relative quality of education in different countries, but this would appear to be a key issue for governments to address if educational quality is to be significantly improved.

The role of R&D in the growth of firms is strongly underlined in various studies and it is clear that successful R&D depends on skilled human resources. Governments need to provide incentives to firms to continue to make investments in the education and training that enhances their innovative capabilities. In particular, attention needs to be paid to the role of the small firm in contributing to R&D and so to overall economic growth. Often small firms may not have

sufficient resources to invest in training their workforce, but they can be expected to benefit from training carried out by larger firms when the trained workers subsequently move to new jobs in the small firm sector.

There is no guarantee that any investment in human capital will result in a positive return, whether it be investment in training, deployment of highly skilled labour, R&D or in some other form. There will always be some risk and uncertainty. In general, the evidence suggests that such investments pay off but each case needs to be considered on its merits.

10.3. Possible areas of future research

This review has drawn attention to difficulties with published data related to the measurement of education and training provision. Many of the growth model studies raised problems with data quality. In particular, consistent time series of educational statistics were often lacking or the time-span coverage was too short for meaningful analysis. Empirical results often proved sensitive to the exact data set in use. The compilation of accurate educational statistics measuring both quantity and quality of provision is an important area of research. Information on the quality of teaching was frequently unavailable to researchers and this undoubtedly limited the rigour of the analysis.

Most of the reviewed research studies were concerned only with educational variables and did not extend to vocational training. This limitation arises from the restricted availability of suitable data on training provision at industry or the economy level. Individual companies often produce such data but they are less frequently available at higher levels of aggregation. There is a strong need to continue to produce consistent statistics on all types of training provision and to ensure that these statistics are broadly comparable across EU countries.

This paper touched upon insights into links between skills, education and training and productivity growth at corporate level. However, given that the prime emphasis was the link to macroeconomic growth, it was not possible here to explore this area fully. Specifically, research studies in HRM and the market valuation of

companies could be examined in greater depth to reveal the mechanisms by which education and training investments lead to improved corporate performance.

Relatively recent studies on social capital and its contribution to economic growth was only

touched upon in this paper but it would certainly warrant a much fuller exploration. Several papers have now been published on social capital but its role as a determinant of economic growth needs to be tested empirically. Again, some important data difficulties will first need to be overcome.

List of abbreviations

CEO	Chief executive officer
ELFS	European labour force surveys
EU	European Union
GDP	Gross domestic product
GNP	Gross national product
HRM	Human resources management
IALS	International adult literacy survey
ISCED	International standard classification of education
NIESR	National institute of economic and social research
R&D	Research and development

Annex

International standard classification of education (ISCED)

Educational level	Details/age range	Common terminology	Classification
Early childhood education	Introduction of pre-school children to a school-type environment, from age 3	Pre-primary, nursery, kindergarten, pre-school	ISCED 0
Primary education	First stage of basic schooling, up to age 11 or 12	Elementary school	ISCED 1
Lower secondary education	Second stage of basic schooling, up to age 14 or 15	Junior high school	ISCED 2
Upper secondary education	Stage leading to final secondary qualification, typically age 18 or 19	Senior high school, Lycee, Gymnasium, Sixth form, Further education	ISCED 3 ISCED 4
Tertiary education	Programmes significantly more advanced than upper secondary studies	Higher education, College education	ISCED 5A ISCED 5B ISCED 6
University level education	Studies leading to a first degree, at least bachelor's level or equivalent		ISCED 5A ISCED 6
Source: OECD (2001a).			

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Empirical analysis of human capital development and economic growth in European regions

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Abstract

Recent discussion of the knowledge-based economy draws increasingly attention to the role that the creation and management of knowledge plays in economic development. Development of human capital, the principal mechanism for knowledge creation and management, becomes a central issue for policy-makers and practitioners at the regional, as well as national, level. Facing competition both within and across nations, regional policy-makers view human capital development as a key to strengthening the positions of their economies in the global market. Against this background, the aim of this study is to go some way towards answering the question of whether, and how, investment in education and vocational training at regional level provides these territorial units with comparative advantages.

The study reviews literature in economics and economic geography on economic growth (Chapter 2). In growth model literature, human capital has gained increased recognition as a key production factor along with physical capital and labour. Although leaving technical progress as an exogenous factor, neoclassical Solow-Swan models have improved their estimates through the inclusion of human capital. In contrast, endogenous growth models place investment in research at centre stage in accounting for technical progress. As a result, they often focus upon research workers, who embody high-order human capital, as a key variable in their framework. An issue of discussion is how human capital facilitates economic growth: is it the level of its stock or its accumulation that influences the rate of growth? In addition, these economic models are criticised in economic geography literature for their failure to consider spatial aspects of economic development, and particularly for their lack of attention to tacit knowledge and urban environments that facilitate the exchange of such knowledge.

Our empirical analysis of European regions (Chapter 3) shows that investment by individuals in human capital formation has distinct patterns. Those regions with a higher level of investment in tertiary education tend to have a larger concentration of information and communication technology (ICT) sectors (including provision of ICT services and manufacture of ICT devices and equipment) and research functions. Not surprisingly, regions with major metropolitan areas where higher education institutions are located show a high enrolment rate for tertiary education, suggesting a possible link to the demand from high-order corporate functions located there. Furthermore, the rate of human capital development (at the level of vocational type of upper secondary education) appears to have significant association with the level of entrepreneurship in emerging industries such as ICT-related services and ICT manufacturing, whereas such association is not found with traditional manufacturing industries.

In general, a high level of investment by individuals in tertiary education is found in those regions that accommodate high-tech industries and high-order corporate functions such as research and development (R&D). These functions are supported through the urban infrastructure and public science base, facilitating exchange of tacit knowledge. They also enjoy a low unemployment rate.

However, the existing stock of human and physical capital in those regions with a high level of urban infrastructure does not lead to a high rate of economic growth. Our empirical analysis demonstrates that the rate of economic growth is determined by the accumulation of human and physical capital, not by level of their existing stocks. We found no significant effects of scale that would favour those regions with a larger stock of human capital.

The primary policy implication of our study is that, in order to facilitate economic growth, education and training need to supply human capital at a faster pace than simply replenishing it as it disappears from the labour market. Given the significant impact of high-order human capital (such as business R&D staff in our case study) as well as the increasingly fast pace of technological change that makes human capital obsolete, a concerted effort needs to be made to facilitate its continuous development.

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1. Introduction

1.1. Human capital theory

As the global economy shifts towards more knowledge-based sectors (e.g. the manufacture of ICT devices, pharmaceuticals, telecommunications and other ICT-based services, R&D), skills and human capital development becomes a central issue for policy-makers and practitioners engaged in economic development both at the national and regional level (OECD, 1996). Yet, the impact education and vocational training activities exert upon changing national and regional economies remains less than thoroughly explained and analysed. Since the introduction of human capital theory in the 1960s, a number of studies have attempted to address this and related issues.

Human capital theory views schooling and training as an investment in skills and competences (Schultz, 1960 and 1961) (Becker, 1964). It is argued that, based on rational expectations of returns on investment, individuals make decisions on the education and training they receive as a way of augmenting their productivity. A similar strand of studies focuses on the interaction between the educational/skill levels of the workforce and measurements of technological activity (Nelson and Phelps, 1966). According to this theory, a more educated/skilled workforce makes it easier for a firm to adopt and implement new technologies, thus reinforcing returns on education and training. Empirical studies provide evidence supporting the aggregate effects of education and training. For example, Griliches (1970) estimated that one third of the Solow (1957) residual (i.e. the portion of the output growth in the US economy that could not be attributed to the growth in labour hours or capital stock) could be accounted for by the increase in the labour force's educational attainments. In the same vein, Denison (1979) reported the effect upon per capita income in the US, while others – including Baumol et al. (1989), Barro (1991) and Mankiw et al. (1992) – have confirmed these positive relationships through a cross-section of countries covering all levels of development.

Bartel and Lichtenberg (1987) and Wolff (1996, 2001) found that education/skill levels are positively related with technological change in the sectors concerned. Also Crouch et al. (1999) provide a degree of evidence that highly educated workers are more likely to be employed in sectors exposed to international competition in a recent period, suggesting close association between education/skill levels of workers and technological activity undertaken. Looking at these impacts upon society as a whole, Abramovitz (1986) argues that education and vocational training is part of a set of key ingredients sustaining society's growth, which he terms 'social capability'.

1.2. Regions, states and skills: structure of the report

When these impacts of education and vocational training are disaggregated, and their distributions among different segments of the society are considered, their effects are mixed and hence effective modes for policy intervention are not adequately developed. Unequal effects of skills and human capital development are very noticeable among regions, as well as among nations. A range of literature provides empirical evidence concerning inter-regional inequality in labour productivity. For example, Dunford (1997) demonstrates persistent disparities among the UK regions in productivity and economic participation. A recent study we have undertaken (Huggins and Izushi, 2002) confirms a significant variation in productivity among advanced regional economies around the globe. This is a source of great concern, since many regions are increasing their independence as political and economic units, and are competing against one another. At the same time, powerful multinational corporations are becoming evermore footloose, increasingly escaping from the controls of nation states (Ohmae, 1995).

Hence an important question is whether the infrastructure and provision of education and

vocational training at the regional level provides these territorial units with comparative advantages. In order to answer this question satisfactorily, it is necessary to understand the manner in which skills and human capital development exerts its influence on regional and national economies, as well as the links between the two geographic layers. The structure of the report is as follows.

Chapter 2 provides an overview of literature on economic growth and human capital. As human capital development and technological progress are inextricably linked, much attention is paid to the impact of technological progress on economic growth. Chapter 2 starts with a review of key models of economic growth. This covers an early neoclassical model employed by Solow and Swan, subsequent attempts to account for the contribution of technological progress to productivity growth, an endogenous growth model developed by Romer, and a Schumpeterian approach that places innovation at the centre of economic growth. It then looks into an issue raised by Benhabib and Spiegel (1994): how human capital affects economic growth. This is

followed by a review of studies that apply national models to regional economies. The chapter also reviews other models that fall outside the neoclassical framework.

Chapter 3 presents the results of our empirical analysis of regions in Europe. The first part looks into relationships between the supply and demand of human capital, and between human capital supply and other economic indicators at regional level. The results show that supply and demand of human capital development have distinct patterns relating to educational level as well as types of regions. The second part of Chapter 3 focuses on the question of which affects the economic growth of regions, the rate of accumulation of human capital or the level of stock of human capital. The empirical analysis demonstrates that the rate of accumulation of human capital has a clear impact upon economic growth at the regional level, while we find no significant impact from the level of human capital stock. This finding provides evidence that refutes Benhabib and Spiegel's thesis (1994).

Finally, Chapter 4 summarises key findings of the study and provides policy recommendations.

2. Models of economic growth and human capital (1)

2.1. Early neoclassical perspectives

Although economists have studied economic growth for generations, there is still disagreement about how it is accounted for in a formal model. While some researchers take a Keynesian route and stress the role of demand factors, other researchers follow the neoclassical route, or more recently a Schumpeterian approach, emphasising the role of factor supplies in growth. In general, supply-side models are designed to uncover production factors for economic growth and are hence considered more appropriate for the purpose of investigating the impact of human capital formation.

Neoclassical growth theory seeks to understand the determinant of long-term economic growth rate through accumulation of factor inputs such as physical capital and labour. Studies reveal a significant contribution from technical progress, which is defined as an exogenous factor. Solow (1957) and Swan (1956) are among those who first demonstrated this.

At the heart of the neoclassical model lies an aggregate production function exhibiting constant returns to scale in labour and reproducible capital. This can be written in general form as follows:

$$Y = F(K, L)$$

where Y is output (or income), K is the stock of capital, and L is the labour force. The function expresses the output Y under a given state of knowledge, with a given range of available tech-

niques, and a given array of different capital, intermediate goods and consumption goods. With constant returns to scale, output per worker (i.e. labour productivity) $y \equiv Y / L$ will depend on the capital stock per worker (i.e. capital intensity) $k \equiv K / L$. Under the assumption of constant returns to scale, the relationship each unit of labour has with capital in production does not change with the quantity of capital or labour in the economy.

A crucial property of the aggregate production function is that there are diminishing returns on the accumulation of capital. In other words, each additional unit of capital used by a worker produces a decreasing amount of output (2). A form called the Cobb-Douglas function usually expresses the relationship:

$$Y = L^{1-\alpha} K^{\alpha}, 0 < \alpha < 1.$$

Alternatively the per worker production function can be written as:

$$y = f(k) = k^{\alpha}.$$

In other words, labour productivity can increase only if there is capital deepening (i.e. if capital intensity increases) (3).

The crucial tenet of the neoclassical model is that, under decreasing returns on capital, output per worker does not increase indefinitely. Assuming:

- (a) people save a constant fraction s of their gross income y (4);
- (b) the constant fraction δ of the capital stock disappears each year as a result of depreciation;

(1) This literature review section owes much to Aghion and Howitt (1998), Armstrong and Taylor (2000), and Richardson (1979) as well as Harris (2001) and Romer (1986 and 1990).

(2) This is expressed in mathematical terms, $F'(K) > 0$ and $F''(K) < 0$ for all K .

(3) The idea is also expressed in mathematical terms as follows: $\frac{dy}{y} = \frac{dY}{Y} - \frac{dL}{L} = \alpha \left(\frac{dK}{K} - \frac{dL}{L} \right) = \alpha \frac{dk}{k}$.

(4) While the assumption of a fixed saving rate is not a bad approximation to long-term data, many argue that people save at a rate that varies over their life. The permanent-income and lifecycle hypothesis presumes that people save with a view to smoothing their consumption over their lifetimes, taking into account their preferences for consumption at different dates and the rate of return that they can anticipate if they sacrifice current consumption in order to save for the future (Aghion and Howitt, 1998, p. 17-18). A model based on this assumption is the Cass-Koopmans-Ramsey model.

(c) the rate of population growth is n , and population growth will cause the capital stock per worker k to fall at the annual rate nk ; then the net rate of increase in k can be written by the following equation as:

$$\frac{dk}{dt} = sf(k) - (n + \delta)k = sk^\alpha - (n + \delta)k.$$

While the decline in the capital stock per worker due to depreciation and population growth is proportional to the capital stock, the growth of per worker capital through saving is constrained by decreasing returns on capital in production. When the marginal product of capital per worker falls to a sufficiently low level, gross investment will be just sufficient to maintain the existing stock of capital. Hence, the capital stock per worker will, in the long term, converge asymptotically to k^* that is defined by:

$$sk^\alpha - (n + \delta)k = 0.$$

In this steady-state equilibrium, output and the capital stock will both continue to grow, but only at the rate of population growth.

The model's implication does not account for empirical evidence of long-term growth. Using this framework, Solow (1957) demonstrated that an attempt to account for decades of US economic growth produced an astonishing residual of approximately 85 %. Solow attributed most of the residual to technological change ⁽⁵⁾. Accordingly, we can modify the neoclassical model by supposing that there is a productivity (or technology) parameter A in the aggregate function that reflects the current state of technological knowledge.

$$Y = F(A, K, L).$$

Assuming that productivity increases smoothly over time at a constant growth rate g ⁽⁶⁾,

$$Y = A_0 e^{gt} K^\alpha L^{1-\alpha}.$$

From this, it follows that growth in income is determined by productivity growth g and the growth of capital per worker ⁽⁷⁾. Hence, even if the capital stock and the labour force grow at the same rate, output per worker will increase provided that the rate of technical progress is higher than zero.

2.2. Limitations of the Solow-Swan model

An obvious limitation of the Solow-Swan model is its failure in accounting for the causes of technological progress. Although the model shows that technological progress contributes to economic growth, it does not spell out why technological progress takes place. The rate of technological progress is set at g without any theoretical relationships with other variables within the model (i.e. the rate is set exogenously). The justification normally given is that technological change originates from knowledge produced by the public science base (e.g. universities, public research institutes) outside the domain of the economic system the model expresses (Solow, 1957) (Shell, 1966 and 1967).

However, there is every reason to believe that technological progress itself depends on economic decisions, to much the same degree as capital accumulation. Entrepreneurs look for ways to make a profit and one way of doing this is to produce new ideas. Since there is a profit incentive to produce new knowledge and to innovate, knowledge creation and innovation need to be incorporated into a model of economic growth in such a way that, while they spur economic growth, they are in turn further advanced by economic growth. In other words, technological progress needs to be endogenised.

Another issue of the Solow-Swan model is its assumption of constant returns to scale. There is some evidence that suggests increasing returns in

⁽⁵⁾ It is worth noting that neither capital stock K nor labour force L included human capital in Solow's calculation. The model assumes that labour is homogeneous.

⁽⁶⁾ Namely, $A = A_0 e^{gt}$.

⁽⁷⁾ In mathematical terms, this is expressed as, $\frac{dy}{y} = \frac{dY}{Y} - \frac{dL}{L} = g + \alpha \left(\frac{dK}{K} - \frac{dL}{L} \right) = g + \alpha \frac{dk}{k}$.

long-term economic growth. For example, Kendrick (1976) attempted to explain US economic growth by adding intangible investments, such as human capital (e.g. R&D and education and training), to the capital stock that normally consists of tangible components (i.e. physical capital and labour). Such intangible investments can be counted as capital stock because they must have a lifetime of more than one year, that is, they improve the quality of the tangible factor over two or more annual accounting periods. However, he found that, between 1929 and 1969, an annual growth rate in real total capital (2.4 %) represented only 70 % of the 3.4 % average annual growth of real product in the private domestic business economy (Kendrick, 1976, p. 131). Romer (1986, p. 1013) suggests that, given the repeated failure of this kind of growth accounting exercise, there is no basis in the data for excluding the possibility that aggregate production functions are best described as exhibiting increasing returns.

The idea that increasing returns are central to the explanation of long-term growth is at least as old as Adam Smith's story of the pin factory (Smith, 1776). Alfred Marshall (1890) introduced the concept of increasing returns that are external to a firm but internal to an industry. Allyn Young furthered the idea with his competitive equilibrium interpretation, though no formal dynamic model embodying that insight was developed. Kenneth Arrow (1962) assumed that the productivity of a given firm is an increasing function of cumulative aggregate investment for the industry. Avoiding issues of specialisation and divisions of labour, Arrow argued that increasing returns arise because new knowledge is discovered as investment and production take place (Romer, 1986, p. 1005).

The failure of neoclassical models to introduce technological progress in such a way to account for its causes (i.e. endogenise technological progress) is, in large part, due to technical difficulty dealing with increasing returns in a dynamic general equilibrium framework. Attempts to understand

increasing returns have sought their source in technological progress. However, the approach entails technical difficulty if it is to maintain the Walrasian framework of marginal product ⁽⁸⁾.

Arrow (1962) avoided the problem by assuming that the growth of productivity A is an unintended consequence of the experience of producing new capital goods, a phenomenon he called 'learning by doing'. He assumed that an increase in K necessarily leads to an equiproportionate increase in knowledge through 'learning by doing'. In his model, K and L are paid their marginal products as those firms that produce capital goods are not compensated for their learning by doing (i.e. contribution to a growth in A). Yet, the growth of A became endogenous in the sense that it would increase saving propensity, which would in turn affect output up to an equilibrium point. The Arrow model is fully operational in the case of a fixed capital/labour ratio. This implies that the model does not have enough increasing returns to sustain output growth in the long term without growth in labour, as in the Solow-Swan model (Aghion and Howitt, 1998, p. 23).

2.3. Frankel-Romer model: AK approach to endogenous growth

More recent attempts to endogenise technological progress were spurred by Paul Romer's two seminal papers (1986 and 1990). Of these, the first 1986 paper has its theoretical origin in Frankel's (1962) AK model ⁽⁹⁾. Frankel assumed that each firm j in the economy has a production function expressed as:

$$Y_j = \bar{A} K_j^\alpha L_j^{1-\alpha}$$

where K_j and L_j are the firm's own employment of capital and labour. He then extended this produc-

⁽⁸⁾ Aghion and Howitt (1998) put this as follows:

... if A is to be endogenized, then the decisions that make A grow must be rewarded, just as K and L must be rewarded. But because F exhibits constant returns in K and L when A is held constant, it must exhibit increasing returns in three 'factors' K , L , and A . Euler's theorem tells us that with increasing returns not all factors can be paid their marginal products. Thus something other than the usual Walrasian theory of competitive equilibrium, in which all factors are paid their marginal products, must be found to underlie the neoclassical model (p. 23).

See Annex 1 for technical explanation of this.

⁽⁹⁾ Aghion and Howitt, 1998, p. 25.

Apparently Romer himself did not realise the theoretical lineage since he did not cite Frankel's work in his 1986 paper.

tion function to the whole economy, assuming that all firms face the same technology and the same factor prices, and will hire factors in the same proportions, which obtains:

$$Y = \bar{A} K^\alpha L^{1-\alpha} \quad (1)$$

To endogenise the productivity parameter \bar{A} , Frankel assumed that it is a function of the overall capital/labour ratio:

$$\bar{A} = A(K/L)^\beta$$

because in many respects the stock of knowledge depends on the amount of capital per worker in the economy. This is based on the idea that technological knowledge is itself a kind of disembodied capital good ⁽¹⁰⁾.

Another assumption made in Frankel's model is that although \bar{A} is endogenous to the economy (i.e. related to changes in K and L), it was taken as given by each firm, because the firm would only internalise a negligible amount of the effect that its own investment decisions have on the aggregate stock of capital.

When $\alpha + \beta = 1$, equation (1) becomes $Y = AK$. This form of model is referred to as the AK model. Diminishing returns on the accumulation of capital play a crucial role in limiting growth in neoclassical models like the Solow-Swan model. However, in the Frankel model, output grows in proportion to capital because of the effect of knowledge creation activities that counteract diminishing returns.

In his 1986 paper, Romer in effect extended the Frankel model by introducing a lifetime utility function $W = \int_0^\infty e^{-\rho t} u(c(t)) dt$, where $c(t)$ is the time path of consumption per person, $u(\cdot)$ is an instantaneous utility function exhibiting positive but diminishing marginal utility, and ρ is a positive rate of time preference. Romer assumed a production function with externalities of the same sort as considered by Frankel, and examined the case in which labour supply per firm was equal to

unity (i.e. $L=1$) and the rate of depreciation δ was zero. If it is supposed that the productivity parameter \bar{A} reflects the total stock of accumulated capital NK where N is the number of firms, $\bar{A} = A(NK)^\beta$.

In a steady-state growth, consumption ⁽¹¹⁾ and output grow at the same rate g , which is expressed as:

$$g = \frac{N^{1-\alpha} A \alpha - \rho}{\varepsilon}$$

if $\alpha + \beta$. This indicates that the larger the number of firms N , the more externalities there will be in producing new technological knowledge and therefore the faster the representative firm and the economy will grow ⁽¹²⁾.

As shown above, the AK approach introduces a specific relationship between technological progress and capital accumulation by assuming that knowledge is a sort of capital good and productivity increases with capital per labour. However, accumulation of knowledge is still external in the relationship since the approach does not explicitly express how knowledge creation is remunerated.

2.4. The second Romer model

Romer takes a different approach to accounting for technological progress in his article published in 1990. While he saw knowledge as part of the aggregate capital K and related technological progress to an increase in capital/labour ratio in his 1986 article, Romer focused this time on the production of knowledge by research workers. This model assumes that technological knowledge is labour-augmented, enhancing their productivity. The production function is expressed as:

$$Y = K^\alpha (AL)^{1-\alpha} \quad (2)$$

so that AL denotes a knowledge-adjusted workforce. Further, the model assumes that research

⁽¹⁰⁾ Aghion and Howitt (1998) explains this:

It [technological knowledge] can be used in combination with other factors of production to produce final output, it can be stored over time because it does not get completely used up wherever it is put into a production process, and it can be accumulated through R&D and other knowledge-creation activities, a process that involves the sacrifice of current resources in exchange for future benefits (p. 25-26).

⁽¹¹⁾ The growth rate of consumption under the model is given in Annex 2.

⁽¹²⁾ In his 1986 article, Romer in fact assumed $\alpha + \beta > 1$, that is, increasing social returns on capital.

workers create technological knowledge. In a simple form, this is expressed as:

$$\frac{dA}{dt} = \delta H_A A \quad (3)$$

where H_A is human capital of research workers, and δ is a parameter. It is plain to see that the more researchers, the more new ideas are created, and the larger the existing stock of knowledge A , the more new ideas are produced (i.e. effect of externalities).

Equation (3) shows that the rate of technical progress will be determined by the stock of human capital of research workers. In other words, an economy with a larger total stock of human capital will grow faster (Romer, 1990, p. S99).

It is worth emphasising that unlike his previous model, the second Romer model explicitly recognises the role human capital plays in economic growth. Also the model differs from human capital models such as the one developed by Becker et al. (1990) that treats all forms of intangible knowledge as being analogous to human capital skills that are rival and excludable. The second Romer model includes two distinct ways in which knowledge enters production. One is the contribution of new ideas (or designs in Romer's term) to producing new goods. Research workers employed by firms undertake the production of new designs. New designs are nonrival but excludable as their property rights are protected by patents. At the same time, new designs also increase the total stock of knowledge shared by the community of research workers and thereby increase the productivity of human capital in the research sector as a whole. Knowledge spillovers imply externalities: knowledge is thus nonexcludable in this realm (Romer, 1990, p. S84).

2.5. Schumpeterian growth model

Introducing the rival property of knowledge protected by property rights, the second Romer model adopts a Schumpeterian view of innovation and explicitly assumes market power. The idea was furthered in the 1990s by those models that assumed imperfect competition and elaborated more on the process of innovation. Among those early attempts was that of Segerstrom et al. (1990), who modelled sustained growth as arising from a succession of product improvements in a fixed number of sectors. However, Segerstrom et al. did not integrate the uncertain nature of innovation in their model. The introduction of uncertainty had to wait for the model proposed by Aghion and Howitt (1992). Aghion and Howitt assumed the creation of innovations through research as a stochastic process in which the innovation quantity is expressed as flow probability. As a specific form of the stochastic process, a Poisson process is normally adopted ⁽¹³⁾.

Aghion and Howitt (1998) extended the model to include more than one economic sector and to consider technology spillovers across sectors (Figure 1). In the model, there is one final good that is produced from a continuum of intermediate goods. Each intermediate good can be used to produce the final good independently of the other intermediate goods, with no complementarities between them. Each intermediate sector is monopolised by the holder of a patent to the latest generation of that intermediate good. Also each intermediate sector has its own research sector in which firms compete to discover the next generation of that particular good. Innovations in research sectors all draw on the same pool of shared technological knowledge that exist beyond sectoral boundaries. The state of this knowledge is represented by leading-edge

⁽¹³⁾ Suppose that events of a particular kind occur at random during a particular time. Poisson process has the probability distribution that meets the following four conditions:

- (a) The probability that each event occurs in a very short time interval must be proportional to the length of this time interval.
- (b) The probability that two or more events of the relevant kind occur in a very short time interval must be so small that it can be regarded as zero.
- (c) The probability that a particular number of these events occurs in a particular time interval must not depend on when this time interval begins.
- (d) The probability that a particular number of these events occurs in a particular time interval must not depend on the number of these events that occurred prior to the beginning of this time interval.

(Mansfield, 1980).

technology. Each innovation at date t in any sector adds an increment to the level of the leading-edge technology at date $t - 1$ and permits the innovator to start producing in his sector using the new level of the leading edge technology. The previous incumbent in sector i , whose technology is no longer leading-edge, will be displaced. Hence the leading-edge technology grows gradually, at a rate that depends on the aggregate flow of innovations in the economy as a whole.

Aghion and Howitt (1998) also incorporated in their model horizontal imitation as a source to restrict effects of increasing returns to scale. While the neoclassical theory of Solow and Swan assumes constant returns to scale, R&D models of growth no longer have constant returns in all the factors that are growing: capital, knowledge and labour. Growth models proposed by Romer (1990), Grossman and Helpman (1991), and Aghion and Howitt (1992), for example, predict that the steady-state growth rate depends on the level of resources devoted to R&D – if the level of R&D resources is doubled, then per capita growth in output should also double. Jones

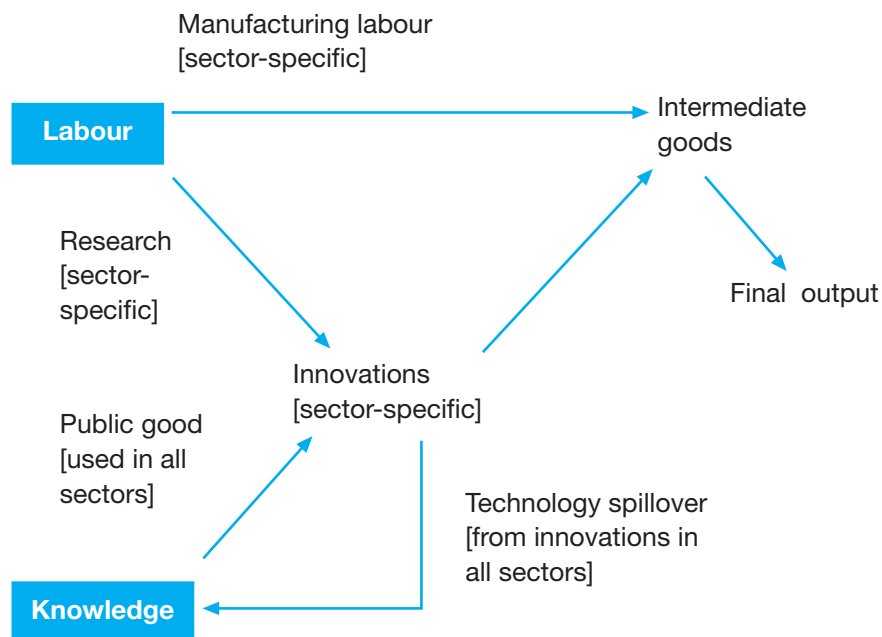
(1995) criticises this, showing the dramatic increase of scientists and engineers in the US during the last 40 years contradicting a constant mean of the growth rate of the economy over the same period. To counter this, Aghion and Howitt argue that a source that limits such scale effects is imitations and a resultant growth of intermediate goods in the economy without adding to overall productivity.

The steady-state growth rate of per-worker income g , which equals the growth rate of leading-edge technology, is expressed as:

$$g = \sigma \lambda \phi(n)$$

where σ is the size of an average increment of knowledge that is added to the level of leading-edge technology at each innovation, λ is the productivity of R&D, n is the amount of input in research which is adjusted by the level of the leading-edge technology ⁽¹⁴⁾, and $\phi(\cdot)$ is a function of the probability with which innovations take place ⁽¹⁵⁾. In other words, the steady-state growth rate g depends positively upon the productivity of R&D (λ). Also, the flow probability of innovations

Figure 1: **A schematic representation of economic activities in the multisector model (Aghion and Howitt, 1998, p. 86)**



⁽¹⁴⁾ It is presumed that as technology advances, the resource cost of further advances increases proportionally.

⁽¹⁵⁾ The function of innovation probability $\phi(\cdot)$ has the property that represents a decreasing marginal product of research input n . The function's property is due to research congestion within a product.

depends positively on technology-adjusted input in research (n). Given the same level of leading-edge technology, the growth rate depends positively upon research input. Further, as an effect of horizontal imitation, Aghion and Howitt argue that the steady-state growth rate of per-worker income also depends positively on population growth ⁽¹⁶⁾.

2.6. Accumulation or stock? Source of economic growth due to human capital

The above review shows that models of economic growth vary in the ways they predict production factors can cause an economy to grow. According to the Solow-Swan model, the growth of per capita income arises from accumulation of capital until the economy reaches a steady state. In the steady state, per capita income growth relies solely on technological progress that the model does not attempt to explain. In contrast, endogenous growth models set R&D at the centre of their framework. They predict that per capita income growth is determined by the amount of resources devoted to R&D. The neoclassical Solow-Swan model sees the change in the amount of capital (i.e. capital accumulation) as the source of economic growth (until the economy reaches a steady state), whereas endogenous growth models assume that the level of the stock of a particular capital (that is devoted to R&D) decides economic growth.

This disagreement about the source of economic growth is also found in discussions on human capital. Broadly, there are two basic frameworks with which to model and analyse the relationship between human capital formation and economic growth (Benhabib and Spiegel, 1994) (Aghion and Howitt, 1998). The first approach has its origin in Becker's (1964) theory of human capital and has attracted attention with the 1988 article by Lucas. It is based on the idea that growth is primarily driven by the accumulation of human capital. According to

this approach, differences in growth rates of per capita income across economies are in large part accounted for by differences in the rates at which the economies accumulate human capital. The second approach dates back to the seminal paper of Nelson and Phelps (1966) and has recently been revived in Schumpeterian growth literature. It contends that the stock of human capital determines the economy's capacity to innovate or catch up with more advanced economies, which in turn drives economic growth. Hence, the level of human capital stock is, though indirectly, a determinant of per capita economic growth in this view.

In the economy assumed by Lucas (1988), individuals choose at each date how to allocate their time between current production and skills acquisition (or schooling), taking into account increases in productivity and wages in future periods that arise from current investment of time in education or training. If h denotes the current human capital stock of the representative person, and u denotes the fraction of the person's time currently allocated to production, the Lucas model can be summarised by:

$$y = k^\beta (uh)^{1-\beta}$$

where k denotes the per capita stock of physical capital, and:

$$\frac{dh}{dt} = \delta h(1-u), \quad \delta > 0.$$

While the second equation expresses that the growth rate of human capital is determined by time spent in education or training, the first equation describes the way human capital affects current production. As the first equation's similarity to the Solow-Swan model suggests, per capita income growth comes from accumulation of human capital (as well as accumulation of physical capital). In other words, the growth rate of per capita income depends positively on the growth rate of human capital (as well as the growth rate of physical capital). Under the assumption of constant returns to the stock of human capital, the steady-state growth is expressed by:

$$g = \delta(1-u^*)$$

⁽¹⁶⁾ Aghion and Howitt (1998, p. 108) note: This new effect [of imitation] shows that what used to be thought of as an embarrassing scale effect in Schumpeterian growth theory can be seen ... as a novel prediction that distinguishes it from the neoclassical theory of Solow and Swan. Instead of saying that growth goes up with the level of population, it goes up with the growth rate of population.

where u^* is the optimal allocation of individuals' time between production and education/training.

In contrast, Nelson and Phelps (1966) suggested that this standard view of human capital as an additional input would represent a gross misspecification of the production process. They argued that education and training facilitate the adoption and implementation of new technologies, which are continuously invented at an exogenous rate. In their view, the growth of productivity parameter A is expressed by:

$$\frac{\frac{dA}{dt}}{A} = c(H) \cdot \frac{T_t - A_t}{A_t}$$

where T_t denotes the level of theoretical knowledge at date t . It is evident in the specification that the growth rate of A depends on the gap between its level and the level of T , and the level of human capital H through the function $c(H)$ where $\frac{dc}{dH} > 0$ ⁽¹⁷⁾.

Extending the model, Benhabib and Spiegel (1994) substituted technology 'catch-up' across different economies for the closing of a gap between A and T in the Nelson and Phelps framework. According to Benhabib and Spiegel, the growth rate of productivity parameter A for an economy i is written as:

$$\frac{\frac{dA_{it}}{dt}}{A_{it}} = g(H_i) + c(H_i) \cdot \frac{\max_j A_{jt} - A_{it}}{A_{it}} \quad (4)$$

where the endogenous growth rate $g(H_i)$ and the catch-up coefficient $c(H_i)$ are non-decreasing functions of H_i . In other words, the level of human capital not only enhances the ability of an economy to develop its own technological innovations (as in R&D-based growth models), but also its capacity to adapt and implement technologies developed elsewhere.

There is disagreement in empirical evidence as to which influences economic growth – accumulation of human capital or level of human capital stock.

In a cross-country study of per capita GDP growth during two periods (from 1965 to 1975 with 87 countries and from 1975 to 1985 with 97 countries), Barro and Sala-i-Martin (1995) obtained the following findings:

- (a) educational attainment (measured by average years of schooling) is significantly correlated with subsequent growth (with a correlation coefficient at around 0.05), although if the aggregate measure of educational attainment is decomposed by level of education, the impact of primary education remains largely insignificant;
- (b) public spending on education also has a significantly positive effect on growth: a 1.5 % increase of the ratio of public education spending to GDP during the period 1965-75 would have raised the average growth rate during the same period by .3 % per year ⁽¹⁸⁾.

Mankiw et al. (1992) also tested the impact of human capital formation using the Solow-Swan model. In their test, they assumed a steady state ⁽¹⁹⁾ and used a proxy for the rate of human

⁽¹⁷⁾ The growth rate of A settles down to the growth rate of T in the long-term.

⁽¹⁸⁾ Barro and Sala-i-Martin assume that a function for a country's per capita growth rate in period t , Dy_t , as

$$Dy_t = F(y_{t-1}, h_{t-1}, \dots),$$

where y_{t-1} is initial per capita GDP and h_{t-1} is initial human capital per person (based on measures of educational attainment and health). The omitted variables, denoted by \dots , comprise an array of control and environmental influences.

⁽¹⁹⁾ Mankiw et al. use an augmented Solow-Swan model that is expressed as:

$$Y_t = K_t^\alpha H_t^\beta (A_t L_t)^{1-\alpha-\beta}$$

where H is the stock of human capital. When the fraction of income invested in physical capital is s_k , and the fraction of income invested in human capital is s_h , the evolution of the economy is determined by:

$$\frac{dk_t}{dt} = s_k y_t - (n + g + \delta) k_t$$

$$\frac{dh_t}{dt} = s_h y_t - (n + g + \delta) h_t$$

where $y = Y/AL$, $k = K/AL$, $h = H/AL$, n is growth rate of L , g is growth rate of A , and δ is depreciation rate. In the steady state, the following equation holds:

$$\log(Y_t/L_t) = \log A_0 + gt - \frac{\alpha + \beta}{1 - \alpha - \beta} \log(n + g + \delta) + \frac{\alpha}{1 - \alpha - \beta} \log s_k + \frac{\beta}{1 - \alpha - \beta} \log s_h.$$

capital accumulation that measures approximately the percentage of the working age population that is in secondary school. In the test that examined GDP per working age person in 1985 for 98 non-oil countries, Mankiw et al. found that the coefficient on human capital accumulation is significant, that is, human capital accumulation, along with physical capital accumulation, accounts for the growth of per capita GDP.

In contrast, Benhabib and Spiegel (1994) estimated the stock of human capital and tested the augmented Solow-Swan model without the assumption of a steady state ⁽²⁰⁾. From the data of 78 countries during the period of 1965-85, Benhabib and Spiegel found that the log difference in human capital in their specification always enters insignificantly, and almost always with a negative coefficient. In other words, human capital accumulation is found to lead to a negative growth of the economy although this impact is statistically not significant.

Benhabib and Spiegel then undertook tests using different models that included the stock of human capital instead of the accumulation of human capital. In the model that includes an average of human capital stock over the period under study, human capital stock enters insignificantly with a negative sign ⁽²¹⁾. However, when initial income levels are introduced in the model, human capital stock enters significantly with the predicted positive sign. Benhabib and Spiegel suggest that catch-up remains a significant element in growth, and countries with higher education tend to close the technology gap faster than others. In the second model that incorporates both endogenous growth and catch-up terms as in equation (4) ⁽²²⁾, the catch-up term enters positively and significantly for the entire sample of 78 countries. However, the coefficient estimate on country-specific technological

progress is negative and insignificant. Benhabib and Spiegel tested the same model for subgroups of their sample, assuming that the relatively strong impact of the catch-up term may change with the relative position of the country. They found:

- (a) for the poorest third of their sample, the catch-up term is positive and significant, whereas the endogenous growth term is negative and insignificant;
- (b) for the middle group, both terms are insignificant;
- (c) for the richest third of the sample, the endogenous growth term enters positively and significantly with a 6 % level of confidence while the catch-up term enters insignificantly with a coefficient estimate that is positive but close to zero.

From these results, they argue that human capital stocks in levels, rather than their growth rates, play a role in determining the growth of per capita income.

2.7. Regional perspectives

These models of economic growth are usually developed with respect to national-level economic growth and treat nations as spaceless units. The lack of attention to space attracted strong criticism from those who study regional economies. The determinants of growth over space carry certain implications that are not easy to reconcile with the central principles of growth models, and particularly neoclassical models. Richardson (1979, p. 142) summarises such neoclassical principles as:

- (a) reliance on the price mechanism as the spatial allocator of resources;
- (b) emphasis on marginal adjustments, whereas spatial functions are discontinuous and loca-

⁽²⁰⁾ They assumed a production function, $Y_t = A_t K_t^\alpha L_t^\beta H_t^\gamma$, and used the following equation to examine the impact of human capital accumulation:

$$\log Y_T - \log Y_0 = \log A_T - \log A_0 + \alpha(\log K_T - \log K_0) + \beta(\log L_T - \log L_0) + \gamma(\log H_T - \log H_0).$$

⁽²¹⁾ The model's specification is as follows:

$$\log Y_T - \log Y_0 = \log A_T - \log A_0 + \alpha(\log K_T - \log K_0) + \beta(\log L_T - \log L_0) + \gamma \left(\frac{1}{T} \sum_0^T \log H_t \right).$$

⁽²²⁾ The model's structural specification is as follows:

$$\log Y_T - \log Y_0 = c + (g - m)H_i + mH_i \left(\frac{Y_{\max}}{Y_i} \right) + \alpha(\log K_T - \log K_0) + \beta(\log L_T - \log L_0).$$

- tion changes usually mean inertia (i.e. no change) or a long-distance jump;
- (c) the assumption that growth can be constructively analysed with an aggregate production function and a homogenous capital stock;
- (d) the predilection for equilibrium solutions;
- (e) a greater facility with deterministic rather than probabilistic solutions.

A central weakness of neoclassical models lies in the assumption that all factors of production are completely mobile between regions within a country. The weakness is particularly acute when neoclassical models are employed to account for long-term regional disparities in economic development. The assumption of mobile factors within a country predicts that any differences in the capital/labour ratio, and thus labour productivity, between regions disappear in the long term as capital and labour move to the regions that yield the highest returns ⁽²³⁾.

As for short- or mid-term disparities, the assumption of nonexcludable knowledge poses another problem. This is because technological knowledge is assumed to be perfectly mobile between regions and always available to all regions simultaneously. For instance, the particular assumption limits the application of the Romer models to the world economy as a whole because technological progress diffuses across geographical space so that even small economies can benefit from it without having to rely on knowledge created within their own frontiers (Armstrong and Taylor, 2000, p. 79) ⁽²⁴⁾. However, innovations do not diffuse instantaneously or at an even rate over the economy as a whole. They diffuse irregularly though predictably, reaching some areas very early in the adoption stage but not being adopted in other areas until very late. In some cases (e.g. when a threshold market is required), adoption at a particular location may never occur (Richardson, 1979, p. 125-126). The pioneering study in this area, Hägerstrand (1966), focusing on agricultural inno-

vations, demonstrated the importance of the communications network as a determinant of the diffusion path ⁽²⁵⁾. He also showed that the diffusion process could be understood by a model of stochastic process ⁽²⁶⁾.

Another aspect of nonexcludable knowledge is that some types of knowledge are embodied in individuals (i.e. tacit) and difficult to transfer through other means than interpersonal, often face-to-face communications. This needs to bring another class into the second Romer model: tacit knowledge embodied in individuals should be distinguished from patent-protected knowledge and shared, codified knowledge. Tacit knowledge also signifies the importance of human capital that represents a carrier of such knowledge. Some even argue about a region's institutional environment as a key determinant of its capacity to create technological progress (Rauch, 1993). According to this view, the creation of technological progress is determined by a collective learning process within which many individuals interact and exchange ideas and information (some of which are tacit). There are economies of scale to be gained from the geographical concentration of highly educated people as this results in a more rapid transfer of knowledge through their proximity. In addition to this, some regions are said to possess an institutional environment or culture that better facilitates such a collective learning process (Saxenian, 1994). In addition to universities and research institutes, a vertically-disintegrated industrial structure, a high mobility of skilled workers, and an abundance of venture capital are often found in such an environment.

Regarding mobility of human capital between regions, Bradley and Taylor (1996) argue that there is a sequential interaction between the local education and training system and the locality's stock of highly-skilled workers. This is shown in Figure 2.

The rate of enrolment in education is influ-

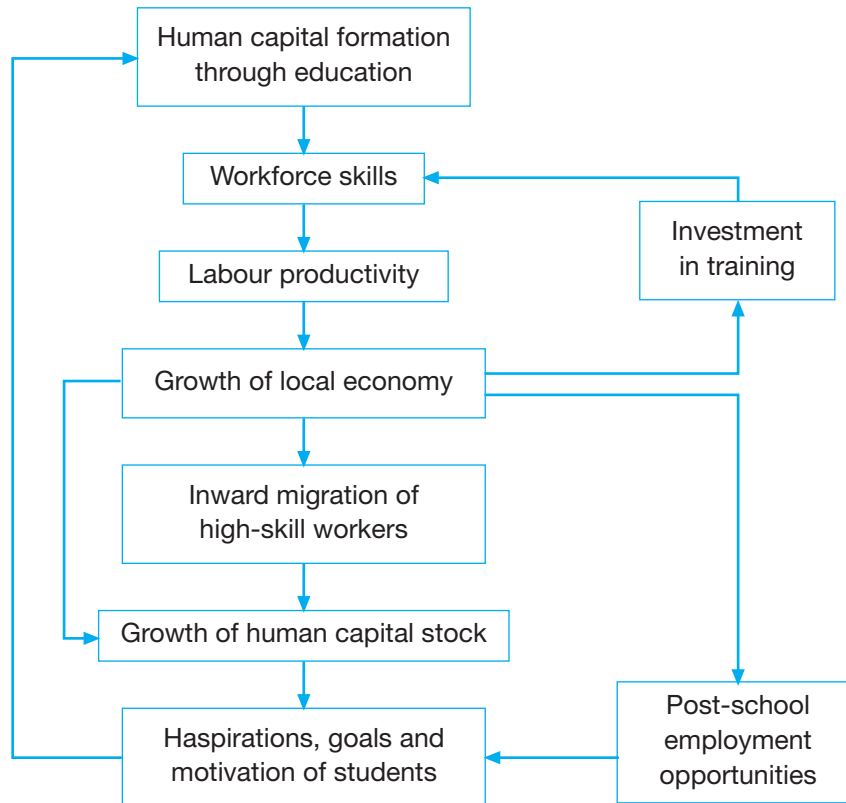
⁽²³⁾ This weakness is mitigated when discussing disparities between nations because international mobility of labour is restricted by immigration regulations.

⁽²⁴⁾ Based on the assumption, Romer argues that a country's economic growth is correlated with the degree of its integration into worldwide markets.

⁽²⁵⁾ The classic study of the diffusion of hybrid corn by Griliches (1957) looked at inter-state differentials but did not explicitly investigate the spatial spread of the innovation (Richardson, 1979, p.125).

⁽²⁶⁾ Innovations diffuse over space and time. A common way of representing general spatial diffusion radiating out from the innovation source is expressed by a distance-decay function: $p(r) = ae^{-br}$

Figure 2: **Interaction between the local education and training system and the locality's stock of highly-skilled workers (adopted from Bradley and Taylor, 1996, p. 3)**



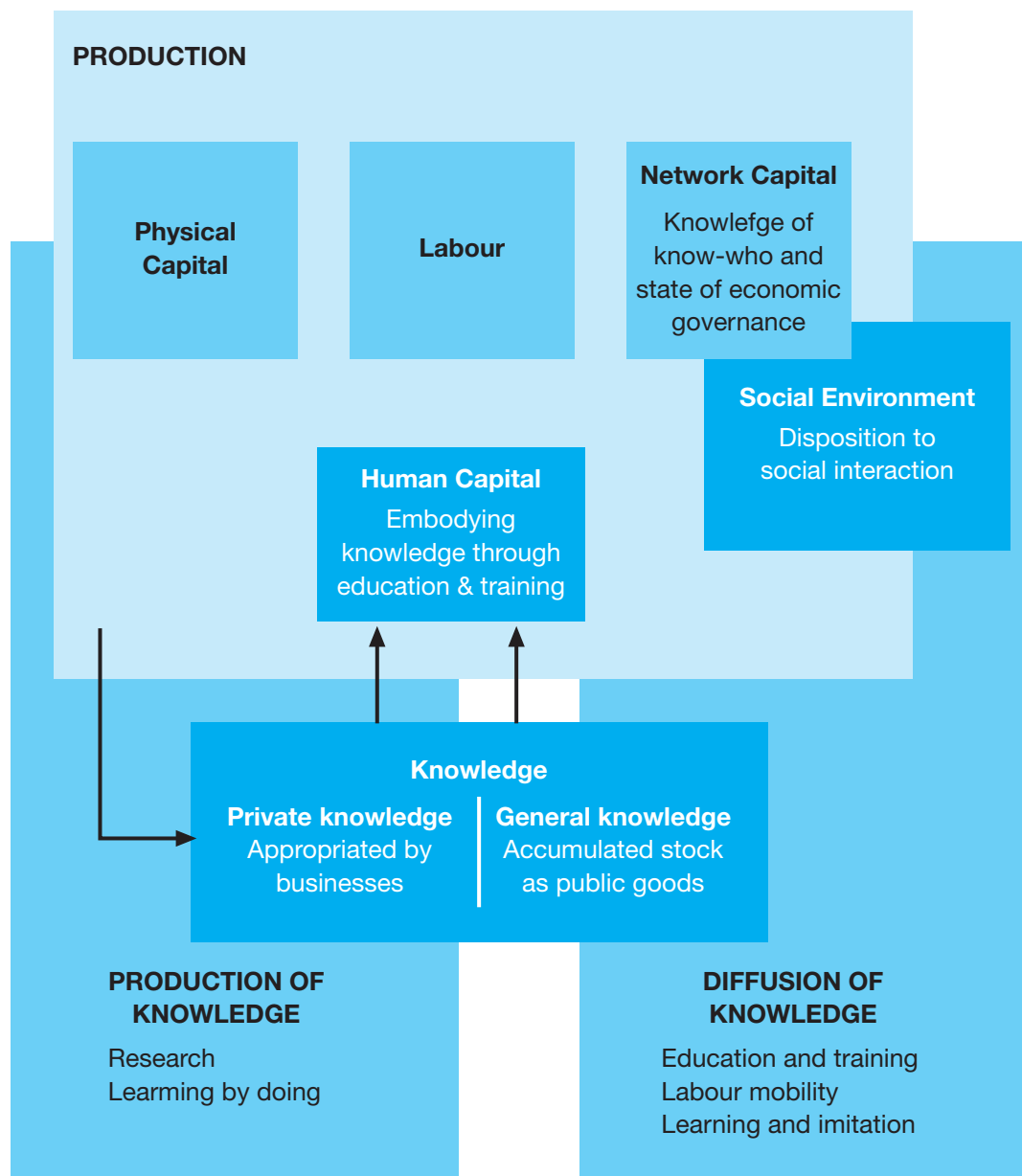
enced by the socioeconomic background of pupils, employment and career prospects in the local economy, and the quality of local schooling. Enrolment, in turn, determines the locality's workforce skills, labour productivity, and economic performance. Its economic performance then determines the volume and occupational mix of inward migrant workers into the locality. Economic growth also provides employers with more worker training, facilitating further skills increase. A shift in the occupational mix towards skilled workers will have beneficial effects on the locality's human capital formation. While skilled workers are often keen to invest in education for their children, an improved economy also provides better employment opportunities and induces other pupils to seek for education and training. Hence, Bradley and Taylor argue that the education and training system interacts with the local economy in such a way that spatial disparities in economic well-being are exacerbated through the cumulative causation mechanism.

A summary of our review of regional studies is given in Figure 3. While regional studies literature

shares a basic understanding of production with economics literature, it pays more attention to the way space affects economic production.

It particularly elaborates more on the effects of spatial agglomeration of economic activity and attempts to identify causes of spatial agglomeration as well as its effects. Distinction between codified knowledge and tacit knowledge is emphasised in the attempt. It is argued that tacit knowledge is embodied in skilled workers and less mobile than codified knowledge. Hence, the assumption of frictionless diffusion of technological knowledge is under attack. Also drawing on more institutional studies than mainstream economics, such as the theories of transaction costs (Williamson, 1975 and 1985) and social embeddedness (Granovetter, 1985), the literature often examines social aspects of relations between economic agents. These efforts lead to the conceptualisation of other types of production factors, such as social capital and network capital. Another area of focus is economic disparities between regions that arise from spatial divisions of labour. It is often argued that high-order

Figure 3: Schematic model of knowledge and production



functions that require significant human capital are concentrated in core regions (due to agglomeration effects), creating regional disparities. Regional studies and economic studies of growth hence intersect at the issue of convergence.

2.8. Summary of literature review

The literature review shows that human capital attracts more attention as economic growth

models attempt to account for technological progress in greater detail. In the classic Solow-Swan model, technological progress was identified as a residual that is not explained by capital and labour. Though capital in the model can theoretically include both human and physical capital, human capital was, in practice, not considered in many empirical studies employing the model. As a step towards accounting better for the role of technological progress in economic growth, the Fankel's AK model related it to an

increase in capital per worker, seeing knowledge as a sort of disembodied capital. Romer (1986) refined the model by incorporating maximisation of lifetime utility with an intertemporal utility function. Yet, both the original Frankel AK model and the first Romer model did not give any explicit role to human capital.

In contrast, Romer's second endogenous growth model (1990) recognises human capital as a primary source of technological progress and, therefore, economic growth. Romer views research workers as the source of new ideas and hence profits. In the model, Romer also distinguishes patent-protected technology from the stock of knowledge that is shared by the community of research workers. Other endogenous growth models, including the Aghion-Howitt model, also set R&D at the centre of their frameworks. Such R&D-based growth models produce implications that are distinct from the neoclassical Solow-Swan model. An example of this is prediction of scale effects.

There remains disagreement on how human capital affects economic growth. While the approach initiated by Lucas (1988) views accumulation of human capital as the source of economic growth, the approach of Nelson and

Phelps (1966) and Benhabib and Spiegel (1994) assumes that stock of human capital determines the ability of an economy to develop and assimilate technologies and thus produce economic growth. This difference in their positions mirrors different treatments of technological progress and R&D in the Solow-Swan model and R&D-based endogenous growth models.

These economic growth models are, however, criticised for their spaceless analysis. Their weakness is said to be acute when accounting for disparities in economic development between regions in which all production factors are assumed to be mobile. The assumption of frictionless diffusion of technological knowledge is under particular attack. It is argued that tacit knowledge is embodied in skilled workers and less mobile than codified knowledge. Furthermore, a mechanism of cumulative causation is said to work in the location of highly-skilled workers through education and training. Such discussions in spatial studies imply increasing disparities between regions. This implication is in stark contrast to neoclassical models of economic growth predicting convergence due to decreasing returns on capital.

3. Empirical analysis of regions in Europe

This chapter presents results of an empirical analysis of regions in EU Member States. The first part looks into relationships among aspects such as investment in education/training, demand for human capital, and economic indicators of regions. The second part provides empirical evidence relating to the debate between the Lucasian approach and the Benhabib-Spiegel approach.

Unless otherwise noted, we use data provided by Eurostat that covers regions and countries in the EU (Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Austria, Portugal, Finland, Sweden, and the UK). We use the EU's definition of regional units, NUTS (Nomenclature of territorial units for statistics) level 1 ⁽²⁷⁾. Because of the definition, some nations are included as regions (i.e. Denmark, Ireland, Luxembourg). Regions in Sweden, as well as regions in some parts of Portugal and Finland, are based on NUTS level 2, a lower level of units.

Data availability restricts the majority of the analysis in the second part to Denmark, Germany (excluding regions in ex-German Democratic Republic), France, Ireland, and Italy whereas the first part covers a greater proportion of the Member States. Also a majority of data, including numbers of students enrolled in education by educational level, are available at the regional level only for short periods in the mid 1990s. This constrained our analysis in the majority of the first chapter.

3.1. Relationship between investment in education/training and demand for human capital

3.1.1. Human capital development and employment patterns

First, we looked at relationships between investment by individuals in education/training and employment size of sectors/functions that require high-order human capital. We use the numbers of students as a percentage of the working age population (15 to 64 years old) as a proxy for investment by individuals in human capital development ⁽²⁸⁾. We chose ICT-related sectors, including manufacturing of ICT devices and ICT services, as requiring high order human capital ⁽²⁹⁾. The two variables are correlated and results are as follows, quantified by enrolments:

- (a) for both general and vocational types of upper secondary education, no significant correlation is found between students as a percentage of the working population and employment in the high-tech sectors;
- (b) for tertiary education, correlation between students as a percentage of the working population and employment in the high-tech sectors is positive (0.41) and significant (0.005) – see Figure 4.

Similarly there is strong association, as shown in Figure 5, between students in tertiary education as a percentage of working age population and volume of R&D staff (including business, government, and higher education institutions). Correlation between the two is positive (0.54) and significant (0.000). We found close association (correlation: 0.31; significance: 0.01) between students in tertiary education as a percentage of the working

⁽²⁷⁾ The NUTS was set up at the beginning of the 1970s as a single, coherent system for dividing up the EU to produce regional statistics. Of its three levels of regions, level 1 is the largest unit that can be compared in size to some smaller member countries of the EU.

⁽²⁸⁾ Mankiw et al. (1992) used this proxy in their study.

⁽²⁹⁾ NACE 30 (office machinery and computers), 32 (telecommunications equipment), 64 (post and telecommunications), 72 (computer-related services) and 73 (R&D services) are included. In Eurostat, the data for NACE 64, 72 and 73 (and NACE 30 and 32 as well) is collated and made available as a single group, not allowing NACE 73 to be separated from the rest.

Figure 4: **Students in tertiary education as a percentage of working age population and employment in ICT sectors**

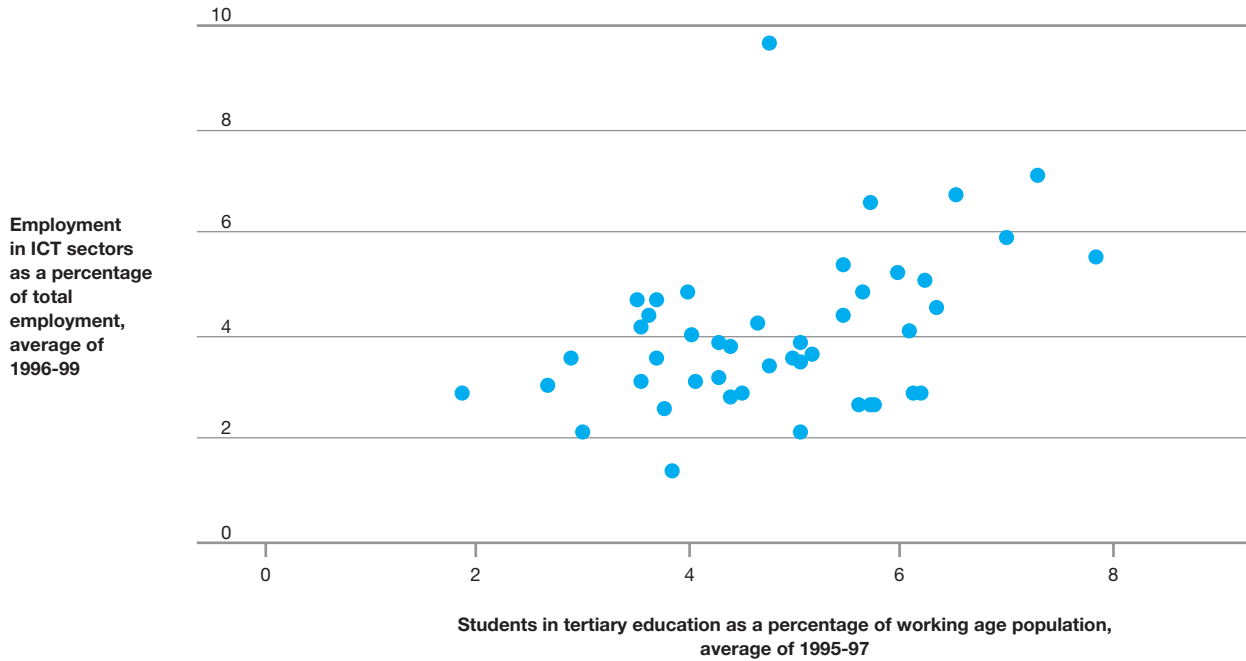
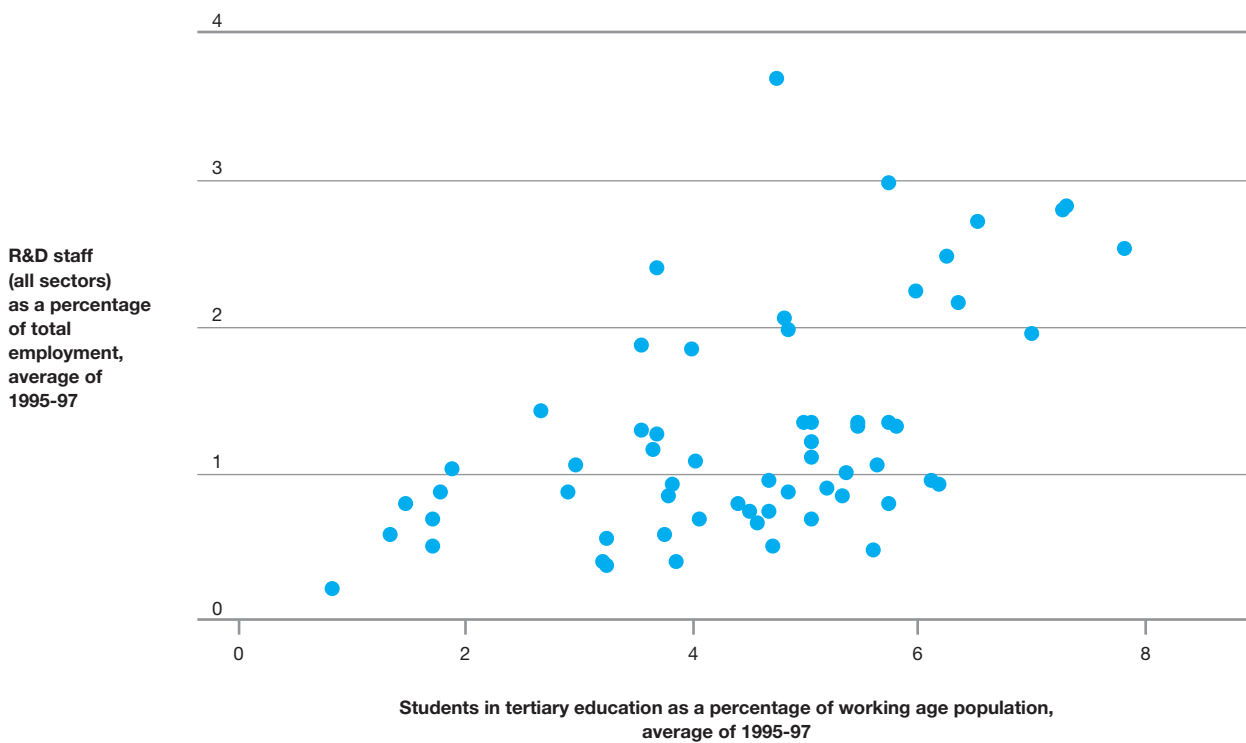


Figure 5: **Students in tertiary education as a percentage of working age population and R&D staff**



population and number of business R&D staff as well. In contrast, no significant association was found between number of R&D staff and students in both general and vocational types of upper secondary education as a percentage of the working population (not in Figure 5).

The results show the tendency that investment by individuals in development of high-order human capital (i.e. tertiary education) is strong in those regions where there is a strong demand from activities requiring it (e.g. high-tech industries, R&D departments).

3.1.2. Human capital development and public science base

We saw close association between human capital development and R&D capacity of private-sector firms above. The R&D capacity of regions is also influenced by public R&D effort from governments and higher education institutions. An examination of the relationship is shown in Figure 6.

As expected, students in tertiary education as a percentage of the population aged 20 to 24 years and public R&D expenditures have close association, with a positive correlation (0.43) at the 1 % significance level (0.000). In contrast, there is no significant correlation between students in upper secondary education as a percentage of the population aged 15 to 19 years and public R&D expenditure ⁽³⁰⁾.

3.1.3. Urban/rural settings and human capital development

One of the arguments found in regional studies is that urban areas in which economic activity concentrates tend to facilitate diffusion of knowledge (particularly tacit knowledge) through the ease of face-to-face interactions. With agglomeration effects, such urban areas hence often host high-order corporate functions (e.g. headquarters and R&D departments) and firms operating in high-tech industries as well as universities and research institutes ⁽³¹⁾.

Given this association between investment in

human capital development and high-tech industries/R&D functions, close association is expected between investment in human capital development and density of economic activity. We use population density as a proxy for economic activity density. Figure 7 shows the relationship.

It is clear that individuals in regions with large metropolitan areas, such as Berlin, Bremen, Hamburg, Île de France, and Comunidad de Madrid, heavily invest in tertiary education. Correlation between the two variables is positive (0.27) and significant (0.02). Metropolitan areas hosting high-order corporate functions have a disproportionate supply of universities which provide suitable human capital.

In contrast, regions with large metropolitan areas have a relatively small number of students in upper secondary education as a percentage of the working population. This is shown in Figure 8 ⁽³²⁾.

Whereas individuals in regions with large metropolitan areas heavily invest in higher education, there is some evidence that gaps between regions are closing. Figure 9 shows the relationship between population density and change in students in tertiary education as a percentage of the population aged 16 to 19 years from 1995 to 1997. Correlation between the two variables is negative (-0.23) and significant at the 10 % level (0.07). As the period is short, the change in enrolment rate is susceptible to short-term shocks. Accordingly, the finding is only suggestive. The figure indicates that an increase in enrolment rate in regions with large metropolitan areas is more likely to be slower while the rate is growing faster in some non-metropolitan regions (i.e. low population-density regions) ⁽³³⁾.

3.1.4. Relationship between human capital development and entrepreneurship

The creation of new businesses is an important source of economic dynamism. High-technology industries in particular evolve through technology-based start-ups and spin-offs by entrepreneurs who are often supported by venture

⁽³⁰⁾ The same relationships are found between the numbers of students as a percentage of the working population by level of enrolment and public R&D expenditure.

⁽³¹⁾ Lucas (1988) discusses this, referring to the work of Jane Jacobs.

⁽³²⁾ Correlation between the variables is negative (-0.20) at the 10 % significance level (0.09).

⁽³³⁾ As might be expected, no significant correlation was found between population density and change in students in upper secondary education as a percentage of the population aged 16 to 19 years.

Figure 6: **Students in tertiary education as a percentage of population aged 20 to 24 years and public R&D expenditures**

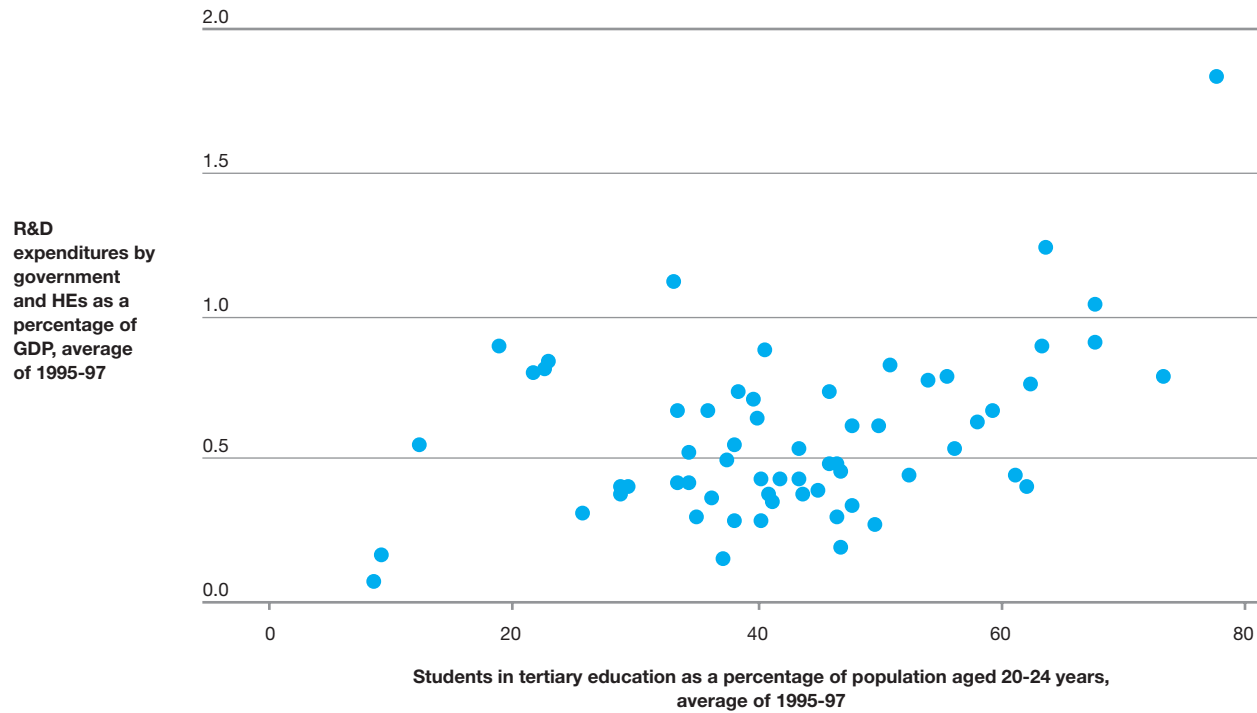


Figure 7: **Students in tertiary education as a percentage of working age population and population density**

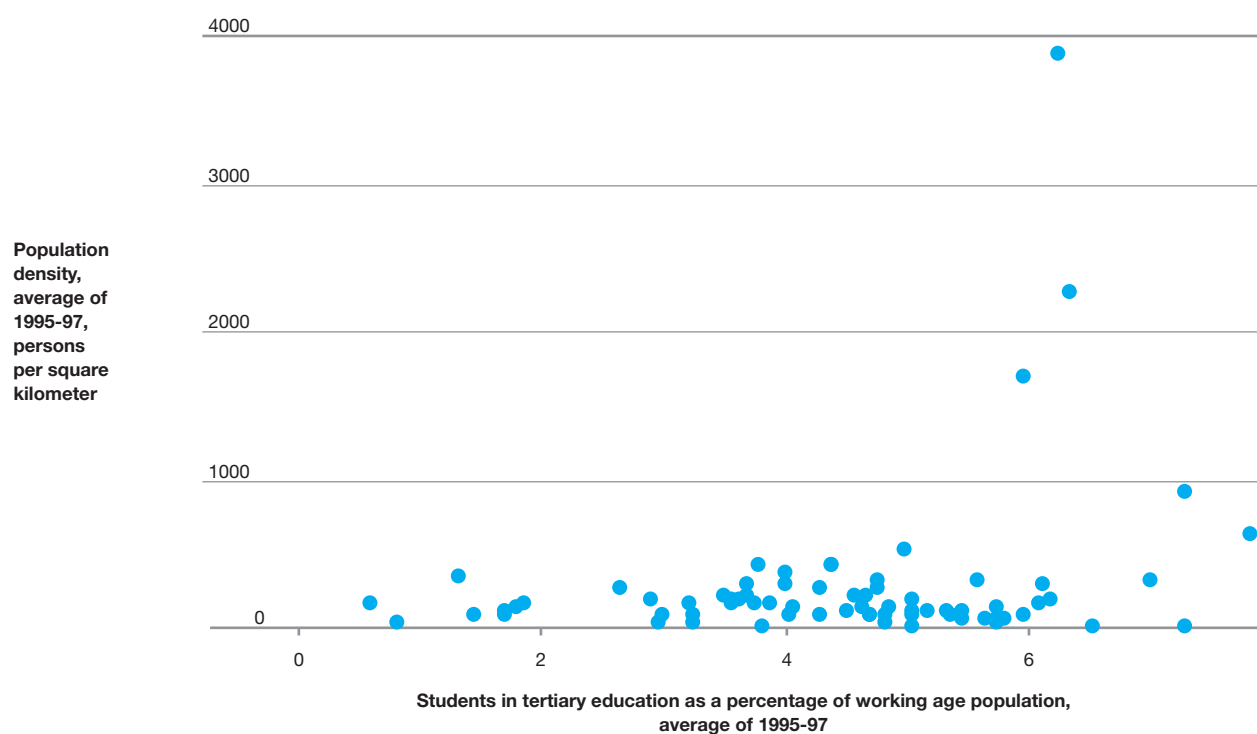


Figure 8: **Students in upper secondary education as a percentage of working age population and population density**

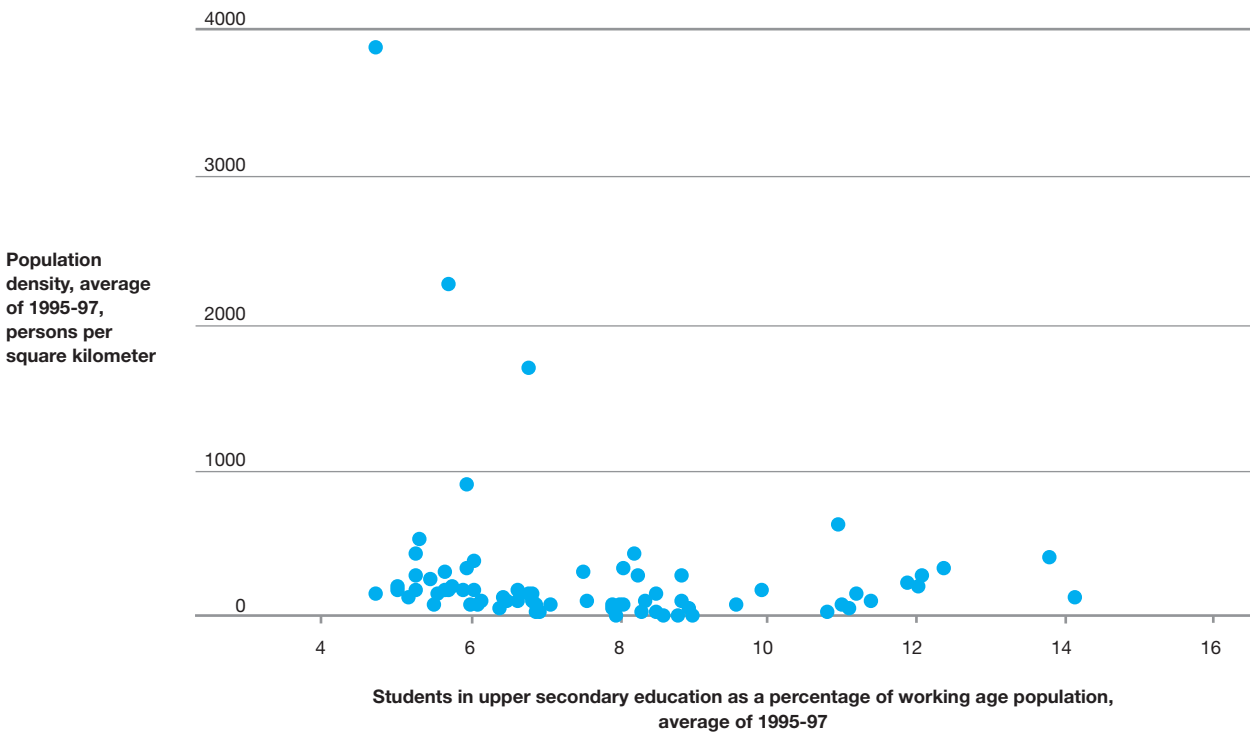
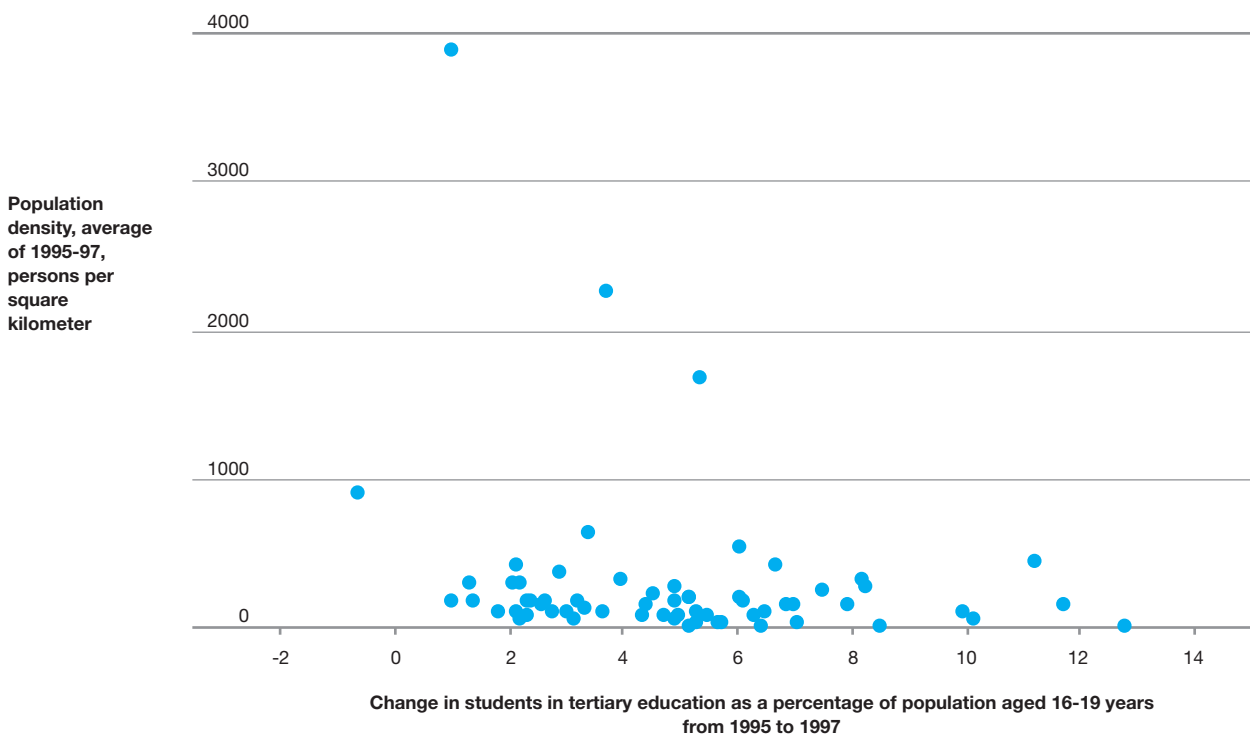


Figure 9: **Change in students in tertiary education as a percentage of population aged 16 to 19 years and population density**



capital. We examined the relationship between human capital development and entrepreneurship, using the average size of firms in selected high-tech sectors as proxy for the rate of new business formation.

We focused upon ICT-related industries as their importance in the economy dramatically increased in the 1990s along with the development of the Internet and related technologies. The industries are divided into ICT-related services and ICT manufacturing ⁽³⁴⁾.

For ICT-related services, we found no significant association between average firm size and students in tertiary education as a percentage of the population aged 20 to 24 years. However, general and vocational types of upper secondary education show contrasting relationships with average firm size in the sectors. Students in general types of upper secondary education as a percentage of the population aged 16 to 19 years show a tendency to increase with the average firm size in ICT-related services (Figure 10). Their correlation (0.62) is significant at the 1 % level (0.001). In contrast, negative association is found between students in vocational types of upper secondary education as a percentage of the population aged 16 to 19 years and the average firm size of ICT-related services (Figure 11). Their correlation (-0.82) is significant at the 1 % level (0.000) again.

These figures suggest that those regions with a high rate of new firm formation in ICT-related services have a high enrolment rate in vocational types of upper secondary education and a low enrolment rate in general types of upper secondary education.

We obtained the same findings for ICT manufacturing, although their significance is weaker.

The correlation between the enrolment rate of general types of upper secondary education and the average firm size in ICT manufacturing is 0.34 and significant at the 10 % level (0.09). For vocational types of upper secondary education, correlation is -0.36 and significant at the 10 % level (0.07).

We also examined the same relationship with respect to traditional manufacturing industries ⁽³⁵⁾. No significant association was found

between average firm size and enrolment rate of any educational level examined.

In summary, human capital development appears to have significant association with the rate of entrepreneurship in emerging industries such as ICT-related services and ICT manufacturing, whereas such association is not found in traditional manufacturing industries. The association with entrepreneurship in ICT sectors is, however, found at the level of vocational types of upper secondary education. The implications of this, along with the lack of significant association with higher education, are subject to interpretation and not clear. Does the finding suggest that graduates from vocational types of upper secondary education start new firms without obtaining higher education degrees? It is often assumed (in the US) that qualified engineers with higher education degrees start new ICT-related businesses with support from venture capital. The above finding seems to contradict this assumption but clarification will require further research.

3.1.5. Human capital development and unemployment rate

Before moving on to the analysis of economic growth, we examine the relationship between human capital development and unemployment rate. Figure 14 shows the relationship between students in tertiary education as a percentage of the working age population and unemployment rate. The correlation is positive (0.19) but its level of significance is slightly over 10 % (0.11). Significant correlation is found between students in upper secondary education as a percentage of the working age population and unemployment rate (Figure 15). The correlation is 0.35 and significant at the 1 % level (0.003). In other words, individuals in regions that have high unemployment rate are more likely to invest in education and training. This fits with the general observation that individuals are more likely to invest in education and training when facing unfavourable employment situations at economic downturns.

Those regions enjoying low unemployment rate tend to have more R&D functions (Figure 16). The correlation between unemployment rate and business R&D staff as a percentage of total

⁽³⁴⁾ ICT-related services include NACE 64 (post and telecommunications), 72 (computer-related services) and 73 (R&D services). ICT manufacturing includes NACE 30 (office machinery and computers) and 32 (telecommunications equipment).

⁽³⁵⁾ The industries examined include general, electrical, and transport engineering.

Figure 10: **Students in general type of upper secondary education as a percentage of population aged 16 to 19 years and average firm size in ICT-related services**

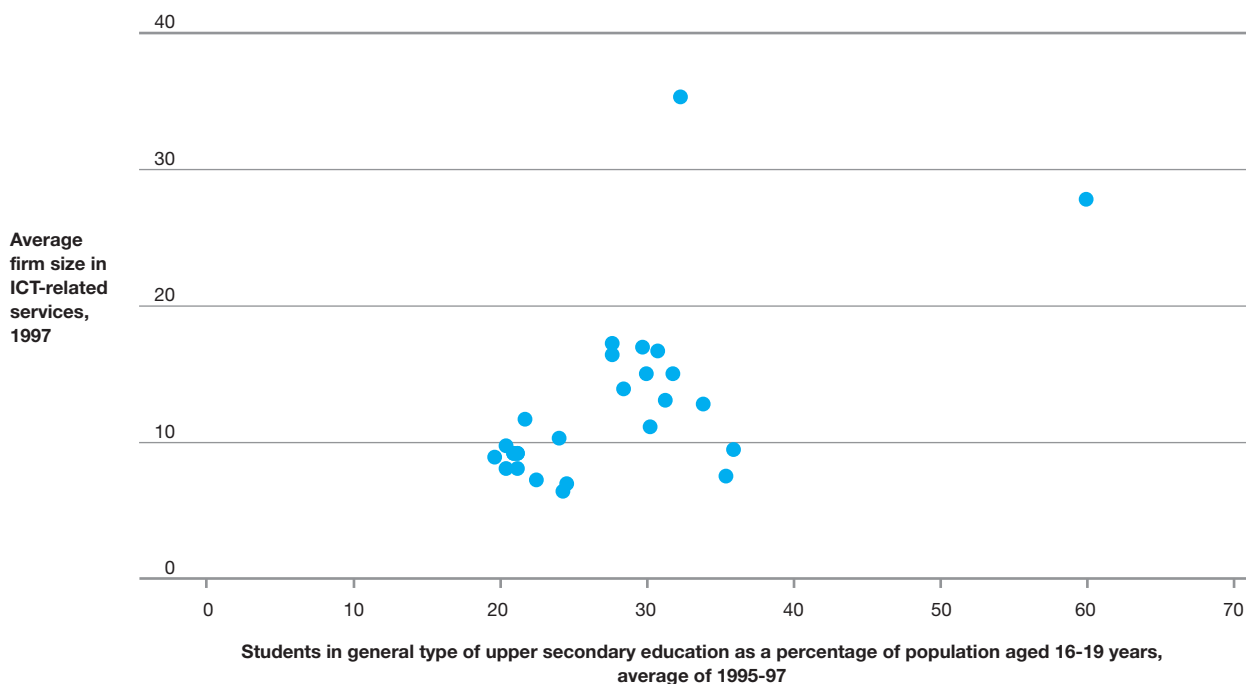


Figure 11: **Students in vocational type of upper secondary education as a percentage of population aged 16 to 19 years and average firm size in ICT-related services**

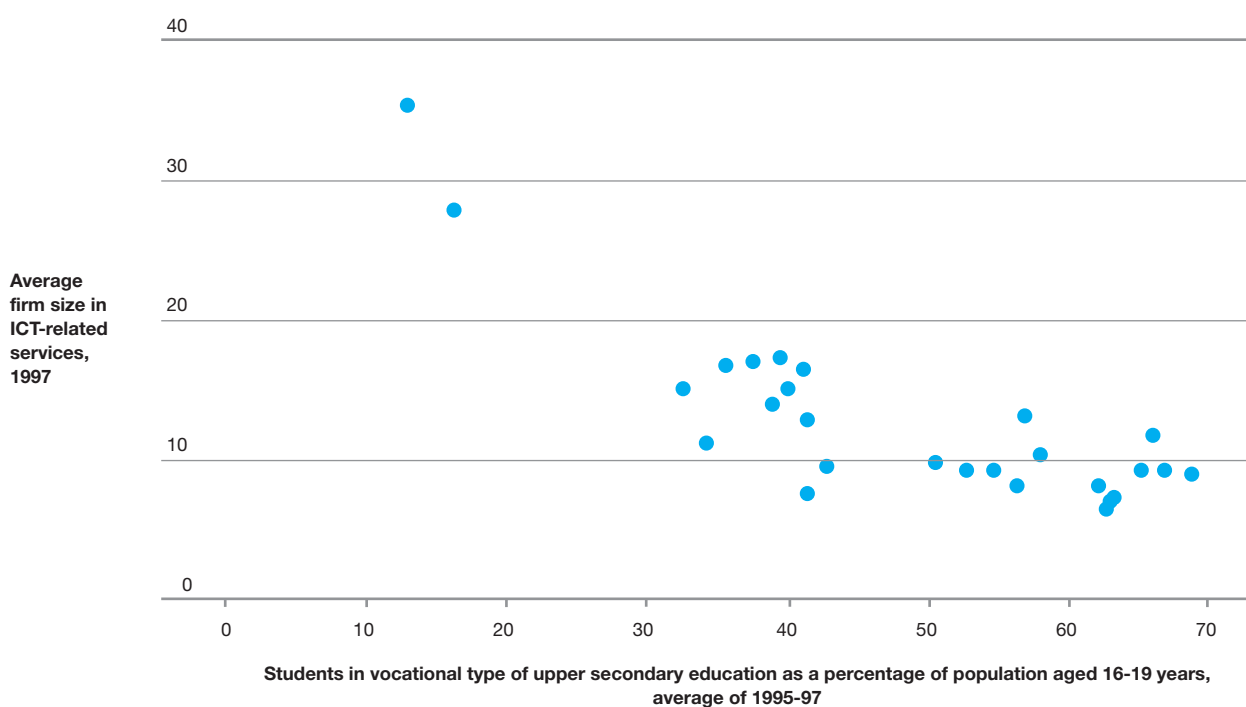


Figure 12: **Students in general type of upper secondary education as a percentage of population aged 16 to 19 years and average firm size in ICT manufacturing**

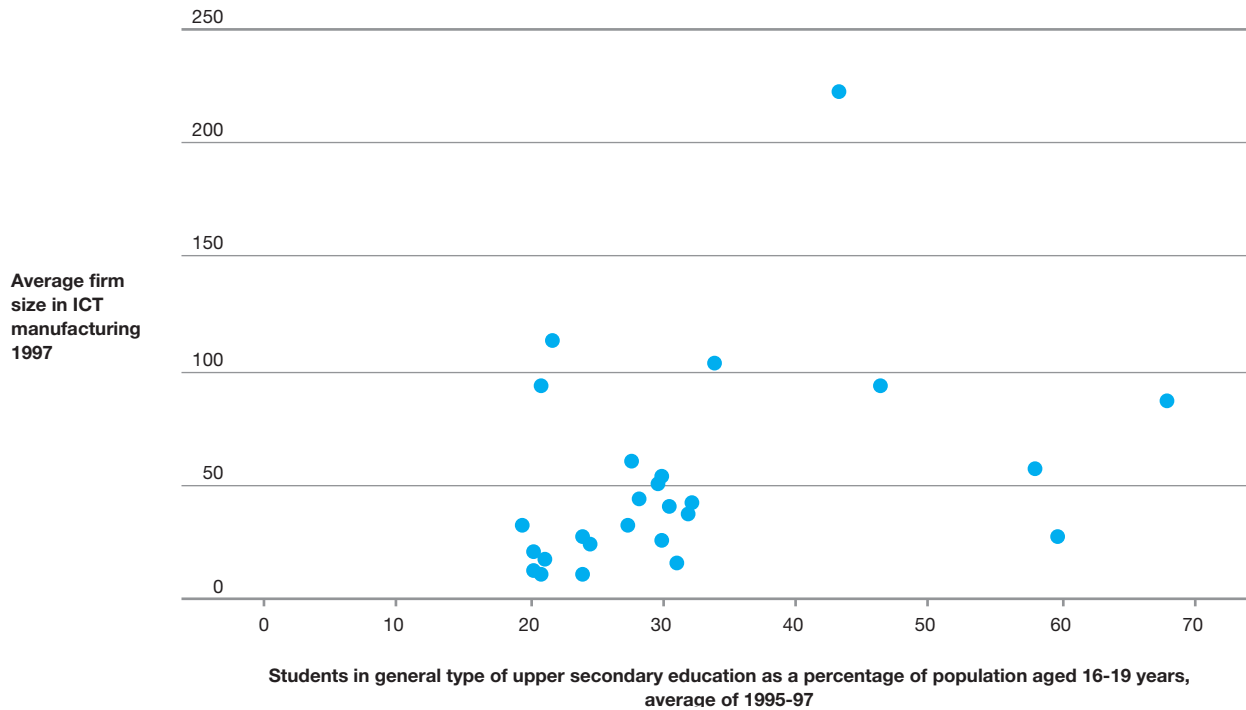


Figure 13: **Students in vocational type of upper secondary education as a percentage of population aged 16 to 19 years and average firm size in ICT manufacturing**

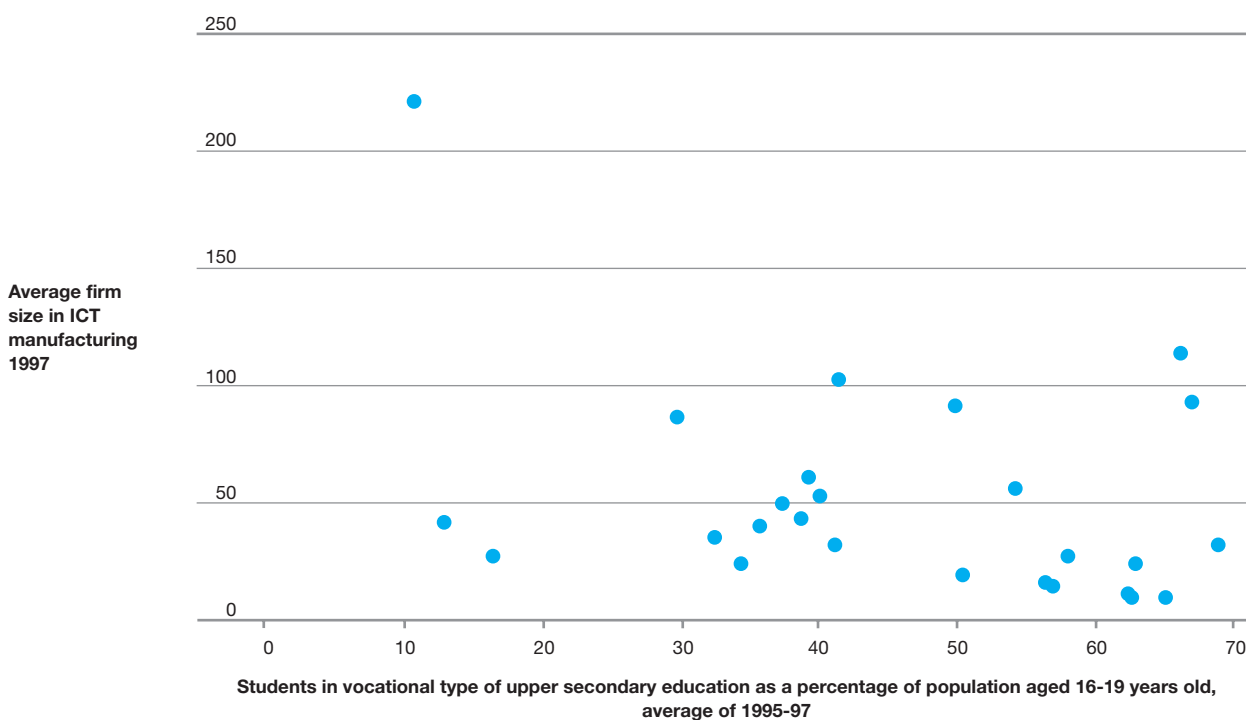


Figure 14: **Students in tertiary education as a percentage of working age population and unemployment rate**

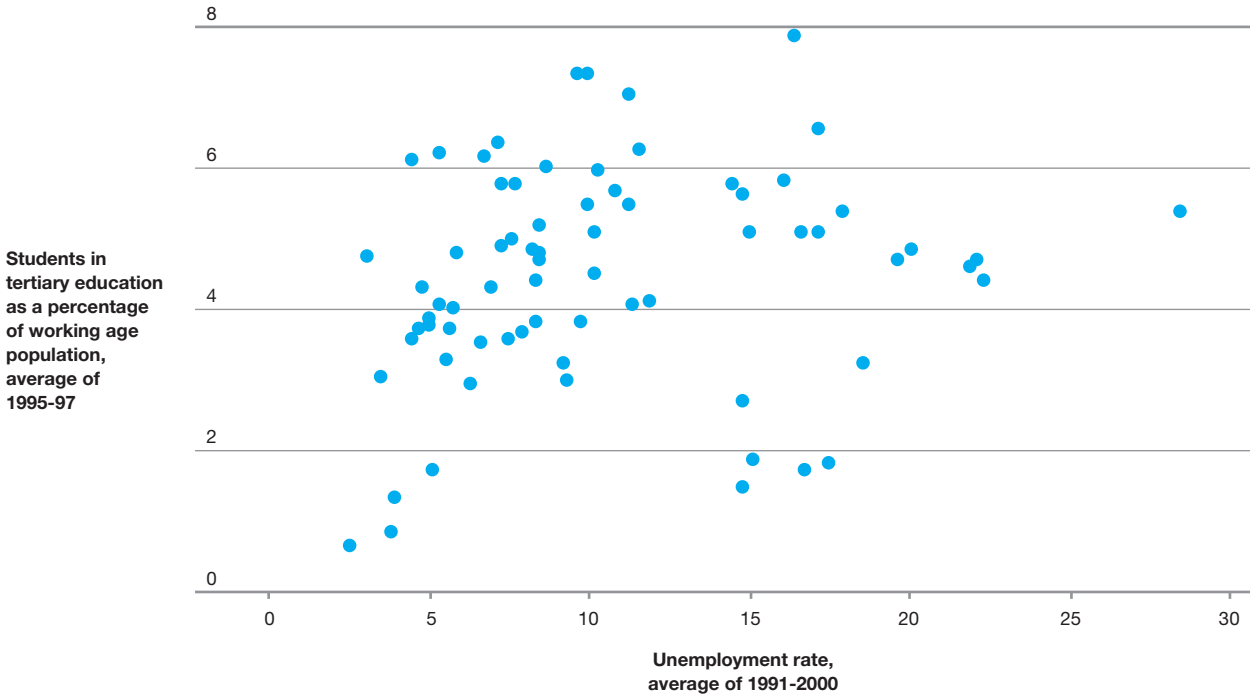


Figure 15: **Students in upper secondary education as a percentage of working age population and unemployment rate**

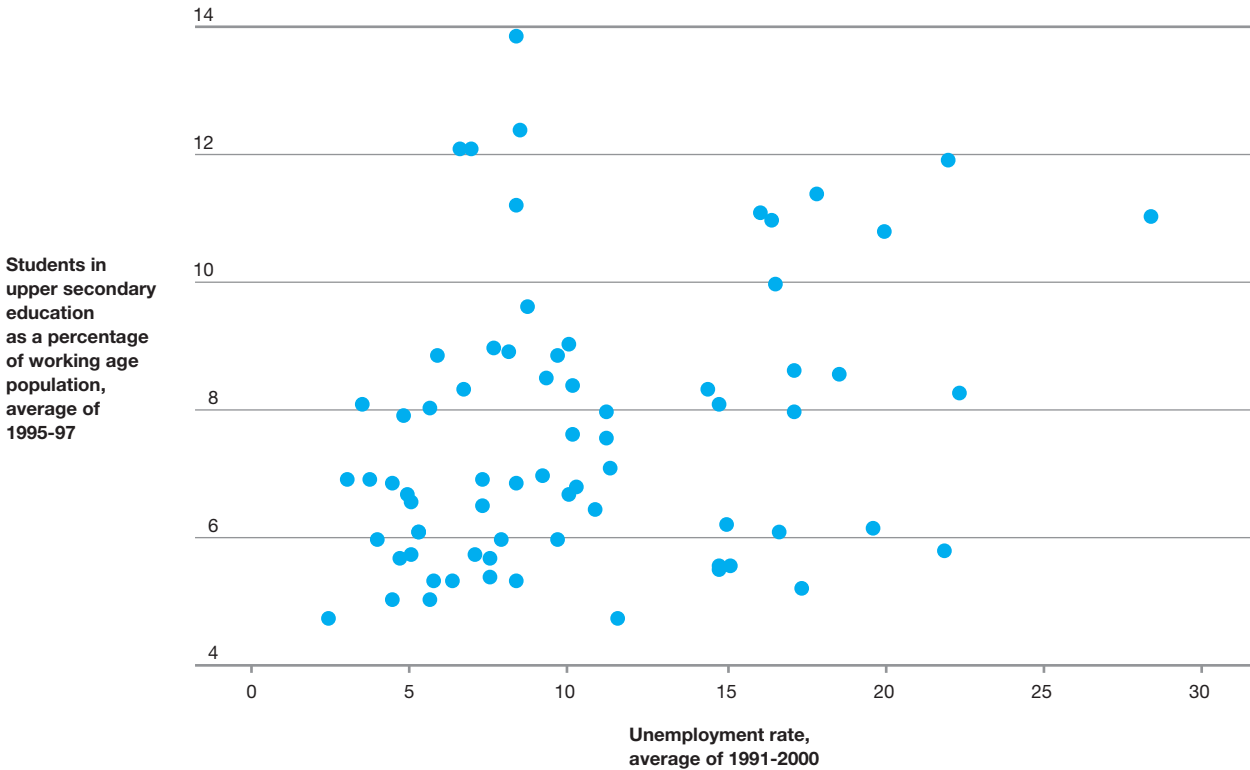


Figure 16: Unemployment rate and business R&D staff

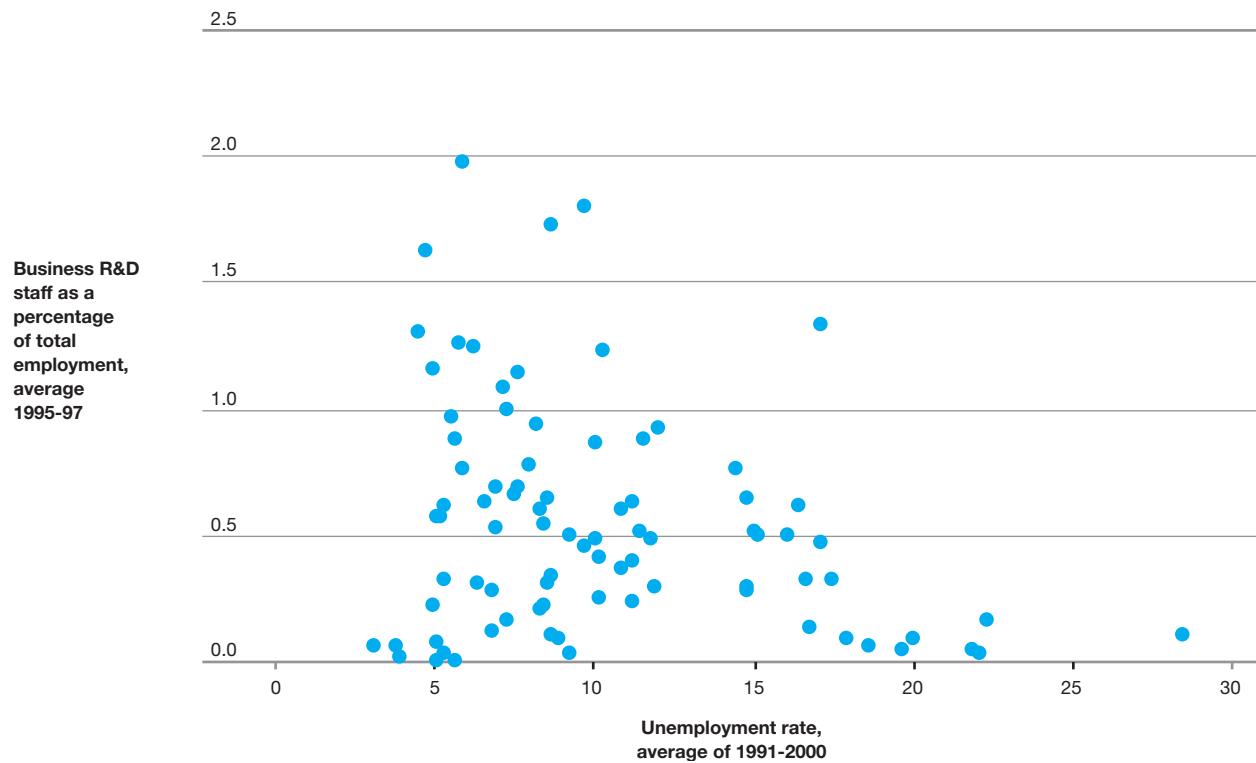


Figure 17: Per worker GDP growth rate and students in tertiary education as a percentage of working age population

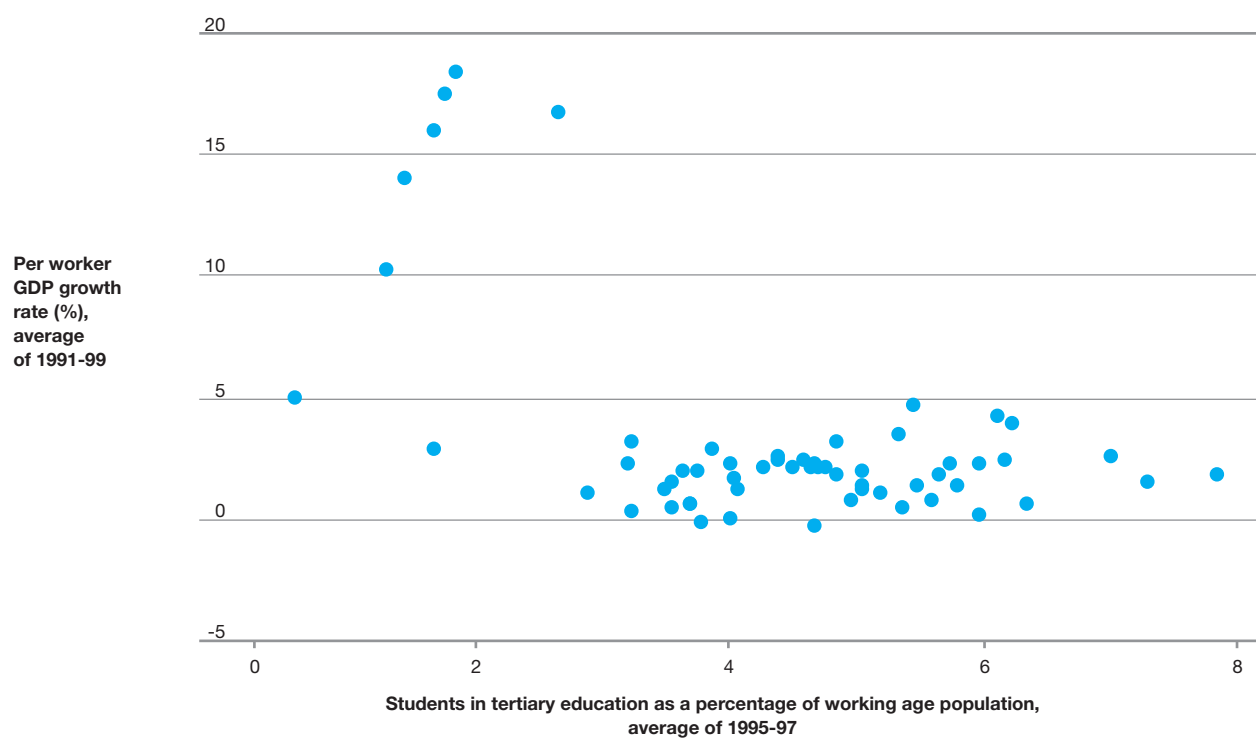


Figure 18: **Per worker GDP growth rate and students in general type of upper secondary education as a percentage of working age population**

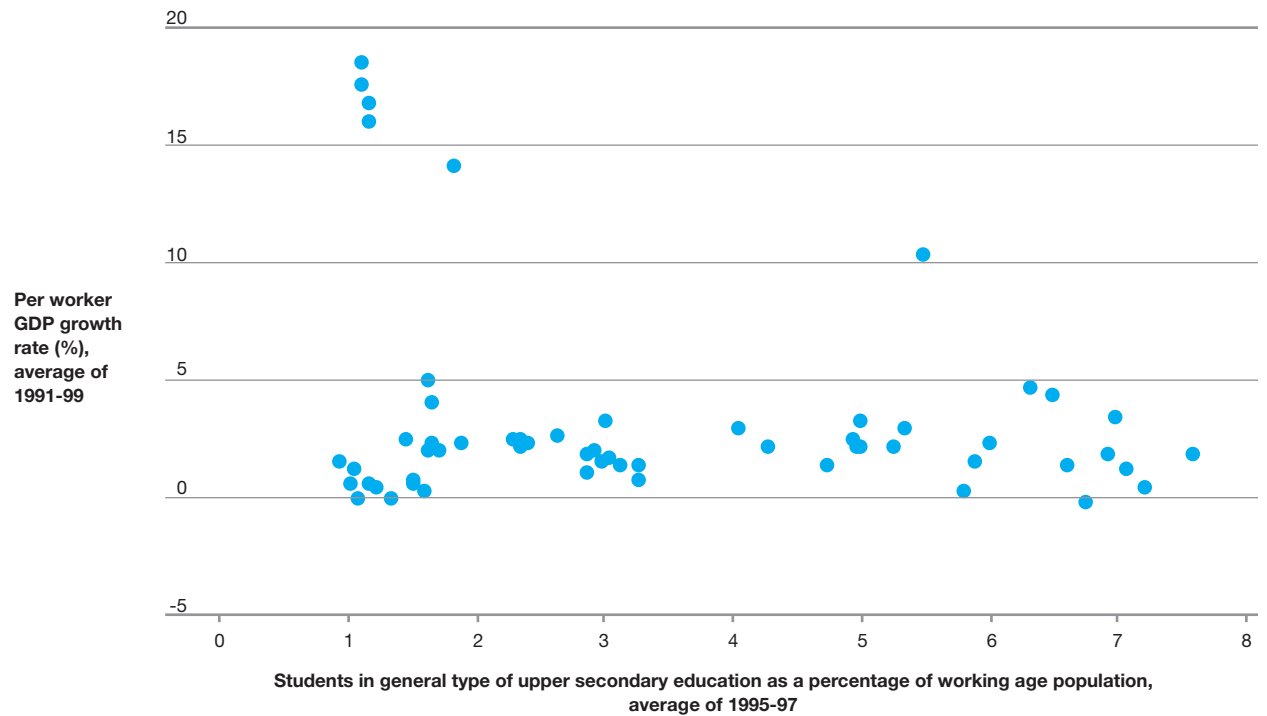
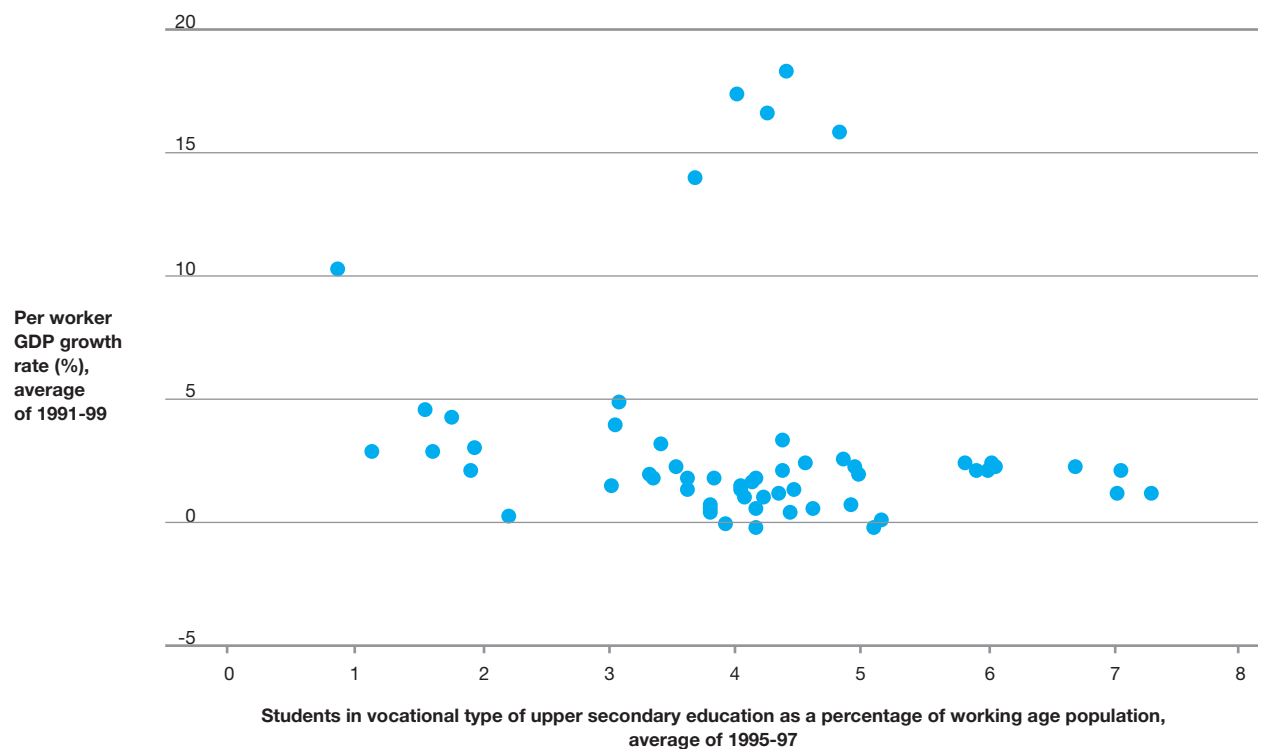


Figure 19: **Per worker GDP growth rate and students in vocational type of upper secondary education as a percentage of working age population**



employment is negative (-0.27) and significant at the 1 % level (0.01). This, along with the above findings, suggests that agglomeration of high-order corporate functions such as R&D departments has a closer association with low unemployment rate than investment by individuals in higher education.

3.1.6. Human capital development and economic growth

An initial look at the relationship between human capital development and economic growth (Figures 17, 18 and 19) shows relationships between per worker GDP (i.e. labour productivity) growth rate from 1991 to 1999 and students by level of education/training as a percentage of the working age population.

The top five regions in terms of labour productivity growth rate are those in the ex-German Democratic Republic (GDR) ⁽³⁶⁾. Their extraordinary growth is due to the opening of their economy to the West at the beginning of the 1990s, which gave rise to an influx of capital and technology. As can be seen from the figures, the numbers of students as a percentage of working age population in relation to labour productivity growth does not follow the pattern of the rest of our sample. Accordingly, we considered the ex-GDR regions as exceptional cases and removed them from the ensuing analysis of economic growth.

Results of the analysis of our sample excluding ex-GDR regions are as follows:

- (a) negative association (-0.26) is found between per worker GDP growth rate and students in tertiary education as a percentage of the working age population. The association is significant at the 5 % level (0.05);
- (b) there is negative association (-0.35) between labour productivity growth and students in vocational type of upper secondary education

as a percentage of the working age population. It is significant at the 1 % level (0.009);

- (c) the correlation between labour productivity growth and students in general types of upper secondary education as a percentage of the working age population is positive (0.21). However, the correlation is not significant at the 10 % level (0.13).

The results contradict the generally assumed association between human capital development and economic growth. This clearly indicates that a better understanding of the relationship requires a more formal analysis that takes into account the impact of physical capital.

3.2. Formal analysis of the relationship between human capital and economic growth at regional and national level

3.2.1. Estimates at the augmented Solow-Swan model: accumulation of human capital

Formal analysis based on the Solow-Swan framework requires data on stocks of physical and human capital (e.g. average schooling years of the labour force). With respect to regions in Europe, data on average schooling years of labour force is not available ⁽³⁷⁾. Mankiw et al. (1992) overcomes this requirement by assuming that countries in their sample are at a steady state in the Solow-Swan framework ⁽³⁸⁾. We used the same method and obtained the results in Table 1.

In both models, the fraction of income invested in physical capital (I/GDP), and $(n + g + \delta)$, has a wrong sign. Furthermore, the fraction of income invested in human capital ($SCHOOL$) has a wrong

⁽³⁶⁾ Namely, Thüringen, Sachsen-Anhalt, Sachsen, Mecklenburg, and Brandenburg in order of labour productivity growth rate.0

⁽³⁷⁾ We attempted to estimate average schooling years of the labour force at the regional level, following the method used by Kyriacou (1991). In his cross-country study of the growth effects of human capital, Kyriacou examined relationships between schooling years and enrolment rates by educational level and devised the following equation,

$$H_{75} = 0.0520 + 4.4390PRIM_{60} + 2.6645SEC_{70} + 8.0918HIGH_{70},$$

where H_{75} represents average years of schooling in the labour force, $PRIM_{60}$ represents the 1960 enrolment rate of primary education, SEC_{70} represents the 1970 enrolment rate of secondary education, and $HIGH_{70}$ represents the 1970 enrolment rate of higher education. We evaluated a similar relationship using data for countries in Europe. However, we found no significant relationship between average schooling years and enrolment rates, so, we were unable to estimate average schooling years for regions using their enrolment data.

⁽³⁸⁾ See footnote 23.

Table 1: Estimation of the augmented Solow-Swan model with the assumption of a steady state

	Model 1	Model 2
Constant	4.49 ^(a) (0.36)	4.59 ^(a) (0.30)
log (<i>I/GDP</i>)	-0.84 ^(b) (0.32)	-0.91 ^(a) (0.25)
log (<i>n + g + δ</i>)	0.36 (0.27)	0.0004 (0.25)
log (<i>SCHOOL</i>)	0.05 (0.16)	-0.67 ^(a) (0.20)
Observations	32	32
R square	0.28	0.48
F statistic	3.58	8.53
NB: - Dependent variable is log of GDP per worker in 1997. - Standard errors are in parentheses. - <i>I/GDP</i> represents gross fixed capital formation as a percentage of GDP (average of 1987-97). - Figures of GDP and gross fixed capital formation are at constant prices in 1995. - (<i>n + g + δ</i>) represents the sum of growth rate of population, growth rate of technical progress, and rate of depreciation. - (<i>g + δ</i>) is assumed to be 0.06 ⁽¹⁾ . - <i>SCHOOL</i> is students in tertiary education as a percentage of working age population (average of 1995-97) in model 1 and students in upper secondary education as a percentage of working age population (average of 1995-97) in model 2. - (a) and (b) represent 1 % and 5 % significance levels respectively. - Regressions were run using ordinary least squares method.		
⁽¹⁾ For a broad sample of countries, Romer (1989) finds that δ is about 0.03 or 0.04. Mankiw et al. (1992) note that growth in income per capita averaged 1.7 % in the US and 2.2 % in their sample of intermediate countries, and thus suggest that g is about 0.02.		

sign in model 2, too. This suggests that the assumption of a steady state is not applicable to our sample.

Accordingly, we decided to use the business R&D staff numbers as an indicator of human capital stock ⁽³⁹⁾. This is consistent with the study's purpose as R&D staff embodies high-order human capital that is deemed critical to technological progress in endogenous growth literature.

We applied the standard augmented Solow-Swan model $Y = AK^\alpha L^\beta H^\gamma$ to the data of physical capital stock, total employment, and

business R&D staff in 1990 and 1997 with different depreciation rates ⁽⁴⁰⁾.

The period from 1990 to 1997 is adopted for the following reasons:

(a) the EU economy entered a new era of integration after the full liberalisation of capital movements in eight Member States in 1990 as well as political landmarks such as the fall of the Berlin Wall in 1989 and unification of Germany in 1990. In tandem with the revolutionary effect of ICTs including the Internet, economic integration spurred movement of money and people within

⁽³⁹⁾ Because total R&D staff data availability is restricted to a smaller number of regions, we could not undertake the same analysis for total R&D staff (including staff in government institutes and higher education institutions) and compare the results with those for private R&D staff only.

⁽⁴⁰⁾ Stocks of physical capital at the regional level are estimated using the Penn World Tables 5.6. A description of the tables is found in Summers and Heston (1991). First, based on a standard three-factor neoclassical aggregate production function with constant returns, $Y = K^\alpha L^\beta H^\gamma$, we estimated at the national level a model that accounts for GDP of EU nations. We obtained a model whose coefficients are all significant at the 1 % level. Then using the model, we estimated the stock of physical capital for each of the regions in our sample. Finally we adopted the perpetual inventory method to produce physical capital stocks for 1986 and onwards. (See Barro and Sala-i-Martin, 1995 about the perpetual inventory method.) As a depreciation rate δ , we used 0.04. See footnote 37 above. To see effects of a different depreciation rate, we also tested 0.07, following Benhabib and Spiegel (1994).

EU. This, in turn, facilitated the rapid exchange of information and knowledge, making leading-edge technology, which firms within a region aim for in their innovation efforts, more generally available. Prevalence of leading-edge knowledge or technology is often assumed in growth model literature;

- (b) we used 1985 as the base year to which the perpetual inventory method was applied to estimate physical capital stock in each region. This is the earliest year we could use to estimate each region's capital stock from

the national data. The 1985 capital stock data at the regional level is subject to estimating error. Because of the cumulative calculation of the perpetual inventory method, the later the start year of the Solow-Swan analysis, the more reliable the regional capital stock data. At the same time, a reasonably extensive period is necessary for the Solow-Swan analysis to measure long-term growth.

By taking log of the standard augmented Solow-Swan model, the following equation is obtained:

$$\log Y_T - \log Y_0 = \log A_T - \log A_0 + \alpha(\log K_T - \log K_0) + \beta(\log L_T - \log L_0) + \gamma(\log H_T - \log H_0).$$

Estimated coefficients are shown in Table 2 ⁽⁴¹⁾.

The augmented Solow-Swan model that includes physical capital, labour, and business R&D staff accounts for the economic growth

between 1990 and 1997 with R square of 0.71 and 0.72 for models 1 and 2 respectively. Although the estimated coefficient for log difference in physical capital is significant only at the

Table 2: **Estimation of the augmented Solow-Swan model**

	Model 1	Model 2	Model 3	Model 4
Constant	-0.04 (0.05)	-0.03 (0.04)	0.72 ^(a) (0.16)	0.73 ^(a) (0.16)
dK	0.40 ^(c) (0.22)	0.42 ^(c) (0.21)	0.36 ^(b) (0.17)	0.38 ^(b) (0.16)
dL	0.53 ^(a) (0.16)	0.49 ^(a) (0.17)	0.67 ^(a) (0.13)	0.63 ^(a) (0.04)
dH	0.16 ^(a) (0.04)	0.15 ^(a) (0.04)	0.08 ^(b) (0.03)	0.08 ^(b) (0.03)
Y_0			-0.16 ^(a) (0.03)	-0.16 ^(a) (0.03)
Observations	32	32	32	32
R square	0.71	0.72	0.84	0.84
F statistic	22.8	23.6	36.6	38.3
NB: - Dependent variable is the log difference in GDP. - Standard errors are in parentheses. - dX refers to the log difference in variable X . - The period for comparison is 1990-97. - K , L , H , and Y_0 represent stock of physical capital, number of workers, and size of business R&D staff, and per worker GDP in 1990 respectively. - Figures of physical capital are at 1995 constant prices. - (a), (b), and (c) represent 1 %, 5 %, and 10 % significance levels respectively. - Models 1 and 3 use a depreciation rate of 0.04. - Models 2 and 4 use a depreciation rate of 0.07. - Regressions were run using ordinary least squares method.				

⁽⁴¹⁾ The equation implies that the first term of the right-hand side of the equation, $\log A_T - \log A_0$, is constant and common for all economies under analysis. In other words, technology or knowledge is spread and available to all economies.

10 % level (0.08 in model 1 and 0.05 in model 2), log differences in labour and business R&D staff enter highly significantly. The significance of log difference in labour is 0.003 in model 1 and 0.008 in model 2, and the significance of log difference in private R&D staff is 0.001 in both models 1 and 2. The results suggest that the change in business R&D staff during the period varies in a way distinct from those in physical capital and labour and accounts for a significant part of the variation of the change in GDP. The positive sign for the coefficient of the log difference in business R&D staff means that an increase in business R&D staff led to an increase in the region's per worker GDP (i.e. labour productivity).

We also entered initial income per worker (GDP in 1990 worker), Y_0 , in the equation (model 3 and model 4). In the neoclassical Solow-Swan framework that supposes decreasing returns on capital, the level of per capita GDP will converge toward its steady state asymptotically. The speed of convergence increases with the distance to the steady state. In other words, when the determinants of the steady state are controlled for, the lower initial values of per capita GDP, the higher transitional growth rates. This is called 'conditional convergence'. As expected from previous empirical studies that support conditional convergence, initial per worker GDP in 1990 enters with a negative sign at the 1 % significance level (0.00 in both model 3 and model 4). More importantly, the coefficient for log difference in business R&D staff remains positive and significant at the 5 % level (0.03 in both model 3 and model 4) although its value becomes less than in models 1 and 2.

The results of Table 2 suggest that high-order human capital represented by business R&D staff contributes to economic growth in the same way as other production factors (i.e. physical capital,

labour). That is, it is the accumulation of the human capital that affects economic growth. This is consistent with the neoclassical Becker-Lucas framework predicting that the accumulation of human capital determines the marginal productivity of education and maintains it at a positive level.

3.2.2. Estimates at the Nelson-Phelps

framework: level of human capital stock

Nelson and Phelps, and Benhabib and Spiegel provide a different framework, according to which it is the level of human capital stock that affects an economy's capacity to develop and implement new technologies. The level of human capital stock is positively related to the rate of technical progress, or the growth rate of productivity parameter A , in their view.

R&D staff certainly reflects such a capacity in an economy. In their cross-country study, Benhabib and Spiegel used average years of schooling in the labour force as an indicator of human capital, focusing on investment in education as a whole. Unlike schooling years, R&D staff are a small segment of the labour force that embodies high-order human capital. Though small in size, this sector is considered a good representation of an economy's capacity to develop new technologies (i.e. knowledge) as argued in an endogenous growth literature. Also, R&D staff are frequently involved in transferring and implementing new technologies developed in other sectors or understanding new technologies invented by other firms in their own sectors (e.g. reverse engineering). Hence the framework of Nelson and Phelps may be applicable to R&D staff.

We tested two equations based on this framework. The first equation takes an average of human capital levels during the period under examination.

$$\begin{aligned} \log Y_T - \log Y_0 = & \log A_T - \log A_0 + \alpha(\log K_T - \log K_0) \\ & + \beta(\log L_T - \log L_0) + \gamma \left(\frac{1}{T} \sum_0^T \log H_t \right). \end{aligned}$$

Table 3 shows results of the estimates of coefficients.

In model 1, all terms, including log of an average of business R&D staff in level from 1990 to 1997, enter the equation significantly at the 1 % level. However, whereas the coefficients for log differences in physical capital and labour are positive (as expected), the coefficient for the

average business R&D staff is estimated as negative. In other words, regions with a higher level of business R&D staff experienced a slower growth from 1990 and 1997.

In model 2, we included initial per worker GDP (labour productivity) in 1990 in the equation to see the effects of conditional convergence. Log differences in physical capital and labour enter

Table 3: Cross-regional growth accounting results: human capital in log levels

	Model 1	Model 2
Constant	-0.16 ^(a) (0.04)	0.58 ^(c) (0.30)
dK	0.92 ^(a) (0.20)	0.58 ^(b) (0.24)
dL	0.50 ^(a) (0.14)	0.62 ^(a) (0.14)
AH	-0.06 ^(a) (0.01)	-0.02 (0.02)
Y_0		-0.14 ^(b) (0.06)
Observations	32	32
R square	0.78	0.82
F statistic	33.9	30.8
NB: - Dependent variable is the log difference in GDP. - Standard errors are in parentheses. - dX refers to the log difference in variable X . - The period for comparison is 1990-97. - K , L , and Y_0 represent stock of physical capital, number of workers, and per worker GDP in 1990 respectively. - AH is an average of business R&D staff during 1990-97. - Figures of physical capital are at 1995 constant prices. - Depreciation rate is 0.04. - (a), (b), and (c) represent 1 %, 5 %, and 10 % significance levels respectively. - Regressions were run using ordinary least squares method.		

significantly (0.02 and 0.00 respectively), taking a proper positive sign. The term for initial labour productivity, Y_0 , also enters significantly at the conventional 5 % level (0.03). Its negative sign shows that the lower initial per worker GDP, the faster an economy grows. In other words, conditional convergence took place among the regions. As for the average business R&D staff in level, its coefficient takes a negative sign. Furthermore, it fails to enter significantly (0.32).

The failure of business R&D staff to enter the equation significantly in model 2 is due to close association between business R&D staff in level and per

worker GDP. As the level of business R&D staff has close association with the level of labour productivity ⁽⁴²⁾, the average R&D staff from 1990 to 1997, AH , in model 1 acts as a proxy for the level of labour productivity and enters the equation with a negative sign, suggesting conditional convergence among the regions. However, when initial labour productivity, Y_0 , is included in model 2, it accounts for the convergence better than level of R&D staff does. Hence level of R&D staff loses its significance in model 2.

The second equation we tested includes two terms of human capital that represent its different effects.

$$\begin{aligned}
 \log Y_T - \log Y_0 &= c + gH_i + mH_i \left[(Y_{\max} - Y_i) / Y_i \right] \\
 &\quad + \alpha (\log K_T - \log K_0) + \beta (\log L_T - \log L_0) \\
 &= c + (g - m)H_i + mH_i (Y_{\max} / Y_i) \\
 &\quad + \alpha (\log K_T - \log K_0) + \beta (\log L_T - \log L_0).
 \end{aligned}$$

⁽⁴²⁾ We examined contributions of physical capital, labour, and business R&D staff in levels to the level of income of regions in 1990 and 1997, using a standard three-factor neoclassical aggregate production function with constant returns, $Y = K^\alpha L^\beta H^\gamma$. The level of business R&D staff enters the equation significantly with a positive sign, suggesting that regions with a higher level of business R&D staff have a higher level of income per capita (labour productivity).

The term, gH , represents endogenous development based on the level of human capital, and the term, $mHi [(Y_{max} - Y_i)/Y_i]$, represents catch-up of region i with the region leading in terms of per capita GDP, Y_{max} (i.e. the region with the highest labour productivity in the data set).

Table 4 shows the results.

In model 1, both log differences in physical capital and labour enter the equation at the 1 % significance level (0.001 and 0.009 respectively) with a proper positive sign. The coefficient estimate for $(g - m)$ on H is negative and significant at the 10 % level (0.08). The negative sign suggests that regions with a higher level of business R&D staff in 1990 experienced a slower growth from 1990 to 1997. In contrast, the catch-up term of business R&D staff, $H_0 (Y_{max}/Y_i)$, fails to enter the equation significantly (significance: 0.79) though it takes a positive sign.

In model 2, we added the initial ratio of the labour productivity of the leading-edge region to that of region i to see the effects of conditional convergence ⁽⁴³⁾. As in model 2 in Table 3, the initial position of a region in terms of labour productivity, Y_{max}/Y_i , enters at the 1 % significance level (0.002). Its sign is positive, suggesting conditional convergence: the larger the initial gap with the leading region, the faster an economy grows. On the other hand, neither Y_0 nor $Y_0(Y_{max}/Y_i)$ enters significantly (0.62 and 0.34 respectively). In other words, conditional convergence that is due to a region's initial position in per worker GDP exerts more significant effects upon its change in GDP. Although the size of business R&D staff, H_0 , plays the role of a proxy for labour productivity level, its effects as an economy's capacity to develop and implement new technology in the Nelson-Phelps framework are found insignificant.

These findings are in stark contrast to those of Benhabib and Spiegel. In their cross-country study, Benhabib and Spiegel found that the catch-up term of human capital enters significantly. The catch-up term maintains its proper sign (i.e. positive) and significance (though significance level drops from 1 % to 5 %) even if the

variable for initial position of income Y_{max}/Y_i is included. In contrast, our results show that neither of the human capital terms is found significant, whereas initial position as well as log differences in physical capital and labour enter at an equal or higher level of significance than in the case of Benhabib and Spiegel ⁽⁴⁴⁾.

Even if we focus on wealthier economies in the sample of Benhabib and Spiegel, their results are different. In their study, Benhabib and Spiegel divided their sample into 3 groups (26 countries each) according to wealth. For the wealthiest third of the sample, they found that the endogenous development term of human capital H enters significantly while the catch-up term is found insignificant. However, the sign for H is found positive in their study suggesting that the capacity to develop and implement new technology, which H represents, contributes to economic growth positively. In contrast (as shown in model 1 in Table 4), the sign of the term in our results is negative, suggesting that the greater the volume of human capital in level (i.e. business R&D staff in our case), the slower an economy grows.

Most important, accumulation of human capital (i.e. business R&D staff in our case) accounts for economic growth at a significant level along with accumulation of physical capital. In the study of Benhabib and Spiegel, accumulation of human capital fails to enter significantly with respect to all three measures of human capital they tested ⁽⁴⁵⁾ as well as alternative subsamples of the data. In addition, the sign of human capital accumulation was found negative in most of the cases they examined.

3.2.3. Human capital and growth: cross-country estimates

An obvious, possible source for the difference between the findings is the different types of human capital examined. While Benhabib and Spiegel adopt average schooling years of the labour force, we use the number of private sector workers engaged in R&D which endogenous growth literature focuses upon as a source of

⁽⁴³⁾ This follows the equation adopted by Benhabib and Spiegel. Adding initial labour productivity in 1990 (as in model 2 in Table 3 as well as many studies of conditional convergence) produces similar results. In that case, the coefficient for the variable takes a negative sign.

⁽⁴⁴⁾ In their estimates, log difference in labour fails to enter the model significantly whereas the coefficient for log difference in physical capital was found significant at the 1 % level.

⁽⁴⁵⁾ Namely, average schooling years used by Kyriacou (1991), the Barro and Lee (1993) estimate of human capital, and literacy.

Table 4: **Cross-regional growth accounting results: Human capital in levels and in product of levels and differences from the leading-edge region in labour productivity**

	Model 1	Model 2
Constant	-0.11 (b) (0.04)	-0.15 (a) (0.04)
dK	0.88 (a) (0.23)	0.59 (a) (0.21)
dL	0.41 (a) (0.14)	0.65 (a) (0.14)
H_0	-0.05 (c) (0.03)	0.01 (0.03)
$H_0 (Y_{max}/Y_i)$	0.006 -0.02	(0.02) (0.02)
Y_{max}/Y_i		0.04 (a) (0.01)
Observations	32	32
R square	0.78	0.85
F statistic	23.9	29.5
NB: - Dependent variable is the log difference in GDP. - Standard errors are in parentheses. - dX refers to the log difference in variable X . - The period for comparison is 1990-97. - K and L represent stock of physical capital and number of workers respectively. - H_0 is the size of business R&D staff in 1990. - Y_{max}/Y_i represents the ratio of the labour productivity of the leading-edge region to that of region i in 1990. - Figures of physical capital are at 1995 constant prices. - Depreciation rate is 0.04. - (a), (b), and (c) represent 1 %, 5 %, and 10 % significance levels respectively. - Regressions were run using ordinary least squares method.		

technical progress. To see if the different type of human capital affects the results, we undertook an analysis based on average schooling years. Since data on schooling for the labour force is not available at regional level, the analysis is only at national level. The figures for persons in the

labour force (25 to 59 years old) who completed education, given by educational level, are available for 11 countries in the EU for the period from 1992 to 2000. From the data, we calculated an estimate of average schooling years ⁽⁴⁶⁾ and tested the following three models:

$$\log Y_T - \log Y_0 = \log A_T - \log A_0 + \alpha(\log K_T - \log K_0) + \beta(\log L_T - \log L_0) + \gamma(\log H_T - \log H_0),$$

$$\log Y_T - \log Y_0 = \log A_T - \log A_0 + \alpha(\log K_T - \log K_0) + \beta(\log L_T - \log L_0) + \gamma\left(\frac{1}{T} \sum_0^T \log H_t\right),$$

and

⁽⁴⁶⁾ We gave 9 years, 12 years and 16 years for those who completed lower secondary education, upper secondary education, and tertiary education respectively.

$$\log Y_T - \log Y_0 = c + (g - m)H_i + mH_i (Y_{\max} / Y_i) + \alpha(\log K_T - \log K_0) + \beta(\log L_T - \log L_0).$$

Table 5 shows the results.

The estimates show lower significance, in large part due to the small sample size. However, the patterns of significance are consistent with the results for business R&D staff except for insignificant estimates for labour. In model 1, only log difference in physical capital enters significantly

(0.014) although all variables take a proper, positive sign. The significance of log difference in schooling years is 0.14, being above the conventional maximum cut-off point of 10 %. However, in model 2 that includes initial level of income, log difference in schooling years and as log difference in physical capital, enter significantly at the

Table 5: **Cross-country growth accounting results, 1992-2000**

	Model 1	Model 2	Model 3	Model 4
Constant	-0.06 (0.04)	-0.15 (0.17)	-0.05 (0.09)	0.01 (0.16)
dK	0.61 ^(b) (0.19)	0.75 ^(b) (0.21)	0.55 ^(b) (0.22)	0.49 (0.28)
dL	0.002 (0.30)	-0.14 (0.31)	0.02 (0.36)	0.06 (0.41)
dH	0.33 (0.20)	0.56 ^(a) (0.26)		
AH			0.0009 (0.006)	
H_0				0.005 (0.02)
$H_0 (Y_{\max}/Y_i)$				-0.008 (0.03)
Y_0		-0.05 (0.04)		
Observations	11	11	11	11
R square	0.65	0.73	0.52	0.52
F statistic	4.3	4.1	2.5	1.6
NB: - The following 11 countries were included: Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, the Netherlands, Portugal, and the UK. - Dependent variable is the log difference in GDP. - Standard errors are in parentheses. - dX refers to the log difference in variable X . - The period for comparison is 1992-2000. - K , L and H represent stock of physical capital, number of workers, and average schooling years of the labour force respectively. - AH is an average of H during 1992-2000. - H_0 is the value in 1992. - Y_{\max}/Y_i represents the ratio of the labour productivity of the leading-edge region to that of region i in 1992. - Y_0 is per worker GDP in 1992. - Figures of physical capital are at 1995 constant prices. - Depreciation rate is 0.04. - (a), (b), and (c) represent 1 %, 5 %, and 10 % significance levels respectively. - Regressions were run using ordinary least squares method.				

levels of 10 % and 5 % (0.07 and 0.011) respectively. In other words, an improvement of educational level in the labour force led to higher economic growth during the period. In contrast, model 3 and model 4, which take schooling years in levels, fail to be significant ⁽⁴⁷⁾. Estimates of the coefficients for human capital terms in the two models are very small relative to standard errors, showing little significance. Though the results are not conclusive due to the small sample size, they suggest that, even if schooling years are adopted

as an indicator of human capital (as in the study of Benhabib and Spiegel), their accumulation, not their stock level, accounts for economic growth.

It is most likely that catch-up effects of human capital Benhabib and Spiegel observed are found in the case of extremely wide gaps between developed countries and developing countries, including ones in Africa and Latin America. When we focus upon developed economies such as regions in the EU, the effects of human capital upon economic growth derives from its accumulation.

⁽⁴⁷⁾ The significances of the models gained from analysis of variance (F statistic) are 0.15 and 0.28 respectively.

4. Summary and conclusions

This report has reviewed literature and empirically examined the way in which human capital development is associated with economic growth in regions in Europe in the 1990s. While powerful multinational corporations are becoming ever-more 'footloose' and escaping from the control of nation states, regions are 'competing' against one another, within and across nations, at attracting investments and supporting local businesses to increase competitiveness in the global market. In this, many regions, and particularly ones in peripheries, are facing the reality of persistent regional disparities in productivity and corporate functions located. By examining the relationship between human capital formation and economic performance in European regions, this study aims to go some way towards answering the question whether, and how, human capital development provides these territorial units with comparative advantages over others.

In growth model literature, human capital has gained increased recognition as one of key production factors following physical capital and labour. The original Solow-Swan model consisted of physical capital and labour alone, failing to account for a significant part of income growth as residual (called the 'Solow residual'). This residual was considered to be an exogenous factor that derives from technical progress taking place where there is a public science base. In the meantime, a number of studies, most notably the seminal work of Becker, drew attention to investment in skills and knowledge as another factor of production. As a result, the Solow-Swan model came to be augmented with the inclusion of an additional term of human capital.

4.1. Significance of economic growth models

Another development in growth model literature is endogenous growth models. Whereas the neoclassical Solow-Swan model treats technical progress as an exogenous factor, endogenous

growth models take into consideration the process of innovation and technology diffusion, making a departure from the assumption of perfect competition. The mechanism of investing in research takes centre stage in the model. As a result, R&D workers, who embody high-order human capital, are often included in the models.

An issue identified in growth model literature is the way human capital development affects economic growth. According to the framework developed by Lucas on the basis of Becker's human capital theory, growth is primarily driven by the accumulation of human capital. In contrast, Nelson and Phelps contend that the stock of human capital determines the economy's capacity to innovate or catch up with more advanced economies, which in turn drives economic growth. Hence, the level of human capital stock is, though indirectly, a determinant of per capita economic growth in this view. While the first framework is in agreement with neoclassical growth models, the second framework has revived in the Schumpeterian growth literature.

4.2. The regional dimension

These economic models are criticised in economic geography literature for their failure to consider spatial aspects of economic development. Unlike the neoclassical assumption that factors of production are completely mobile, knowledge and innovations do not diffuse instantaneously or at an even rate over the economy as a whole. Tacit knowledge in particular, whose transfer often relies on interpersonal, often face-to-face communications, is argued to be concentrated in major metropolitan areas, signifying the importance of human capital that represents a carrier of such knowledge. Furthermore, there is a view that the position of metropolitan areas is strengthened by the cumulative causation mechanism in which the education and training system interacts with the local economy to further spatial disparities in economic well-being.

Our empirical analysis of European regions

shows that investment by individuals in human capital development has distinct patterns. Those regions with a higher level of investment in tertiary education tend to have a larger concentration of ICT sectors (including provision of ICT services and manufacture of ICT devices and equipment) and research functions. On the other hand, there is no significant association between such high-order functions and investment in upper secondary education, both general and vocational types.

In relation to the density of economic activity, those regions that include major metropolitan areas show a high enrolment rate for tertiary education. While this is, to some degree, due to a concentration of higher education institutions in those areas, the association also suggests a possibility of link to high-order corporate functions that tend to concentrate in high-density metropolitan areas. However, some low-density regions have made progress in take-up of tertiary education at a faster pace, closing a gap in the formation of high-order human capital.

Generation of new firms is an important source of economic dynamism. In our empirical analysis, the rate of human capital development appears to have significant association with the rate of entrepreneurship in emerging industries such as ICT-related services and ICT manufacturing, whereas such association is not found with traditional manufacturing industries. The association with entrepreneurship in ICT sectors is, however, found at the level of vocational type of upper secondary education, not at the level of tertiary education. The implications of this are subject to interpretation and require further research.

Individuals in regions that suffer from high unemployment rate tend to invest more in education and training. This fits with the general observation that individuals are more likely to invest in education and training when facing with unfavourable employment situations at economic downturns. Another finding in relation to this is that individuals in regions with lower unemployment rate tend to have a higher level of R&D functions.

In short, a high level of investment by individuals in tertiary education is found in those regions that accommodate high-tech industries and high-order corporate functions like R&D. Regions support such high-order functions through the

urban infrastructure, facilitating exchange of tacit knowledge, as well as through a public science base. They also enjoy a low unemployment rate.

However, the existing stock of human capital does not lead to a high rate of economic growth. We did not find any significant effects of scale that would favour those regions with a larger stock of human capital. Instead, our empirical analysis demonstrates that the rate of economic growth is associated with the accumulation of human capital. Furthermore, those regions with a lower per worker GDP at the beginning of the period of our analysis tend to show a faster growth rate.

4.3. Policy implications

The primary policy implication of our study is the need to support continuous human capital development. The growth of computers and digital technology has led a number of observers to a renewed enthusiasm for the Schumpeterian vision of capitalist creative destruction (Harris, 2001). With the notion of the 'knowledge-based economy' they view that creation of knowledge and its conversion to commercial use plays a greater role than ever in economic development. Knowledge is distinct from natural resources in its non-rival nature: its use by one firm or person in no way limits its use by another. Once it is created, knowledge is not depleted: it adds to the existing stock of knowledge.

This non-excludable nature of knowledge in turn allows research workers to share the stock of knowledge and act on it to create new ideas. New ideas will be then embodied in new or improved products and production processes, bringing about economic growth. A prediction drawn from this view of the knowledge-based economy is its ever-continuing growth. As an economy shifts its primary activities to knowledge creation, with its conversion to commercial value, the economy is more likely to benefit from the existing stock of knowledge that only continues to grow. The view also predicts the advantage of an economy with a large stock of research workers: the more workers are engaged in research, the more new ideas are likely to be created. Accordingly, a rosy picture of continued

growth in advanced economies emerged with the long-term boom in the US economy in the 1990s.

In contrast to the prediction of the knowledge-based economy, our findings show that there is not any significant association between the existing stock of research workers and economic growth. Instead, economic growth is found to be associated with accumulation of research workers. This suggests that a key to economic growth is continuous development of high-order human capital. While there is little doubt that advanced economies in Western Europe are becoming more knowledge-based, they cannot rest on the existing research base to grow further. Given the increasingly fast pace of technological change that makes human capital obsolete, a concerted effort needs to be made to facilitate continuous development of high-order human capital.

The development of high-order human capital does not mean education and training to increase research workers alone but refers to development of 'knowledge workers' in a broad spectrum of economic activities. As Kline and Rosenberg (1986) demonstrate, knowledge creation has shifted from a traditional linear process of innovation to a more complex chain-linked model based on interactions between knowledge workers. In this new mode, creation of new ideas takes place throughout the entire value chain spanning an organisation's different functions (e.g. R&D, production, marketing, sales) and its external partners (e.g. suppliers, customers, universities, research institutes, government organisations). Development of such an organisation-wide innovation capacity in an economy will require education and training policy that aims to upgrade continuously a broad range of human capital to a higher level.

List of abbreviations

GDR	German Democratic Republic
ICT	Information and communication technology
NUTS	Nomenclature of territorial units for statistics
R&D	Research and development

Annex 1

Technical difficulty of incorporating increasing returns to a neoclassical model

Suppose the prices of output F and factors K , L and A be p , w_K , w_L , and w_A respectively. If each factor is paid its marginal product,

$$w_K = p \frac{\partial F}{\partial K} \quad w_L = p \frac{\partial F}{\partial L} \quad w_A = p \frac{\partial F}{\partial A}$$

Output F can be then written as:

$$F = \frac{1}{p} (w_K K + w_L L + w_A A) = K \frac{\partial F}{\partial K} + L \frac{\partial F}{\partial L} + A \frac{\partial F}{\partial A} \quad (5)$$

According to Euler's Theorem, if $f(x_1, \dots, x_n)$ has continuous first partial derivatives and is positively homogeneous of degree k , then:

$$\sum_{i=1}^n x_i \frac{\partial}{\partial x_i} f(x_1, \dots, x_n) = k f(x_1, \dots, x_n)$$

This suggests that equation (5) holds if $F(K, L, A)$ is positively homogeneous of degree 1, that is:

$$F(tK, tL, tA) = tF(K, L, A)$$

It is easy to see that this would mean constant returns in K , L and A . Hence under increasing returns, all factors cannot be paid their marginal products.

Annex 2

Growth rate of consumption in Romer (1986) model

The rate of saving is determined by the owner of the representative (i.e. average) one-worker firm who tries to maximise his lifetime utility W . Thus the problem is expressed as:

$$\max \int_0^{\infty} u(c_t) e^{-\rho t} dt$$

subject to $\frac{dK}{dt} = \bar{A}K^{\alpha} - c$ (i.e. investment equals net product minus consumption) and $\frac{dK}{dt} \geq 0$.

Assuming a constant intertemporal elasticity of substitution (i.e. $u(c) = \frac{c^{1-\varepsilon} - 1}{1-\varepsilon}$), the above dynamic optimisation problem yields the Euler equation:

$$\frac{\frac{dc}{dt}}{c} = \frac{1}{\varepsilon} \left(\frac{\partial F}{\partial K} - \rho \right) = \frac{1}{\varepsilon} \left(\alpha \bar{A} K^{\alpha-1} - \rho \right)$$

(because of $L = 1$, $F = \bar{A}K^{\alpha}$ in the case of the representative one-worker firm).

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Non-material benefits of education, training and skills at a macro level

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Abstract

The macrosocial, as opposed to the microsocial or economic, benefits of education are often neglected by researchers and policy-makers. An emphasis on individual actors and communities as the foundations of macrostructures has limited potential when understanding societal properties. Macrosocial concepts such as social cohesion and societal values have received much attention in sociological theory as it relates to education and this paper is part of what we identify as a wider rediscovery of such concepts in educational research and policy.

The macrosocial is conceptually different from the microsocial in terms not only of level, but also in terms of its emphasis on the relational properties of social functioning. These conceptual differences are highlighted through discussion of various macrosocial indicators – crime, social cohesion, societal values and citizen participation.

Beginning with an analysis of crime, we discuss why developmental and economic perspectives on criminal behaviour offer a limited understanding of crime, particularly in a comparative context. However, the structural antecedents of crime (particularly inequality and labour market position) are shown to be powerful explanatory tools.

Next we move to consider social cohesion, trust and values. Classical sociological accounts clearly construe cohesion as a macrosocial issue but current policy debates rarely refer to classical conceptions and freely conflate societal aspects of cohesion with micro and meso concepts of social capital and community. Through a discussion of these themes we ascertain that national and historical differences in these properties cannot be explained as aggregated microphenomena. Moreover, the educational system, including vocational education and training (VET), has a pivotal (yet sometimes contradictory) role to play in the construction of social cohesion.

It is not as clear that active citizenship and the antecedents of civic and political participation are macro phenomena in the same way as social cohesion. There are clear mechanisms involving resources and status which link VET to all aspects of participation. However, there are also cultural differences in the nature of participation and the relationships between participation and general trust. There is, therefore, a need for micro relationships between education and citizenship outcomes to be understood in terms of local and national context as part of a more general macro-micro synthesis.

From this review of literature we discuss the ways in which we may evaluate the relationship between VET and macrosocial outcomes. Although an evaluation in a summative and final sense would be ill-conceived in terms of societal outcomes, a hybrid of formative evaluation and macro causal forms of comparison is potentially fruitful. We employ a macro causal and evaluative form of comparison through the use of both macrosocial and microsocial data. These enable us to test hypotheses related to distributional considerations and the primacy of cultural over individual factors. Although the results are

exploratory, there is some evidence that distribution considerations are important factors in producing social cohesion.

We conclude by restating the case for comparative approaches to these issues. Both distribution considerations and the values transmitted through education are important in realising macrosocial benefits, in particular social cohesion. In terms of implementation, although there are cultural limits on the extent that 'policy borrowing' is appropriate, there are clear lessons for policy-makers; improving the distributional equality of educational outcomes is as important as raising average skill levels.

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1. The macrosocial benefits of education

In this report we examine what we call the macrosocial benefits of education. The question of delimiting between micro- and macrosocial benefits is difficult. For many economists and social scientists, steeped in the traditions of methodological individualism, there is no macrosocial, and any benefits derived at that level are simply the aggregation of microsocial benefits. This view *in extremis* can be found in the 'Austrian school' economists' belief that macro aggregates are not meaningful, being simply descriptive compositions of heterogeneous micro-processes. This view is the antithesis of that of theorists such as Lockwood (1992) who reject the idea of reducing macrosocial phenomena to the behaviour of individual actors (Mortensen, 1999). Here we take the view that societal effects are, at least in part, irreducible to individual level phenomena since understanding at the macro societal level may require analysis of the effects of some structures and characteristics which are integral to the collectivity or society itself, and which have meaning only at that level.

In terms of what might be called the microsocial benefits of learning, there is much evidence that education impacts upon individual health, propensity to commit crime and general quality of life (McMahon, 2000). Much of this evidence is grounded in the theoretical perspective of human capital, in that individuals are theorised to make decisions on the basis of present and future costs and benefits in order to maximise their net economic welfare. This would include any non-monetary benefits of education, what Becker (1993) refers to as psychic income, in addition to monetary benefits. Blaug specifies the contemporary definition of human capital theory to include non-monetary benefits: 'People spend on themselves in diverse ways, not only for the sake of present enjoyment, but also for the sake of future pecuniary and non-pecuniary returns.' (Blaug, 1992, p. 207).

1.1. What are macrosocial benefits?

Many of the social benefits of learning can be located in a microeconomic or microsocial frame-

work and are embedded in human capital conceptions of education. However, when we progress to wider units of analysis such as the family, community and nation, the limitations of such an individually-based framework become apparent. This is not only in terms of whether the nature of the benefit can be reduced to individual decision-making, but if it can be expressed as an identifiable individual benefit. In some ways, macrosocial benefits may be thought of as ecological in that they provide a framework in which other microsocial benefits may be enhanced or diminished.

There are three primary features of macrosocial benefits of education to consider. First, they possess the characteristic of non-identifiability. Many micro-social benefits, such as improved health or crime reduction, can be attached to an individual, or a community. Macrosocial benefits do not have the property of identifiability in that they cannot necessarily be attached to a person, or community at lower than the national level (although their impact may be felt at this level). For example, social cohesion may be measurable, or at least proxied, but it is not possible to quantify the social cohesiveness of an individual. In economic terms, macrosocial benefits are a pure public good as the benefits derived are non-rival and non-excludable.

Second, they are often relational or positional in nature. Benefits such as improved literacy can be expressed in terms of one individual. However, educational equity in terms of the distribution of educational test scores cannot. They may be expressed only in terms of relations between individuals and, in this sense, may be thought to be macrosocial in nature.

Third, they are system level or social integration benefits (Mortensen, 1999). Macrosocial benefits cannot necessarily be aggregated from other social indicators, although their properties may well be related to microsocial indicators. For instance, individuals' answers to the general trust question in the world values survey (WVS) ⁽¹⁾ do

(1) 'Do you trust people in general?'

not necessarily represent societal trust, although they can be used as a rough proxy for it. Obviously, there will be measurement error as individual perceptions of trust are not the same as the actual level of trust. However, even given this error, the level of social trust comparatively speaking is more than the aggregation of expressed individual trust as it comprises historically and culturally derived norms of trust which, although they determine individual responses and are captured in their measures, will deviate from those in other countries.

We can use human capital, social capital and social cohesion to illustrate arguments of identifiability, position and level. Human capital is clearly identifiable – the benefits can be attached to an individual, although it may make some sense to discuss the skills base of a nation. It is partly relational in that there is a relationship between an individual's relative human capital stock and his or her access to resources such as political power (Nie et al., 1996) or employment as evidenced by the burgeoning literature on overeducation. Human capital can be aggregated to a national skills base, although whether this skills base has macrosocial properties separate from the individual stock of capital is questionable. So human capital accumulation is not necessarily a clear example of a macrosocial benefit as benefits are primarily realised at the individual level. However, recent developments in the economics of education such as endogenous growth theory and on the social benefits of education such as democratisation (McMahon, 2000) indicate that there is potential for an engagement with macrosocial issues by human capital theorists. For example, endogenous growth theorists relate human capital accumulation to economy-wide innovation and lower crime (Sianesi and Van Reenen, 2000).

It is not as clear that social capital, defined by Putnam as 'social networks and the norms of reciprocity and trustworthiness that arise from them' (Putnam, 2000, p. 19) is a microlevel benefit of education. The ability of social capital to span micro-, meso- and macrolevels of analysis is much noted by its advocates (Lin, 2001) (Baron

et al., 2000). Social capital cannot necessarily be attached to one individual (although Glaeser et al., 2000, attempt to distinguish between individual and community social capital) and from the writings of Putnam (1993, 2000) it is clearly ecological in nature. There are relational or positional elements of social capital in terms of its distribution or individuals' access to social capital, although it is rarely expressed in these terms. However, the role of social capital in system functioning or integration is not clear. In certain cases, the formation of civic associations and trust may work against forces for social cohesion (Skocpol and Fiorina, 1999) (Green and Preston, 2001).

Although it is not as clearly defined as either human or social capital, social cohesion can be considered to be a macrosocial benefit of education. It is clearly non-attributable to individuals or communities (although individuals or communities may have characteristics conducive to it). It has relational or positional properties in that the positioning of various groups within society is instrumental in producing social cohesion ⁽²⁾.

In this report, we begin by examining the macrosocial benefits of VET, and education and training (ET) more generally, by examining three related sets of literature. First we review literature related to education, crime and the formation of delinquent attitudes. Crime can be considered to be an important element in the potential for social cohesion. In particular, certain types of crime, such as hate crime, may be considered particularly relevant to the struggle for integration. Next, we examine literature related to education, social cohesion and the formation of values such as social trust and tolerance. This is diverse. And in particular, work relating to the influence of education on social cohesion is often of a qualitative nature. It is therefore often difficult to operationalise and test hypotheses related to learning and social cohesion within a positivist framework. We then move to consider the impact of education on the formation of an active citizenry in terms of civic and political life.

In the last part we examine how far quantitative and qualitative techniques can be used to investigate the impact of education on the macrosocial

⁽²⁾ Social cohesion is also synonymous with social integration and system maintenance, at least in functionalist theories of society (Parsons, 1951). Parsonian or neo-Parsonian views of societal functioning are regarded critically by Marxist theorists such as Lockwood (1992) who stress the role of structural contradictions within capitalism as the basis for social conflict or social disintegration.

benefits of learning. We critically overview literature related to the comparative method, econometric techniques (such as the social rate of return) and evaluation methodologies. We then present two related pieces of quantitative work to investigate how far different methodologies

(aggregate analysis and microsocial analysis within a comparative context) can be used to ascertain the impact of education on macrosocial benefits. We also test some of the hypotheses raised in this report related to the role of education in comparative context.

2. Crime in comparative context

2.1. Introduction

We begin our report by examining the literature on the impact of ET on crime. As with all macrosocial indicators, comparisons of crime statistics are troublesome in comparative context. Differences in legislation, recording and even cultural differences in the perception of criminal activity mean that cross-national comparisons should be made with caution.

There is little evidence that the collection of cross-national crime statistics has improved over time (Jousten, 1998, p. 282). One frequently cited example of a measurement problem is that there is less variation between countries in victimisation rates (self-reported crime) than in police data owing to differences in how the police define, handle and count offences (Killias and Aebi, 2000, p. 45). Particular problems occur in researching criminal subpopulations such as drug users where there are 'rare and hidden subpopulations hard drug users are difficult to reach and not very willing to co-operate' (Ødegård, 1998, p. 358).

Measurement problems are of a cultural as well as a legalistic nature. Even given differences between actual crime, reported crime, police records and judicial interventions there is a social dimension to perceptions of crime (Jousten, 1998, p. 283) which can be seen as a driver of national policies, including those concerning education or resocialisation of offenders. Garland (2000) identifies what he calls a culture of high crime societies in the UK and the US and also potentially in other Northern European countries such as Germany. This is not necessarily a recent phenomenon. Historically public perceptions of crime have partly driven crime policy (Walton et al., 1999).

Competing definitions and interpretations of crime are rife in literature which, given its multidisciplinary nature, makes a generalised assessment of the effects of ET on crime difficult. Internationally there have been attempts to collect crime statistics with cross-cultural differences in mind. For example, the *European sourcebook on*

national crime, the *International crime victimisation survey (ICVS)* and to a lesser extent Interpol statistics provide a basis for international comparisons. Moreover, qualitative work, or that which examines trends (rather than absolute levels of crime), enables us to understand in part the effects of ET on crime at an aggregate level.

Given these qualifications concerning measurement and interpretation, we now turn to the research evidence connecting ET to crime. We have identified two broad areas of research: individual explanations of the ET-crime relationship; and cultural, ecological and grand theories of crime.

2.2. Individual theories of crime – the rediscovery of the offender

There has recently been a return to individual explanations of crime phenomena or a rediscovery of the offender (Kaiser, 1997). These approaches eschew grand theories of crime and theories which emphasise cultural rather than situational factors. Most influential in the current criminological literature is Gottfredson and Hirschi's (1990) 'general theory of crime' which, although using a single explanatory mechanism called 'control theory' to explain individuals' propensity to commit crime, involves what Gottfredson and Hirschi (1990) call a culture-free perspective. They argue that: 'cultural variability is not important in the causation of crime, [and] that we should look for constancy rather than variability in the definition of and causation of crime, and that a single theory of crime can encompass the reality of cross-cultural differences in crime rates' (Gottfredson and Hirschi, 1990) (quoted in Vazsony et al., 2001).

Individuals who are inadequately socialised in early life and fail to bond with their parents through lack of adequate family structures are believed to lack self-control as adults. This lack of self-control is thought to result in antisocial behaviour and crime across all categories. As

self-control is formed in early childhood, there is little role for formal education in influencing this, except where educational interventions may be applied later after identification of supposedly inadequate family structures. Other developmental approaches to criminology, such as criminal careers research, are similarly sceptical regarding the role of later education in addressing bio-social and early childhood antecedents of crime.

Although there is a substantial number of national studies which support the tenets of control theory (Lanier and Henry, 1998, pp. 164-165), there has been little cross-cultural validation or testing of the concept. Most of what there has been has involved studies of youth and delinquency or crime-analogous behaviours such as deviance rather than more serious adult crimes. However, in a study of adolescents in Hungary, the Netherlands, Switzerland, and the US (Vazsony et al., 2001) the reliability of self-control and a scale for deviance (the normative deviance scale, NDS) is shown to be within acceptable limits for all countries. Moreover, self-control is the most powerful predictor of deviance, with differences between countries accounting for only 0.6 % of the variance. This implies that most variation is within countries rather than between countries (although the outcomes are crime-analogous behaviours rather than crime as legally recorded).

While control theory and other developmental perspectives emphasise the role of individual difference as a cause of crime, routine activities theory (Felson, 1999) stresses the supply of opportunities for crime. Routine activities theory is an economic theory of crime which argues that criminal decisions are part of the category of more general economic behaviour based on rational perceptions of the costs and benefits of criminal activity (Becker, 1968), although strict assumptions regarding the degree of individual rationality are not necessarily supported in contemporary economic criminology (Lanier and Henry, 1998, pp. 76-77). A lowering of the costs of crime, in terms of a greater availability of criminal opportunities or reduced punishments, produces a greater amount of criminal behaviour. The recent surge in mobile phone theft in the UK could be seen to be explained by such a theory

given the increased use of these phones and hence opportunities of theft.

A routine activities approach is employed by Killias and Aebi (2000) in an analysis of European crime trends from 1990 to 1996. Compared with the US experience, there has not been a significant decline in European crime trends in recent years although aggregate levels for most crimes are still higher in the US. Despite having demographic trends similar to those in the US, most European Union (EU) countries saw rises in crimes of all types, with a particularly sharp rise in property crimes and drug offences. According to Killias and Aebi (2000) there is no need to utilise grand theory, involving concepts of anomie or demography (which, in any case, are reasonably convergent across the EU, and not substantially different from those in the US) to explain these trends. Rather, the opening up of markets across Europe and wealth inequalities between East and Western Europe have offered new markets for stolen goods and new supply lines for drugs. Killias and Aebi (2000) do not suggest that education could play a major role in the context of this recent increase in crime. However, they mention that a lack of educational and labour market opportunities for migrants in the EU and Eastern European youth in general may have facilitated this process (Killias and Aebi, 2000, p. 52). This signals a possible role for targeted ET.

The lack of emphasis which both developmental (namely control theory) and economic (namely routine activities) theories of crime place upon formal education is borne out in national empirical literature. There is little evidence that educational level has an influence on an individual's propensity to engage in crime independently of other factors (Witte, 1997), although level of education has a powerful effect on other factors, such as income, which are related. Other educational outcome measures show a direct correlation. Time spent in education (Witte, 1997, p. 227) is associated with crime (but note that time spent in education is strongly correlated with social class), as is early childhood education (Rutter, 1994). Educational failure (dropping out) is also related to crime (Lochner and Moretti, 2001 reviewed in Feinstein, 2002).

Furthermore, there is significant evidence that delinquency is linked with poor performance at school or early school leaving (Friday, 1980,

pp. 117-120). However, there is little evidence that delinquency necessarily leads to crime except for those individuals already at risk of criminal behaviour through poor early socialisation (Farrington and Loeber, 1999).

This relative neglect of ET or educational level is not true of all individual-orientated theories of crime. In the life-course approach, such as that adopted in the Tübingen studies (Kerner et al., 1995) ET is one possible road out of criminality (Kaiser, 1997, p. 373). Laub and Sampson (1993) perceive training and work as possible turning points in the criminal life course through social control and the creation of informal social bonds. The life-course approach has also been used to assess the impact of education on victimisation (the probability of being a victim, rather than a perpetrator of crime). Using reconstructed longitudinal data from the Netherlands, Wittebrood and Nieuwbeerta (1999) find that those who are of higher education and status are more likely to be victims of violent victimisation, particularly robbery and property crime. As they are less likely to commit crime, though, this has some effect on reducing their chances of being a victim of violent crime.

Individualistic criminological theories have little to say (either theoretically or empirically) about the role of ET as opposed to early and targeted interventions (Witte, 1997, pp. 220-233). They have also been challenged regarding their methodology and socially authoritarian potential. Haines (1999) criticises criminal careers and life-course research as being based on small, unselective samples which quickly become less relevant for policy concerns as respondents age. For example, the three major UK birth cohort studies started with samples born respectively in 1946, 1958 and 1970. This means that even in the latest cohort most individuals would have progressed through formal education in the years 1975-86 with VET following this period. The implication is that a number of important UK policy changes in ET, such as reforms in the qualifications system and the introduction of internal markets in ET provision, could not be tracked in this cohort. For the older cohorts (those born in 1946 and 1958) the policy context in which they undertook their education is even further removed from the concerns of contemporary policy-makers.

In addition Haines (1999) follows Garland's

(2000) contention regarding the manner in which cultural perceptions of crime are reified as social fact. There is little in individualistic theories of crime, other than in the life-course approach, about rehabilitation in adulthood. Policy-makers have capitalised on the more authoritarian aspects of these theories with an emphasis on early identification (youth crime policies, identification of potential juvenile offenders by teachers in primary schools in the UK) and incarceration (zero tolerance in the UK, three strikes policy in the US).

Therefore, the role of ET in mitigating criminal activity is seldom identified in individual theories of crime. As we have shown, there is little research evidence linking ET to individual propensity to commit crime, independent of its indirect effects (although there is more evidence on delinquency and crime-analogous behaviour). Moreover, the emphasis in these theories on the early formation of criminality seems to rule out the efficacy of later interventions. However, life-course theories offer some space where we may at least theorise a role for ET and there is some evidence that increased training may (given the availability of labour market positions) offer a route out of criminality (Laub and Sampson, 1993). Here, though, evidence is tentative.

2.3. Cultural, ecological and grand theories of crime

Unlike individualistic theories of crime, in cultural, ecological and grand theories the role of education systems and national educational strategies is more apparent, and necessary. Although studies of this nature tend to be based on a small number of cases – if nations or regions are the unit of analysis – they enable us to move beyond context-free examination of simple causality between education and crime. As Ødegård (1998, p. 365) states with regard to drug use: 'For two different nations one and the same characteristic can generate opposite effects in the same way that some people can become alcoholics because of their milieu, while others can become total abstainers because of the same milieu'.

We will begin this section by examining the evidence relating national cultures and ET systems to crime. We will then move on to

discuss the position of ET in relation to the formation of certain criminal subcultures, namely those which perpetrate hate crimes and football hooliganism. Finally, we will examine the indirect effects of education on crime through meso and macro level mediators such as community, employment levels and income equality.

The importance of culture and institutions in understanding relationships between crime and other variables, such as education, is explored by Junger-Tas (2001) in her report of the preliminary results from the International self-report delinquency study (ISRD) which involves surveys of youth aged 14-21 in 13 countries including 11 EU Member States. Although there is similarity in the relationship between self-control and delinquency in different countries, there are also important national differences. For example, in England and Germany father absence was associated with higher delinquency, whereas in Nordic countries this was not the case. This is possibly due to different welfare arrangements between countries whereby single parent families receive more support in Nordic states (Junger-Tas, 2000, p. 323). Similarly, whereas there was a relation between large peer groups and delinquency in some countries, this was not the case in southern Europe where, arguably, these are often the norm. This reveals, again, the importance of different social and cultural contexts. With regard to education, Junger-Tas (2001) reports from a continuing survey of Dutch youth that shows that school achievement and parental supervision are important factors in reducing juvenile delinquency. However, for ethnic minorities youth parental support is greater and they are more likely to be victims of physical abuse than Dutch youths.

In another example, Eisner and Wikstrom (1999) compare violent crime in Stockholm and Basel. They find that the temporal and spatial patterns of crime are similar, occurring more frequently in the evenings and early mornings, particularly in areas with high social disorganisation resulting from poverty, unemployment and transient populations. However, there are differences in the levels and types of crime, with violent crime particularly high on weekend nights in Stockholm. Eisner and Wikstrom (1999) suggest that this is due to the

cultural norms amongst young men in Stockholm. However, they find that education has a perverse effect on the rate of violent crime in Basel, with the percentage of university students in each district being positively correlated with the rate of violent crime (an effect which may be due to the nature of undergraduate fraternities there?). This effect persists even when controlling for indicators of local deprivation, although other educational controls (such as the number of educational establishments in a district) are not used.

The relationship of European ET systems to juvenile crime is further discussed by Estrada (1999). Estrada distinguishes between two models of post-war juvenile crime – one in which the trend has been a general and continuing increase (in England, Finland, Germany ⁽³⁾) and one in which it levelled off in the 1970s (in Austria, Denmark, the Netherlands, Norway, Scotland, Sweden, Switzerland). Given these differential trends, Estrada does not consider that either routine activities or control theory are suitable explanations. The availability of crime opportunities did not necessarily differ from country to country. Indeed, most countries adopted a punitive approach to juvenile crime prevention which would not explain the divergent trends (Estrada, 1999, p. 37). In addition, those factors which would suggest a deterioration in family functioning, such as increases in the divorce rate, occurred mainly from 1965 to 1975 which is not consistent with the increases in crime from 1950 to 1965 nor with the levelling off in juvenile crime which occurred in most countries thereafter.

Estrada argues against an individually-based explanation of crime and in favour of one based mainly on the social control functions of ET. According to him, the segregation of young people from adult society through 'the increasing length of educational careers, a later and later entrance into the labour market and the growth of a youth focused popular culture' have been responsible (Estrada, 1999, p. 38). This process has occurred at various times and with variable rates of consistency across Europe and this, he argues, explains the variation in crime trends. For example, the crime trend in Sweden can, he argues, be explained by the fact that

⁽³⁾ To construct a German time series, Estrada (1999) uses crime statistics for that part of the country known as West Germany up to 1989.

post-compulsory education and late entry into the labour market increased dramatically from 1950 to 1960, peaking in the late 1960s and stabilising thereafter. To support this point Estrada cites self-report evidence from both Denmark and Sweden which suggests that youths are actually more disciplined now than in the 1970s (Estrada, 1999, p. 38). The fact that juvenile crime trends have not levelled off in some countries can be explained by the continuing extension of education and youth separation from the labour market, according to Estrada (1999, p. 38). However, this is somewhat belied by the rise in youth crime in Germany where the ET system is generally believed to provide a highly structured entry into adult life (Brown et al., 2000). In addition, it would be interesting to know whether changes in the segregation of youth correspond with changes in other social indicators such as the distribution of skills or income inequality.

In his long-range sociohistorical study of European homicide rates, Eisner examines the determining role of education systems in the light of Norbert Elias' theory (1978) on the effects of modernisation in engendering self-control (Eisner, 2001). From a variety of historical records, Eisner constructs a time series data set for Belgium, England, Germany, Italy, the Netherlands, Switzerland, and the Scandinavian countries from around 1200 to the present day. Although cautious of measurement issues, he is able to identify a downward secular trend in homicide rates where the 'phases of accelerated decline [...] often seem to coincide with periods of rapid expansion and stabilisation of state structures' (Eisner, 2001, p. 630). For example, the decline in Swedish rates coincides with the establishment of centralised bureaucratic structures and the decline in Italian rates with national unification in the 1870s. Eisner uses Oestreich's (1968, 1982) concept of social disciplining resulting from a period of state intrusion into everyday life in order to explain these phenomena (Eisner, 2001, p. 631). In particular, he argues that 'the expansion of literacy and schooling and early capitalist expansion of work constitute independent sources of the disciplining process in the early modern age [...] Their effects on the structures of the self were both rigidly to enforce self-control and to provide the social and cultural resources for a more orderly conduct of life' (Eisner, 2001,

p. 631). Education did not act independently of context but 'these effects may have been particularly penetrating among those groups and areas where intensified moral control by the church, expanded schooling, pervasive state structures, and work discipline intertwined into mutually reinforcing power structures' (Eisner, 2001, p. 631). At the same time he sees the rises in homicide rates which occurred at the end of the 16th century and in the period around 1800 as reflecting social and cultural transformation in European societies. Similarly, the rise in homicide rates since the 1960s may reflect the transition from modern to post-modern society (Eisner, 2001, p. 633).

These studies show how general theories of crime are limited by their blindness to cultural differences. Different cultural antecedents of delinquency operate not only for national populations (Estrada, 1999) (Eisner, 2001) (Junger-Tas, 2001), but also for subpopulations (Junger-Tas, 2001) (Eisner and Wikstrom, 1999). We also see the influence of distinct national cultural contexts in examining criminal subcultures.

The role of educational arrangements and institutions within national cultural contexts is apparent in comparative work on criminal subcultures. For example, there has been recent policy and research interest in what are called hate crimes in the EU. These are crimes involving violence against a specifically targeted racial or national group which have specific implications for social cohesion. According to Levin and Rabrenovic (2001, pp. 584-585) various commentators argue that hate crimes are 'more harmful to the social fabric of society than comparable crimes without a bias motive'. This is due to victim interchangeability (victims are chosen because of their membership of a specific group, not because of prior actions or opportunity), secondary victimisation (that attacks against the victims family and community escalate due to hate crimes) and escalation (that hate crimes may escalate into large scale social conflict).

There are obvious cultural differences in terms of legal definitions, types and targets of hate crime. In a study of aggressive youth cultures and hate crime in Germany, Watts (2001) contrasts hate crime in Germany and the US. He argues that although the historical roots of hate crime are different in both countries, the structural

antecedents of right-wing violence amongst the skinhead subcultures are similar across cultures. These antecedents are status anxiety, decline of working-class culture and unemployment due to marginalised positions in education, labour and housing markets (Watts, 2001, p. 612).

Similarly, Dunning (2000), in an analysis of football hooliganism as a world phenomenon, identifies cultural differences between the nature of hooliganism but identifies similarities in structural antecedents. In Belgium, for example, Van Limbergen et al. (1987) cite unemployment and a short and frustrating school career as responsible, whereas in Holland typical Dutch hooligans 'tend to resent and resist formal education' (Van der Brug, 1986, cited in Dunning, 2000, p. 160). Dunning states that hooliganism is situated around fault lines in each country 'in England, that means social class and regional inequalities [...] in Italy city particularism [...] in Germany the relations between East and West' (Dunning, 2000, p. 161).

In all cases economic (and educational) inequalities are realised and expressed in different cultural forms of hooliganism. Although the role of education in hate crimes and hooliganism is not direct, educational inequality (particularly in terms of lack of access to labour markets) can be seen as one part of various inter-related inequalities.

However, explanations of subcultures of crime which are orientated around working class or underclass social and economic disadvantage are problematic. Crime statistics tend to overrepresent working class crime. Moran (2000) with reference to UK and US data demonstrates how the criminal justice systems over-record the number of working class men as perpetrators of homophobic violence (see also Lees, 1996 for a feminist critique of the construction of rape and domestic violence as a predominantly working class crime). Additionally, working class crimes are often perceived to be a greater social problem than so called 'white collar crimes'. Robson (2000) examines how football hooliganism has been identified as a problem among white working classes (at least in the UK) whereas statistics demonstrate it features a range of social classes (as conceded by Dunning, 2000). Such studies may cause us to treat direct causal relationships between economic and social disadvantage and

crime with due caution, although there is some evidence of these effects, as discussed in the next section.

2.4. Indirect effects of ET on crime: unemployment, community effects and inequality

What we have seen is that the influence of education on crime is not direct and that cultural factors and institutional arrangements are important. However, there is some evidence that there are indirect effects of education on crime. The labour market advantages associated with a higher level of education, namely a lower probability of unemployment and a higher salary, may be mechanisms through which ET has an impact. We have already explained how unemployment is part of the social exclusion involved in hate crimes and hooliganism. Indeed, at a microsocial level of analysis, longitudinal studies reveal an association between early school leaving, unemployment and crime (Farrington et al., 1986) although crime may paradoxically rise in times of high employment. Dunning (2000) shows that football hooliganism in the UK was much higher in the 1960s when there was virtually full employment when compared to the economic depression of the 1930s when hooliganism was virtually non-existent.

Such paradoxes may be resolved by reference to macroanalysis. At an aggregate level, the influence of unemployment on crime operates in two opposing directions (Beki et al., 1999). Firstly, unemployment reduces general economic activity and reduces the value of goods to be stolen. This suggests an opportunity effect which would lead to a negative relationship between unemployment and crime. As low levels of economic activity are credibly associated with lower levels of conspicuous consumption and business activity, the opportunity and temptation for crime falls. Second, unemployed individuals may have more incentive to steal as they have lower absolute and relative incomes. Through a time series analysis of the Netherlands from 1950 to 1993, Beki et al., (1999, p. 410) show that unemployment has a negative effect on the aggregates for most theft crimes including burglary (the opportunity effect).

The only positive relationship between unemployment and crime is in terms of fraud where there may be an unsurprising motivation effect.

Possible area, or ecological, effects of education are also indirect. Social disorganisation theories examine the influence on crime of variables such as poverty, ethnic heterogeneity and residential mobility. In practice, proxy measures for these variables such as indices of deprivation, ethnic mix and unemployment are used (Mesch and Fishman, 1999). The use of these proxies has led to some debate as to whether social disorganisation is a single characteristic of areas, or rather a cluster of unrelated variables. Mesch and Fishman (1999) dispute that a latent variable for social disorganisation fully accounts for the direct effects of urbanisation and family disruption on crime whereas Glaeser et al. (1996) contend that the quality and quantity of social interactions are more important than social disorganisation. In terms of ET, social disorganisation theory may be criticised as neglecting the indirect effects of education on values, as opposed to their labour market functions. For example, in socially disorganised areas the weak socialisation capacity of ET institutions are rarely examined explicitly (Bursik, 1998). Indeed, there is some evidence that peer group effects are predictors of juvenile delinquency (Gaviria and Raphael, 2001), although again whether this leads to subsequent criminal activity is questionable.

Rather than examine the intrinsic characteristics of communities in order to identify criminogenic elements, a strand of research involves analysing the relative standing of countries and communities in terms of income inequality. Using cross-national data, Braithwaite, J. and Braithwaite, V. (1980) show a statistically significant correlation between greater inequality of earnings and higher homicide rates across countries. Messner (1982) found that the extent of income inequality accounted for 35 % of the differences in homicide rates among the 39 countries for which he had data.

Research based on US state level data also suggests a link between inequality and crime. Kelly (2000) shows that even controlling for other factors such as poverty, race and family composition there are strong associations between economic segregation and crime. Lee (2000) shows how the spatial isolation of poor individ-

uals from the wealthy is a more powerful predictor of crime than the intrinsic properties of individuals and communities. He uses this finding to criticise researchers who attempt to identify essentialist explanations of crime among African Americans, rather than examine relative inequalities. Kelly (2000) also indicates the potential for replication of inequality and crime studies using European data. Examining inequalities and the relative position of individuals and groups may enable us to investigate how far social disorganisation theories of crime have validity.

Econometric literature shows that income and education inequality are strongly associated (Nickell and Layard, 1998). Countries with wider dispersion of skills and qualifications, as we will show later, also tend to have greater inequality of income. If income inequality is related to higher levels of certain types of crime at regional and national levels, it may be that societal levels of crime are indirectly affected by education inequality.

2.5. Conclusion

In conclusion, there is relatively little quantitative evidence at the individual level to support a direct relationship between levels of ET, or even post-compulsory education, and crime when other factors, such as social class, are controlled for. However, there are clearly indirect effects.

In comparative context, the effects of education systems (and particularly the relationship between education and labour markets) are more apparent and probably derive as much from the content and distribution of educational outcomes, as from the average levels in any given country. The effects of education on crime are highly mediated by their national context. Indeed, to a certain degree how we perceive crime is constructed differently between nations (Garland, 2000). The macrosocial effects of education on crime are perhaps best perceived in terms of long periods of time (Eisner, 2001) and there has been relatively little research conducted into long duration relationships. However, we may make a number of tentative generalisations.

First, the marginalisation of individuals from labour markets and the norms of society is one of the features of criminal subcultures across European societies, although the form of this marginali-

sation differs between countries. Second, although there are distinct cultural realisations of crime, there are identifiable common structural antecedents. Although the relationship between unemployment,

social disorganisation and crime is unclear, there is emerging evidence that income inequality, and by implication education inequality, is an antecedent of some types of crime.

3. Social cohesion: values, trust and tolerance

3.1. Defining social cohesion

Social cohesion is a concept with a long and complex history. All societies have been concerned with problems of social order and their philosophers have written extensively about them from Aristotle to Hobbes. During the 19th century an explicitly sociological approach to the problem was developed which examined the forces, institutions and values which hold – or fail to hold – society together. It might be said that social order and social cohesion represented the defining problems of the new discipline of sociology developed by Comte, Saint-Simon, Durkheim, Spencer, Weber and Tönnies in 19th century Europe. The founding fathers of the new science of society (or secular religion as detractors were likely to call it) concerned themselves with social cohesion because they were aware that they lived in an era of rapid transition when traditional bonds and ties were being eroded and where the centrifugal forces of industrialisation and democracy could rip apart previous social connections. As Marx, contemplating the whirlwind of capitalism, famously wrote: ‘All that’s solid melts into air.’ We are currently living in a similarly transformative age and ask similar questions.

The answers provided by the 19th century social thinkers to the problem of social cohesion were varied, as they are today. All noted that industrialisation and the division of labour were transforming social and spatial relations from societies based on face-to-face community (what Durkheim called ‘mechanical solidarity’) to some new form of order with more diverse and distributed social connections. To Durkheim this meant the erosion of the collective conscience and close-binding values of traditional society and their replacement by new forms of organic solidarity based on the functional mutual interdependencies created by the division of labour. To Tönnies it meant the shift from society based on community (*Gemeinschaft*) to society based on contract (*Gesellschaft*). Such changes were seen to be inevitable, but they did not guarantee that social cohesion and order would prevail. For Spencer unfettered market relationships were

enough to hold society together, but for the continental thinkers no such benevolent hidden hand existed. For Comte and Tönnies it was ultimately only the state that could hold society together. For Durkheim, who criticised Comte’s insistence on moral consensus and both Comte’s and Tönnies’ reliance on the state, there had to be other forces, beyond market and state, which maintained cohesion, although he recognised that the state had an important role to play in promoting core values of morality and meritocracy. In times of rapid transition, and particularly when technological change outran society’s moral capacities for adaptation, pathological social disorders arose which required new remedies. Primary among Durkheim’s candidates for this were the new intermediary associations of civil society that stood between the state and the market – most notably professional associations (Lukes, 1973). Education also had a key role, and Durkheim became a key advocate of the Third Republic’s characteristic educational policy of promoting social solidarity through schooling. ‘Society,’ he wrote, ‘can only exist if there exists among its members a sufficient degree of homogeneity. Education perpetuates and reinforces this homogeneity by fixing in the child, from the beginning, the essential similarities that collective life demands.’ (Durkheim, 1977).

Durkheim wrote as a liberal socialist republican in late 19th century France (Lukes, 1973), but his theories left a complex legacy informing both left and right notions of social order and social cohesion. In the American liberal tradition, a particular strand of Durkheim’s thought was appropriated by the school of structural functionalist sociology developed by Parsons and Merton (Parsons, 1951). This stressed the idea of the market division of labour and functional interdependence in complex modern societies as a source of self-reproducing order but failed to address processes of change. Continental social democratic traditions, on the other hand, have placed more stress on the role of state and organised intermediary associations as the basis of cohesion in modern societies. Indeed, it is hard to separate the idea of the modern welfare state and social partnership from continental conceptions of social cohesion.

Both traditions have stressed in their different ways the importance of education to social cohesion. In Parsonian theory, schools have the vital role of ensuring efficient allocation of skills in the labour market as well as being a major socialisation agency for children into the key normative values of society, not least by promoting loyalty to a meritocratic belief system which is taken to be the main ideological cement of society. Social democracy, and particularly the Nordic variety, has, on the other hand, placed more stress on the role of education in fostering social solidarity though common experience and learning (Boucher, 1982).

It is fair to say that education has been given a major role in traditional sociological accounts of social cohesion. However, it should be stressed that most theories accord equal importance to full employment, welfare, crime, industrial relations, community relations, national identity, and citizenship. There is literature for instance on: the welfare State (Mortensen, 2000), governance (Ritzen et al., 2000b), equity (Ritzen et al., 2000b) (Heynemann, 2001) and opportunity structures (Mann, 1999), value formation (Parsons, 1951), gender relations (Siim, 1999), crime and corruption (Ritzen et al., 2000b) and industrial conflict (Mouzelis, 1999).

Classical sociological accounts construe social cohesion as a macro societal issue. However, current policy debates rarely refer to classical conceptions and theories and freely conflate societal aspects of cohesion with micro and meso conceptions of social capital and community. The Canadian Policy Research Institute (1997, p. 2), define social cohesion as 'the ongoing process of developing a community of shared values, shared challenges and equal opportunity within Canada, based on a sense of trust, hope and reciprocity amongst all Canadians', whereas Ritzen et al. (2000b, p. 6) write of 'a state of affairs in which a group of people (delineated by a geographical reason, like a country) demonstrate an aptitude for collaboration that produces a climate for change'.

The use of terms such as trust, reciprocity and collaboration provides a parallel with writing on social capital and, for some theorists, social cohesion is little more than a special case of social capital, whereby linking rather than bridging social capital ties groups into the

nation-state. Implicit in the definition is the importance of a sense of consensus, shared values and shared challenges in the formation of social cohesion. Indeed, in recent writings on global civil society (Anheier, 2001), the social capital metaphor has been applied to the (trans) national dimension (Dasgupta and Serageldin, 2000).

The applicability of social capital theory or a general sense of community to this level of aggregation may be questioned as themes of structural inequalities or how shared values such as trust and reciprocity come to be arrived at in society, are not tackled. For example, even a neoliberal perspective on social cohesion Ritzen and Woolcock (2000a, p. 6) finds it necessary to incorporate a macro political component.

Questions of macro relationships, equity and hegemony are central to an analysis of the impact of education on social cohesion. Social cohesion requires more than neighbourhood or regional stability (what has come to be called community cohesion) or the inflation of communitarian ideals to macrosocial objectives.

Social cohesion, in terms of both values and macrosocial outcomes, has been a long standing national objective of both general education and ET. According to Heynemann and Todoric-Bebic (2000, p. 161) the social cohesion function of education is at the heart of each countries education system: 'at the end of the 20th century, public schools are asked to perform more or less the same task as they were at the beginning of the 17th century – or trying, anyway'. Heynemann and Todoric-Bebic (2000) state that the meaning of social cohesion as an objective of national education systems is not uniform. In some countries, such as the newly independent ex-Soviet states, reducing public corruption and fostering civil society may be seen as primary social cohesion objectives. In others, such as Europe and the US, ethnic and supranational identity may be concerns (Hepburn, 1992).

Although social cohesion objectives vary between countries, the importance of fostering (potentially) socially cohesive values such as social trust and tolerance is a clearly stated objective in many national curricula and it is to these areas which we now turn our attention.

3.2. Trust

Trust is a notion which is frequently associated with both social capital and social cohesion. Social capital theory treats trust as a key constituent of social capital, seeing it as the product of iterated face-to-face interactions between individuals engaged in common pursuits within associations and networks. In Putnam's account, trust is the outcome of association (Putnam, 2000), rather than the cause, although little evidence is cited to justify this interpretation (Green and Preston, 2001). Putnam also assumes for the most part that trust within bounded associative groups spills out into a wider trust throughout society as a whole. However, this more diffuse form of societal trust may be better thought of as a qualitatively distinct characteristic. A thinner trust which Newton (1999, pp. 17-20) refers to as abstract trust may be a more appropriate analytical concept than general trust in investigating macrosocial benefits such as social cohesion. Abstract trust is not necessarily based on repeated face-to-face interactions, but often on the limited and sporadic contacts which take place continuously within modern industrial societies. It also reflects trust in imagined, or empathic communities, such as trust with other Europeans, and therefore connects with notions of identity.

The basis of this abstract trust, according to Newton, may lie in education. He writes:

'education which teaches the young to understand and operate the abstract principles of such things as trust, fairness, equality and universalism [...] Education also provides the disparate citizens of modern society with a common set of cultural references without which daily understanding would be impossible [...] Education, it is said, is what is left after people have forgotten what they have been taught. A willingness to trust and reciprocate may be among the things which stick when all else has been forgotten.' (Newton, 1999, p. 18).

This socialisation and value formation function of education is somewhat contrary to the resource-based function of education supposed by Putnam (2000), although it is central to both Durkheimian and Parsonian conceptions (Morrow and Torres, 1995). Rather than education enhancing personal resources, which in turn are the antecedents of organisational membership

and eventually generalised trust, education in this conception acts directly on higher-order trust in abstract systems. We discuss the socialisation functions of ET later in this section.

It may be additionally argued that in many countries, and in certain areas of industrialised countries, 'thick' trust, defined in terms of intensive, daily contacts with community or family members, is of greater significance than thin trust. This concept of thick trust is proximate to what Durkheim (in Giddens, 1972) refers to as mechanical solidarity (as opposed to organic solidarity, which is analogous to thin trust) and what Tönnies (1957) refers to as *Gemeinschaft*. Although thick trust can probably not be used as an explanatory variable for macrosocial outcomes in advanced, industrial societies, pockets of thick trust will exist among isolated, tightly-knit urban and regional communities and ethnic enclaves within countries.

In addition to the various kinds of interpersonal or general trust discussed above, there are also further measures of trust in institutions (institutional trust) and in democratic processes (democratic trust).

Trust is generally considered an important property for social capital, social cohesion and the health of civil society generally (Almond and Verba, 1963). Consequently it has been measured over a number of years across many countries, usually by asking respondents if they generally trust other people and specified institutions. There has been some debate about whether the first question is construed by respondents in terms of trusting in close friends and family or more widely, but it seems likely that most people understand it in the second sense as intended since trust levels are extremely low in some countries (10 % in Brazil on WVS figures). Aggregate responses change over time within countries, but slowly, and there is a remarkable consistency in the country levels in different surveys (Inglehart, 1990); so it would appear that measurement is reasonably robust. In WVS and other surveys there is also a striking difference in levels between countries – from 70 % plus trusting in Nordic countries to single figure levels in some countries. This suggests that the question is measuring a fairly central and durable feature of cultural life in different countries.

There is some debate about how closely these

various concepts of trust relate to each other. Social capital theorists claim that generalised trust is the basis for other forms of trust, particularly abstract trust in systems, national and supranational entities, but there is little comparative evidence that types of trust are correlated within or across countries (Prakash and Selle, 2001) (Norris, 2000). Even where correlations are found to exist, for example between general and democratic trust (Green and Preston, 2001), it is not necessarily the case that organisational memberships are the cause of higher levels of trust in both cases as Putnam contends. There is an equally valid argument for claiming that the causation runs from trust to associational membership, rather than from membership to trust. Trust is seen as an important factor contributing to other desirable socioeconomic outcomes such as economic growth and strength of democracy (Norris, 2000). However, despite the strength of these relationships in contemporary advanced societies (Norris, 2000) over the longer historical term more complex relationships emerge. It may be, for instance, that distrust and conflict between various interest groups have been instrumental in the production of both European democracy and economic dynamism at various periods (Skocpol and Fiorina, 1999, p. 14). There is clearly an historical and institutional element to trust which cannot necessarily be identified within one country or through statistical analysis.

Evidence on the trends in levels of trust in modern societies produces a mixed picture. Putnam provides substantial evidence that general trust is eroding for various different groups in the US (Putnam, 2000). Hall's (1999) analysis of data for the UK between 1959 and 1990 shows that levels of trust have declined for all groups defined by age, gender, class and education, although the decline within working class groups has been greater than among middle class groups. Other studies, however, have found more mixed effects in different European countries (de Hart and Dekker, 1999 for the Netherlands; Van Deth, 1999, for Finland, Norway and Spain).

We have little evidence on the relationships between ET and trust at the macro level, and it may well be that this depends very much on what type of trust is being considered. ET may be particularly effective, for instance, in promoting

thin trust in terms of abstract notions of general trust, fairness and universalism, but to substantiate this would clearly require more research. As we show later in this report, there is no significant correlation across countries between levels of education and levels of trust, although there is a strong correlation between distribution of education outcomes and trust. Given that levels of trust vary hugely between countries, and rather more than levels of education, we may assume that other factors are involved in generating trust as well as education.

3.3. Tolerance

Another commonly assumed component of social cohesion is tolerance and, like trust, this is a highly contested concept. Tolerance may be understood as acceptance of intragroup lifestyle differences (permissiveness), or it may be understood as openness towards other cultures (as in ethnic tolerance). These propensities may not necessarily coincide. Equally there may be libertarian conceptions of tolerance as acceptance of all values, no matter how abhorrent, which are quite different from liberal notions which accept value differences but only where they do not transgress certain core values. Libertarian attitudes may involve a general permissiveness towards deviant majority group behaviour but may not necessarily include attitudes conducive to ethnic or racial tolerance. Research evidence suggests that, at the individual level, in certain social contexts, education is associated both with more permissive attitudes and with greater acceptance of other cultures (Putnam, 2000) (Inglehart, 1990). However, effects at the societal/national level may be much more complicated.

Halman (1994) reports on the results of Eurobarometer surveys across Member States which seek to gauge attitudes towards foreigners. In the 1988 survey, 37 % of those surveyed thought that there were too many people of a foreign nationality living in their country while 33 % thought there were too many of another race, and 29 % too many of another religion. There were substantial differences in responses across countries, but with responses relating to foreign nationality and other races covarying. The most likely to believe there were too many people of a

foreign nationality in their country were respondents from (in descending order) Belgium, the UK, France, West Germany and Denmark. Least likely (in ascending order) were those from Ireland, Spain, Portugal and the Netherlands. Most likely to believe that there were too many from other races were respondents from (in descending order) West Germany, the UK, France and Belgium and least likely from (in ascending order) Ireland, Portugal, Spain and the Netherlands. The Danish respondents were most likely to be concerned about the numbers from other religions and cultures, but least likely to be concerned about the numbers from different social classes. In the 1988 data there is a close correspondence between the proportion in each country believing that there are too many foreigners and the proportion saying that their lives were disturbed by their presence, although it was the other races which were perceived as most disturbing rather than the foreign nationals.

The 1993 survey shows considerable changes in levels of intolerance in a number of countries, with declines in West Germany but an overall increase in most countries. Most marked were the increases in Denmark, where the proportions finding the presence of foreigners disturbing rose in respect of other nationals (from 10 to 21 %), other races (from 13 to 20 %) and other religions (from 15 to 19 %). By 1993 the Danish respondents were far more likely than those in other countries to be disturbed by those of another religion (39 % as against 19 % in the next highest country – Belgium) and most likely overall to be bothered by people of different nationalities, races or religions. However, the European values survey (EVS) – which asks respondents whether they dislike having different categories of people as neighbours – shows Danes to be the most tolerant as regards such groups as drinkers, drug addicts and political extremists, suggesting that it is quite possible to combine intragroup permissiveness with closure towards foreign cultures. The EVS data for 1981 and 1990 show increases in levels of tolerance in Ireland, the Netherlands, the UK and West Germany, and decreases in Belgium, Denmark, France and Italy.

Although these data suggest interesting regional variations in attitudes, with southern Europe coming off apparently better in relation to tolerance than northern Europe, they may not tell

us much about how far different national groups are, inherently or culturally prone to intolerance. Levels of discomfort with foreigners appear to be quite situational as they correspond closely to actual levels of immigration and to perceptions of difficulties arising from the presence of immigrants. They also change rapidly from one period to another, presumably in response to circumstantial events – like unification in Germany, which initially seems to have had a positive effect – or to political climate shifts. They may, therefore, tell us very little about whether one national population will respond more intolerantly than another to the presence of a given proportion of foreigners under similar circumstances. It should also be noted that although the proportions feeling discomforted by foreigners have risen across EU countries, the vast majority still say that they are not disturbed by the presence. In as much as intolerance appears to have risen, and during a period of rising levels of education, we may conclude from this analysis that it is wise to be cautious about assuming any direct effect of average education levels on aggregate levels of tolerance. If there are such effects they may be overwhelmed by other more powerful contextual effects.

In a wide-ranging review comprising research from several European countries, Hagendoorn and Nekuee (1999) collected evidence concerning ET and racial tolerance based largely on microdata in individual countries. According to Hagendoorn (1999) there are two main causal mechanisms by which education may lead to increased racial tolerance.

First, education leads to increased cognitive skills involving enhanced abilities to categorise, understand causal relationships and perceive states of the world. Hence individuals will be increasingly able to understand that potentially racist statements, for example blaming migrants for unemployment, are based on faulty reasoning. The second mechanism is through the formation of racially tolerant values as part of socialisation through schooling. There is much research evidence that years and levels of schooling have an impact on subscribing to racist views. Although there is little evidence to suggest that particular interventions or types of curriculum lead to a reduction in racism (Hagendoorn, 1999, p. 5) there is some evidence that courses which stress individ-

uals' critical capacities seem to have a greater effect than other courses (Hagendoorn, 1999, p. 6).

Given the quantity of research evidence, Hagendoorn (1999) admits that there are a number of paradoxes in education-racism literature. For example, despite rising education levels in the US and many education interventions aimed at increasing racial tolerance, there is evidence that US youths are as racist as they were after the Second World War. Hagendoorn (1999) explains that rising levels of education may simply moderate the expression of racism. Although educated individuals may not wish to state racist views in public (or in a survey) they may be racist in their private lives and in informally supporting discriminatory practices. Pettigrew and Meertens (1995) refer to this as a difference between blatant and subtle forms of racism amongst those of different social classes and educational levels. From a longitudinal survey of evidence from the Netherlands, Verberk and Scheepers (1999) show that those with intermediate education are not likely to be blatantly racist but are more likely to be subtly racist than those with lower levels of education.

The effects of education are also dependent on other factors, not least socioeconomic context. For example, those with low relative levels of education may face actual (or at least perceived) competition for unskilled jobs (Cox, 1970, pp. 392-422) (Roediger, 1991) (Hagendoorn, 1999, p. 3) or in housing and community politics (Rex and Tomlinson, 1979). In an analysis of pooled European data (EVS), Jasinska-Kania (1999, p. 90) shows that the impact of education on racial tolerance is greater in those countries with greater levels of immigration, whereas in countries with small proportions of immigrants in the population the impact of education on racism is much smaller. This may be because more circumstantially-driven racism provides more opportunity for educational attenuation, while hard-core (under-any-circumstances) racism is impervious to educational mitigation.

Given the impact of actual or perceived competition for economic resources on racism, we suggest that aside from values and cognitive resources there is a third possible pathway through which ET may effect racism – what Verberk and Scheepers (1999) refer to as realistic conflict theory. As they argue: 'A central assumption of realistic conflict theory is that socioeco-

nomic competition for scarce resources between groups such as ethnic groups leads to the formation of negative attitudes of the other groups. The competition may be concrete such as housing or labour, or abstract such as culture, power and status' (Verberk and Scheepers, 1999, p. 179). Cognitive resources may be implicated in this mechanism in that the source of resource conflict (unequal distribution of resources by the state or businesses) may be wrongly attributed to migrants rather than state or business interests themselves.

Although little attention has been paid to realistic conflict theory in mainstream research literature, it has been a current of Marxist and neo-Marxist thought for some decades, at least since the black American Marxist Oliver Cromwell Cox developed these ideas in the 1940s (Cox, 1970). Realistic conflict theory provides us with a theoretical framework for examining racism in terms of structural inequalities (in which education is implicated) rather than in terms of individual moral and cognitive deficits. However, the theory clearly has limitations. Historically, racism has often developed among the most affluent and powerful groups with limited reasons to feel competition over scarce resources with immigrant or ethnic minority groups. They may, however, have been in exploitative relationships with members of these groups, in their positions of slave owners, colonial administrators, or low-paying employers, which it may have been expedient to rationalise through racist ideologies. Moreover, it is important to note that working class groups in potential material conflict with immigrants and minorities will not always develop hostile views. Within education in contemporary England, for instance, working class students frequently resist, rather than accept, racist doctrines (Gillborn, 1995). This leads us to be critical of left realist perspectives which cite racism within the working class aside from a more dialectical view of class and race relations.

Given the three possible mechanisms by which ET may influence racial tolerance – value formation, cognitive and realistic-conflict – we now examine the empirical literature on education and tolerance.

There are a number of national differences in the influence of ET on values conducive to racial tolerance. In some countries (such as Italy), the

influence of education on tolerant values has been found to be small and indirect (Peri, 1999), whereas in others (France, Germany) large effects have been identified (Haegel, 1999) (Winkler, 1999). Moreover, the relationship between racial intolerance and other personality characteristics (namely authoritarianism) differs from country to country.

Peri (1999) finds that in Italy the direct impact of education is small. The influence of education on tolerance is indirect, operating through channels of conformism, traditional values and professional employment. However, Peri's study is both correlational and cross-sectional, so strict claims of causality cannot be made. We do not know, for example, if education or the family was implicated in developing conformism and traditional values. In a French study, Haegel (1999) examines the influence of education on both authoritarian values and racial tolerance. She finds a positive association of education with tolerance, although the effects are weaker for those with vocational qualifications. Interestingly, there are different levels of ideological consistency depending on the individual's level of education. For those individuals with low levels of education, there is little relationship between authoritarianism and racial tolerance, although those in such a position are likely to feel insecure about the future. Although individuals with higher levels of academic education are more likely to be tolerant, those who are racially intolerant are likely to hold authoritarian attitudes.

As Haegel (1999) shows, individuals with different levels of education may exhibit different clusters of values. She relates this to the French education system and sees the coercive flip-side of the French model of assimilation as being the rejection of certain other ethnic differences (Haegel, 1999, p. 34). Similarly, for Germany, Winkler (1999) shows that there are different pathways for racism between individuals with different levels of education, although he arrives at different conclusions from Haegel concerning the relevance of authoritarianism. Through structural equation modelling, Winkler (1999, p. 126) demonstrates that there are different pathways explaining racism for highly and less highly educated people. He suggests that sociocultural insecurity, comprising right-wing views, national pride and authoritarianism, is a powerful predictor

of racism for those with lower levels of education, whereas for those with higher levels of education authoritarianism is not significantly related to racism. Winkler's (1999) study additionally provides some support for realistic conflict theory as sociocultural insecurity is a particular predictor of racism of those with lower levels of education.

There is a difference in the role which authoritarianism plays in the formation of racism among those with low levels of education in the two countries. In France, Haegel (1999) shows that authoritarianism does not correlate with racist values, whereas in Germany Winkler (1999) shows that there is a strong correlation. The relevance of this factor may result from the historical development of racism in the two countries.

In terms of the cognitive mechanism by which education influences racism, De Witte (1999) distinguishes between various forms of racism. He refers to these as general racism (negative attitudes towards migrants), biological racism (a belief in the hereditary superiority of one's own race) and cultural and economic racism (a belief that the cultural habits of migrants differ and that they expose nationals to resource competition). It is this last form that De Witte refers to as everyday racism as it is the least ideologically formed and most prevalent. Although everyday racism has shown little change in Belgium over time, it is at a higher level than in other European countries. De Witte (1999) contends that cognitive capacity is a strong mechanism in the reduction of everyday racism. He argues that research in Belgium (Gavaert, 1993) and the Netherlands (Raaijmakers, 1993) has shown that those following vocational courses are more likely to exhibit everyday racism and that this may be due to the greater attention paid to cognitive skills in Belgian academic education. It might also be argued that this is a class effect, since those following vocational courses are likely to come from less affluent social groups and thus more likely to perceive competition over scarce resources. However, De Witte (1999, p. 68) does not necessarily reject the socialisation function of education and believes that there is a difference in the emphasis placed on values in the academic track (De Witte, 1999, p. 69).

In the debate concerning the influence of education on tolerance, there may be little to choose between whether education influences

values or cognitive skills. Values are obviously important, as are national characteristics and the nature of the education system in each country. So too is the role of the curriculum in building individual resources. It may be helpful, then, to see values and cognitive resources as joint parts of a process of formation of racial tolerance. Sniderman and Gould (1999) see the process of racial tolerance as the interaction of values acquired through socialisation, values invoked at the moment of choice, and cognitive sophistication. Education has an influence not only on long-term value formation but also on the exercise of values at the moment of choosing whether to express a racist opinion or action. In addition, reasoning is involved in both the long-term formation and short-term exercising of values.

To processes of cognitive and value change, we would add that the formation of values takes place within a historical and cultural context. As Halman (1994) shows, rising absolute education levels have not led to an increase in racial tolerance. Education does not remove the individual from society – individual values are embedded in a social context. For example, the role of authoritarianism in the formation of racist values may differ from one culture to another. We must also remember that under certain historical conditions there may be a perverse relationship between education and tolerance, at least in terms of support for intolerant regimes. As Abramson and Inglehart remind us: ‘the assertion that education has some inherent tendency to instill democratic values does not stand up in historical perspective. In Germany during the Weimar era, for example, the National Socialists won student elections in eight universities, at a time when the Nazis won only 18 % of the vote in national elections... Today, higher education does tend to support democratic values, but this relationship reflects specific historical conditions and is not an automatic consequence of education.’ (Abramson and Inglehart, 1994, p. 800).

3.4. Social cohesion and VET

We have shown that social cohesion is historically derived and culturally specific, involving equity, values and macrosocial actors such as the welfare state. The specific role of education in bringing

about social cohesion in a society depends not only on the level of qualifications, but potentially on the distribution of skills and opportunities as well as the transmission of values. Moreover, the role of education systems is both historically and culturally situated (Abramson and Inglehart, 1994). Given the multiple and embedded functions of education there is a limit to which we can make generalisations concerning its role across the EU, let alone more specifically in relation to VET. However, there are a number of qualitative comparative studies of vocational education and apprenticeships which have interesting things to say about value formation.

As Aldrich (1999) explains, the nature of apprenticeship has historically involved the social and legal integration of youth into society. However, this occurs in quite nationally specific ways. For example, in the UK, apprenticeship is now largely considered to be part of vocational training whereas in France and Germany the route to a *Beruf* or profession involves a more structured process of social and legal transition, at least in theory. Young (2000) refers to these distinctions in terms of differences in assessment regimes. In the UK, an outcomes-based system of assessment does not involve the same type of integration into adult life as the institutional approach favoured by Germany.

The German dual system of apprenticeship is often held up as an ideal model of the relationship between training and economic and social integration. As Green and Sakamoto (2001, pp. 69-74) explain, embedding the dual system within a neocorporatist system involving workplace codetermination, sectoral agreements and other aspects of social partner regulation of work and training, has delivered not only high skills but an upgrading of skills and jobs throughout the economy. In terms of citizenship in the wider social sense, the system also enables wider community acceptance of youth, aiding transition into adult life (Evans, 1998).

This emphasis in the dual system on integration into both economic and social spheres is philosophically underpinned by the work of the late 19th century Bavarian writer Georg Kerschensteiner who was concerned with orientating education systems around both civic responsibility and work. In Kerschensteiner's theory, work schools are required to develop both

manual and intellectual skills. Students would learn within work groups which would develop the basic rules for civic cooperation and communal life (Röhrs, 1993). Although Kerschensteiner placed an emphasis on the duties (rather than rights) of citizens, the practice of those duties within the work school would be through independent, responsible work.

The contemporary German dual system still manifests this concern with civic responsibility; in its broad curriculum, encompassing preparation for both work and citizenship, and in the way in which it seeks to provide a structured transition for young people into the highly regulated German labour market (Brown et al., 2001). The school (*Berufsschule*) component of the apprentice has a particularly broad mission including general education and occupational theory. According to the general 1991 framework agreement for vocational schools set out by the Land Minister and the BIBB, *Berufsschulen* have amongst their objectives:

- (a) 'to impart professional competence, specialised competence in conjunction with human and social capabilities;
- (b) to develop occupational flexibility in order to cope with the changing demands of the working world and of society, as well as having regard to the growing together of Europe;
- (c) to encourage preparedness for continuing and further professional training;
- (d) to provide the ability and willingness to act responsibly in terms of the individual shaping of one's own life and in the public sphere' (quoted in Brown et al., 2001).

The final emphasis on the public sphere is indicative. However, despite these foundations, the dual system may also have certain characteristics which can have negative consequences for social cohesion.

In a comparative study, Evans and Heinz (1994) consider youth transitions through a comparative study of vocational preparation in England and Germany. They use the term active-individualisation to describe an ideal type transition involving a process of self-determination and planning. This is opposed to passive-individualisation involving weak specification of goals. On these grounds one would expect the German system of vocational preparation to be superior in its social integration function as routes are clearly specified,

with clear links between employment and citizenship. In the UK youth entered the labour market two years before their German counterparts and progression routes were poorly defined. This led to some individuals in the UK reporting a lack of integration and a sense of powerlessness in attempting to gain employment or citizenship. However, although in Germany progression routes were much clearer, for those individuals who experienced difficulties or dropped out, the lack of flexibility meant that it was difficult to achieve reintegration. The Evans and Heinz study (1994) indicates the difficulty of equating an historically well functioning system of vocational preparation with one which delivers social integration.

Even in those systems of vocational preparation which appear to deliver a smooth transition into adult roles and citizenship we need to be aware of the latent functions that deliver income and social equality. For example, the German apprenticeship system may perpetuate labour market inequalities, with girls and immigrant children typically finding places – and hence later jobs – in only the lower status (Bynner, 1994) (Brown, 2001). The role of education (particularly vocational preparation) in maintaining inequalities in terms of economic and cultural reproduction is rarely referred to in policy discourses on social cohesion, although it is central to current educational theory (Morrow and Torres, 1995).

In a review of the European literature on the role of social class in the reproduction of educational inequalities, Hatcher (1998) cites evidence that in only two EU countries (the Netherlands and Sweden) did social class inequalities in education decline between the First and Second World Wars with only limited improvement for some countries since the Second World War. Moreover, even in a country often cited as an exemplar of egalitarian educational and welfare policy – Sweden – there has been very little movement in the pattern of class inequality. The pattern of educational inequality remained reasonably constant in Sweden from 1970 to 1990. However, although inequality of social opportunity in Sweden is roughly the same as that of other EU countries, welfare provision means that there is lower inequality in terms of standards of living (Erikson and Jonsson, 1996a and 1996b) (cited in Hatcher, 1998). This evidence points to the intractability of class

inequalities and the difficulties of educational or VET reform more generally in addressing these inequalities. This represents the counterpoint to educational reform which seeks to address social cohesion as an issue purely of increasing educational access.

However, even if we should not expect VET to address class inequalities, there are opportunities for such education to lead to active or critical citizenship. As shown by the ETGACE project (Education and training for active citizenship in Europe) work related ET may open up critical spaces for discussion and dissemination of ideas.

The project's case studies show the close links between lifelong learning and various interlocking areas of civic life. This includes VET and the workplace. For example, in Belgium a case is provided of workers cooperative (De Wrikker) where the relationship between VET and citizenship occurs in terms of making choices concerning alternative conceptions and practice of work (ETGACE, 1992). This particular notion of active citizenship as solidaristic and socially transformative differs substantially from that offered by many contemporary theorists, as we shall see in the next chapter.

4. Active citizenship, civic and political participation

The position of an active citizenry as a macro-, rather than microsocial, benefit of education is unclear in empirical literature. Although there are many studies which indicate that education is associated with varied civic and political behaviour (Emler and Fraser, 1999, provide a useful summary of this literature) it is not clear how education is expected to impact on such behaviour. Most studies assume that education has a role in increasing the resources of individuals and that this leads to an increase in various forms of participation. However, some studies are concerned with the positional aspects of education (Nie et al., 1996).

Nie et al. (1996) examine the positional nature of political participation in the US. Through ordinary least square (OLS) regressions over time they find that it is the relative, rather than absolute, level of education that is important in determining access to network central positions and political influence. As the general level of education increases, the value of each qualification level in gaining network centrality and political influence declines. They use preliminary evidence from the EVS to indicate that the results of their study may be generalised beyond countries other than the US. Although Nie et al. (1996) take into account context in terms of educational level, there are few other studies which examine education for citizenship comparatively. In particular, emphasis on microsocial or institutional case studies has meant that there are relatively few studies concerned with the influence of national education systems or contexts on citizenship outcomes. Those studies which do exist are mainly historical, concerning the development of education and the nation-state (Green, 1990).

One contemporary study that does take into account the impact of national systems of education on citizenship is the IEA (International association for the evaluation of educational achievement) citizenship study of 28 countries (Torney-Purta et al., 2001). This cross-national study of 90 000 14 year-olds attempted to ascertain processes and outcomes of citizenship

formation through qualitative and quantitative data from students, teachers and schools.

Students demonstrated a basic knowledge of democratic processes, although their understanding was often at a superficial level, and a positive relationship between civic knowledge at 14 and future preference for voting was identified. Many students also rejected conventional political routes in favour of non-violent political action and collecting money for charities or environmental causes. Schools with democratic processes and an open climate were found to be particularly effective in inculcating civic knowledge and activity in all countries.

The distribution of civic knowledge within countries was not as unequal as the distribution of other educational outcomes such as mathematics or literacy. Although this could result from the nature of civic knowledge (there is naturally less variation than in other types of knowledge) it could also signify that civic knowledge is not necessarily a process in which schooling plays a major part (less than common accessible media). However, despite the narrow distribution of civic knowledge between countries, significant differences were found between both knowledge and activity. Although, in general, transition countries and older democracies scored more highly on civic knowledge, there are some interesting contradictions within the results.

In terms of civic knowledge, the Czech republic, Finland, Greece, Italy, Norway, Poland and Slovakia were significantly above the international mean. Many of these countries have in common a high level of reading literacy (Torney-Purta et al., 2001, p. 78), and this may indicate a relationship between civic knowledge and general cognitive skill. Belgium and Portugal were significantly below the international civic knowledge mean. However, there is not necessarily a relationship between civic knowledge and civic engagement, at least at the national level. For example, Portugal was significantly above the mean in terms of belief that conventional forms of civic engagement are important (despite being below the country mean for civic knowledge)

whereas the Czech Republic was below the country mean in terms of belief that non-conventional forms of civic engagement are important (despite being above the country mean for civic knowledge). This may reflect the respective histories of the two countries. For example, in the Czech Republic transition to a market economy and democracy may mean that there is less need to support unconventional forms of political engagement in order to effect change. Interestingly, many of the Nordic countries (Denmark, Finland and Sweden, but not Norway) also scored below the mean in terms of support for all forms of political participation, which may indicate preferences for more consensual or institutionalised forms of political action or a perception that there are not so many injustices to contest.

The data also show that there is not necessarily a relationship between country levels of literacy, civic knowledge and support for rights for women and ethnic minorities. Slovakia, for example, scored significantly above the international mean in terms of civic knowledge, but in terms of support for rights for women and ethnic minorities was significantly below the international mean alongside other transition economies (Bulgaria, Estonia, Hungary, Latvia, Lithuania). This result is not necessarily surprising given the conservative forms of nationalism which currently predominate in these countries (Brubaker, 1996).

There are various messages from the IEA civic participation study, but one which resonates with this report is the importance of national context in examining microsocial relationships. The individual level relationship between civic knowledge and civic activity, for example, is well established in various studies (Emler and Fraser, 1999). This relationship does not necessarily hold at a national level, however. For example, those countries with high levels of civic and reading literacy do not necessarily have high levels of support for political activity. This seems to imply that a

resource, or cognitively based model of political participation, is inadequate in explaining variations in the level of political activity (rather than the relationship between learning and political activity) internationally. It seems that regional patterns of civic knowledge, attitudes and behaviour are important.

The importance of comparative research becomes clear when examining the effect of education on civic participation in other studies. In particular, national differences in the causes of civic participation, in forms of civic participation and in the relationships between civic participation and other values, such as trust, become clear. There are different causes and consequences of civic participation – education being only one possible route. The Putnamesque ⁽⁴⁾ model of social capital may be seen to be particularly narrow when applied to countries outside of the US (Prakash and Selle, 2001).

The sub-elements of what has come to be called social capital, both structural (social networks and civic participation) and cultural (localised and generalised trust), are not necessarily correlated at national level (Prakash and Selle, 2001). Norris (2000) provides evidence for the lack of correlation between levels of associational memberships and general trust ⁽⁵⁾ across 47 countries using evidence from the WVS ⁽⁶⁾. Moreover, there is a strong tendency for the distribution of trust and associational memberships in countries to follow patterns which might reflect underlying cultural values of the countries concerned, rather than a random distribution of social capital. In terms of the distribution of associational memberships and trust Norris categorises countries as belonging to one of four typologies (Table 1).

As can be seen in Table 1, not all countries have either rich or poor social capital. Many fall into the mixed category with no positive correlation between trust and associational membership.

⁽⁴⁾ For Putnam (2000) civic associations are the root of social capital formation. Individuals participate in associational life which leads to the development of localised trust (in other associational members) and then to more generalised trust (in people as a whole). Hence general trust (and more universal social benefits such as democratisation) develop as a result of civic life. Although this somewhat simplifies Putnam's (2000) argument, the emphasis on civic association as the key to general trust and a stream of social benefits is, we believe, the core of 'Putnamesque' social capital.

⁽⁵⁾ As measured by the percentage of individuals answering positively to the question 'Generally speaking would you say that people can be trusted or that you can't be too careful in dealing with people'.

⁽⁶⁾ As measured by the percentage of individuals in each country who were a member of at least one voluntary association including church and religious organisations, sports or other recreational associations, labour unions, professional associations, charitable organisations and any other voluntary associations.

Table 1: **Structural and cultural dimensions of social capital**

Social capital – mid 1990s		Structural dimension (Associational activism)	
		Weak	Strong
Cultural dimension (Social trust)	Strong	Mixed (e.g. East Asian countries including China, Japan, Taiwan)	Rich social capital (e.g. Nordic countries including Finland, Norway, Sweden, also West Germany)
	Weak	Poor social capital (e.g. Spain and acceding EU countries plus Bulgaria and Turkey)	Mixed (e.g. Latin American countries including Brazil, Chile and Mexico, also perhaps the UK and the US)

Source: adapted from Norris (2000, p. 23)

We may have reason to suspect that the distribution of countries to each quadrant is non-random – countries within each quadrant follow clear geographical groupings. A Putnamesque explanation for this distribution would involve theorising about distributions of social capital in terms of similarities in social and generational trends in each country, for example, explaining low levels of trust in Latin America on the basis of increased television viewing. However, this would not explain the coexistence of low levels of social trust in Latin American countries with relatively high levels of associational membership – as revealed by Table 1. The two should comprise part of a coherent syndrome and there is no reason to expect imbalance between the two to persist, particularly across a range of Latin American countries. In the absence of the ability of social capital to explain this phenomenon, we may pursue alternative explanations such as income inequalities, national culture or differential impacts of supranational phenomena, such as globalisation. We may also speculate on the historical role of national education systems in fostering these types of relationship – a point to which we will return in our conclusion.

In Chile, for example, explanation of thriving civil society with low trust could be based upon the recent history of a corrupt and dictatorial regime. As in former Eastern Bloc countries in Europe (such as the former German Democratic Republic) associational memberships may have

been a necessity for many citizens in securing a basic standard of living.

In common with other authors (Knack and Keefer, 1997) (La Porta et al., 1997), Norris (2000) also finds little correlation between the associational membership component of social capital and macrosocial outcomes. It appears that any apparent relationships are driven by general trust. For example, although there are strong and significant correlations between social trust and various macrosocial benefits such as educational enrolments, life expectancy, the human development index, per capita gross domestic product (GDP), economic growth, democratisation, political involvement, ownership of televisions, newspaper readership, and use of the Internet, only per capita GDP and internet usage are correlated with membership of voluntary associations (although interestingly, tolerance is also significantly correlated with organisational membership rather than trust).

Aside from the difficulty in identifying coherent patterns of relationship between associational membership, trust and macrosocial outcomes as would be expected by Putnam, there are also issues concerning the meaning of these terms in comparative context, or even when they are investigated within a national context, such as the US.

A point explored in part by Putnam (2000) is that different types of membership and association may result in different macrosocial outcomes. Like any form of capital, social capital can be

used for malign purposes – whether to exclude others, practice intolerance or for criminal or terrorist purposes – what Putnam refers to as its dark side (Putnam, 2000, pp. 350–363). However, Putnam also states that social capital without social mixing is better than no social capital at all as a second-best solution. Hence, separate schools, churches and associations are seen as beneficial in building a fraternal society (Putnam, 2000, p. 362), although these institutional divides have been widely accepted as contributing to lack of community cohesion (Home Office, 2001) and even institutional racism (Gillborn and Youdell, 2000) in the UK. Such a binary division between useful (i.e. most) social capital and its dark side is not necessarily helpful in understanding the relationship between associational membership and social outcomes. Possible conflicts between social capital and what we might refer to as social cohesion are clear.

Prakash and Selle (2001) suggest that a subtler characterisation of associational groupings is more helpful in attempting to ascertain the types of benefits produced. This may mean distinguishing between those groups with a political as opposed to a social purpose, between those who are deliberative and interest based, between those with a hierarchical and egalitarian structure and between those associations where membership is voluntary, ascribed or a hybrid of the two. Fukuyama (2000), on the other hand, makes a primary distinction between forms of association on the basis their degrees of moral authority and ideological reach. In a recent study of social cohesion and fragmentation in modern societies (Fukuyama, 2000) he considers the changing nature of associational life and the apparent paradox, in America, of the coexistence of relatively high levels of association and growing levels of distrust and social fragmentation. The answer, he says, ‘has to do with moral miniaturisation: while people continue to participate in group life, the groups themselves are less authoritative and produce a smaller radius of trust. As a whole, then, there are fewer common values shared by societies and more competition amongst groups.’ (Fukuyama, 2000, p. 49). Whether or not one shares Fukuyama’s socially conservative analysis of the causes of societal fragmentation, he has certainly pointed to a dilemma at the heart of social capital theory and one which underlines the importance of societal explanations of social cohesion.

However, even if we distinguish between types of association, we cannot necessarily ever understand their purposes or outcomes outside the national sociopolitical and cultural context in which they are embedded. As Prakash and Selle (2001) explain, associations and their aims evolve in relation to the development of political institutions, societal change and mobility. This means that organisations which may seem to represent a suboptimal form of social capital in one social context – such as chequebook memberships in the US – may lead to social benefits in others, such as the UK (Maloney, 1999). In particular, informal networks and associations have been shown to result in specific macrosocial outcomes. For example, Gundelach and Torpe (1996) find that informal, network-type associations have a greater impact on Danish attitudes than classical, formal political associations of the de Toquevillian model. Additionally, Parry, Moyser and Day (1992) show that ad hoc, rather than formally constituted, political groups are important in producing further political involvement and altering attitudes in the UK.

4.1. Conclusion

It seems that there are problems in applying models which at the individual level imply a relationship between education, training and skills and citizenship benefits in a comparative context. First, as shown by exhaustive comparative studies (Torney-Purta et al., 2001) there are not necessarily relationships at the national level between skills, knowledge and civic outcomes. There is considerable variation in civic outcomes between countries with those nations scoring most highly on civic knowledge not necessarily being favoured with high levels of civic engagement. Indeed, there appear to be clear regional groupings, with a different group of countries with high levels of civic knowledge (the Nordic countries and transition countries) as compared to those with high levels of civic activity (a range of EU countries, excluding the Nordic countries). There is also considerable variation in the relationships between civic activity and other values, such as trust. Again, the story seems to indicate that simple causality between education and macrosocial outcomes is somewhat misplaced.

Our conclusions to this chapter are therefore

cautious. In signalling the role of specific historical conditions on the relationship between ET, trust, tolerance and social cohesion more generally, we would call for a reappraisal not only of the importance of historical contexts but also of the connection between structural relationships and social cohesion outcomes. Education may have important effects on many of the outcomes under consideration under certain conditions. However, many of the effects are indirect and conditional

on other – often more powerful – contextual determinants. To study these effects therefore requires attention to time and place and the exhaustive analysis of a range of factors and variables operating at the macro level. Quantitative comparative analysis at the macro level will have some value where the variables are sufficiently carefully specified. However, much of the work of explaining complex interactions will require more in depth comparative qualitative analysis.

5. Evaluating the macrosocial benefits of education, vocational education and training

5.1. Is it possible to evaluate the macrosocial?

In examining the impact of ET on macrosocial benefits there are obvious limits to how far any single technique can hope to capture the range of benefits, their qualitative dimension and the historical and cultural context in which they are embedded. In this report, we have made reference to various techniques for ascertaining the macrosocial benefits of learning, involving qualitative and quantitative techniques. It seems that a mixed-methods approach to examining these benefits is required. For example, Eisner (2001) incorporates both statistical analysis and historical studies in examining trends in European homicide rates over time. Here statistical data is used descriptively in the analysis of trends. Eisner's approach enables us to explain the trends involved with reference to factors other than variation between individuals, namely differences between education systems and other associated entities involved in the formation of nation-states. Although such an approach is probably optimal, in this report we use mainly statistical techniques in the evaluation of macrosocial benefits. However in future, the Centre for the wider benefits of learning (WBL) will develop the interrelationships between quantitative and qualitative techniques (Schuller et al., 2001).

When examining the macrosocial benefits of education, training and skills there are limits to how far the concept of evaluation can be used, at least in its summative sense. It is perhaps helpful to distinguish between three types of activity (Plewis and Preston, 2001): measuring, modelling and evaluation.

Measuring macrosocial outcomes is an activity engaged in by many international bodies such as the EU, OECD and the World Bank. Accurate measurement is central to any evaluation but measuring alone tells us little concerning the relationship between educational activities or systems and these benefits. For example, we cannot

assume *post hoc* that an increase in life-expectancy in a country arises from increasing levels of education. To make such statements requires some preliminary form of modelling. At its most basic, this may involve descriptive comparison of aggregates through scatter plots or correlations. More advanced techniques such as multilevel modelling (MLM) or structural equation modelling (SEM) are also employed. The extent to which these represent analysis of actual macrosocial aggregates rather than contextualisation of microsocial relationships is a matter for debate.

One method of modelling would be to examine macrosocial and macro educational aggregates. Using time series data on educational levels, educational distributions, macrosocial aggregates and appropriate controls one would model relationships over time. This would allow speculation on causality – whether changes in education variables cause changes in social cohesion variables independently of other influences. Time series data on macrosocial and educational indicators over time is difficult to obtain, although McMahon (2000) constructs time series for a number of countries. In the EU, for example, measures of skill distribution (derived from the International adult literacy survey – IALS) or values (derived from the WVS) are only available over short time periods, where causality would be difficult to determine.

The ecological fallacy is often referred to as a reason why such macrosocial analysis is inappropriate. The ecological fallacy holds when the wrong units of analysis are considered in making an interpretation of data. For example, that both the mean level of education and the mean level of tolerance are high in a country does not indicate that there is a relationship between education and tolerance for all individuals in that country. Alternatively, that respondents in a country are generally more trusting does not mean that there is a national culture of trust as a property of that country – this is the fallacy of aggregation.

Although it is important to be aware of the

ecological fallacy, it is equally important to understand that the fallacy operates both ways. It is the importance of choosing an appropriate unit of analysis, not the automatic acceptance of methodological individualism which is implied by the fallacy. The aggregate level of trust elicited through individual trust levels may be meaningful in itself, and useful in analytical work. There are also some indicators which it is impossible to express at an individual level such as skill distributions, income distributions, ethnic conflict, industrial disputes or government corruption.

Another technique would be to use microsocial data to model the relationships between education and social outcomes in various countries and then to compare effect sizes. There are various approaches which could be utilised here such as regression analysis or multiple comparison of groups using SEM. The interpretation of such findings is a matter of some difficulty, though. That education has a bigger effect on social outcomes in one country than another does not necessarily mean that the education system of that country is better, or that conditions in that country are more adequate in facilitating the effects of education. Differences in the absolute levels of education and the social outcome may mean that education has a greater effect in those countries where general educational levels or levels of the social outcome are lower. It would also be possible to use MLM to examine interactions between countries, regions (where possible) and individual effects. Data considerations are very important when attempting to use MLM, for example a sufficient number of sampling units are required. This means that MLM is not necessarily an efficient technique when making comparisons among a small number of countries.

If robust estimates of effect sizes are obtained it may also be possible to monetarise these benefits in order to calculate a social rate of return. The social rate of return on education is an expression of the relative benefits and costs of an educational input. More precisely, it is the rate of discount at which the current and future stream of educational benefits for an individual and society are equal to the current and future stream of educational costs. Although many calculations of social rates of return are actually fiscal, concentrating only on the costs and benefits of education in terms of government expendi-

ture and tax revenue, there has been significant progress by economists towards monetarising other social benefits such as intergenerational transfers, health and crime (McMahon, 2000).

How far social rates of return can be used as an indicator of the macroeconomic, or macro, rather than micro, social benefits of education is a matter for debate. Even if such an indicator were to be calculated, the difficulty of making international comparisons using the social rate of return is well documented (Bennell, 1998). As the social rate of return shows the marginal rate of return to education within a country, it makes little sense to aggregate or compare these marginal rates. If country A has a social rate of return on education of 8 % and country B a social rate of return of 6 %, it does not make sense to say that country A is more (or less) efficient at producing social outcomes of education than country B unless human capital assets are fully mobile between the two countries. Moreover, as the social rate of return is a marginal indicator, we cannot be sure how far additional investment in education will depress this rate. Clearly economic rates of return on learning are not necessarily macrosocial in that consequences for the individual taxpayer do not necessarily have an impact on social structures and the organisation of social life in general.

As social rates of return cannot specifically be considered a macrosocial property of education we have not discussed them at length in this report. Clearly, in bringing together both the social costs and social benefits of educational investment (and in reconciling the social and economic) they are potentially a powerful microeconomic tool. This potential has only been partially realised at present as those studies which do exist tend to focus on monetarising one, or at most two, social benefits of education (McMahon, 2000).

It is difficult to see how the calculation of a full social rate of return, using all social benefits, could be achieved. Many of the macrosocial effects of education such as social cohesion and changes in attitudes and values, which we have identified in this report could not be easily incorporated within a social rate of return (although this does not rule out other forms of economic modelling). Moreover, as the macrosocial effects arising from ET take effect over long periods of time, the social rate of return

would need to be calculated with reference to inter-generational considerations.

Modelling, whether in terms of regression, SEM, MLM or calculation of the social rate of return does not represent the same sort of activity as evaluation. Evaluation implies a systematic analysis of the effects of a particular programme or activity which should usually be built into the programme design. Modelling is not normally built into the programme design and does not usually involve an analysis of the effects of a particular programme. For example, modelling may examine the effects of educational level on social outcomes, whereas evaluation may involve the effect of a specific social programme on targeted social outcomes.

Comparatively, summative evaluation seems to be a poor model for research of this type. National education systems are of a different order to educational qualifications and certainly do not represent targeted programmes. This is not to say that specific programmes or policies cannot be evaluated in a summative sense. However, the evolution of education systems over time and their contested nature make us sceptical about claims that they are designed in order to meet discrete social objectives (although there may be general aims underlying education systems). Moreover, the embedded nature of education systems within national cultures and institutional structures means that it is difficult to separate out the effects of education. It may even be counterintuitive to do so given that the functions of education are so tightly embedded within other national systems such as the welfare state.

However, the identification of differences and similarities between countries and their systems is a staple of comparative research. For example Ragin (1981) explains how by systematically stating similarities and differences between countries one may arrive at a series of logical statements regarding country properties. This enables us to test hypothesis, or at least answer research

questions, comparatively. The most powerful, macrocausal forms of comparison (Skocpol and Somers, 1980) involve logical analysis of multiple instances where a particular phenomenon occurs and the conditions they have in common, and the comparison of these with a range of instances where the phenomenon does not occur. Where certain condition(s) are common to the first set and are absent in the second set, and if the cases are otherwise similar, it can be concluded that these conditions represent causes of the phenomena in question. The procedure is, as with quantitative methods, open to the charge that there are possible causes which remained unobserved, but the logical comparative method has the distinct advantage that it treats each case as a totality, seeking to explain causal processes in the real context. This procedure is not totally contrary to evaluation. Moreover, the criteria of summative (final) evaluation are probably too strict for comparative work. Evaluation can be formative and examine development, rather than targets.

Hence it is probably best to consider research questions involving the macrosocial benefits of education as a hybrid somewhere between modelling and evaluation. Comparative research of this type cannot be evaluative in its summative sense as the targets to be met (the macrosocial benefits) cannot be modelled in such a way as to remove confounding influences. Countries are historically produced, open systems, and it is not possible to subject education systems or nation-states to control or experiment (at least social-democratic ones). It is possible, though, to gain understanding of developmental processes and to identify similarities and differences between countries. In this way, a hybrid representing modelling and formative judgements may represent the closest comparative research of this type can get to evaluation. With this in mind, we therefore proceed to a preliminary investigation of the effects of education, training and skills on macrosocial benefits.

6. The macrosocial benefits of education: a preliminary investigation

From our review of literature, it would seem that there are three hypotheses worthy of investigation:

- (a) macrosocial indicators do not form a coherent syndrome at national level;
- (b) distribution of education is as important as educational levels in influencing macrosocial benefits;
- (c) education/skill has a differential impact on various macrosocial indicators according to country context.

We will use two quantitative methods of investigation in exploring these hypotheses. First, we will provide an analysis involving country level aggregates from a combined data set. Second, an analysis will be conducted involving comparison of national groups using individualised respondent data.

6.1. Education and social cohesion: a macrosocial approach

We begin by examining the ways in which macrosocial indicators relate to each other and to various educational aggregates. We have shown in our discussion how it is not only the properties of national education systems that are important in determining macrosocial outcomes, but also the distribution of educational qualifications and other related properties such as income distribution. As our discussion has shown, there is no reason to expect macrosocial indicators to covary across countries (Knack and Keefer, 1997) (Norris, 2000) (Newton and Norris, 2000).

In this analysis we select countries which are not only advanced democracies, but from which data is readily available from various international surveys. Specifically, we will be using data from the WVS, the IALS, Interpol crime statistics and the ICVS. Our

country set includes mainly EU countries (Belgium, Denmark, Finland, Germany, Ireland, the Netherlands, Norway, Portugal, Sweden and the UK) although a small number of non-EU countries were also included (Australia, Poland and the US). We use various macrosocial indicators: general trust (GENTR) and trust in democracy (DEMTR); civic cooperation in terms of attitudes to cheating on taxes and public transport (TAXCH and TRANCH); a civic participation measure (GROUP); a tolerance indicator (TOLER); and measures of violent crime and a perception of risk of assault in the local community (CRIME and RISK). Note that these crime and community safety variables are coded so that a reduction in crime or risk would be thought to be socially beneficial.

As Table 2 shows ⁽⁷⁾ there is no significant relationship ⁽⁸⁾ between general trust (GENTR), associational memberships (GROUP) and opposition to cheating on public transport fares (TRANCH) at an aggregate level. Figure 1 shows in the form of a scatter plot the lack of clear relationship between group memberships (GROUP) and general trust (GENTR) at national level – elements which are often taken to be centrally coherent syndromes of social capital.

However, as Table 2 also shows, there are significant correlations between general trust (GENTR) and trust in government (DEMTR) ⁽⁹⁾ ($r=.563$, $p=.029$). There are also strongly significant relationships between general trust and a feeling of local safety (RISK) ($r=-.724$, $p=.005$) ($p<0.001$) and between norms of civic cooperation such as never cheating on taxes (TAXCH) and never cheating on public transport (TRANCH) ($r=.592$, $p=.020$) ($p<0.001$). These do not significantly correlate in our analysis with trust and membership, but in Knack and Keefer's (1997) analysis of the same data, which uses an aggre-

⁽⁷⁾ Estimates were computed using the SPSS computer package.

⁽⁸⁾ The test for significance is $p<0.05$ for a two-tailed test.

⁽⁹⁾ This conflicts with Knack and Keefer's (1997) findings from WVS that aggregate national levels of civic cooperation covary with social trust scores.

Table 4: Mean proficiency scores and test-score ratio for countries in sample

Country Code	Country	PROLEUS	PROUS	PROTERT	P3
AU	Australia	250.60	280.00	310.40	1.24
B	Belgium	242.50	281.00	312.30	1.29
CA	Canada	233.40	283.80	314.80	1.35
CH	Switzerland	228.10	274.10	298.30	1.31
D	Germany	265.60	283.80	310.10	1.17
DK	Denmark	252.80	278.10	298.50	1.18
FIN	Finland	261.60	295.90	316.90	1.21
IRL	Ireland	238.80	288.20	308.30	1.29
NL	Netherlands	257.50	297.00	312.10	1.21
NO	Norway	254.50	284.40	315.10	1.24
P	Portugal	206.60	291.50	304.80	1.48
PL	Poland	210.50	252.70	277.30	1.32
S	Sweden	275.40	302.30	329.10	1.19
UK	United Kingdom	247.90	281.90	309.50	1.25
US	United States	207.10	270.70	308.40	1.49

methodology to Nickell and Layard (1998, p. 67) we calculated a test score ratio based on the differences between the average literacy levels of those who attended minimal compulsory education for that country and those who continued their education after the upper secondary level. Following the method used by the OECD (2000) when assessing the social consequences of inequalities in literacy, we used the measure of prose literacy rather than the measure of quantitative literacy employed by Nickell and Layard (1998, p. 67). There may be questions about the suitability of these measures, or a combined measure as a proxy for skill distribution in the labour market, and this is an issue for further debate.

Table 4 shows the mean prose scores for those whose educational level is less than upper secondary (PROLEUS), for those who have attained upper secondary education (PROUS) and for those who have attained some tertiary education (PROTERT). The test score ratio (P3) is the ratio of the score of those attaining tertiary education (PROTERT) to those attaining lower than upper secondary education (PROLEUS). Hence it is the ratio between the level of attainment of those who have experienced post-compulsory education and those who have only attained the lowest level of secondary education.

The results show that measures of inequality in skills outcomes are rather higher in English-speaking countries such as Canada, the UK and the US than in some continental and Nordic countries such as Germany and Sweden. The relative positions of countries here confirm some of the findings on skills spreads by Brown et al. (2001), based on analysis of IEA data for test scores at 14 years old, and Green and Sakamoto (2001) based on adult distributions of qualifications. They have also been broadly confirmed in the recent OECD PISA study (OECD, 2001).

If we correlate national measures of skills distribution against national measures of social cohesion (Table 5) we find that there is a significant ($p < 0.05$) correlation ($r = -.592$, $p = .020$) between educational inequality (P3) and one commonly used macrosocial measure, the general level of trust (GENTR). Hence, the higher the level of educational inequality, the lower the level of general trust. This is demonstrated in Figure 2 which shows a scatter plot of general trust, as measured in the WVS, against skills distribution, as measured by the skills ratio (P3). There is clearly a negative relationship between the two variables with those countries with low inequality of skills (such as Denmark, Norway and Sweden) also having high levels of trust and those countries with high inequality of skills (such as Portugal, the UK and the US) having low levels of trust.

Figure 2: Educational equality and general trust

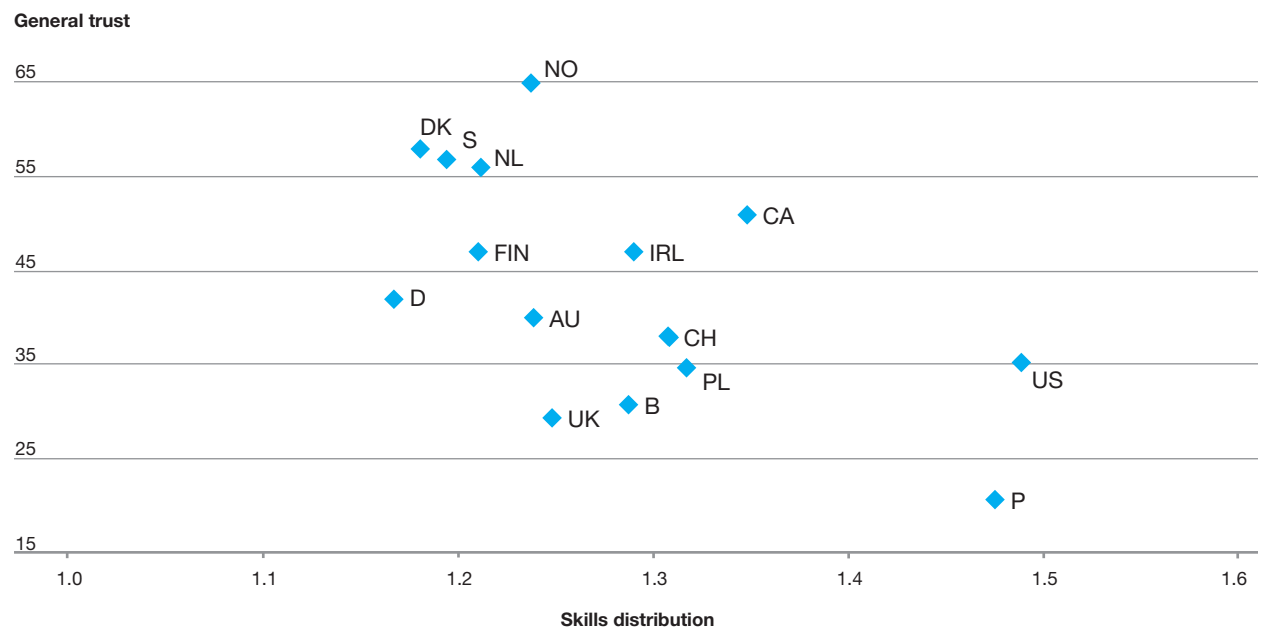


Table 5: Pearson correlation coefficients and levels of significance for distribution of educational attainments and social cohesion aggregates

		GENTR	GROUP	DEMTR	TAXCH	TRANCH	CRIME	TOLER	RISK
P3	Pearson correlation	-.592 ^(a)	.333	-.283	.265	.171	.398	-.060	.404
	Sig. (2-tailed)	.020	.225	.307	.340	.543	.142	.831	.171
	N	15	15	15	15	15	15	15	13

(a) Correlation is significant at the 0.05 level (2-tailed)

6.4. Education and income inequality

In our literature review we have referred to the influence of the distribution of income, or at least of opportunity, on macrosocial outcomes. We can test the effects of educational distributions on income distributions using a method adapted from Nickell and Layard (1998).

In measuring the degree to which skill differentials correspond to income inequality, Nickell and Layard (1998) employ earnings ratios, i.e. the ratio of incomes between individuals of differing educational levels. In this paper, we employ measures of income inequality (GINI) coefficients which are a more general measure of earnings inequality for the whole population. GINI coefficients employed are provided in Table 6.

Figure 3 shows the relationship between

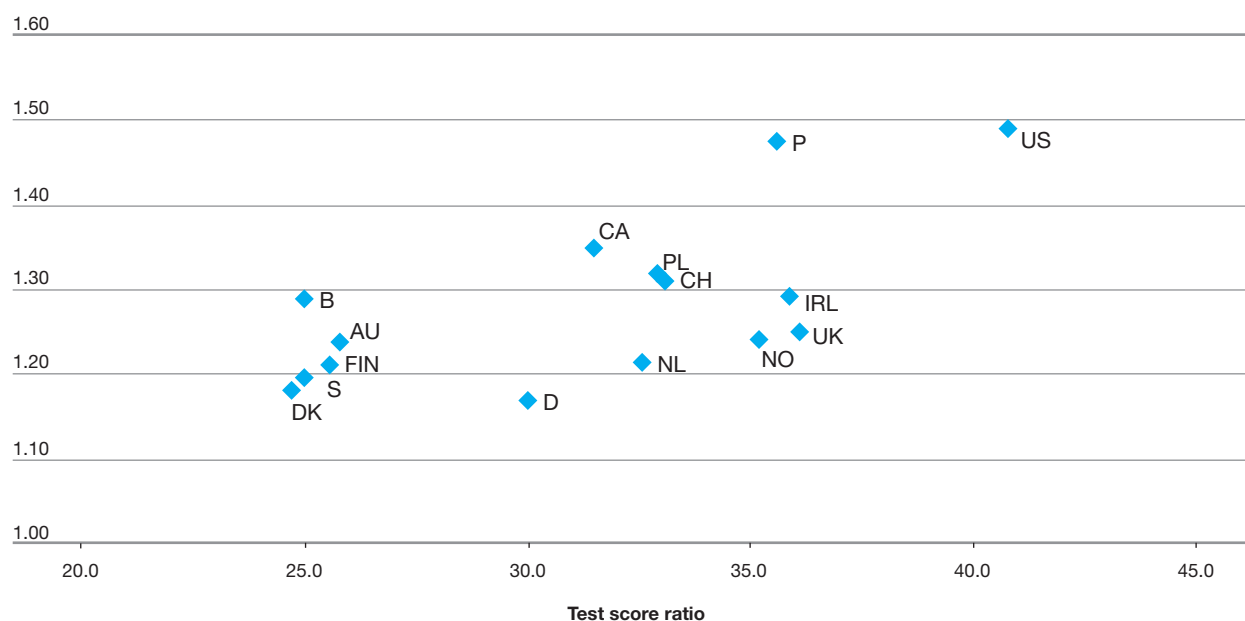
educational inequality, measured by the test score ratio P3, and income inequality for the 15 countries in our sample. As can be seen, there is an association between distributions of literacy skills and income inequality. Economies with a high degree of skill disparity also have high degrees of income inequality and vice-versa. As shown in Figure 3, there is a clear relationship between the test score ratio (P3) and the GINI coefficient. This relationship is statistically significant ($p < 0.01$) with a positive and large correlation coefficient ($r = .650$, $p = .009$).

We cannot know from this correlation which way any causality may run. It is quite probable that income equality impacts on educational equality through equalising access to education. It is also likely that social cohesion and solidaristic cultures and political ideologies promote both income equality and educational equality through equalising aspirations and supporting certain types of

Table 6: **GINI coefficients (mid 1990s)**

Country code	Country	GINI
AU	Australia	35.20
B	Belgium	25.00
CA	Canada	31.50
CH	Switzerland	33.10
D	Germany	30.00
DK	Denmark	24.70
FIN	Finland	25.60
IRL	Ireland	35.90
NL	Netherlands	32.60
NO	Norway	25.80
P	Portugal	35.60
PL	Poland	32.90
S	Sweden	25.00
UK	United Kingdom	36.10
US	United States	40.80

Source: World Bank (2001)

Figure 3: **Educational inequality and income inequality****Income inequality**

policy interventions. Minimum wages and other forms of labour market regulation that make wage agreements binding and inclusive for entire sectors may well enhance income equality (Blau and Kahn, 1996) (Nickell and Layard, 1998). Measures to equalise resources for, and admissions to, schools may make educational outcomes more equal, as

may shared aspirations about the value of schooling; this has been argued in the case of the at least until recently highly egalitarian Japanese education system (Green, 1999). These relationships are still to be investigated but our analysis here of correlations at least suggests that there is an issue to be explored.

7. Macrosocial benefits through microsocial data?

As a second approach to assessing the effects of education on macrosocial outcomes, we adopt an approach using microsocial data within comparative context. We tackle similar questions as in the macrosocial analysis. First, we examine whether there are differences in the composition of various social indicators between countries. That is if the measurement indicators are invariant. Second, we examine the effects of educational level on these social indicators in order to ascertain whether there are systematic differences between the four countries. As we are now dealing with microsocial indicators we are limited both in terms of the indicators we use and the data set(s) employed. As we are dealing with individual level data we cannot use indicators such as the distribution of skills or income. In addition, we cannot merge data sets such as the WVS and IALS which utilise different samples of respondents.

The 1995 sweep from the WVS probably presents the optimum choice both in terms of social variables and a standard measure of educational level. We included data from four countries: Sweden representing a Nordic country (N=1 009), Western Germany representing a Northern continental country (N=1 017), Spain representing a Mediterranean country (N=1 211), and Poland representing a former Eastern European block (and future EU acceding) country (N=1 153). In total there were 4 390 respondents. The WVS recommends weighting of the samples in order to arrive at equal sample sizes. Using different weights within each country the sample sizes were boosted to 1 503 for Sweden, 1 495 for Western Germany, 1 503 for Spain and 1 499 for Poland, in total 6 000 subjects.

We analyse four social outcome variables. Political action is a measure of to what extent people have carried out or would potentially carry out actions directed against the establishment in order to improve the current state of affairs. Respondents indicated on three point scales (1-3) whether they have done, might do or would never carry out a certain action. We based the scale on three items indicating ordinary action; sign a peti-

tion, joining a boycott and attending a lawful demonstration. Initial analysis showed that including two more extreme activities (as indicated by the skewnesses of the items), joining unofficial strikes and occupying buildings or factories, fitted SEM models less well than models in which these two items were not included. Hence, the scale was assumed to probe ordinary instead of extreme action. The scale was reverse coded with higher values indicating more action. The mean internal consistency, as measured by Cronbach's alpha, was .71 across the four countries.

Trust in institutions was measured by responses to the question 'could you tell me how much confidence you have in (institution)?' Answers were given on four point scales: 1 = a great deal, 2 = quite a lot, 3 = not very much, 4 = none at all. We selected three institutions, the legal system, parliament and civil service, and reverse coded the scale, higher values indicating more trust. The mean internal consistency across the countries as measured by Cronbach's alpha was .67.

Support for democracy was measured with three items. The respondents rated on four point scales to what extent they agreed with each statement (1 = agree strongly; 2 = agree; 3 = disagree; 4 = disagree strongly). The three statements were 'in democracy, the economy system runs badly', 'democracies are indecisive and have too much squabbling' and 'democracies aren't good at maintaining order'. After initial analysis it was decided to drop a fourth item 'democracy may have problems but it's better than any other form of government' which, in some countries, did not load on the same factor as the three first mentioned items. Given that the statements were negative, negative responses to these (i.e., higher values) were taken to be indicative of support for democracy in general. The mean internal consistency was a Cronbach's alpha of 0.77.

Race tolerance was measured with three items. The respondents were asked to sort out who they would not like to have as a neighbour from a list of distinctive groups. We used responses to other races, immigrants and

Muslims. Responses for each group were coded 0 if they mentioned the group and 1 if they did not. The scale was thus formed as an index ranging from 0 to 3, higher values indicating more tolerance (i.e., they had nominated fewer of the mentioned groups as potential neighbours). The three items were all skewed. The mean internal consistency was a Cronbach's alpha of 0.67.

Our main predictor of these variables is educational level, while we controlled for the effects of socioeconomic status and age. Education level was recorded according to the structural options available within each country and standardised within each country in order to make these comparable. We also standardised socioeconomic status (SES), which was measured in different ways across countries and ages. Initial analyses showed that age, SES and education level were interrelated in two expected ways. First, older participants within each country had a lower level of education and second, educational level and SES were positively correlated.

A technique known as structural equation modelling (SEM) was employed to model the effect of education on each of the social outcomes. SEM allows us to analyse the impact of education on various latent variables, measuring the social outcomes simultaneously, and to compare effects to identify systematic differences between countries. The full details of the modelling are provided in Annex 2 where we explain how the models were specified and confirm that the models were an adequate fit to the data across all four countries. Here we will concentrate on the substantive results.

Figure 4 shows the effect of education on various microsocial indicators of social cohesion: political action (POL), institutional trust (INST), trust in democracy (DEM) and race tolerance (RACE). The diagrams show the effect of education having controlled for socioeconomic status and age. Each arrow shows the effect size in terms of both standardised and non standardised regression coefficients. For example, in Sweden, the effect of education on political action is 0.09, or 0.24 when standardised. As explained in Annex 2, we used significance tests to show where the effect sizes differed significantly between countries. Results show that effect sizes for both Sweden

and Poland are significantly different from those in the other countries, namely, the effect of education on both trust in institutions and trust in democracy was stronger in Sweden. In addition, the effect of education on political action was lower in Sweden. Somewhat surprisingly, the effect of education on racial tolerance was higher in Poland than the other countries.

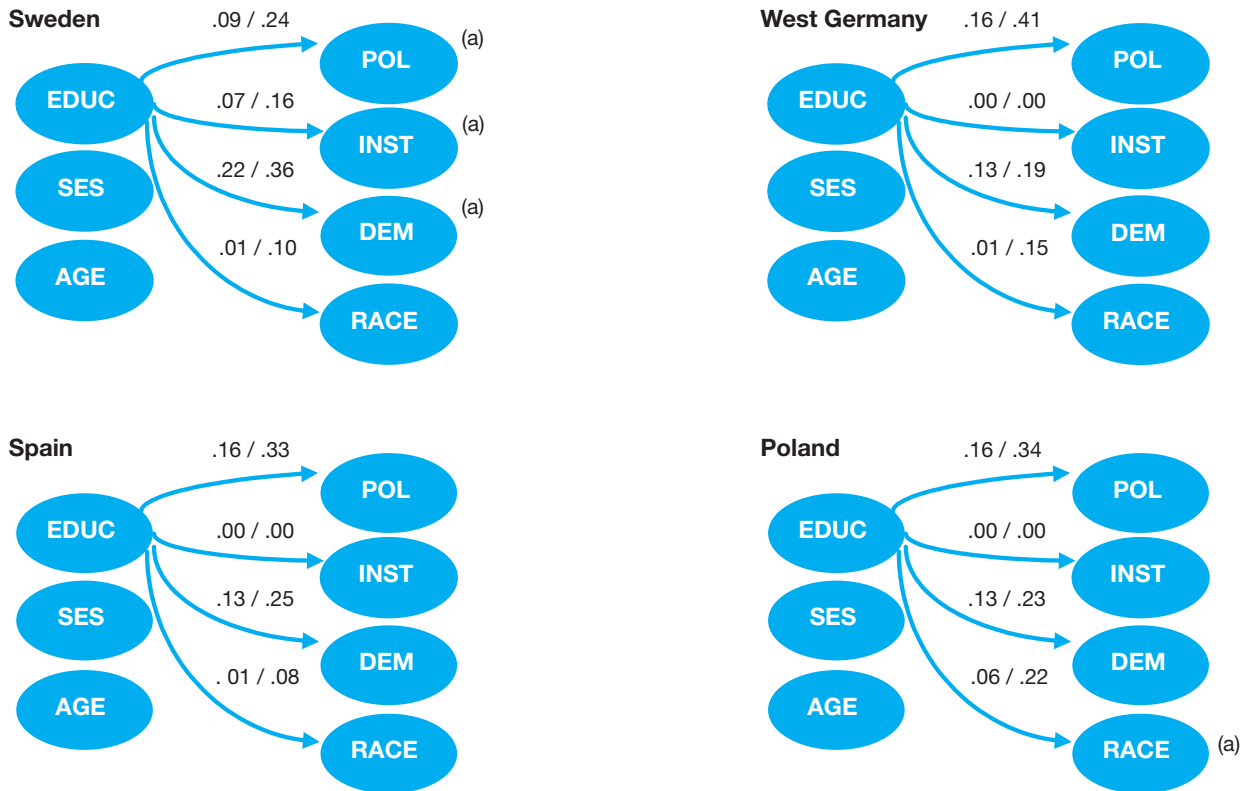
There are two possible explanations for these effects. First, that the effects simply represent differences in country means ⁽¹⁰⁾. That is, in countries with a low mean score for racial tolerance (for example), education will have a stronger effect as there is more room for potential increases in the tolerance score. This argument may apply in the case of Poland where, as the IEA study shows, levels of racial tolerance are low. This is also confirmed in the data used in this study. Table 9 shows the raw weighted means for each country, and Poland has the lowest mean level of racial tolerance (2.33). This may also be the case for institutional trust in this study, where descriptive statistics show that the Swedish level of institutional trust is below that of the other four countries in the study with a mean value of 2.51.

Second, it could be tentatively argued that differences in education effects represent differences in the socialisation effects of education (as opposed to other influences) in these countries. In Sweden, for example, it could be argued that education has a central role in imparting trust whereas socialisation into forms of political action may occur through involvement in the community or workplace (given Sweden's high rates of unionisation and the importance of unions in national policy determination). In Poland, the education system may play an important function in terms of increasing racial tolerance, whereas for the other three countries the family or community may have a more important role.

These conclusions are tentative in that further analysis and more qualitative studies are required. However, we have shown here the possibilities of using microsocial analysis to illuminate, although not explain, macrosocial differences in education systems in terms of their socialisation functions.

⁽¹⁰⁾ As the variables used in this SEM are latent variables we can not readily convert effect sizes into marginal effects (e.g. the effect of a level of education on a unit change in tolerance, for example) although we may compare effect sizes between countries. Mean values are given for the sample population as a whole and are indicative of the general level of the variables in each country.

Figure 4: **Effects of education on social cohesion in four countries (non standardised and standardised regression coefficients) with controls for socioeconomic status and age**



Note:

EDUC = Educational level standardised within each country
 SES = Socioeconomic status standardised within each country
 AGE = Age standardised within each country
 POL = Political action
 INST = Trust in institutions
 DEM = Support for democracy
 RACE = Race tolerance

(a) regression path that is significantly different from path in the other three countries as tested in a nested model comparison (Dc2; $p < .05$). For sake of readability regression paths from SES and AGE, as well as latent correlations were omitted.

Table 9: **Raw weighted means and standard deviations (in brackets) within each country**

	POL	INST	DEM	RACE
Sweden	2.30 (.52)	2.51 (.55)	2.82 (.71)	2.79 (.58)
Western Germany	2.18 (.51)	2.60 (.50)	3.01 (.54)	2.84 (.47)
Spain	1.65 (.60)	2.68 (.62)	2.75 (.60)	2.73 (.69)
Poland	1.57 (.55)	2.68 (.64)	2.14 (.65)	2.33 (1.04)

NB: POL = political action, INST = trust in institutions, DEM = support for democracy. RACE = race tolerance

8. Conclusions

In this paper we have explored the effects of education, training and skills on a wide range of macrosocial outcomes including crime, social cohesion, citizenship, civic and political participation. Through a review of literature and statistical modelling we have mapped out both the problem aspects of methodological individualism and the comparative approach. In particular, the possibility for summative evaluation (rather than measuring or modelling) of education systems appears to be limited, although the component parts of national education systems are open to evaluation. We suggest instead that evaluation of macrosocial benefits requires a hybrid approach to evaluation involving both modelling and formative evaluation. The procedures advanced by Ragin (1981) appear to be helpful in this respect as they enable us, through the method of similarity and difference, to construct workable research questions concerning the outcomes of education.

In terms of the status of various models of the relationship between education and social outcomes, we are troubled that many of these models are specified at the individual level. While many microsocial impacts of education within countries are best specified as relations involving individual resources, knowledge and skills, when comparing countries the country context matters. Moreover, country context is more than just another variable and is not ecological in a simple sense. There are expressions of national context such as distributions of skills and income, education systems and culture which cannot be specified except in comparison to other countries.

With regard to macrosocial benefits of education, training and skills there are a few generalisations which can be made across all EU countries.

First, that for some macrosocial benefits (or costs) there are common structural antecedents. Various forms of criminal activity can be regarded as local manifestation of structural phenomena. For example, with regard to work on football hooliganism (Dunning, 2000), juvenile delinquency and hate crime (Watts, 2001) and possibly tolerance, similar structural antecedents (unemployment and alienation) related to education are implicated. The

relevance of income distribution (and by implication the distribution of skills) and the spatial characteristics of high crime areas are also potentially similar structural antecedents of crime (Kelly, 2000) (Lee, 2000). As shown by our work using macrosocial aggregates, there are clearly relationships between educational inequality, income inequality and outcomes such as general trust, crime and feelings of community safety.

Second, the clustering of social benefits and educational level which one may see at the micro level does not necessarily hold at the macro. Educational level and social benefits such as general (and other forms of) trust, association memberships and crime are not necessarily related at the national level as evidenced by our literature review and our modelling of macrosocial outcomes. Macrosocial outcomes are not related at the country level and do not form a coherent syndrome (Putnam, 2000). The implications for education systems are that generalisations concerning the role of education in the rebuilding of civil society (social capital investment) or in fostering widespread political involvement through civics education are not applicable across nation-states. While such policies are not necessarily misguided, in that some individuals may benefit, the effect on national levels of social outcomes may be small or non-existent. As our literature review has shown, there is much evidence that increases in the general level of education have not had any effect on national levels of tolerance, crime or social cohesion. Evidence from Wilkinson (1996, p. 20) supports this general conclusion with respect to health: 'In effect, the extent of the variation around a society's norms is fixed so that the proportion of people with bad diets, who are heavy drinkers, who have high blood pressure etc. is a reflection of where the society's norms are [...] it was easier to change the societal norms than to leave them unchanged while trying to reduce the proportion of the population over some level of risk.'

However, that societal norms and inequalities are hard to change does not mean that there is no role for education or training. As Eisner's work

(2001) explains, the effects of various institutions implicated in state formation (such as education) may only be seen to have effects over a long period of time. Moreover, we may speculate as to the role of education systems in various regional groupings on the formation of values and the construction of inequalities.

To illustrate this point, it is clear that the Nordic countries form a group of high trust, mainly low crime countries where general levels of civic participation are also moderate. In the Danish case, this is combined with high levels of lifestyle permissiveness but rather low levels of tolerance towards foreigners (at least on Halman's evidence, 1994). The high levels of trust may be associated with various non-education macro factors such as the strongly solidaristic welfare states and historically relatively high levels of ethnic/cultural homogeneity (Knack and Keefer, 1997), although we have not examined these factors here. They may also relate to relatively high levels of income equality. Lower levels of ethnic tolerance in Denmark may be associated, paradoxically, with that same emphasis on cultural homogeneity that may be conducive towards high trust in this case (although we do not suggest that these relationships would hold in all national contexts). We may hypothesise that relative equality of educational outcomes promotes trust and lower crime through its impact on income equality. The strong effect in Sweden of education on trust in institutions and in democracy may be attributable to the strong solidarity principles enshrined in curricula and in the universal nature of primary and secondary school systems which remain comprehensive and non-selective up to the end of upper secondary schooling (*gymnasieskola*). However, the lower levels of civic association (compared to other – mostly European – countries in our sample) may result from the historically prominent role of the state in Nordic social democracy in promoting equity and inclusion and to the success of this in promoting social equity. This may seem to obviate the need to take political action outside mainstream channels. The evidence from our micro level analysis that education has a weak effect on civic association in Sweden may reflect the fact that civic participation in Sweden is highly institutionalised, not least with the prominent role of trades unions within the social partnership system.

In contrast, the UK has high levels of crime and scores low relative to the other countries in our

sample on both trust and association, while also being low on tolerance according to Halman's evidence (1994). Although (due to data constraints) the UK was not included in our microsocial analysis, an historical overview sheds light on why this might be the case. Non-education macro factors associated with higher crime and lower trust may include the high rates of income inequality (among the highest in the EU) and higher levels of intolerance may relate in part to historically high levels of immigration over the past 40 years (Halman, 1994). Education may play a part in generating lower levels of trust and higher crime through its impact on income inequality. A high level of market influence, relative to the rest of Europe, with high levels of inequality in outcomes between schools and regions, and consequently wide distributions of educational outcomes, may be significant in generating income inequality and lower trust. The latter arises both through its effect on income inequality and more directly through the competitive values it promotes, which are not counteracted by any Nordic style emphasis on social solidarity in the school curriculum. Since differences between schools reflect ethnic differences, given the tendency for increasing ethnic concentration/segregation in schools in a quasi-market system, this may also play a part in both decreasing trust and increasing intolerance (the latter because of the reduction in ethnic mixing). The low to moderate UK level of association relative to the rest of the countries in our reduced sample is harder to explain given Britain's history of valuing civil society and intermediate associations (Gramsci, 1971), although the reduction in trade union membership and activity following the restrictive laws brought in by the Thatcher government after 1979 may have had some effect.

These are obvious generalisations and somewhat stereotypical depictions of these countries' education systems. We do contend, though, that the macro-social benefits of ET are rooted both in the distribution of educational outcomes and in the values transmitted through education systems. They are also contingent on the relationship between education and the labour market and other parts of the welfare state. Although there are cultural limits to the extent to which policy borrowing is appropriate with regard to education systems, there are clear lessons for policy-makers. In particular, raising educational skills and training levels

is neither a necessary nor sufficient condition for promoting macrosocial benefits. However, improving the distribution of educational outcomes may be one

way in which education and training can make some contribution to more general economic and social redistribution.

List of abbreviations

AGE	Age standardised
AIC	Akaike information criterion
CFI	Comparative fit index
CRIME	Violent crime
DEM	Trust in democracy/support for democracy
DEMTR	Trust in democracy/trust in government
EDUC	Educational level standardised
ET	Education and training
ETGACE	Education and training for active citizenship in Europe
EVS	European values survey
GDP	Gross domestic product
GENTR	General trust
GINI	Measures of income inequality
GNP	Gross national product
GROUP	Civic participation measure/associational memberships/group membership
IALS	International adult literacy survey
ICVS	International crime victimisation survey
IEA	International association for the evaluation of educational achievement
INST	Institutional trust
ISRD	International self-report delinquency study
MLM	Multi-level modelling
P3	Test score ratio/measure of educational inequality
POL	Political action
PROLEUS	Educational level lower than upper secondary
PROTERT	Tertiary education attained
PROUS	Upper secondary education attained/the mean level of upper-secondary attainment in literacy
RACE	Race tolerance
RISK	Risk of assault/perceived risk/feeling of local safety
RMSEA	Root mean square error of approximation
SEM	Structural equation modelling
SES	Socioeconomic status
TAXCH	Cheating on taxes
TOLER	Tolerance indicator
TRANCH	Cheating on public transport
VET	Vocational education and training
WVS	World values survey

Annex 1

Macrosocial data

As no one data set could satisfy the international comparisons required, a combined data set was constructed using data from the WVS, IALS, World Bank, Interpol statistics and the ICVS. All data used was from the years 1990 to 2000. Fifteen countries were included in the core data set being Australia, Belgium, Canada, Denmark, Finland, Germany, Ireland, the Netherlands, Norway, Poland, Portugal, Sweden, Switzerland, the UK and the US. Social cohesion variable levels for each country are given in Table 10.

Social cohesion measures were obtained from the most recent country sweep available of the WVS. In most cases, data used was from the 1995 to the 1997 sweep, although when data for these years was not available, data from the 1990 sweep was substituted.

General trust (GENTR) was measured by the percentage of individuals sampled in each country who agreed that most people could be

trusted when asked: ‘Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?’ (WVS, question V27).

Associational memberships (GROUP) was measured by the mean number of associational memberships for sampled individuals in each country, not including memberships of sporting associations (WVS, questions V28 and V30-V36).

Trust in government (DEMTR) was measured by the percentage of individuals sampled in each country who agreed or strongly agreed that they had confidence in their parliament (WVS, question V144).

Civic cooperation measures cheating on public transport fares (TRANSC) and cheating on taxes (TAXCH). They were measured by the percentage of individuals in each country who stated that such actions were never justifiable (WVS, questions V193 and V194).

Table 10: **Macrosocial aggregates for 15 countries**

Country Code	Country	GENTR	GROUP	DEMTR	TAXCH	TRANCH	CRIME	TOLER	RISK
AU	Australia	39.90	1.06	30.60	62.10	62.80	37.38	95.42	2.25
B	Belgium	30.60	.28	42.80	33.90	57.70	29.84	82.28	1.89
CA	Canada	50.70	.47	37.90	59.20	61.90	109.21	94.30	1.78
CH	Switzerland	37.80	.68	43.90	53.70	59.30	34.40	89.99	1.87
D	Germany	41.80	.54	29.40	40.10	38.60	86.92	95.60	N/A
DK	Denmark	57.70	.18	42.00	57.30	74.50	47.69	88.95	1.67
FIN	Finland	46.90	.32	32.40	57.40	62.60	45.42	85.44	1.77
IRL	Ireland	46.80	.23	50.30	48.80	57.50	96.88	93.78	1.99
NL	Netherlands	55.80	.36	51.60	42.90	55.80	121.46	88.64	1.83
NO	Norway	64.80	.61	69.50	47.50	70.20	31.26	81.75	N/A
P	Portugal	20.70	.19	33.50	39.90	53.40	62.57	90.53	2.18
PL	Poland	34.50	.03	34.50	55.20	68.10	71.04	75.89	2.29
S	Sweden	56.60	.52	44.60	49.30	47.00	85.38	95.34	1.68
UK	United Kingdom	29.10	.20	46.10	53.90	59.40	144.83	88.30	2.10
US	United States	35.00	1.63	30.30	73.60	66.50	209.85	90.31	1.95

The measure of educational inequality (P3) was obtained from IALS secondary data by dividing the mean prose score of those individuals who had completed tertiary education by the mean prose score of those who had completed upper secondary education only. To compute these scores, we utilised the most recent sweep of IALS data (OECD and Statistics Canada, 2000).

Measures of income inequality (GINI) and GNP per capita (GNPCAPIT) were taken from the most recently available World Bank Statistics (World Bank, 2001, pp. 282-283).

The measure of crime (CRIME) was obtained from Interpol statistics for 1996 (International Criminal Police Organisation, 1996). The measure

of crime used being the sum of homicides, robberies and violent thefts per 10 000 inhabitants.

The measure of tolerance (TOLER) was obtained from question V57 of the WVS and measures the percentage of respondents in each country who would not mind having an immigrant as a neighbour.

The measure of perceived risk of crime (RISK) was obtained from the mid-1990s, or most recent possible, sweep of the ICVS and measures the mean score for each country from respondents' feelings of safety when walking alone after dark in the area (very safe=1, very unsafe=4). Figures were not available for Germany and Norway and so these countries were not included in analysis involving this variable.

Annex 2

Details of SEM modelling

The raw data was first screened for missing values, which were replaced using regression imputation techniques as available in the SPSS MVA module. Regression imputation techniques provide less biased parameter estimates than do list wise or pair wise deletion or mean value imputation of data. After the data imputation, correlation matrices, and mean and standard deviation moments were estimated in weighted samples, the data was imported into the AMOS software.

We then conducted the following analyses. First, by using SEM techniques we set up a Confirmatory factor analyses (CFA) in order to test the structural validity of a model including four latent constructs and three manifest indicators for each construct. This means that we wanted to investigate whether the items actually measured the underlying property that we hypothesised, by testing this empirically. The logic of SEM is to test whether one's theory (here three items loading on each of the four constructs) as defined in a measurement model fits the data well. If there is no significant difference between data and model then one's theory receives support. We evaluated model fit by the Comparative fit index (CFI), values over .95 indicating good model fit (Bentler, 1990), and the Root mean square error of approximation (RMSEA) values lower than .05 indicating good model fit (Brown and Cudeck, 1993). Even though the χ^2 and χ^2/df are susceptible to sample size and model complexity these are reported. Additionally we report the Akaike information criterion (AIC) (Brown and Cudeck, 1989) measure, which is not affected by the particularities of the default AMOS null models when estimating means and intercepts (Arbuckle and Wothke, 1999). Separate models fitted the data well within each country. We then proceeded to testing a four-country model according to the following specifications.

We wanted to investigate whether our latent constructs measured the same thing across the four countries, which is the cornerstone of cross-cultural research, or when comparing measurements across subgroups (Little, 1997). If the researcher can demonstrate measurement invariance across the

subgroups, the comparison of means or regression coefficients across the subgroups becomes meaningful. The strictest test of measurement invariance is to constrain both factor loadings (regression path from latent construct to manifest item) and intercepts (mean level of the manifest indicator). A less strict test would be to constrain the factor loadings (but not the intercepts), which would still be indicative of structural validity across contexts. If the constrained model holds, we can thereafter proceed to include educational level (with controls for socioeconomic status and age) as predictor of the four latent constructs.

We proceeded by first testing a freely estimated model (model 1, Table 11) including four correlated latent constructs, each with three manifest items. All factor loadings were allowed to vary across the four groups. The model fitted data well (RMSEA = .016; CFI = .983). Next, we constrained the factor loadings across the four groups in model 2, which fitted the data less well than model 1 (the freely estimated one), but still had a good model fit (RMSEA = .021; CFI = .960).

In the next series of models we included the latent means to be estimated. In model 3 we constrained the intercepts while allowing the means to vary, in model 4, both the intercepts and factor loadings while the means varied, and in model 5 intercepts, factor loadings, and latent means were constrained. The equal intercept model held (RMSEA=.028; CFI=.941) but the model with equal intercepts and factor loadings did not (RMSEA=.038; CFI=.886). Model 5 in which the latent means were constrained indicated that there were cultural differences with regard to the four outcomes, however, given the poor fit of model 4 we did not pursue testing these differences. In sum the first set of models (model 1-5) demonstrated that it is possible to constrain the factor loadings, which is indicative of structural validity across the four countries. However, the misfit of models 4 and 5 indicated that it is not possible to estimate latent mean differences due to incompatible intercept struc-

ture. Nevertheless, we deemed equal factor structures as a plausible way forward for testing the effect of educational level on the four outcomes, with controls for socioeconomic background and age, across the four countries.

In order to investigate the main research question of this study, that is how educational level affects social cohesion across four countries, we included regression paths from educational qualifications, socioeconomic status and age upon each of the four latent constructs, thus creating a model with three latent predictor variables and four latent outcomes.

Next, model 6 included three latent predictors and four latent outcomes with freely estimated factor loadings for the outcomes (the latent predictors only included one manifest indicator each, which were set to 1.00). In model 7 the factor loadings of the four latent outcomes were constrained

across the countries while the regression paths were allowed to vary. As we can see in Table 11, model 7 fitted less well than model 6, but still at an acceptable level, whereby we in the following models constrained the factor loadings. We tested whether the effect of education was the same in all four countries by comparing the model in which the regression paths in the four countries were constrained to be equal as compared against a model in which these were freely estimated (model 7), in nested model comparisons, as a form of *post hoc* test. We then observed the difference between the two nested models according to the difference of χ^2 between the two models ($\Delta\chi^2$). In order to improve fit between the two nested models, some parameters were relaxed until the $\Delta\chi^2$ became non-significant. This means that there are significant differences in the regression paths between the countries. These regression coefficients are presented in Table 12.

Table 11: Descriptions of, and goodness of fit indices for models 1 to 5

Model	Verbal description	χ^2	df	χ^2/df	RMSEA	AIC	CFI
1	free factor loadings	472.98	192	2.46	0.016	712.98	0.983
2	constrained factor loadings	872.21	216	4.04	0.023	1064.21	0.960
3	equal intercepts	1196.64	216	5.54	0.028	1484.64	0.941 ^(a)
4	equal intercepts and factor loadings	2137.04	240	8.90	0.038	2377.04	0.886 ^(a)
5	equal intercepts, factor loadings and latent means	5129.48	252	20.36	0.057	5345.48	0.706 ^(a)

(a) In models in which means and intercepts were estimated, the CFI fit index was calculated using a self-defined null-model

Table 12: Descriptions of, and goodness of fit indices for models 6 to 11

Model	Verbal description	χ^2	df	χ^2/df	RMSEA	AIC	CFI
6	free factor loadings and free regression paths	1579.04	324	4.87	0.025	1891.04	0.939
7	constrained factor loading and free regression paths	1992.85	348	5.73	0.028	2256.85	0.920
8	constrained regression EDUC → POL (not Sweden)	1998.77	350	5.71	0.028	2258.77	0.920
9	constrained regression EDUC → INST (not Sweden)	1996.62	350	5.71	0.028	2256.62	0.920
10	constrained regression EDUC → DEM (not Sweden)	1997.50	350	5.71	0.028	2257.50	0.920
11	constrained regression EDUC → RACE (not Poland)	1997.21	350	5.71	0.028	2257.21	0.920

In model 8 (Table 12) we first constrained the effect of education on political action across the four countries. When we set the regression path in the Swedish group free we found that the effect was lower (the non standardised coefficient was $\beta_{\text{unstand}}=.09$; $p<.001$) and standardised coefficient was $\beta_{\text{stand}}=.24$; $p<.001$), than in the other three countries ($\beta_{\text{unstand}}=.16$; $p<.001$; $\beta_{\text{stand}}=.41$) which were not different from each other.

In model 9 we tested, in the same manner, whether there were differences in effects of education on trust in institutions. The nested model comparison showed that the effect of education was stronger in Sweden (.07/.16) than in the other three countries (.00/.00), which were not different from each other. The regression effects were not significant in Poland, Spain or Western Germany.

In model 9, the regression path from educational level to trust in democracy in Sweden (.22/.36), had a stronger effect than in the other three countries (.13/.19-.25), which were not different from each other.

Finally in model 10, the effect of educational

level on race tolerance was stronger in Poland (.06/.22), than in the other three countries, in which the effects were not different from each other (.01/.08-.15).

In our analysis we compared a number of models in which different parameters were constrained (Table 11 and 12). Importantly, the models in which intercepts and factor loadings were constrained across countries did not reach an appropriate model fit. This means that there are cultural differences in which people perceive, interpret and give weight to the different items that constitute the four social cohesion measures. We were not able to compare the properties of the construct in the strictest sense. Previous studies have acknowledged the difficulty of attaining measurement invariant constructs of social capital (Lillbacka, 2002). However, in a less constrained model the factor loadings were found to be equal across countries, demonstrating that the structural validity of the constructs are compatible (i.e., the items measure that certain latent construct, and not another construct).

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Macroeconometric evaluation of active labour-market policy – a case study for Germany

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Abstract

Most evaluation studies of active labour-market policies (ALMPs) focus on the microeconomic evaluation approach using individual data. However, as the microeconomic approach usually ignores impacts on non-participants, it should be seen only as a first step to a complete evaluation to be followed by analysis at macroeconomic level.

Our study evaluates the impact of active labour-market programmes in Germany on the whole economy. The evaluation focuses on vocational training and additionally on subsidised employment programmes in order to compare them to vocational training. To do this we outline the institutional structure of ALMPs in Germany and conduct a theoretical discussion that enables us see how ALMP might influence the whole economy. This framework serves as a starting point for the empirical analysis, which uses regional data from 175 German labour office districts and a dynamic panel data estimator to evaluate the impacts of ALMP in Germany from 1999 to 2001.

The empirical analysis relies on the Beveridge curve relationship, explaining total unemployment as a function of vacancies and ALMP activity. With this empirical model we are able to estimate the overall effect of ALMP on the economy. We use a dynamic specification that enables us to control for the highly persistent pattern of German unemployment. Since the usual estimation methods are not appropriate in dynamic panel data models, we use a system generalised method of moments (GMM) estimator that was found to perform well in the case of highly persistent data.

Within the system GMM framework we account for the inherent simultaneity problem resulting from the fact that ALMP would normally be determined by a policy reaction function, i.e. the decision on how much is spent on ALMP is driven by the economic situation. This would result in a causal link from the dependent variable (unemployment or employment) to the ALMP measures which would result in misleading estimates.

Our results indicate different pictures in East and West Germany. Whereas in West Germany we find a positive result for vocational training, the results in East Germany do not look favourable. The results for East Germany should be treated with caution since adequate estimators cannot be implemented due to a too small number of regional units. Comparing vocational training programmes in West Germany with job creation schemes (Arbeitsbeschaffungsmaßnahmen, JCS), we additionally find that vocational training is the more efficient measure in reducing unemployment.

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1. Executive summary

We were interested in estimating the net effects of ALMP in Germany. As microeconomic evaluations usually ignore impacts on non-participants, we used a macroeconomic approach to analyse the effects of JCS, structural adjustment schemes (Strukturanpassungsmaßnahmen, SAS), only for East Germany, and continuing vocational training (Förderung der beruflichen Weiterbildung, FbW) on employment in Germany from 1999 to 2001.

Our analysis starts with an overview of the institutional structure of ALMP in Germany. Labour-market policies in Germany are organised by the Federal Employment Service (Bundesanstalt für Arbeit). Up to 1998, the legal basis for policy has been the work promotion act (Arbeitsförderungsgesetz, AFG), established in 1969. From that point, the new social welfare code SGB III (Sozialgesetzbuch) took over this role. Changes have been made both in objectives, such as a more intensive focus on problem groups in the labour market, and also in the institutional organisation of labour-market policy, leading to decentralisation and more flexibility in the regional allocation of resources to different measures.

Since our data ranges from 1999 to 2001, we focus only on SGB III which was created in an economic situation with high unemployment rates and narrow budget constraints. The most important goal of ALMP within the framework of SGB III is the (re)integration of problem groups in the regular labour market while using resources in an efficient way. With respect to the organisational set up of ALMP, SGB III allows local labour offices to allocate their budgets relatively freely to different measures. This leaves the decision on the mix of instruments to the relevant regional branch of the Federal Employment Service (Brinkmann, 1999). Therefore, any evaluation of the efficiency of labour-market policy must give more consideration than before to regional flexibility.

In terms of spending, we find that FbW is the most important ALMP measure for both East and West German regions, followed by traditional JCS. In West Germany there is a big difference

between spending on FbW and JCS, whereas in East Germany the situation is much more balanced. Finally, we also consider structural adjustment schemes which are similar to traditional JCS but with less severe eligibility criteria. Since structural adjustment schemes are of minor importance in West Germany they are only evaluated for East Germany.

As a starting point for our empirical analysis we present a theoretical framework which aims to identify the various channels through which ALMP might influence the whole economy. Leaving aside the traditional way of 'cheating the Phillips curve', i.e. improving the unemployment-inflation trade-off and thereby reducing the non-accelerating inflation rate of unemployment, a model is needed that explains the relevant labour-market variables (e.g. regular employment or unemployment) and is also capable of incorporating ALMP.

The most important requirement of a macroeconomic model used to analyse ALMP is that it is able to explain a positive equilibrium unemployment rate. Theoretical considerations of ALMP are, therefore, mostly based on the Layard and Nickell framework or the search model framework.

Considering the traditional aim of ALMP, and especially vocational training programmes, to overcome structural imbalances in the labour market, the search model framework seems most advantageous for analysing impacts. The basic mechanism within the search model framework is that ALMP helps to increase the searching efficiency of participants and thus lowers unemployment for a given set of vacancies, i.e. it improves the matching process. This might also affect labour demand since vacancies become more profitable if they are filled more quickly. Other important effects are reduced welfare, productivity effects and effects on labour force participation. Since data limitations do not allow estimates of structural relationships we cannot analyse these effects separately.

Flow data is required in order to estimate the effects of ALMP on the matching process. Unfor-

Unfortunately such data is not available so we are utilising the Beveridge curve relationship for our empirical analysis. The Beveridge curve can be used as an indirect way of estimating matching efficiency since it is the steady state relationship between unemployment and vacancies resulting from the matching process.

For our empirical analysis we use a revised Beveridge curve that relates job seekers, i.e. the unemployed and programme participants, to vacancies. Using the revised Beveridge curve is important since it avoids estimating the book-keeping effect and thus focuses on the net effect of ALMP.

Immense differences are found in terms of previous empirical findings from macroeconomic evaluations for Germany. As Calmfors and Skedinger (1995) note, the exact specification and the methods of estimation seem to be crucial to the results of a macroeconometric evaluation. This may result from the fact that ALMP only have marginal impacts on the whole economy since they are mostly designed to affect a particular group in the labour market.

The availability of quarterly data allowed us to

use a dynamic panel data model, i.e. to take dynamics and persistency in the labour market into account. In order to control for the problems arising in the dynamic panel data context we applied a system GMM estimator where we also accounted for the inherent simultaneity problem of ALMP. In order to solve the simultaneity problem we use lagged levels of the ALMP measures as instruments. Although this choice of instruments may not be the best, it is a valid option. Other appropriate sets of instruments are not available since they are either endogenous or suffer from too little variation.

The fact that there are major differences between the East and the West German labour markets made a separate estimate necessary for both areas. But since the number of regions available for East Germany is too small, the system GMM estimator cannot be implemented. Therefore our analysis for East Germany relies only on the within estimator (see box in Chapter 6) and should be treated with caution since the within estimator does not account for endogeneity of the lagged dependent and the ALMP measures.

2. Introduction

In view of the immense spending on ALMPs in Germany (about DEM 43 billion in 2000) and their debatable success, evaluation literature has been growing in recent years ⁽¹⁾. Most studies focus on the microeconomic approach using individual data. The importance of this approach is straightforward and the framework for such an analysis is well developed (Heckman et al., 1999). However, as the microeconomic approach usually ignores impacts on non-participants it should only be seen as a first step to a complete evaluation, to be followed by a macroeconomic analysis. Instead of looking at the effect on individual performance, we would like to know if ALMP represent a net gain to the whole economy. This is likely to be the case only if the total number of jobs is positively affected by ALMP.

Two major strands of literature on how to estimate macroeconomic effects can be distinguished. First are the structural, general equilibrium models (e.g. Davidson and Woodbury, 1993; or Heckman et al., 1998). The advantage of these studies is that they make explicit assumptions about the mechanism generating the general equilibrium effects and also provide a framework that allows estimates of many evaluation parameters (Smith, 2000). One obvious disadvantage, however, lies in the strong identifying assumptions they require ⁽²⁾. Second, authors like Forslund and Krueger (1994) prefer to use variation in programme scale across regional units (jurisdictions) combined with data at the regional level to estimate the effects. This can, in principle, also be done at national level with cross-country data, even though such an analysis might suffer from the heterogeneous policy

measures between the countries (e.g. Jackman et al., 1990).

As we want to evaluate the effects of ALMP in Germany for recent years, the second strand seems more appropriate and will be described in Chapter 4. In 1998 the legal basis for the labour-market policy in Germany changed to the new social welfare code SGB III. Changes have been made not only in the objectives, such as a more intensive focus on problem groups of the labour market, but also in the institutional organisation of labour-market policy, leading to decentralisation and more flexibility in the regional allocation of resources to different measures. This decentralisation allows an adjustment to the situation in local labour markets while requiring any evaluation to give more consideration to regional flexibility than before. The importance of suitable data, allowing regional heterogeneity to be taken into account, has to be stressed. This is especially problematic in Germany due to permanent adjustments in the regional delimitations of the labour office districts (*Arbeitsamtsbezirke*). In contrast, in other evaluation studies this is not problematic because no such changes occurred in the time under consideration.

The aim of the study is to add a new perspective to the evaluation of ALMP in Germany. This is done by using regional data to obtain macroeconomic or net effects of these measures. Therefore we focus especially on training programmes and compare these with the alternative ALMP programmes JCS and SAS.

The remainder of this paper is organised as follows. In the next chapter we give an overview of ALMP in Germany before we present some theoret-

⁽¹⁾ See Hagen and Steiner (2000) or Hujer and Caliendo (2001) for extensive overviews regarding micro- and macroeconomic evaluations of ALMP in Germany.

⁽²⁾ Those studies of the general equilibrium effects of ALMP are based on a general equilibrium model of the whole economy. Behavioural equations that are obtained from standard micro foundations describe the general equilibrium of the economy. The effects are obtained by calibrating the model, i.e. by imposing explicit functional forms for the basic equations and numerical values for the exogenous parameters. Solving the model allows the effects of ALMP to be estimated. Problems arise for the following reasons: first, the assumptions the model is built on must be correct; second, the imposed functional forms must be correct, e.g. should a utility function impose risk aversion or should it impose risk neutrality; third, the true values for the exogenous parameters must be used. Hypothetically these parameters should be estimated with econometric methods, but this often fails due to data limitations. Therefore, often arbitrary choices on those parameters are made and thus the estimated effects of ALMP are questionable.

ical issues on the macroeconometric evaluation of ALMP, which also includes a short comparison between micro- and macroeconometric evaluation approaches. Highlighting the advantages and shortcomings of each approach makes clear their necessity as additional ingredients to a complete evaluation. Furthermore we will present macroeco-

nomic theory on ALMP that is needed to build up the econometric model. Following that, we review previous empirical findings of macroeconomic evaluations in Germany before we offer our empirical analysis, where we will briefly present the methods of estimating and the results from separate estimates for East and West Germany.

3. ALMPs in Germany

Labour-market policies in Germany are organised by the Federal Employment Service (*Bundesanstalt für Arbeit*). Up to 1998, the legal basis for labour-market policy in Germany was the work promotion act, established in 1969. From 1998 the new social welfare code SGB III took over this role. Changes have been made both in the objectives, such as a more intensive focus on problem groups in the labour market, and also in the institutional organisation of labour-market policy, leading to decentralisation and more flexibility in the regional allocation of resources to different measures.

Since the data we analyse ranges from 1999 to 2001, we focus on SGB III and discuss AFG very briefly. A good overview of AFG's historical evolution can be found in Staat (1997) ⁽³⁾. The improvement of the labour force structure, i.e. the adjustment of the labour supply to the changing labour demand, was the primary goal in the early years. It was intended to deal with the continual growth of the economy that changed the labour-market conditions permanently, with a continuous adjustment to the labour force structure to fulfil the new requirements. A shortage of jobs with specific (high-level) skills and an excess of jobs requiring low skills was to be avoided.

These goals had to be quickly revised at the end of 1973 when sharply rising unemployment, connected to the first oil price shock, refocused attention. This becomes clear when we look at ALMP participation. In the early 1970s, less than 15 % of all participants had been unemployed before participation, whereas in the 1980s this was the case for almost 80 %.

After some innovations and amendments, AFG had been replaced by SGB III in 1998. A good overview of the most relevant reforms can be found in Fitzenberger and Speckesser (2000) who present an extensive discussion of the new SGB III, especially regarding the responsibility of employees for their own labour-market success.

Fertig and Schmidt (2000) explain and classify the different measures of employment promotion and explicitly distinguish between non-discretionary and discretionary measures. Brinkmann (1999) discusses aspects of decentralisation and regionalisation as well as the now mandatory output evaluations.

Whereas the AFG was implemented under full employment conditions, SGB III came into being in a harsher economic climate with labour-market policy affected by narrower budget constraints. Some of the AFG's objectives, such as securing a high employment rate and the avoidance of low-quality employment, were dropped. The most important goal (Paragraph 7.3, SGB III) is the (re)integration of problem groups into the regular labour market while using resources in an efficient way (*Grundsatz der Wirtschaftlichkeit und Sparsamkeit*). As the government sees itself only in a promoting role, SGB III places particular emphasis on the fact that employees have to act on their own authority regarding their labour-market success. This comes together with a tightening of the 'reasonableness' clause (*Zumutbarkeitsklausel*), which makes it harder for the unemployed to turn down job offers.

Besides the change of the objectives, there have also been organisational changes increasing the flexibility of ALMP on a regional and local level. Local labour offices are now allowed to allocate their budgets relatively freely to different measures. According to paragraph 71b, SGB IV, several categories of ALMP must be financed by one single budget item (*Eingliederungstitel*), which is then assigned to the regional labour office. The new feature of SGB III is now that the labour offices are free to set their priorities in relation to different programmes. This leaves the decision on the mix of instruments to the regional branch of the Federal Employment Service (Brinkmann, 1999), allowing adjustment to local labour-market conditions. Furthermore, 10 % of the budget can be used for

⁽³⁾ The main goals can be found in paragraphs 1,2 AFG and have been: (a) securing high employment; (b) avoidance of low-quality employment; (c) improvement of the structure of the labour force; (d) promotion of mobility; (e) social goals and (f) promotion of target groups.

Table 2: **Unemployment rate in Germany, 1994–2000**

	1994	1995	1996	1997	1998	1999	2000
Germany	10.6	10.4	11.5	12.7	12.3	11.7	10.7
West Germany	9.2	9.3	10.1	11	10.5	9.9	8.7
East Germany	16	14.9	16.7	19.5	19.5	19	18.8
Source: Bundesanstalt für Arbeit (2000)							

overview see Fitzenberger and Hujer (2002). Another new point in the SGB III is mandatory output evaluation. Labour offices are now required to draw up integration balances (*Eingliederungsbilanzen*, paragraph 11, SGB III), including, most importantly, the employment status of each participant some time after completion of a measure. Unfortunately the integration balance cannot be seen as a proper evaluation approach, since it does not compare the status of participants with the status of comparable non-participants. Therefore the question of how the participants would have done without the programme cannot be answered with an integration balance.

Any evaluation of the efficiency of labour-market policy must give more consideration than before to regional flexibility and take into account the various support strategies developed by the labour offices (Brinkmann, 1999).

Table 1 shows the spending on labour-market policies in Germany from 1998 to 2000. Whereas in 1998 only 29.6 % of total spending was dedicated to active measures, the proportion rose to 34.2 % in 2000. In West Germany, the proportion of ALMPs rose from 23.5 % to 30.6 %, though it remained relatively stable in East Germany at around 40 %. One obvious reason for the limited success in switching resources into active measures is the constantly high unemployment rate in East Germany (Table 2). As unemployment benefits are entitlement programmes and most active measures are discretionary in nature, the former increase automatically with a rising unemployment rate, whereas the latter are more easily discarded.

The most important measures in 2000 were the promotion of further FbW with DEM 13.31 billion and subsidised employment, consisting of traditional JCS with DEM 7.2 billion and SAS with DEM 2.67 billion.

In principle, public vocational training under AFG comprised three types of training measures, namely further training (*Fortbildung*), retraining (*Umschulung*) and training to familiarise with a new occupation (*Einarbeitung*) ⁽⁴⁾. The first two types have been summarised in one item (paragraphs 77–96, 153–159, 517, SGB III). The latter is now part of employment subsidies and will not be discussed here ⁽⁵⁾. The Federal Employment Service pays the costs of the training measures and a subsistence allowance (*Unterhaltsgeld*) to the participants, which amount to 60 % (67 % with one or more children) of the previous net income (equal to unemployment benefit). The main goals are to reintegrate the unemployed by improving their skills and to avert the danger of unemployment for employees at risk.

The German subsidised employment programmes consist of JCS and SAS. JCS is the more important programme in East and West Germany, with expenditure in 2000 of DEM 7.2 billion. JCS (paragraphs 260–271, SGB III) are normally only available to non-profit organisations. They should support activities which are of value to society and additional in nature, that is without the subsidy they could not be executed. Priority is given to projects which improve the chance of permanent jobs, that support structural improvement in social or environmental services or that aim at the integration of extremely hard-to-place individuals. SAS (paragraphs 272–279, SGB III) is particularly prominent in East Germany, with spending amounting to DEM 2.4 billion in 2000. Their goal is, analogous to JCS, integration into regular employment, but less severe eligibility criteria apply to participants, so both the unemployed and individuals threatened by unemployment may participate. The SAS consist of a wage subsidy equal to the average amount of unemployment allowance or

⁽⁴⁾ See Hujer and Wellner (2000) for an overview of vocational training under the AFG.

⁽⁵⁾ See Hujer et al. (2001) for an overview.

assistance (including contributions to the social security system) paid in the Federal territory.

Looking at the distribution of spending on different measures, considerable differences between East and West Germany become clear. The main measure used in the West is FbW, where expenditures amount to DEM 7.94 billion, corresponding to a share of 10.16 % of total spending. The next important measures are JCS with a share of 2.56 % and SAS with 0.36 %. In East Germany, the situation is much more balanced. Again, FbW is the most important programme (DEM 5.37 billion, 11.24 %) but JCS (DEM 5.2 billion, 10.87 %) follow closely.

The discrepancy between both parts also becomes clear in Figures 7 and 8 in the annex. They show the number of participants in the three most important programmes for East and West Germany from April 1997 to April 2000. In West Germany, an average of 200 000 individuals

participated in FbW in every quarter, 50 000 in JCS and around 8 000 in SAS. The ratio of participants to unemployed is 1:10.

As expected, the situation in East Germany is different. First, participation in the different measures is more balanced. The most important measures are JCS with 143 000 participants on average, followed by SAS with 137 000 and FbW with 134 000. The ratio of participants to unemployed is 1:3.

After looking at spending on the different measures and the participating individuals, it is also interesting to look at the average duration of the measures. This should give us important hints on the lag structure for our latter analysis. The average duration for the measures under consideration in 1999 is between 8 and 10 months. JCS have the shortest duration with 8.3 months, followed by FbW (8.4 months) and SAS with 9.8 months (*Bundesanstalt für Arbeit*, 2000).

4. Theoretical issues on the evaluation of ALMP

The ideal evaluation process consists of three steps. First, the impact of the programme on the participating individual should be estimated. Second, it should be examined whether the impacts are large enough to yield net social gains. Finally, it should be determined if this is the best outcome that could have been achieved for the money spent (Fay, 1996).

The main question of microeconomic evaluation is whether the particular outcome variable for an individual is affected by participation in an ALMP programme. That being so, the direct gain can be compared with the associated costs and the success of the programme can be judged. However, microeconomic approaches estimate, in nearly all cases, the effect of treatment on the treated. One important concept in this context is the stable unit treatment value assumption (SUTVA) (Rubin, 1980). One implication of SUTVA is that the effect of the intervention on each individual is not affected by the participation decision of any other individual, i.e. the treatment effect for each person is independent of the treatment of other individuals. This assumption guarantees that average treatment effects can be estimated independently of the size and composition of the treatment population. Among other things SUTVA excludes cross-effects or general equilibrium effects. Even though its validity facilitates a manageable formal setup, in practical applications it is frequently questionable whether it holds. If one looks at the immense amounts spent on ALMP in Germany and the large scale of the programmes, spill-over effects on non-participants are very likely. Therefore the microeconomic approach is partially analytical and should only be seen as one step in a complete evaluation or, as Heckman (1999) puts it, microdata are no panacea and must be used in conjunction with aggregate time-series data to estimate the full general-equilibrium consequences of policies.

Important negative effects that a microeconomic evaluation ignores are deadweight losses and substitution effects ⁽⁶⁾. If the outcome of the programme is not different from what would have

happened in its absence, we talk about a dead-weight loss. A common example is the hiring from the target group that would have occurred also without the programme. If a worker is taken on by a firm in a subsidised job instead of an unsubsidised worker who would have been hired otherwise, we talk about a substitution effect. In this context it is also possible that a worker is dismissed and replaced by a subsidised worker. The net short-term employment effect in this case is zero. Such effects are likely in the case of subsidies for private-sector work. There is always a risk that employers hold back ordinary job creation in order to be able to take advantage of the subsidies. Another problem might be that ALMP crowd out regular employment. This can be seen as a generalisation of the so-called displacement effect. This effect typically refers to displacement in the product market, e.g. where firms with subsidised workers increase output but displace (reduce) output among firms that do not have subsidised workers. Calmfors (1994) also stresses the importance of tax effects in the sense that programmes have to be financed by taxes which distort the choices of both participants and non-participants.

To see how problems can arise if one neglects such effects let us discuss an example. As the outcome variable of interest in Germany is usually employment for participants, we consider a wage subsidy programme that aims to increase the employment probability of the long-term unemployed by giving employers a subsidy if they hire an individual out of the target group. The usual microeconomic approach analyses the effects on the labour supply side of the market by looking at the individual's performance. Where the individual got a job because of the subsidy, the programme was a success. The shortcoming is, however, the possible occurrence of substitution or displacement effects, e.g. if an unsubsidised worker is fired to hire a subsidised worker. Hujer et al. (2001) suggest estimating the success of wage subsidies on the labour demand side of the market by looking at the employ-

⁽⁶⁾ For details see Hujer et al. (2002).

ment situation within the firm. In this way, substitution effects within the firm already ‘net out’ and give a clearer picture of the net effects. Displacement effects between firms, however, cannot be detected with this approach. Clearly, these effects have to be taken into account if one intends to make statements about the net effect of ALMP.

As the outcome variable in a macroeconomic evaluation is an aggregated variable, substitution and displacement effects plus the deadweight losses can be taken into account.

Estimating the effects on aggregate variables is not straightforward and, compared to the amount of micro-analysis, existing literature is relatively small. This might have several causes, such as the inherent simultaneity problem or the availability of suitable data. The issue of simultaneity arises because spending on ALMP should influence the labour-market situation but might also be determined by it. The major obstacle, however, is the absence of an obvious theoretical framework within which to couch the analysis. Leaving aside the traditional way of ‘cheating the Phillips curve’, i.e. improving the unemployment-inflation trade-off and thereby reducing the non-accelerating inflation rate of unemployment (Bailey and Tobin, 1977), a model is needed that explains the relevant labour-market variables (e.g. regular employment or unemployment) and is also capable of incorporating ALMP.

The most important requirement of a macroeconomic model used to analyse ALMP is that it has to be able to explain a positive equilibrium unemployment rate. Theoretical considerations on ALMP are, therefore, mostly based on the Layard and Nickell framework or the search model framework (e.g. Pissarides, 2000). Both models differ in their primary reason for equilibrium unemployment. In the framework presented by Layard and Nickell (1986), unemployment is generated through a wage setting process that pushes wage rate over the equilibrium rate generated by labour demand and supply. One possible explanation for these wage distortions is the power of unions in the wage bargaining process or efficiency wages. Search models on the other hand assign the cause of unemployment to a time and cost consuming matching process. Theoretical considerations on the impacts of ALMP in these two frameworks are given for example by Calmfors and Lang (1995) and by

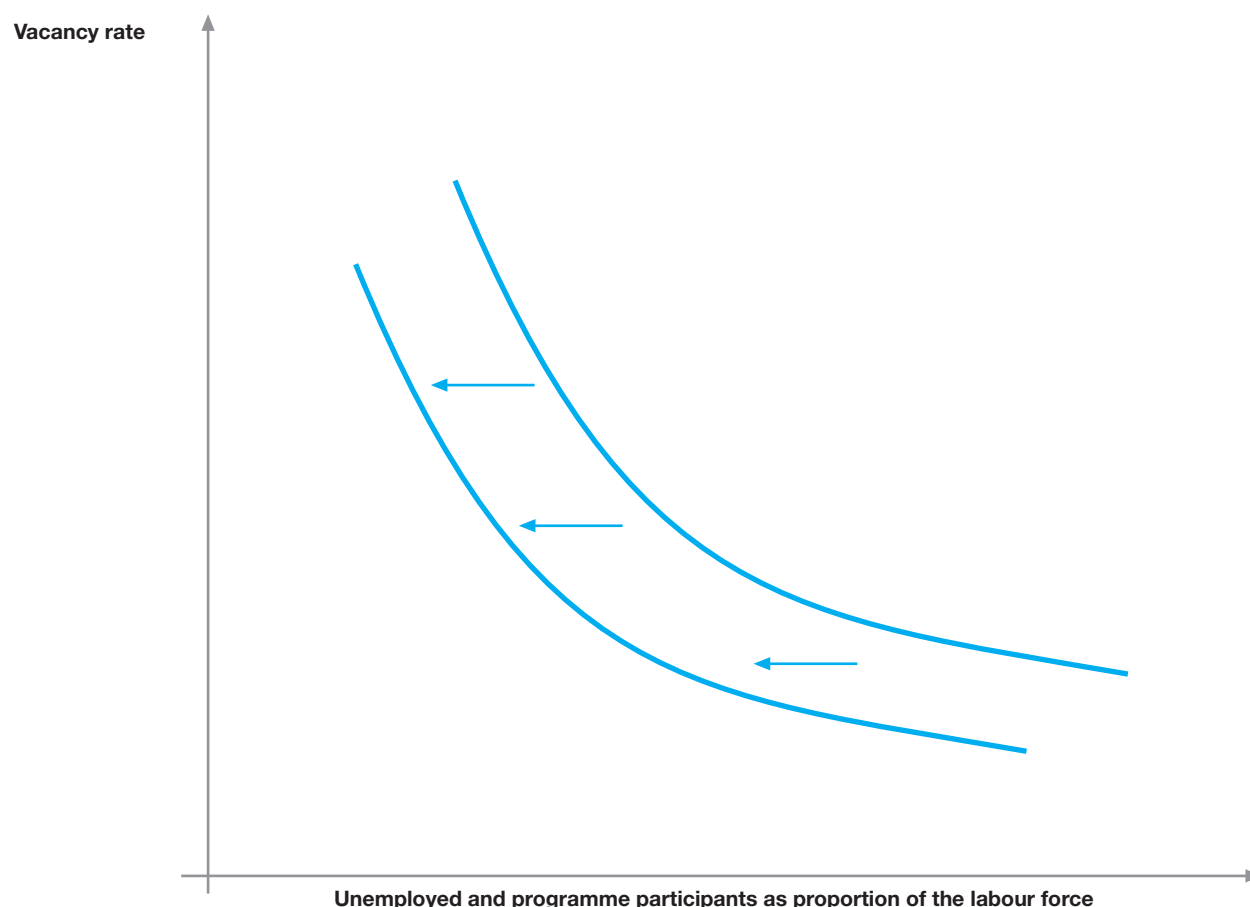
Holmlund and Lindén (1993). Additionally, both frameworks can be combined to approximate usual labour-market situations more realistically (Calmfors and Lang, 1995).

Considering the traditional aims of ALMP, and especially vocational training programmes, to overcome structural imbalances in the labour market, the search model framework seems most advantageous for analysing the impacts of ALMP. The core element of these models is a matching function that determines the number of new recruitments with respect to the stock of the effective job seekers and the stock of vacancies. Effective job seekers are mostly defined as the weighted sum of the programme participants and the unemployed, where the weights are given by the search efficiency of the respective group (Holmlund and Lindén, 1993) (Calmfors and Lang, 1995). Search efficiency can be thought of as a parameter that summarises various characteristics that determine the efficiency of job seekers in finding a successful match. This includes search intensity, i.e. how much effort a job seeker puts into actively searching for a job, or the level of education or experience in the occupational career of the job seeker. If ALMP is able to improve the search efficiency of the group of participants and if this group is large enough, the programme would be able to improve the matching process, i.e. to increase the number of new recruitments for a given stock of vacancies and job seekers.

Calmfors (1994) gives three explanations of how ALMP can help to improve search efficiency. First, ALMP can increase the search intensity of programme participants by encouraging them to search more actively. Second, ALMP can upgrade the skills of participants and adjust them to labour demand. Third, participation can serve as a substitute for regular work experience which can reduce the employer’s uncertainty about the employability of the job applicant.

However, there are also negative effects on search efficiency if the programme implies full time engagement. In the case of full time employment, ALMP programmes should be expected to reduce search efficiency because the effective time available for an active job-search would be reduced. But this locking-in effect reduces the search efficiency only when participants are in the programme. After the programme expires, the

Figure 1: The revised Beveridge curve



search efficiency of participants should be higher relative to other unemployed.

The usual strategy for evaluating the effect of ALMP on the matching process would be to estimate the matching function itself, i.e. to regress new recruitments against the number of unemployed, programme participants and vacancies. Unfortunately, no reliable data on new recruitments are available to allow for unbiased estimates for the parameters of the matching function. Furthermore, an estimate of the matching function would not deliver a complete picture of the effects of ALMP, as it only considers the effects on inflows into employment; the effects of ALMP on existing jobs are omitted. If, for example, ALMP helps to increase the level of hiring, we do not know if such hiring only replaces existing jobs, leaving employment constant.

The Beveridge curve (i.e. the unemployment-

vacancy relationship) can be used to circumvent this problem. The Beveridge curve is a steady state condition where the outflow from employment equals new intake. Since the matching function ensures the simultaneous coexistence of unemployment and vacancies, the Beveridge curve results directly from the existence of the matching function. Therefore, as Petrongolo and Pissarides (1999) note, the Beveridge curve can be used as an indirect way estimating matching efficiency.

For our empirical analysis we will follow Calmfors (1994) and use the revised Beveridge curve which relates job seekers, i.e. the unemployed and programme participants to vacancies. The utilisation of the revised Beveridge curve is important since it avoids estimating the book-keeping effect. In particular, a rise in programme participation is usually associated with a proportional decrease in the unemployed ⁽⁷⁾. Therefore,

(7) Note that this depends if unemployment is an eligibility criteria for being placed into a programme.

an application of the conventional unemployment vacancy relationship would lead to an overestimation of the effects of ALMP. The revised Beveridge curve (i.e. the relationship between the vacancies and the sum of openly unemployed and programme participants) therefore allows an estimate of the net effect of ALMP.

In Figure 1 we have plotted the revised Beveridge curve, i.e. the relationship between the unemployed plus the programme participants and the vacancies. If the programme participants come from the unemployed, a programme expansion would not lead to a shift of the revised Beveridge curve in Figure 1.

But if ALMP improves search efficiency, and therefore matching efficiency, there would be a shift of the revised Beveridge curve to the origin because the number of vacancies and job seekers is reduced simultaneously.

But there may also be consequences for existing jobs, in that ALMP can tend to increase wages or to change productivity ⁽⁸⁾. The most important effects of ALMP with respect to wages are reduced welfare losses where ALMP participation is associated with an expected higher income compared to being unemployed, so the welfare losses of being unemployed are reduced. The expected higher income might result from a higher compensation level compared to unemployment benefits and/or from better job oppor-

tunities resulting from programme participation. In a wage bargaining process between workers and firms the expected higher income leads to an increase in wage claims of workers, and so to higher wage rate.

The productivity effect of ALMP programmes may be assigned to the fact that participation serves as a substitute for work experience. In the case of training programmes that are aimed at improving skills, an impact on the productivity is part of the objectives.

An important point in this context is that productivity effects depend heavily on the type of participant. If the skill level of participants is relatively low, a training programme has greater effects on productivity than if the skill level of participants is relatively high.

Since the effects on productivity and wage rate also affect the Beveridge curve we cannot observe the pure effect resulting from changes in the matching process. Implementing the revised Beveridge curve as an econometric model relates more to a reduced form model which can be used to estimate the overall effect. In theory, the important effects of ALMP besides the effect on the matching process are reduced welfare losses of unemployment, effects on productivity and labour force participation. Since data limitations do not allow for the estimation of structural relationships we cannot analyse these effects separately.

⁽⁸⁾ See Calmfors (1994) for an extensive theoretical discussion of the effects of ALMP.

5. Previous empirical findings for Germany

We will now give a brief overview of empirical findings from macroeconometric evaluations for Germany on a regional level.

Büttner and Prey (1998) use yearly data (from 1986 to 1993) from 74 planning regions of West Germany to evaluate the effects of training programmes and public sector job creation on labour-market efficiency. They use a disequilibrium approach and their results suggest that training programmes have no effect and job creation programmes have a significant positive effect on matching efficiency.

Prey (1999) extends this work by additionally controlling for regional age structure and recipients of welfare assistance and estimating separately for men and women. She finds that vocational training increases (decreases) the mismatch for women (men), whereas JCS decrease the mismatch for men. Thus she finds an opposite effect for men and women.

Pannenberg and Schwarze (1998) use the data from 35 local labour office districts to evaluate training programmes in East Germany. They use monthly data from 1992 to 1994 and find that the programmes have negative effects on regional wages.

Steiner et al. (1998) examine the effects of vocational training on labour-market mismatch using data from 35 local labour office districts in East Germany. They observe only very small effects on matching efficiency which disappear in the long-run.

Schmid et al. (2000) use yearly data from 142 local labour office districts to estimate the effects of further training, retraining, public sector job creation and wage subsidies on long-term unemployment from 1994 to 1997. They find that job creation programmes reduce only 'short'

long-term unemployment (6-24 months), whereas vocational training reduces long-term unemployment (>24 months).

Hagen and Steiner (2000) evaluate vocational training, JCS and SAS in East and West Germany using data from local labour office districts. The time period under consideration differs and ranges from 1990 to 1999. The estimated net effects are not very promising as all measures increase unemployment in West Germany. Only SAS reduces the unemployment rate slightly in East Germany, whereas JCS and vocational training increase it.

Blien et al. (2002) analyse the effects of ALMP on the development of regional employment in Eastern Germany and find positive impacts. They use detailed data from employment statistics covering 1993 to 1999. Their regional units are 112 districts (*Landkreise/ kreisfreie Städte*). Their method is an econometric equivalent to conventional shift-share analysis (based on constrained regression), which is extended to include many determining variables.

These studies demonstrate immense differences in the results. The inherent simultaneity problem of ALMP may serve as an explanation, since it is not evident how to tackle this problem. Furthermore all empirical models relate to different theoretical backgrounds, i.e. they use different specifications for the empirical analysis. As Calmfors and Skedinger (1995) note, the exact specification and the methods of estimation seem to be crucial for the results of a macroeconometric evaluation. This may result from the fact that ALMP have marginal impacts on the whole economy, since they are mostly designed to affect a particular group in the labour market. Therefore, it is not only an appropriate econometric model that is necessary to identify the effects of ALMP on the whole economy but also appropriate methods of estimating.

6. Estimation methods

The empirical analysis undertaken by the authors exploits a pooled time-series cross-section data set for the German labour office districts. This data was taken from administrative processes in the Federal Employment Service. The cross section in this data set comes from the administrative areas of the local offices of the Federal Employment Service in Nuremberg. Putting East and West Germany together we have 175 regional units. As discussed

in Chapter 3, the immense differences between the East and the West German labour markets make it necessary to analyse both areas separately. The number of cross sections for West Germany are $N=141$ and $N=34$ for East Germany ⁽⁹⁾.

The time span ranges from the first quarter 1999 to the fourth quarter 2001, leaving us $T=12$ observations for each labour office district. The basic equation we want to estimate is given by

$$c(L)s_{it} = a_0 + b_1(L)v_{it} + b_2(L)\Psi_{it} + b_3(L)X_{it} + u_{it},$$

where s_{it} denotes the total rate of job seekers (JSR) at time t for region i , that is defined as the sum of unemployed and participants in ALMP programmes relative to the labour force. v_{it} is the vacancy rate (VR), i.e. the number of vacancies relative to the labour force. Ψ_{it} is a vector containing the measures for the activity of ALMP programmes JCS, SAS and FbW. ALMP activity is measured with so-called accommodation ratios that are defined as the sum of programme participants relative to the stock of job seekers. X_{it} is a vector that summarises other explanatory variables, such as national unemployment (NUR) and national vacancy rate (NVR) as well as seasonal dummies to control for the cyclic pattern in quarterly data.

$c(L) = 1 - c_1L - c_2L^2 - \dots - c_pL^p$ is a polynomial in the lag operator associated with the job seeker rate, with p as maximum lag, and $b_j(L) = b_{j0} + b_{j1}L + b_{j2}L^2 + \dots + b_{jq}L^q$ is a polynomial in the lag operator associated to the vacancy rate, the ALMP measures and the other explanatory variables, with q as maximum lag. Therefore q need not be the same for all variables. The imposed dynamic specification enables us to control for the highly persistent pattern of the unemployment rate. Since the average duration of German ALMP programmes is about 8 to 10 months, the inclusion of several lags for the ALMP measures seems to be crucial for identification.

The job seeker rate is included as explanatory with four lags. The vacancy rate and ALMP measures are included up to the fourth lag and the national variables are included with the first and the second lag. Therefore, we cover exactly one year using quarterly data.

While attempting to make clear statements about the effects of ALMP measures on the job seeker rate, the interpretation of the parameters with the inclusion of four lags may be a bit cumbersome.

A more straightforward interpretation of results is the use of so-called lag coefficients. Lag coefficients describe the impact of an ALMP expansion in t on the job seeker rate after $t+q$ quarters, e.g. the second lag coefficients gives the change of the job seeker rate resulting from an ALMP expansion two quarters ago ⁽¹⁰⁾.

The overall effect of an ALMP expansion, i.e. the total change in job seeker rate after q quarters is then simply given by the sum of the lag coefficients up to the q 'th quarter. We use the cumulative lag coefficients to make a general statement about the effects of an ALMP expansion through time.

For the residual u_{it} we assume a one way error component structure, i.e. $u_{it} = \mu_i + \varepsilon_{it}$, with μ_i as an unobserved regional specific effect and ε_{it} as a residual varying over the regions and time.

The empirical model relates to a revised

⁽⁹⁾ Due to data limitations, Berlin is excluded from the analysis.

⁽¹⁰⁾ See Greene (2000) for the calculation of the lag coefficients.

Beveridge curve, explaining total unemployment (i.e. the job seeker rate) as a function of vacancies and the ALMP measures. There are two major concerns in estimating the effects of ALMP. First, our model is a dynamic panel data model where usual estimation methods such as ordinary least squares (OLS) or the within transformation are biased (e.g. Baltagi, 2001). The bias of the OLS estimator results from the non-zero correlation of the explanatory variables with regional specific effects, i.e. we would face a violation of the classical OLS assumptions (Greene, 2000). As discussed in Baltagi (2001) the OLS estimator tends therefore to be upward biased with respect to the autoregressive parameters. In contrast to the OLS estimator, the within estimator accounts for the correlation with the regional specific effect by transforming the data so that the regional specific effect is removed.

This transformation is appropriate for static models (i.e. no lagged dependent variable is included in the econometric model) but leads to biased estimates in the case of dynamic panel data models.

A second issue is that the ALMP measures in Ψ_{it} should be expected to be determined by a policy reaction function, i.e. the job seeker rate and the ALMP measures are determined simultaneously.

In order to handle both problems we apply the system GMM estimator suggested by Blundell and Bond (1998). In our macro application we must expect that those variables that vary over the regions (i.e. JSR, VR, JCS, SAS and FbW) are all correlated with the regional specific effect μ_i . If we consider the first differences residual

$$\Delta u_{it} = c(L)\Delta s_{it} - a_0 - b_1(L)\Delta v_{it} - b_2(L)\Delta \Psi_{it} - b_3(L)\Delta X_{it}$$

The econometric model used for estimating the effects of ALMP is a dynamic panel data model. Dynamic refers to a specification where the lagged values of the dependent variable (the job seeker rate) are used as explanatory variables. A panel data model uses data where cross sectional data (observations for different regions) and time series data (a sequence of observations in time) are combined.

OLS estimator

The OLS (ordinary least squares) estimator is a simple estimation method that ignores the regional specific differences in the data. In particular, if these differences are not fully represented by the explanatory variables but are correlated with them, the OLS estimator leads to biased estimates. In the case of a dynamic model this problem is particularly severe since a regional specific effect that is constant in time affects the actual and lagged job seeker rate. Therefore the explanatory variable is a priori correlated with the regional specific effect.

Within estimator

The within estimator utilises a data transformation that ensures that the regional specific effect is removed. Application of the OLS estimator on the transformed data leads to the within estimator. Unfortunately, in the case of a dynamic model, the within transformation produces a correlation between the lagged dependent variable and the residual term. This correlation leads to biased estimates when the within estimator is used for dynamic models.

System GMM estimator

Usual panel data estimation methods are not valid for dynamic models. In order to obtain reliable estimates the system GMM estimator is a useful alternative. The basic idea is to combine the model equation in first differences with the model equation in levels. Since there is a considerable loss of information due to the first differencing the additional equations in levels improve the performance of the System GMM estimator. In contrast to the OLS and the within estimator the system GMM estimator results in consistent estimates for dynamic panel data models.

where Δ is the first differenced operator, i.e. $\Delta X_{it} = X_{it} - X_{it-1}$, we see that the regional specific effect is removed from the first differenced residual. Therefore the system GMM estimator uses moment conditions that are based on the equations in first differences. Following Arellano and Bond (1991) we can set up the following moment conditions for the lagged dependent variable:

$$E(s_{it-g} \Delta u_{it}); \text{ for } t = 6, \dots, T \text{ and } 2 \leq g \leq t-1.$$

Note that these moment conditions require that there is no serial correlation in ε_{it} . We assume that the ALMP measures are endogenously determined, and thus we can set up the moment conditions analogously to the lagged dependent variable.

$$E(\Psi_{it-g} \Delta u_{it}); \text{ for } t = 6, \dots, T \text{ and } 2 \leq g \leq t-1.$$

Due to the utilisation of this moment condition we use lagged levels of the ALMP measures as instruments for the current and the first lagged ALMP measure. Thinking about ALMP determined by a policy reaction function, the question arises whether there may exist better instruments to tackle the simultaneity problem. Calmfors and Skedinger (1995) for example proposed the utilisation of political measures such as the share of seats in the parliament assigned to the left parties. Unfortunately, for Germany such a measure would suffer from too small variation. Since elections usually take place every four years, the time dimension of the data set does not even cover one legislature period. Furthermore, the regional units are the administrative offices of the labour office whereas political data is on country or *Länder* level. Therefore political data would not vary significantly in the time dimension as well as in the cross section. In addition, the labour office is a tripartite body and not governed by national government, but also by social partners.

Other possible instruments could be regional variables resulting from the administrative processes of local labour offices, such as youth

unemployment or long-term unemployment. Unfortunately, a strong interdependency is likely between these variables and the job seeker rate, i.e. these variables are also endogenous and thus cannot be valid instruments.

Therefore we use only lagged levels of the ALMP measures as instruments, bearing in mind that although these instruments may not be the best instruments, they are valid.

We assume that the vacancy rate is also endogenously determined. Standard search theory predicts that the number of vacancies supplied by firms depends on the labour market. In particular the number of vacancies supplied by firms depends on the unemployment rate since a higher unemployment rate implies a shorter time in which vacancies remain open. This is equivalent to a cost reduction that makes a vacancy more profitable. Bearing these theoretical considerations in mind we assume that the vacancy rate is endogenously determined and thus the following moment conditions are valid:

$$E(v_{it-g} \Delta u_{it}); \text{ for } t = 6, \dots, T \text{ and } 2 \leq g \leq t-1.$$

For the variables in X_{it} that contain no regional information we simply use them to instrument themselves, i.e. we imply that the following orthogonality conditions must hold:

$$E(\Delta X_{it} \Delta u_{it}) = 0.$$

Furthermore the system GMM estimator uses moment conditions that are based on the equations in levels, i.e. the moment conditions refer to the level residual given by:

$$u_{it} = c(L)s_{it} - a_0 - b_1(L)v_{it} - b_2(L)\Psi_{it} - b_3(L)X_{it},$$

The following moment conditions relate to the assumption that the regional variables s_{it} , Ψ_{it} and v_{it} in first differences are not correlated with the regional specific effect μ_{it} . In this case we can use the variables in first differences as instruments, i.e. the following moment conditions are valid:

$$E(\Delta \Psi_{it-g} u_{it}); \text{ for } t = 6, \dots, T \text{ and } g = 1, \dots, 4$$

$$E(\Delta s_{it-g} u_{it}); \text{ for } t = 6, \dots, T \text{ and } g = 1, \dots, 4$$

$$E(\Delta v_{it-g} u_{it}); \text{ for } t = 6, \dots, T \text{ and } g = 1, \dots, 4$$

Finally, we again use the variables in X_{it} simply as instruments for themselves, i.e. we impose the moment conditions:

$$E(X_{it}u_{it}) = 0$$

This moment condition states simply that we predict the X_{it} with themselves since they are not correlated with the residual u_{it} .

For the calculation of the system GMM estimator, the indicated set of moment conditions is used ⁽¹¹⁾. Furthermore, Monte Carlos simulations have shown that the heteroscedasticity consistent two-step estimates for the system GMM estimator are downward biased ⁽¹²⁾. In order to make reliable inference we use a finite sample correction for the asymptotic variance of the two step estimates as proposed by Windmeijer (2000). In

order to test the sensitivity of the results from the system GMM estimator, we additionally present the results from the OLS and the within estimator.

Unfortunately, the system GMM estimator cannot be calculated for East Germany since there are not enough cross sections at hand. As we have only 34 cross sections but 12 time observations at hand, the number of moment conditions becomes too large relative to the number of cross sections and thus the estimates are not reliable. In order to make some statements about East Germany, we calculate OLS and the within estimator. But the results from both estimators should be treated with caution because they do not control for the problems in the dynamic panel data context as well as for the simultaneity problem of ALMP.

⁽¹¹⁾ For details see Blundell and Bond (1998) or Blundell et al. (2000).

⁽¹²⁾ For system GMM estimator there exist a one- and a two-step estimator. Whereas the one-step estimator is obtained from a restricted variance-covariance matrix, the two-step estimates are obtained from an unrestricted one. The unrestricted variance-covariance matrix is estimated from the one-step estimates (for details see Blundell et al. (2000)).

7. Empirical analysis

Estimating the effects of ALMP on the job seeker rate is done separately for East and West Germany. For both regions the estimates are done with the same model, with the exception that for West

Germany the SAS are not included. This is because the SAS are of minor importance in West Germany. Tables 7 and 8 in the annex show that there are, on average, only 62 people in SAS programmes in

Table 3: **Estimate results for West Germany (OLS and within estimator)**

Variable		OLS estimator		Within estimator	
		Param.	t-value	Param.	t-value
	Const.	0.2778	6.773	-	-
Job seeker rate	JSR_{t-1}	0.8480	16.587	0.4508	5.509
	JSR_{t-2}	-0.1208	-1.603	-0.2583	-4.034
	JSR_{t-3}	0.1222	4.051	-0.0121	-0.476
	JSR_{t-4}	0.1157	0.974	-0.2020	-0.667
Vacancy rate	VR_t	0.0661	0.330	0.0007	0.006
	VR_{t-1}	-0.1083	-1.502	-0.1962	-3.356
	VR_{t-2}	0.0579	1.750	-0.0645	-1.430
	VR_{t-3}	0.0226	0.894	-0.0359	-0.618
	VR_{t-4}	-0.0987	-0.596	-0.1971	-1.709
Participants in job creation schemes	JCS_t	-0.3983	-6.192	-0.3753	-5.251
	JCS_{t-1}	0.3966	4.132	0.2655	3.701
	JCS_{t-2}	0.1783	2.048	0.2293	1.774
	JCS_{t-3}	-0.0742	-1.581	0.0010	0.017
	JCS_{t-4}	-0.0783	-1.460	-0.1318	-1.280
Participants in vocational training	FbW_t	-0.1119	-4.862	-0.1449	-4.351
	FbW_{t-1}	0.1487	5.522	0.1144	6.322
	FbW_{t-2}	-0.0541	-3.226	-0.0537	2.680
	FbW_{t-3}	0.0327	2.136	0.0106	0.745
	FbW_{t-4}	-0.0472	-2.305	-0.0710	-2.567
National unemployed rate	NUR_{t-1}	-1.9988	-3.708	0.0309	0.034
	NUR_{t-2}	-0.1583	-0.547	1.1980	1.874
National vacancies rate	NVR_{t-1}	-3.0450	-2.527	2.3923	0.709
	NVR_{t-2}	-2.9899	-2.494	-0.7527	0.923
Seasonal dummy 1	SD_1	-0.0094	-7.332	0.0063	0.897
Seasonal dummy 2	SD_2	0.0058	0.676	-0.0022	-0.295
Seasonal dummy 3	SD_3	0.0023	1.316	-0.0133	-1.332
Wald test of joint significance		[26]	156544.178	[26]	7716.9457
First-order serial correlation		[141]	3.95	[141]	-4.136
Second-order serial correlation		[141]	1.97	[141]	-0.133

West Germany, whereas East Germany has 3 105. The other ALMP measures, namely JCS and FbW are included for both regions.

The results for West Germany resulting from the OLS and the within estimator are reported in Table 3. Considering the coefficients for the job seeker rate, we find a strong persistent pattern

for the OLS estimator and a weak persistent pattern for the within estimator. Therefore the estimates from the within estimator predict that after a unit shock (i.e. a one-shot increase) the job seeker rate adjusts much faster to the primary level (i.e. the level before the shock) than compared with the OLS estimates. This coincides

Table 4: **Estimate results for West Germany (GMM estimator)**

Variable		System GMM estimator	
		Param.	t-value
	Const.	0.3267	6.123
Job seeker rate	JSR_{t-1}	0.8591	21.909
	JSR_{t-2}	-0.0928	-1.237
	JSR_{t-3}	0.0895	2.759
	JSR_{t-4}	0.1044	0.998
Vacancy rate	VR_t	0.1784	0.526
	VR_{t-1}	-0.1086	-1.090
	VR_{t-2}	0.0438	0.873
	VR_{t-3}	0.0303	0.760
	VR_{t-4}	-0.1825	-0.699
Participants in job creation schemes	JCS_t	-0.7612	-5.568
	JCS_{t-1}	0.7873	5.198
	JCS_{t-2}	0.0004	0.004
	JCS_{t-3}	0.0833	1.316
	JCS_{t-4}	-0.0941	-1.686
Participants in vocational training	FbW_t	-0.2068	-4.712
	FbW_{t-1}	0.2217	6.617
	FbW_{t-2}	-0.0707	-3.308
	FbW_{t-3}	0.0245	1.176
	FbW_{t-4}	-0.0293	-1.334
National unemployed rate	NUR_{t-1}	-2.0112	-3.143
	NUR_{t-2}	-0.4238	-1.051
National vacancies rate	NVR_{t-1}	-1.7853	-1.417
	NVR_{t-2}	-5.7245	-3.786
Seasonal dummy 1	SD_1	-0.0105	-6.362
Seasonal dummy 2	SD_2	-0.0009	-0.094
Seasonal dummy 3	SD_3	-0.0003	-0.189
Wald test of joint significance		[26]	34822.626
Sargan test		[241]	124.871
First-order serial correlation		[141]	-2.189
NB: Parameters are the two-step estimates of the system GMM estimator Corrected standard errors as suggested by Windmeijer (2000)			

with the insight that, with respect to the autoregressive parameters, the OLS estimator tends to be upward biased and the within estimator downward biased.

Turning to the results from the system GMM estimator in Table 4, we find that the cumulative coefficients for the lagged dependent variable imply a persistent pattern that is slightly below the pattern of the OLS estimator. This means that the estimates from the system GMM estimator suggest a faster adjustment after a unit shock compared to the OLS estimates. Therefore the results from the system GMM estimator look most favourable.

There is no clear negative relationship between the vacancy rate and the job seeker rate for all estimators. In particular, the coefficients on the vacancies resulting from the system GMM estimator are entirely insignificant and thus the existence of any relationship between the total unemployment rate and the vacancy rate as predicted by the Beveridge curve is not observable. It is important to note in this context that the vacancy rate resulting from the administrative data does not contain all vacancies in the economy. This is because not all open vacancies are reported to the labour office and therefore the vacancy rate

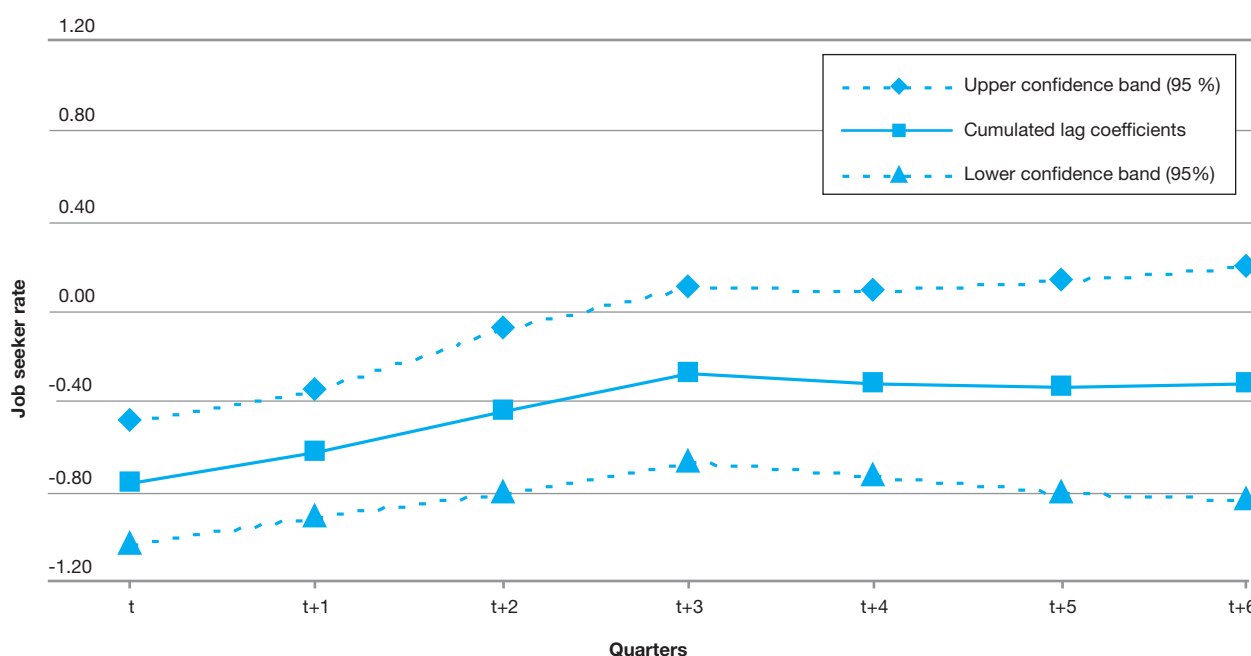
describes only a fraction of the labour market. Hence one should be cautious when making any statements about the existence of the Beveridge curve when relying on administrative data for the vacancy rate.

Turning to the coefficients for the ALMP measures, we find that the signs of the coefficients for JCS differ only for the third lag, but the coefficient is not significant. Considering the magnitude, the system GMM estimator implies much stronger effects from the contemporaneous and the first lagged job creation scheme measure. For the coefficients on FbW, there are no differences in the signs and the magnitude is rather similar between the different estimators.

We choose to calculate the lag coefficients up to $t+6$ quarters and to summarise the effect beyond this timeframe with the long run effect⁽¹³⁾. Therefore we can analyse the effects up to 1.5 years after a programme expansion has occurred. The cumulative lag coefficients resulting from the system GMM estimates are plotted in Figure 2 for the JCS and in Figure 3 for FbW.

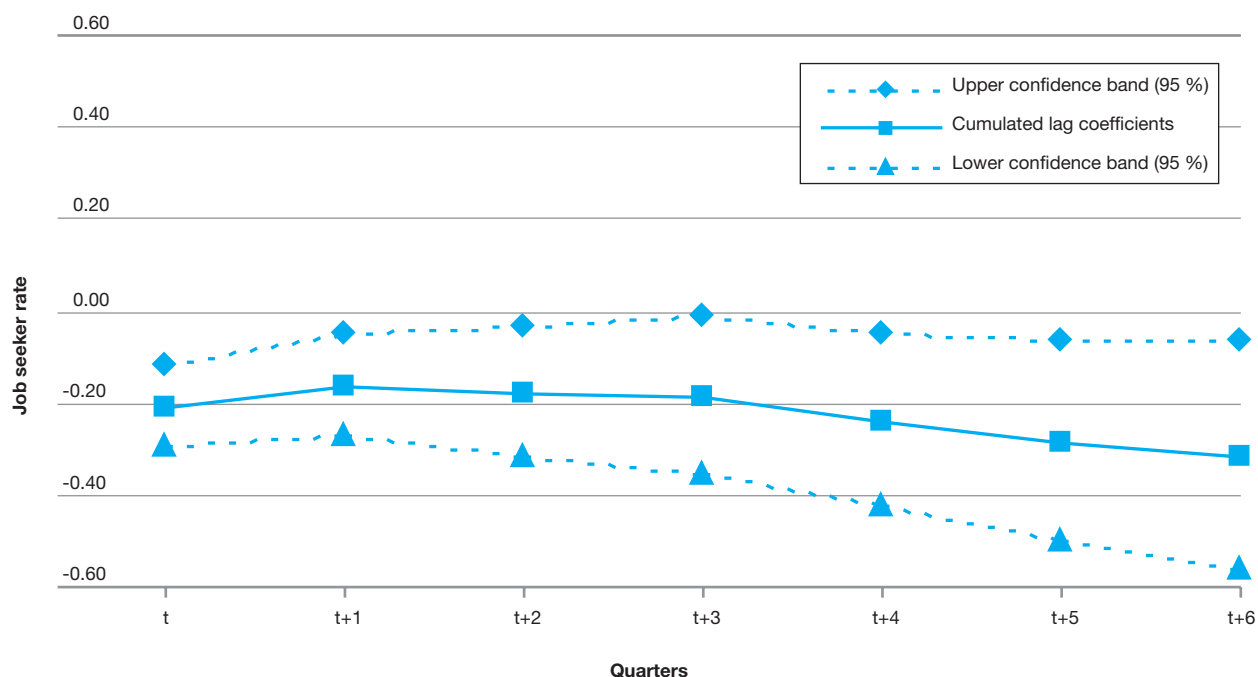
For the JCS we observe an immediate significantly negative impact on the job seeker rate (here and in the following a negative implies an intended positive effect, i.e. reduction of unemployment).

Figure 2: Cumulative lag coefficients for JCS in West Germany (GMM estimates)



⁽¹³⁾ See Greene (2000) for the calculation of the long run effect.

Figure 3: Cumulative lag coefficients for FbW in West Germany (GMM estimates)



The effect remains negative for two following quarters and becomes insignificant in the long run. Therefore we can conclude that the JCS in West Germany are able to improve the situation in the labour market only in the short run, whereas this negative effect vanishes very quickly.

For the West German FbW programmes we observe a more favourable picture. The cumulative lag coefficients indicate that the immediate significant negative impact on the job seeker rate remains negative through time. Furthermore the negative effect becomes larger, which could be seen as evidence for locking-in effects. As the long run effect for FbW is also negative significant, we can conclude that FbW programmes improve the labour-market situation in all respects, indicating that in West Germany FbW is the most effective programme. This is especially true with respect to medium-term and long-term effects.

The results from the OLS and the within estimator for East Germany are reported in Table 5. Unfortunately, the results from the OLS estimator depict an unstable path for the job seeker rate. This should be seen as an evidence that the OLS estimates for the autoregressive parameters are upward biased. Furthermore, due to the unstable pattern of the OLS estimates the lag coefficients resulting from these estimates are not reliable. Therefore we will base our analysis only on the within estimator, although

this estimator is also known to be biased in the dynamic panel data context.

As with West Germany, we do not find a clear picture in relation to vacancies and so the existence of the Beveridge curve may be questionable. We have plotted the cumulative lag coefficients for the ALMP measures JCS, SAS and FbW resulting from the within estimator in Figures 4, 5 and 6.

For the JCS we find a near zero and insignificant effect, indicating that they have hardly any impact on the East German labour market. In the case of the SAS we find throughout a negative cumulative lag coefficient, although it is significant only for t+4 up to t+6. This provides some evidence that the SAS are able to reduce the job seeker rate in the medium- and long-term. Finally, we find for FbW an insignificant positive effect, i.e. there is no evidence of an effect on the job seeker rate.

Summarising our results, we find very different situations in East and West Germany, though the estimates for East Germany should be treated with caution. Comparing the performance of FbW programmes with other ALMP measures, we find that in West Germany FbW is the most efficient type of programme. In East Germany this does not hold since the effects are, at best, insignificant.

Table 5: Estimate results for East Germany

Variable		OLS estimator		Within estimator	
		Param.	t-value	Param.	t-value
	Const.	0.2680	3.933	-	-
Job seeker rate	JSR_{t-1}	0.6729	10.042	0.4644	8.133
	JSR_{t-2}	-0.2104	-2.231	-0.2176	-3.221
	JSR_{t-3}	0.1139	1.352	0.0318	0.492
	JSR_{t-4}	0.4274	5.631	0.4768	6.168
Vacancy rate	VR_t	-0.4437	-2.491	-0.2064	-0.857
	VR_{t-1}	0.3060	1.261	0.1673	0.824
	VR_{t-2}	-0.0719	-0.248	-0.0517	-0.187
	VR_{t-3}	0.2385	0.990	0.2198	1.244
	VR_{t-4}	-0.1483	-0.786	-0.0132	-0.073
Participants in job creation schemes	JCS_t	-0.0118	-0.362	0.0009	0.028
	JCS_{t-1}	0.0127	0.317	0.0099	0.305
	JCS_{t-2}	0.0020	0.063	-0.0022	-0.076
	JCS_{t-3}	0.0196	0.750	0.0155	0.687
	JCS_{t-4}	-0.0165	-0.988	-0.0125	-0.835
Participants in structural adjustment schemes	SAS_t	-0.1011	-2.801	-0.0886	-2.142
	SAS_{t-1}	0.0927	1.869	0.0647	1.522
	SAS_{t-2}	-0.0038	-0.084	0.0027	0.065
	SAS_{t-3}	-0.0220	-0.604	-0.0058	-0.157
	SAS_{t-4}	-0.0165	-0.494	-0.0839	-2.377
Participants in continuing vocational training	FbW_t	-0.0573	-1.234	-0.0766	-1.439
	FbW_{t-1}	0.0452	0.871	0.0926	1.760
	FbW_{t-2}	-0.0776	-1.694	-0.0131	-0.321
	FbW_{t-3}	-0.0415	-0.996	-0.0359	-0.967
	FbW_{t-4}	0.0323	0.951	0.0908	2.105
National unemployed rate	NUR_{t-1}	-3.2415	-3.785	-1.8423	-2.373
	NUR_{t-2}	0.4996	0.671	0.9055	1.224
National vacancies rate	NVR_{t-1}	0.7601	0.423	3.4963	2.154
	NVR_{t-2}	-2.1817	-1.090	-1.0512	-0.655
Seasonal dummy 1	SD_1	0.0088	2.553	0.0150	4.245
Seasonal dummy 2	SD_2	0.0204	1.746	0.0139	1.488
Seasonal dummy 3	SD_3	0.0030	0.650	-0.0039	-0.726
Wald test of joint significance		[26]	691131.047	[26]	78622.047
First-order serial correlation		[34]	3.982	[34]	-3.769
Second-order serial correlation		[34]	2.543	[34]	0.455

Figure 4: Cumulative lag coefficients for JCS in East Germany

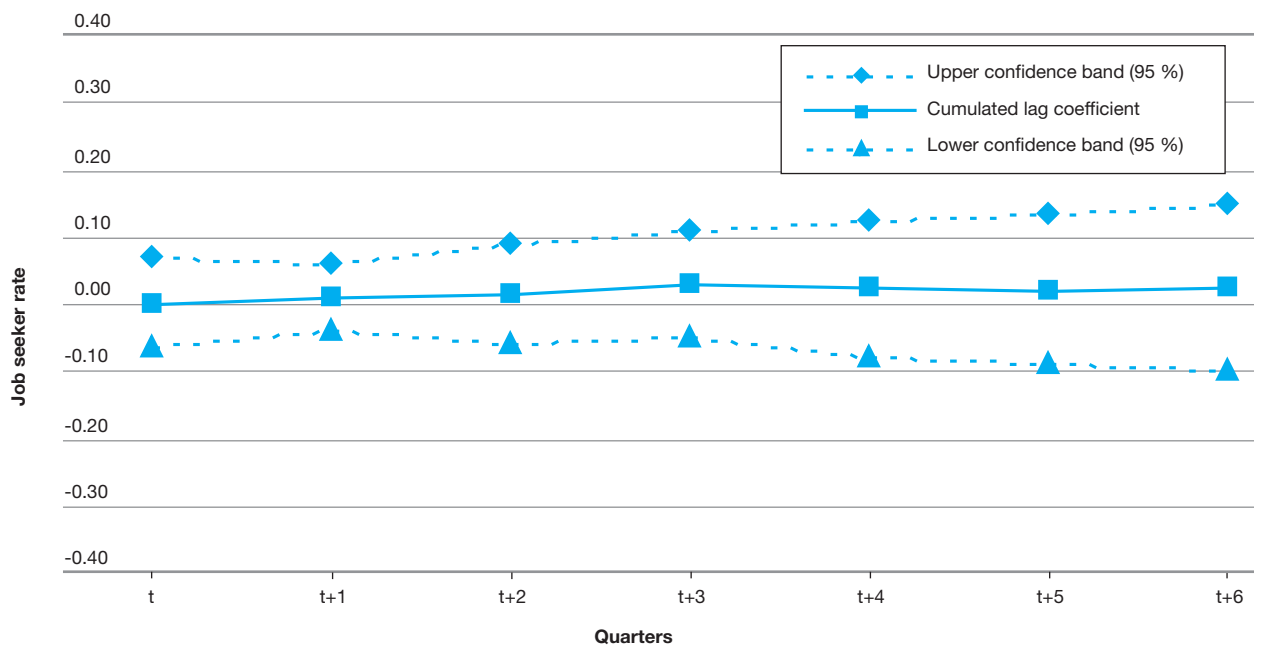


Figure 5: Cumulative lag coefficients for SAS in East Germany (within estimates)

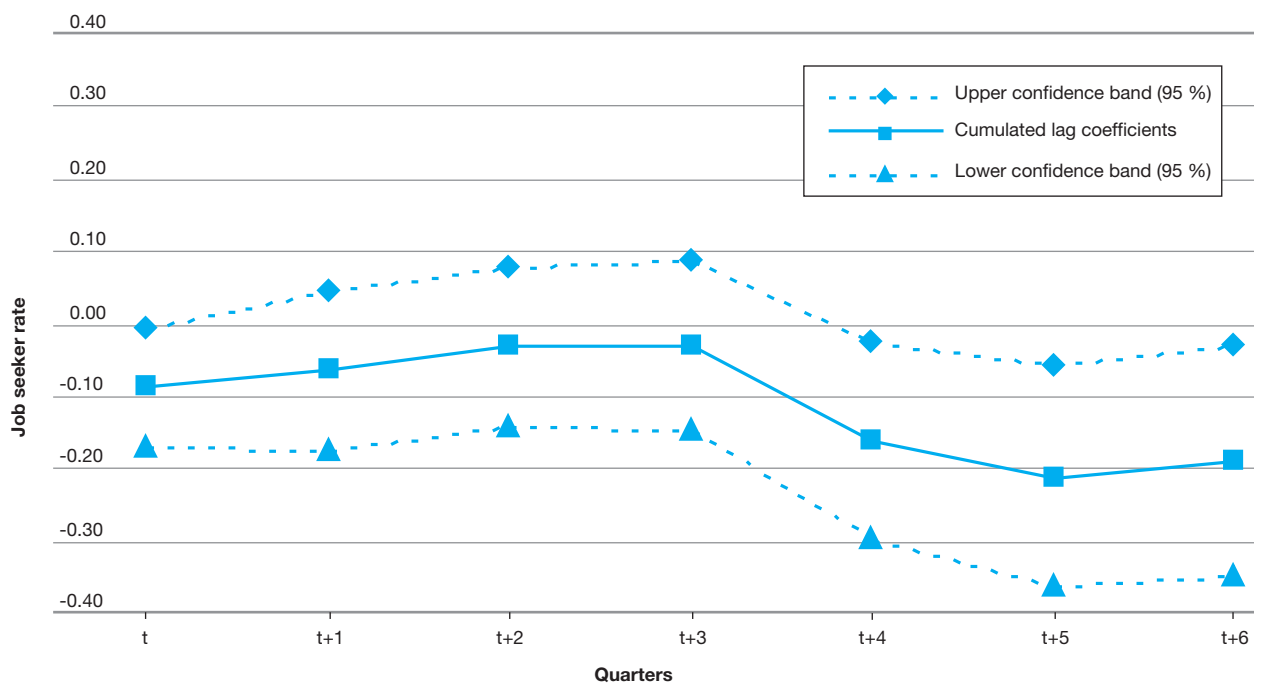
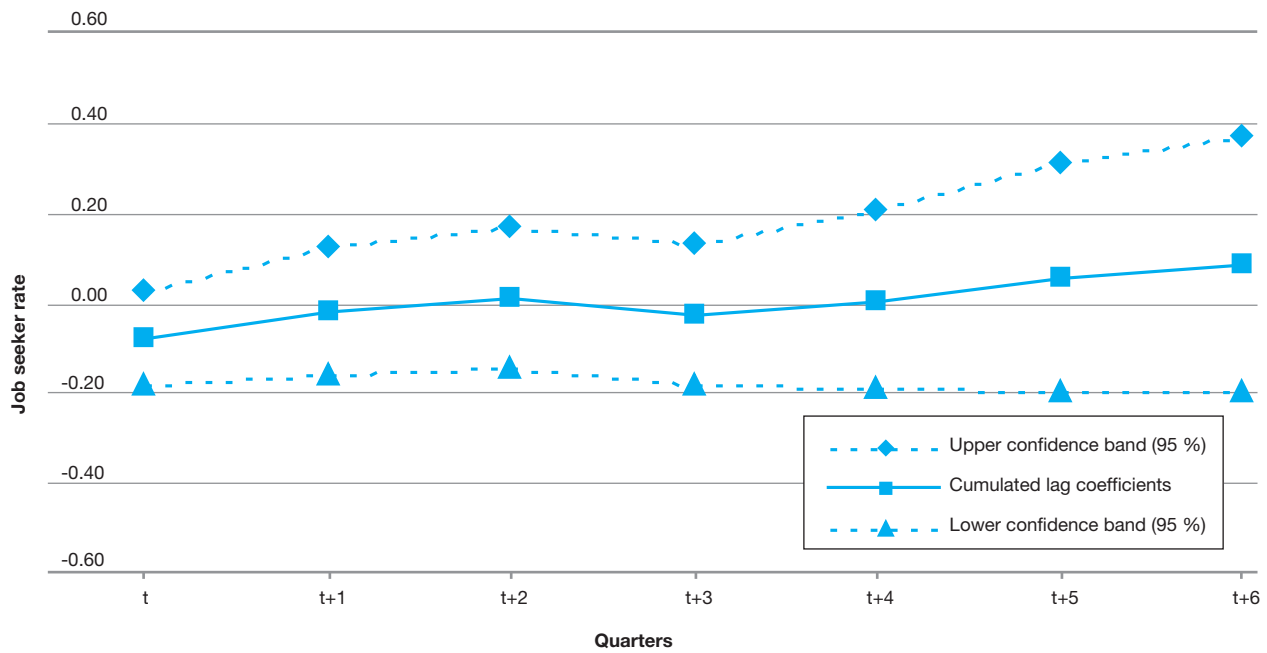


Figure 6: Cumulative lag coefficients for FbW in East Germany (within estimates)



8. Implications for policy and future research

What policy implications can be drawn from our results? Empirical evidence suggests that if policy in West Germany has the objective of reducing unemployment, spending on ALMP should be shifted from JCS to vocational training. This conclusion can be drawn simply from the finding that vocational training is the more efficient ALMP measure in West Germany. For East Germany we cannot make similar statements since we did not find a favourable picture for the effects of ALMP, and the results are questionable from an econometric point of view.

An explanation for the non-significant result in East Germany may be the fact that the labour-market conditions in East Germany are very different from West Germany. Unemployment in East Germany is more severe and where this results from a shortage in labour demand, vocational training cannot affect the labour-market situation. This is because vocational training affects the structure of labour supply but cannot solve demand side problems.

This may also be an issue for West Germany since major difficulties on the labour demand side seem to be responsible for recent unemployment. Therefore, if policy intends to shift resources to vocational training it should be considered whether such a shift is practical in the current situation.

Additionally, the objective of ALMP is not solely to increase reintegration into regular employment. Job creation programmes, in particular, have objectives that are not directly associated with economic success. If ALMP is designed to fulfil a set of objectives of which only a proportion are of an economic nature, more than economic conse-

quences should be considered. As our study can only assess the economic consequences of ALMP, the policy implications drawn from our results can only be associated with economic objectives of the programmes.

If we consider only the economic aspects, we can state that the shift of resources to FbW programmes should have favourable effects on employment in West Germany. If there is the question of what type of programme should be extended, FbW programmes seem to be the most promising option. Our results for East Germany do not encourage policy statements since they are unreliable.

It is recommended for future research that more work should be carried out on estimation techniques for dynamic panel data models. There should also be some consideration of how the simultaneity problem of ALMP can be solved. This is directly related to the estimation techniques. In the context of instrumental variables or GMM estimators it is a question of finding appropriate instruments, i.e. instruments that are not only not correlated with the residual of the regression equation but also have a good predictive power with respect to ALMP measures. To do this it might be useful to consider the decision process of how money is allocated to different ALMP measures.

Finally, it would be informative to compare a macroeconometric evaluation with a microeconomic evaluation. If the data is generated from the same sources it enables the researcher to make statements on how the same programme affects individuals and how it affects the whole economy.

9. Conclusions

Our results indicate for West Germany that FbW has a negative significant effect, that is FbW is able to reduce the job seeker rate. JCS also has a negative effect but only in the short run. Therefore FbW seems to be the more efficient ALMP measure in West Germany for tackling unemployment. In East Germany we do not find any evidence of a significant effect for JCS and FbW, whereas for SAS there is weak evidence for a negative effect in the medium-term.

The results from our empirical analysis indicate that there are major differences with respect to the effectiveness of ALMP between East and West Germany. That ALMP seems to work in West but not in East Germany may be caused by the fact that the labour market in East Germany is much worse.

Another interesting result is the clear differences in the effects of FbW and JCS in West Germany.

Since FbW programmes have a persistently negative effect on unemployment, they seem to be more effective in improving the labour market.

Finally, we can state that a macroeconometric evaluation should be seen as an important ingredient of a complete evaluation, since deadweight losses, substitution and displacement effects are a major problem of ALMP. Important issues with respect to empirical analysis are the inherent simultaneity problem and an appropriate underlying theoretical framework for the econometric specification. Furthermore, the application of dynamic models seems to be essential because of the high persistency of labour-market data. Basically, the ideal macroeconomic evaluation requires three elements: a well developed macroeconomic theory, which is applicable in an econometric framework and which does not fail due to data limitations.

List of abbreviations

AFG	Work promotion act [<i>Arbeitsförderungsgesetz</i>]
ALMP	Active labour-market policy
CAST	measures which are implemented in pathfinder regions and aim to promote the employment of low-qualified individuals or long-term unemployed
FbW	Continuing vocational training [<i>Förderung der beruflichen Weiterbildung</i>]
FS	Free support
GMM	Generalised method of moments
JCS	Job creation schemes [<i>Arbeitsbeschaffungsmaßnahmen</i>]
JOB-AQTIV	The reform law regarding the ALMP instruments
JSR	Job seeker rate
JUMP	Special programme to combat youth unemployment
NUR	National unemployment
NVR	National vacancy rate
OLS	Ordinary least squares
SAS	Structural adjustment schemes [<i>Strukturanpassungsmaßnahmen</i>]
SAS-East	Sam-East for private firms
SGB	Social welfare code [<i>Sozialgesetzbuch</i>]
SUTVA	Stable unit treatment value assumption
VR	Vacancy rate
VT	Vocational training

Annex

Table 6: **Descriptive statistics for Germany**

Variable	Mean	Std	Min	Max
No of labour office districts: 175 No of observations: 2 100 Time range: 1999:1 – 2001:4				
Quarterly average measures				
Participants in JCS	1 041	1 682	3	12 547
Participants in SAS	653	1 468	0	9 091
Participants in FbW	1 890	1 407	255	8 500
Unemployed	20 855	14 108	3 331	88 317
Dependent labour force	200 124	112 471	54 113	991 637
Regional information				
Area (in hectare)	203 502	134 599	16 406	813 574
Additional national data				
National unemployed	3 943 250	206 213	3 688 358	4 402 852
National vacancies	492 768	49 220	413 141	562 266
National labour force	41 668	281	41 116	42 068

Table 7: **Descriptive statistics for West Germany**

Variable	Mean	Std	Min	Max
No of labour office districts: 141 No of observations: 1 692 Time range: 1999:1 – 2001:4				
Quarterly average measures				
Participants in JCS	356	339	3	2 181
Participants in SAS	62	107	0	1 241
Participants in FbW	1 227	930	255	8 500
Unemployed	17 092	11 282	3 331	88 317
Dependent labour force	201 539	119 919	59 864	991 637
Regional information				
Area (in hectare)	176 204	95 609	16 406	478 275

Table 8: Descriptive statistics for East Germany

Variable	Mean	Std	Min	Max
No of labour office districts: 34				
No of observations: 408				
Time range: 1999:1 – 2001:4				
Quarterly average measures				
Participants in JCS	3 882	2 019	1 048	12 547
Participants in SAS	3 105	1 894	514	9 091
Participants in FbW	3 813	1 422	1 139	8 197
Unemployed	36 462	13 946	10 671	74 296
Dependent labour force	194 258	73 800	54 113	368 984
Regional information				
Area (in hectare)	316 708	198 754	56 906	813 574

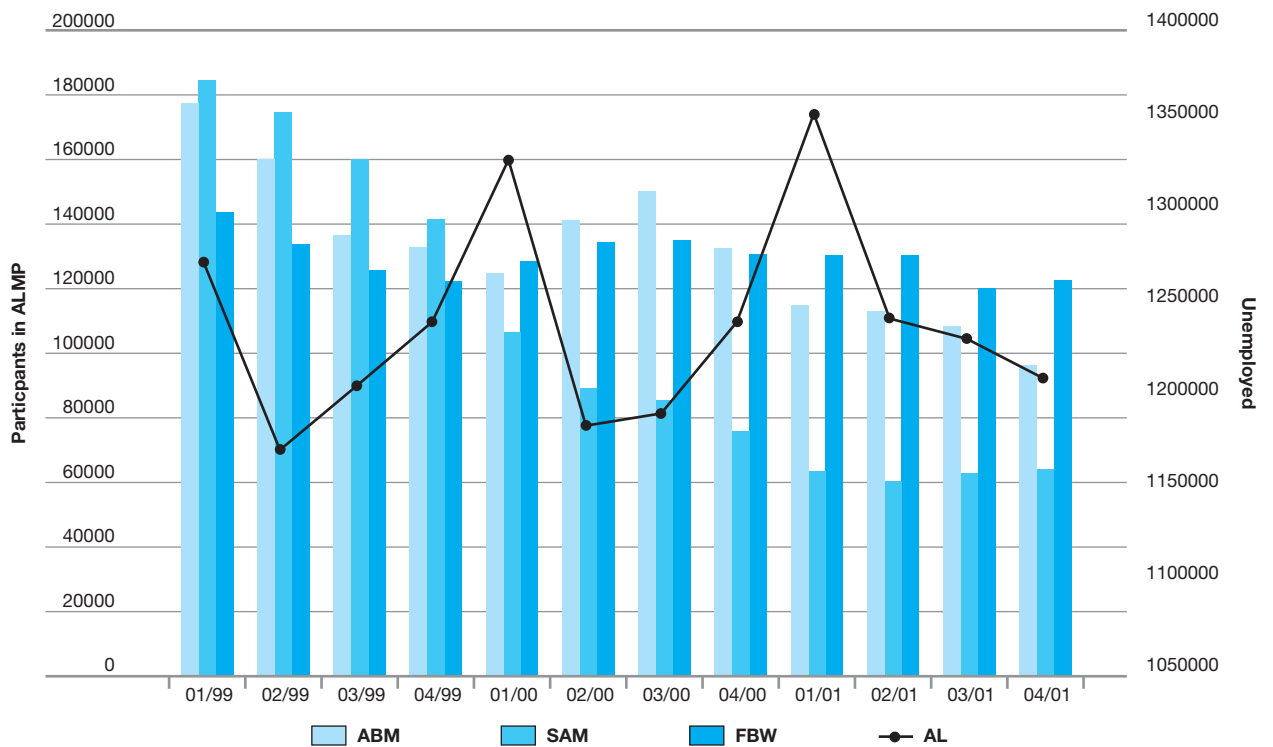
Table 9: Cumulative lag coefficients for West Germany

Job creation schemes				
Quarter	Lag coefficients	Standard error	Cumulative lag coefficients	Standard error
t	-0.7612	0.137	-0.7612	0.137
t+1	0.1333	0.056	-0.6279	0.145
t+2	0.1856	0.055	-0.4423	0.186
t+3	0.1623	0.065	-0.2801	0.200
t+4	-0.0395	0.090	-0.3196	0.208
t+5	-0.0185	0.065	-0.3380	0.240
t+6	0.0217	0.031	-0.3163	0.266
Long run effect	-	-	0.3930	1.142
FbW				
Quarter	Lag coefficients	Standard error	Cumulative lag coefficients	Standard error
t	-0.2068	0.044	-0.2068	0.044
t+1	0.0440	0.021	-0.1629	0.057
t+2	-0.0137	0.022	-0.1766	0.072
t+3	-0.0098	0.023	-0.1864	0.088
t+4	-0.0542	0.015	-0.2406	0.096
t+5	-0.0423	0.018	-0.2829	0.109
t+6	-0.0336	0.020	-0.3164	0.127
Long run effect	-	-	-1.5228	0.385

Table 10: Cumulative lag coefficients for East Germany

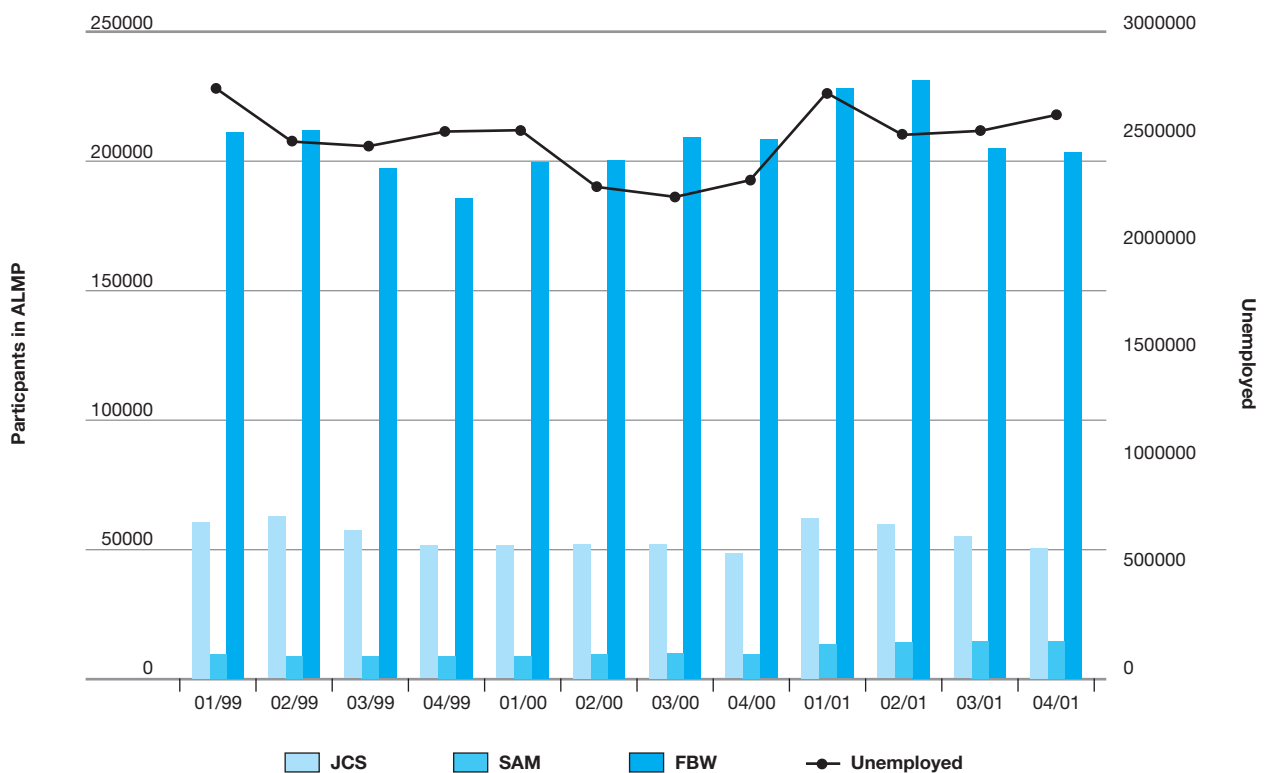
Job creation schemes				
Quarter	Lag coefficients	Standard error	Cumulative lag coefficients	Standard error
t	0.0009	0.034	0.0009	0.034
t+1	0.0103	0.020	0.0113	0.026
t+2	0.0024	0.018	0.0136	0.038
t+3	0.0144	0.018	0.0281	0.041
t+4	-0.0055	0.018	0.0226	0.052
t+5	-0.0007	0.010	0.0218	0.056
t+6	0.0025	0.009	0.0243	0.063
Long run effect	–	–	0.0477	0.130
Structural adjustment schemes				
Quarter	Lag coefficients	Standard error	Cumulative lag coefficients	Standard error
t	-0.0886	0.0413	-0.0886	0.0413
t+1	0.0236	0.0389	-0.0650	0.0564
t+2	0.0329	0.0359	-0.0321	0.0552
t+3	0.0015	0.0413	-0.0306	0.0607
t+4	-0.1318	0.0409	-0.1624	0.0692
t+5	-0.0493	0.0247	-0.2117	0.0773
t+6	0.0215	0.0238	-0.1901	0.0817
Long run effect	-	-	-0.4534	0.251
FbW				
Quarter	Lag coefficients	Standard error	Cumulative lag coefficients	Standard error
t	-0.0766	0.0532	-0.0766	0.0532
t+1	0.0571	0.0478	-0.0195	0.0714
t+2	0.0300	0.0354	0.0105	0.0812
t+3	-0.0368	0.0333	-0.0263	0.0808
t+4	0.0325	0.0355	0.0063	0.1015
t+5	0.0513	0.0377	0.0575	0.1295
t+6	0.0299	0.0205	0.0874	0.1439
Long run effect	-	-	0.2366	0.275

Figure 7: Participants in ALMP and unemployed in East Germany



Source: Bundesanstalt für Arbeit, 2001.

Figure 8: Participants in ALMP and unemployed in West Germany



Source: Bundesanstalt für Arbeit, 2001.

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Active policies and measures: impact on integration and reintegration in the labour market and social life

Kenneth Walsh, David J. Parsons

Abstract

This paper forms a contribution to the third research report on vocational education and training (VET) research in Europe. The objective is to provide a comprehensive and critical overview of the success of active labour market and social policies (with a VET component), and to outline the implications for policy and practice, as well as indicating ways for further improvement. The focus of this report, as with other contributions to the third research report, has been secondary analysis. The literature review has involved the examination of references over a long period of time, but cannot be considered exhaustive in its coverage of all relevant material. More specifically, we have sought material post-1999 for detailed analysis, but refer to previous composite studies. Relevant material has been identified through national experts in EU Member States and also through various Internet sites of variable quality and usefulness. The report covers the methodological issues in the evaluation of active labour-market policies (ALMPs), including the main approaches and the problems that are likely to arise that can influence the validity of the results. The results of selected evaluations from various countries are reviewed, looking for commonalities in approach and the efficacy of the measures in terms of positive VET outcomes. Tentative conclusions on further research, policy stance and evaluation practice are made, aimed at all those involved with the design, implementation, monitoring and evaluation of ALMPs with a VET content.

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1. Executive summary

The subject of the report is the evaluation and impact of VET. It aims to describe and discuss the types, methodologies and results of evaluation research at different levels of analysis and the specific problems VET research is facing. Particular attention is paid to the implications of the research for policy, evaluation practice and further research.

In preparing our report, we have concentrated on a review of published and grey literature and accessing Internet-based material. In particular, we have sought material pre-1999 that summarises a range of studies from a range of countries, and within the limitations of secondary analysis we have brought together evaluation material from a diverse range of sources and attempted to extract the most robust and relevant for the focus of this study. The limitations of the analysis are largely the constraints of the content, access and transparency of the source material.

The main element we are concerned with is labour-market training for unemployed adults and those at risk, since this is likely to capture most of the relevant training/retraining measures.

Methodologically, the evaluations mostly tend to fall into the quasi-experimental sort, with an emphasis on the econometric elaboration of programme outcomes. However, there is some evidence of the innovative use of administrative and available survey-based data (such as from labour force surveys – LFSs) to underpin these analyses. The quality and validity of these evaluations are significantly dependent on the quality of the data used.

The problems in comparing programmes across countries are caused by exogenous circumstances affecting the relative effectiveness of programmes. This is particularly so for training/retraining measures, where a commitment can involve a substantial lead-time for a forecast future skill need. Effectiveness will, therefore, depend on factors such as the accuracy and timeliness of labour-market information, the ability of employers to assess and communicate their future needs, the ability of training providers to meet the articulated skill needs and

appropriate learning context, and changes in business and political circumstances.

The growing emphasis on activation measures and the coordination of active and passive measures further complicates effective evaluation. It leads to a lack of clarity about the structure and objectives of individual programmes and causes difficulties in gathering reliable information on participation.

There seem to be growing tensions between accountability-led evaluations, those justifying the value secured from public funds, and the continuous improvement model. Evaluation frameworks and/or research designs seem to have a narrowness of focus built into them, and this does not encourage the sort of breadth of scope and analysis needed to provide the quality of feedback on VET impacts with ALMP needed to policy-makers, national or transnational.

Some of the best studies are those that take a wider methodological perspective, certainly using experimental approaches where feasible, but complementing this with the use of administrative data and more qualitative information on, for example, processes and the perceptions of programme participants. It suggests that evaluation hitherto has been more academically driven rather than policy driven, which is not so much a criticism of the former as a lack of proper attention in the latter.

The lack of an evaluation culture in some countries (including some Member States) means that programme evaluation is not conducted effectively, if at all. In addition, there are other cases where ALMP evaluation has been carried out on behalf of countries under the auspices of international agencies, which is not the best basis for effective policy follow-through.

It was disappointing to note that there was little evidence of what might be called a ‘holistic’ approach to programme evaluation. These wider evaluations are often too easily dismissed as impossible to measure, and so the challenge remains largely untouched. This seems a particularly important limitation in understanding VET impacts.

As the mix between active and passive measures becomes blurred, the focus of evaluation is also likely to suffer. Furthermore, some of the existing studies are often only focused on pilot or demonstration projects, to the extent that they are never given the opportunity for extensive (wider and longer-term) application.

Many evaluation studies point to the need for programmes to have labour-market relevance. Good forward-looking labour-market information can provide strong indications of what the characteristics of the demand for labour are likely to be and this can help inform programme provision (and individual choice). Also, the involvement of employers in the design and delivery of training programmes provides a more direct way of ensuring that the skills acquired by programme participants are likely to have real currency in the labour market.

The evaluations generally agree that the best programmes are those that are small in scale and highly targeted, and this ties in with some key developments in the approach to ALMPs, most notably the trend for offering customised support

to the unemployed. Typically, this will offer a menu of active measure options, one of which is normally training of various sorts.

Those training programmes with job guarantees seemed to show more positive outcomes and suggested greater participant engagement (motivation and commitment) in the learning processes involved. This raises issues of how such interventions need to allow for the socialisation of skills development and learning in programmes.

The review shows that, while evaluations are taking place, it is neither a consistent nor uniform activity. We conclude that policy and policy-makers, looking to improve the quality, efficacy and cost-effectiveness of VET interventions in ALMPs, are not being very well served by current evaluation approaches.

This raises serious questions about just how much we know concerning the effectiveness of these mechanisms, and calls for reform of current practices involving not just evaluations, but crucially those specialising in evaluation frameworks and selecting/commissioning evaluations.

2. Introduction

2.1. Background to the study

This paper forms a contribution to the third research report on VET research in Europe. The subject of the report is the evaluation and impact of VET and it aims to describe and discuss the types, methodologies and results of evaluation research at different levels of analysis, as well as the specific problems VET research is facing. Particular attention is paid to the implications of the research for policy, evaluation practice and further research.

2.2. The study

The overall objective of this paper is to provide a comprehensive and critical overview of the success of active labour-market and social policies (with a VET component), and to outline the implications for policy and practice as well as indicating ways for further improvement.

Our initial thoughts on the parameters of the research were set out in the *Abstract of planned research* presented at the first meeting of the third report ⁽¹⁾. Subsequent discussions at the conference and comments by Cedefop on these parameters were refined and set out in an interim report ⁽²⁾ along with discussion of the planned approach.

The feedback from Cedefop at these various stages highlighted a number of key issues to consider in this final report and these have been taken on board insofar as this has been possible. In particular, we have:

- (a) limited our review of evaluation methodologies and descriptions, given the focus of other papers in the third research report;
- (b) opened the scope of our paper to all active measures with a VET element, even where it may not be the main part of the programme;
- (c) concentrated on post-1999 material in the

interests of using the limited resources for the work as efficiently as possible, while recognising that there have been some useful overviews of relevant evaluations pre-1999;

- (d) ensured that our search for relevant material is not restricted to Member States;
- (e) examined evaluations conducted in the context of EU programmes such as those funded through the European Social Fund (ESF) and in the review process for the European Employment Strategies (EES).

Cedefop was also keen to encourage liaison with other relevant papers of the third research report. However, building this complementarity has proved difficult; in particular, the Internet portal created to facilitate this communication has not been extensively used by any of the contributors.

2.3. Approach and focus

The focus of this report, as with other contributions to the third research report, has been secondary analysis. In preparing our report, we have therefore concentrated on the following tasks:

- (a) a review of published and grey literature,
- (b) access to Internet-based material.

The literature review has involved the examination of references over a long period of time, but cannot be considered comprehensive or exhaustive in its coverage of all relevant material. More specifically, we have sought material pre-1999 that summarises a range of studies from a range of countries, so that the limited project resources can be concentrated on accessing newer material. This was seen as the best way we could add value to current understanding on the evaluation of ALMPs.

Relevant material has been identified in a number of ways. First, national experts were contacted in Member States (e.g. through the employment observatory Sysdem network) for

⁽¹⁾ Held at Cedefop, Thessaloniki, from 28.2.2002 to 1.3.2002.

⁽²⁾ Presented to Cedefop in May 2002

advice on details of suitable studies. This proved a fruitful source of information, limited only by the range and quality of evaluations available in each Member State, which sometimes differed considerably.

Member States such as Ireland, the Netherlands, Sweden (especially) and the UK all have a track record of robust and relevant work. In many other Member States, information either lacks transparency or is extremely limited or non-existent (as far as we could tell). Inevitably, our analysis of this material was restricted by language limitations – basically, anything in English or French could be tackled ⁽³⁾ and fortunately some reports in other languages were either translated into English or had an appropriate summary.

Second, information was identified through various Internet sites of variable quality and usefulness. Those sites of particular relevance to this study included transnational organisations, and in particular:

- (a) European Commission,
- (b) International Labour Office (ILO) – particularly the Labordoc database,
- (c) Organisation for Economic Cooperation and Development (OECD),
- (d) the World Bank.

The material available for downloading through these (and other) agencies has expanded rapidly and will continue to do so, thereby facilitating wider search parameters through appropriate links (e.g. with national agencies, government departments, etc.) and cross-referencing.

Within the EU, much of the relevant evaluation effort in Member States has been a response to the demands of the ESF and its constituent programmes (such as Employment and ADAPT). This has generated many national studies and EU-wide appraisals (e.g. European Commission, 2001) that provide a rich source of information. Unfortunately for both the mid-term and final evaluations, the national reports were not all translated into English or French and nor were they uploaded to the Internet, so access to them is restricted. Nevertheless, the EU-wide reports provide a good summary of the findings and have been an important contribution to this review.

More accessible are the national reports from the review of the EES which are available in

English and/or French on the EU website. These reports are, of necessity, wide-ranging, covering as they do all four pillars of the EES. Nevertheless, extensive coverage is given to pillar 1, employability, and it is here that some useful material has been collected for this study. However, the quality and empirical scope of the national reports varies a great deal. Some provide systematic and thorough evaluations, while others are essentially little more than uncritical discussions of activity, without any real attempt at analysis of key issues such as impact and success factors.

In summary, within the limitations of secondary analysis, we have brought together evaluation material from a diverse range of sources and attempted to extract the most robust and relevant for the focus of this study. The limitations of the analysis are largely the constraints of the content, access and transparency of the source material and, of course, the resources available to do the work. Other omissions and errors of interpretation are those of the authors alone.

2.4. Report structure

This introductory chapter of the report is followed by an examination of the methodological issues in the evaluation of ALMPs, as seen through the literature. This covers the main approaches and the problems that are likely to arise that can influence the validity of the results. There is also discussion of the general approach to ALMPs in an international context, including the relative importance of those focused on VET.

Then the report examines the results of selected evaluations from various countries, looking for commonalties in approach, the efficacy of the measures (as shown through the evaluations) and summarising what we interpret as working well and what does not, in producing positive VET outcomes.

The final chapter of the report draws together the findings from the previous analysis and provides a series of tentative conclusions on further research, policy stance and evaluation practice aimed at all those involved with the design, implementation and monitoring and eval-

⁽³⁾ These parameters were agreed with Cedefop at the outset of the study.

uation of ALMPs with a VET content. The relative efficacy of the different approaches to ALMPs is examined further through an exploration of what could be construed as the best options for ALMPs with a VET focus. While not attempting to

establish a model for such programmes, which we believe would be premature given the evidence constraints, we try to isolate those ingredients that are likely to be more successful in terms of VET outcomes.

3. Methods and definitions

3.1. Introduction

It is important to consider the basic methodological issues that underpin evaluations of ALMPs. This provides an important context for the analysis and assessment of VET outcomes later in this paper. In doing so, we are aware that other papers in the third research report (see in particular Hujer et al., 2003a) are concentrating more on the methodological issues to do with evaluation generally, and so here we have tried to be very focused. However, it is reasonable to set out the main approaches used for the active measures in general, and those concentrating on training/retraining in particular, in order to provide a backdrop for understanding what has actually been done.

3.2. ALMP evaluation in context

In general, there seems to be disappointment with both the number and quality of ALMP evaluations. Martin and Grubb (2001) make the point, in their overview of OECD countries, that much of the evaluation work that exists emanates from Canada and the US, where there has been a 'long-standing tradition of evaluating labour-market programmes' (p. 10), going on further to suggest that there is a 'mandatory requirement on the public authorities to evaluate their programmes.'

These authors suggest that this good practice has rubbed off on some countries (Australia, Belgium, Germany, Ireland, the Nordic countries, Switzerland and the UK are mentioned) who are now more inclined to do thorough evaluations, whereas in others there is less evidence of such practice. Here, the suggestion is that monitoring of individual VET outcomes post-programme alone is not enough to constitute proper evaluation. Nonetheless, this focus on individual or participant gains remains quite common practice.

In a similar vein, the OECD (2001) thought the number of rigorous evaluations of ALMPs was inadequate (p. 29) and this reflects our review of the evidence. In some countries, this seems to

stem from a weak evaluation culture, let alone evaluation of available ALMPs. However, there may be mitigating circumstances. For example, Kluve et al. (1999) point out that in the case of Poland, rigorous evaluations have been curtailed through a lack of appropriate data (p. 5).

This situation regarding robust official data for source or benchmark evidence is not unique to Poland. To a greater or lesser extent it applies to all transitional countries. It is likely that problems with data extent, utility of classifications and accuracy also inhibit thorough evaluations of programmes in some Member States. However, the lack of critical attention to this in the source material makes it difficult to decide, in such cases, whether it is due to a lack of evaluation culture impeding gathering better data or vice versa. Cause and effect here seem very confused.

The rigours of the funding requirement and implementation of ESF and the EES have helped raise the profile of proper evaluation in Member States. However, there is still a great deal of diversity evident in the approach and content of national reports, which makes the job of pulling together an EU-wide perspective particularly daunting. This is well illustrated by one of the principal conclusions of the review of EES policies in Greece (OMAS, 2001), which stated that a 'thorough assessment of the employment policies' (p. 97) should be carried out, as well as an evaluation of the EES in the Greek labour market (presumably one leading to the other).

By contrast, the Dutch EES review is much more thorough, albeit relying on pre-existing evaluation studies (with which the Netherlands is reasonably well endowed). The Belgian EES review is similarly dependent on previous research, while those for Ireland and the UK are perhaps less rigorous in terms of using previous evaluations and are more reliant on programme monitoring information.

3.3. Evaluation methodology

There are various general sources of information on the approach to ALMP evaluation. The most recent

from the World Bank (2001) is particularly useful in setting out in simple terms the types of approach, from setting up and monitoring appropriate performance indicators, to carrying out cost-benefit and cost-effectiveness analysis. It usefully highlights the distinction between monitoring and evaluation, often muddled in such source material, while stressing their complementarity when assessing the viability of any activity. The tools described in this study are generic and have been proposed as applicable to a much wider range of situations than active labour-market policies. However, this shows that there is no particular mystique to the evaluation of such measures.

For a more thorough discussion of the options, the collection of papers edited by Schmid et al. (1996) is a rich source of case study, as well as methodological material, which includes some useful work programmes relevant to our research. Another methodological report we have found to be of particular value is that of Pierre (1999) in which the discussion on the strengths and weaknesses of the various approaches to evaluation is particularly informative. This study has the virtue of being (unusually) focused on the evaluation of ALMPs. Its conclusions are perhaps controversial in that the author finds that evaluation 'has not been systematically carried out' (p. 30), especially in Europe (the US fares a little better). Furthermore, the author laments the lack of attention given to evaluation of ALMPs by policy-makers, despite the cost and political prominence of such interventions.

A distinction needs to be made between the two principal types of policy evaluation as follows:

- (a) impact of policies on the individual,
- (b) effect on aggregate employment and unemployment.

The first of these essentially seeks to measure the individuals' labour-market outcomes on completion of their programme participation and is most frequently focused on employment and earnings. ALMPs, where the objective is to improve the employability of the participant, are well suited to this form of evaluation, and those involving training/retraining particularly so.

The second type is more concerned with overall employment effects, with attention given to any negative outcomes that can diminish the efficacy of the programme. While some of these

potentially negative effects can be present in training/retraining ALMPs, they are more likely to be present in programmes centred on subsidised jobs.

In the evaluation of relevant active labour-market policies, it is possible to categorise two main approaches as follows:

- (a) scientific:
 - (i) experimental;
 - (ii) quasi-experimental.
- (b) non-scientific.

This is not presented as a typology, but more a simple reference framework with which to compare different emphases in the different ALMP contexts.

Scientific evaluation essentially uses the technique of comparing the outcomes of those taking part in a programme (the treatment group) and those not taking part (the control group). Under experimental techniques (sometimes called controlled social experiments), the two groups are established prior to the programme intervention and should be based on a randomised sample distribution. However, bias can be introduced in the selection of programme participants (e.g. the programme administrators may select the more able and thus exclude those who they feel may not benefit from the programme) that will ultimately diminish the results. Similarly, the actions of the control group cannot be guaranteed, in that, for example, some may choose to follow a different training/retraining course that would affect (positively) their performance in the labour market.

These and other restricting methodological factors (see Hujer et al., 2003a for a discussion of these matters), coupled with the potential difficulties of setting up such experiments (e.g. they can fall foul of equal opportunity legislation) and the associated costs, means that there are only limited examples of this technique being applied and most of them originate from North America. This may be due to a greater willingness of policy-makers in the US and Canada to countenance such experiments, whereas in Europe there may be a greater reluctance to exclude certain eligible groups or individuals from a programme (e.g. based on an unwillingness to deny the unemployed access to opportunities). However, it is difficult to corroborate the reasons postulated with hard evidence.

It is not surprising, therefore, that the more common impact evaluation approach is of the quasi-experimental kind. Here, the treatment and control groups are derived after the programme intervention, with statistical techniques used to correct for any differences in the characteristics of the two groups. However, such differences can be minimised through the use of the matched pairs approach, whereby the influential characteristics of the treatment and control groups (such as gender, age, unemployment duration, location, etc.) can be selected to form the basis for both samples. Matched pairs can provide a robust basis for contrasting impact, but at a cost that some policy-makers or fund holders would find prohibitive. However, it should be noted that there are other techniques sometimes used (such as before- and after-studies, cross-sections and repeated cross-sections, etc.) and for a more detailed discussion see the work by Hujer et al. (2003a) for this third research report.

Both experimental and quasi-experimental approaches have their limitations. They essentially measure the impact of participation in the programme, and this is most frequently articulated in terms of the following two quantifiable indicators of impact on the individual:

- (a) employment,
- (b) earnings.

Clearly, there is a fundamental need to know if a programme increases the likelihood of participants finding work. The earnings outcome provides a crude proxy for job quality in that it can show if the programme has helped participants improve their capacity to earn. This can be an important consideration for a training/retraining programme, given the investment required by the individual in their training, and can add a powerful incentive effect when present (and proven).

One of the big disadvantages with the scientific approach to evaluation is that it cannot measure the negative effects that inevitably accrue from active policies. Most significantly, any displacement or substitution ⁽⁴⁾ effects cannot be picked up through these methods and

can only be gauged through other techniques (such as employer surveys). Similarly, other effects from the implementation of a programme, such as spill-overs, crowding out and similar unintended attributes, are not usually measurable through the generalised approach to evaluation and can only be picked up through a combination of methods applied either simultaneously or possibly consecutively.

Non-scientific evaluation techniques are much more useful in these cases. Typically, these include using official, non-official and/or programme statistics to examine programme participation and outcomes. Approaches are also likely to include some combination of surveys and interviews with employers, employees, programme participants, training providers, etc. Clearly some of these techniques (e.g. an employer survey) could be carried out under rigorous controls in terms of sampling, questionnaire design, etc., and can render robust results. However, in terms of the evaluation of the impact of active measures in most cases they are seen as complementary to the scientific techniques. Their use in addressing some of the negative effects from programmes has already been pointed out, and it is perfectly feasible to include questions in a quasi-experimental survey of programme participants (and the control group) that will provide the raw material for both approaches (Walsh et al., 2000). This can, for example, provide strong indicators of the dead weight effect in programmes ⁽⁵⁾.

However, this is too simplistic a notion of policy effectiveness. Introducing a particular programme could have effects reaching beyond the individual participant, or even aggregate employment and unemployment. Here, we are talking about the effects on society as a whole, such as changes in attitudes, culture and maybe the way labour markets or businesses operate. These could be construed as indirect effects but are still important.

Societal effects arising from an ALMP could, for example, encompass such indicators as crime

⁽⁴⁾ These negative effects occur when the programme participants take the place of existing workers. Substitution takes place in the firm where the programme participant finds a job and displacement may occur when jobs are lost in another firm because of the unfair cost advantage gained by the firm taking on the programme participant. See Hujer et al. (2003b) for a case study of evaluation trying to cope with such bias.

⁽⁵⁾ The deadweight effect essentially measures the proportion of programme participants that would have followed similar activities (such as retraining) in the absence of the programme.

rates, incidence of poverty and health problems. But no matter how important these might be in a holistic appraisal of programmes, they remain virtually untouched by evaluation literature and are often dismissed as all but impossible to measure (e.g. the Dutch EES report). The paper by Green et al., (2003) for the third research report also covers this area.

For this study, we considered relevant evaluations that are based on any of the techniques outlined above, as well as combinations of these. Within this, we have concentrated on the effects on the individual, which fits with the remit of the research. The contribution of Hujer et al. (2003b) has more to say on the macro effects of active measures in the case of Germany.

Another important issue to consider in any ALMP evaluation is whether it is feasible to isolate the different elements of the programmes (and, for our use, those concerned with training and retraining).

Another potential problem for the evaluator raised by Martin and Grubb (2001) is the problem of ever-changing programmes. The conditions under which the various programmes operate are under constant review by national governments, who respond not so much to the results of monitoring and evaluation, but to the exigencies of budgetary constraints and political demands. Whatever the cause of these changes, their impact on the operation of the programmes themselves is undeniable and only serves to make rigorous evaluation even more difficult.

Martin and Grubb go on to highlight other limiting factors. For example, evaluations tend to cover only short-term outcomes from programme participation, maybe up to a maximum of one or two years' post-participation in the programme. Also, many evaluations target pilot or demonstration programmes which are, by nature, small scale and often experimental in scope (the implication being that they do not, therefore, test the real world circumstances that the programmes would have to operate in).

Another complicating factor is the development of so-called coordinated active and passive programmes. These effectively bring together the payment of unemployment (and subsequent social) benefits with conditions on job search, training and other programme participation. Some of the major developments are listed in

OECD (2001) and include reforms to the Canadian employment insurance system, the US welfare system and the Danish and Irish unemployment benefit systems. In the UK, variants on the New Deal programme have taken this approach for a few years now, and in France, the PARE (*Plan d'aide au retour à l'emploi*) seeks to take a similar approach.

Essentially, these initiatives aim at linking the payment of unemployment benefits (and subsequent social benefits) to evidence of active job search or, where job search is either not feasible (i.e. the unemployed person is not yet ready to look for a job on the regular labour market) or ineffective, to participation in an active measure. This often involves a customised approach for the unemployed, with particular attention paid to individual abilities and motivation. In the UK, for example, this has been taken a step further with the merging of the traditionally separate activities of the payment of benefits and employment services. Under Jobcentre Plus (the title applied to the initiative), the hitherto separate services have been physically brought together under the same roof, with staff dealing with all aspects of the unemployed client's needs.

There are other examples of such coordinated approaches and it is proving to be a strong trend in the structure of ALMPs. The downside for evaluators is that the divisions between the different parts of the programme become obscured. It is often not possible to isolate a particular effect because of its interdependence on other factors. For example, when looking at the New Deal programme in the UK, Walsh et al. (1999) found that participants were dipping in and out of various options under the initiative, such that the separate effects became virtually impossible to isolate.

3.4. Coverage of the active policies

The OECD employment outlook (1993) helpfully set out three main elements that condition active labour-market policies, as follows:

- (a) mobilising labour supply with job creation schemes, job subsidies and similar approaches;

- (b) developing employment-related skills with measures such as retraining;
- (c) promoting efficient labour markets with employment services, job matching and counselling.

It is the second of these main elements that we are concerned about in our research. However, the degree of importance attached to this policy (as proxied by the proportion of total spending on active measures devoted to it) varies considerably between countries. Table 1 plots the information from the OECD (2001), showing various measures of ALMP expenditure. This draws on the well-established OECD Labour-market programmes (LMP) database ⁽⁶⁾ which charts mainly public expenditure on active measures.

The list of measures covered extends to the following:

- (a) public employment services and administration,
- (b) labour-market training,
- (c) youth measures,
- (d) subsidised employment,
- (e) measures for the disabled,

- (f) unemployment compensation,
- (g) early retirement for labour-market reasons.

The categories we are interested in are the second and third in the list and need some further explanation as to their coverage, as follows:

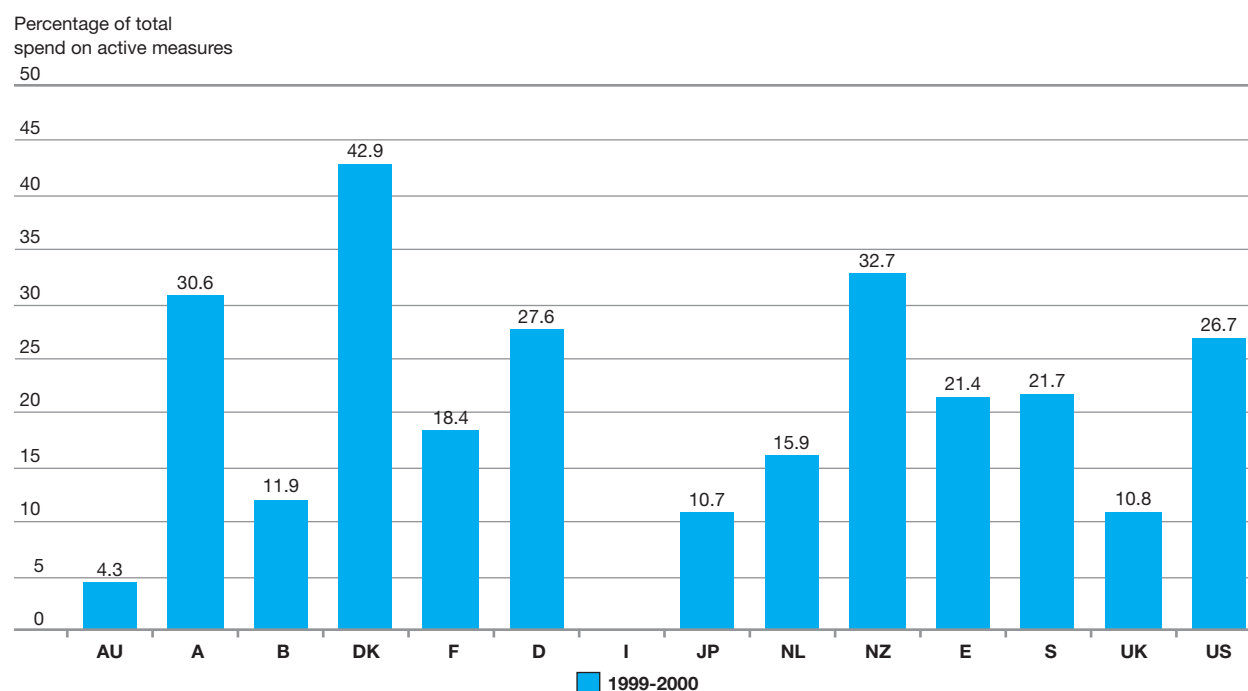
- (a) labour-market training: this includes both course costs and subsistence allowances, but specifically excludes special training programmes for youth and the disabled;
- (b) youth measures: these include support for apprenticeships and related forms of general youth training.

Both categories exclude any unemployment or social benefits paid to the participants, which would be included in the expenditure on passive measures.

According to the table, total expenditure on active measures ranged from a high of 1.54 % of GDP in Denmark, to a low of 0.15 % in the US. Both countries have similar levels of unemployment and so there is no real correlation between these two indicators. The differences are the consequence of policy emphasis.

The main element we are concerned with is

Figure 1: **Expenditure on training for adults and those at risk (percentage of total spend on active measures)**



Source: Martin & Grubb (2000)

⁽⁶⁾ The LMP database contains data from 1985.

Table 1: **Expenditure on ALMPs 1997-2000 (percentage of GDP)**

Country	Total active spend 1997	Total active spend 2000	Labour-market training			Youth			Passive expenditure 2000
			Training for unemployed adults and those at risk	Training for employed adults	Total	Measures for unemployed and disadvantaged youth	General youth training	Total	
Australia*	0.63	0.46	0.02	0.02	0.04	0.01	0.07	0.08	1.05
Austria	0.45	0.49	0.15	0.02	0.17	0.02	0.02	0.04	1.07
Belgium**	1.46	1.35	0.16	0.09	0.25	0	0	0	2.34
Denmark	1.66	1.54	0.66	0.18	0.84	0.1	0	0.1	2.96
France**	1.34	1.36	0.25	0.03	0.28	0.21	0.19	0.41	1.76
Germany	1.23	1.23	0.34	0	0.34	0.07	0.01	0.08	1.89
Italy**	na	na	0.08	0.04	0.12	0.01	0.23	0.25	0.64
Japan*	0.34	0.28	0.03	0	0.03	0	0	0	0.54
Netherlands	1.47	1.57	0.25	0.05	0.3	0	0.04	0.04	2.08
New Zealand*	0.77	0.55	0.18	0	0.18	0.07	0.07	0.14	1.62
Spain	0.49	0.98	0.21	0.09	0.29	0.06	0	0.06	1.34
Sweden	2.03	1.38	0.3	0.01	0.31	0.02	0	0.02	1.34
United Kingdom***	0.39	0.37	0.04	0.01	0.05	0.04	0.11	0.15	0.58
United States*	0.17	0.15	0.15	0.04	0	0.04	0.03	0.03	0.23
* 1996/97 and 1999/2000 figures ** 1997 and 1999 figures *** 1997/98 and 1999/2000 figures Source: OECD (2001)									

labour-market training for unemployed adults and those at risk, since this is likely to capture most of the relevant training/retraining measures. Expenditure in this category varies from between 0.66 % of GDP in Denmark to 0.03 % in Japan. However, a much clearer picture of the relative importance attached to training/retraining comes from the comparisons in Figure 1. This plots labour-market training for unemployed adults as a proportion of the total spend on active measures and shows that most emphasis was again in Denmark (42.9 %), followed some way behind with New Zealand (32.7 %) and Austria (30.6 %). Least emphasis was in Australia (4.3 %), Japan (10.7 %) and the UK (10.8 %).

According to the OECD (2001), there has been little overall change in the pattern of expenditure on ALMPs, with minor changes showing a small decline in the proportion of expenditure on youth

and disabled programmes and a small increase in employment subsidies. However, the general trend in many countries towards activation measures of the integrated sort makes the measurement of expenditure on sub-elements hazardous.

Typically, the transitional countries tend to spend less on training/retraining, favouring other policies such as public works job creation and subsidised jobs. However, these proportions will tend to shift as policy emphases change. For example, some countries spent a large proportion of their ALMP budget on developing their employment services in the 1990s, only to switch emphasis to other policies once the required level of service had been established.

Elements of training/retraining may also be integrated within other programmes such as job subsidies (where the employer might be required to offer some structured training to the participant) and

more directly in job search/counselling activities (Bysshe et al., 1998). However, to avoid the complication of separating out the training/retraining element in such programmes, we will not be specifically including these hybrid approaches in our research. While the application of training in employment clearly falls within the remit of VET, we feel that it would not be feasible to isolate the training element from other aspects of the programme.

In further refining what we cover in this report, a study by Dar and Tzannatos (1999) provides a useful typology for training/retraining programmes. The authors suggest the three following categories:

- (a) training for the long-term unemployed,
- (b) retraining for those laid off (*en masse*),
- (c) training for youth.

The rationale for this split from an evaluation perspective is that many of the relevant policies are targeted at one of these subgroups. Furthermore, the influential factors that need to be taken into account when comparing outcomes tend to vary between them. For example, the previous employment experience of the different subgroups is potentially important, with the long-term unemployed by definition having been away from the labour market for some time ⁽⁷⁾, those facing redundancy clearly in a job, and, for youth, any experience of a job possibly still some way off. These three strands should enable us to encompass the wider constituency affected by ALMPs. However, as with all matters in secondary research, this will only be so far as the evaluation literature permits it.

⁽⁷⁾ Here, the conventional definition of long-term unemployment is periods of 12 months or longer.

4. Evaluation findings

4.1. Introduction

In this chapter of the report, we review selected evaluations of ALMPs with a training/retraining element for different countries, bringing out where possible the methodological approach, the findings, and exploring any observable connections between these elements.

In doing so, we have adopted the following criteria in the selection of material, given the focus of our study:

- (a) coverage of different countries, including southern Member States;
- (b) evaluations carried out in transitional countries;
- (c) concentrating on post-1999 material.

We have examined the options available to make best use of the secondary research focus and limited resources available, and also the need to balance breadth with depth of coverage.

There is also much historical information available on the evaluation of active measures that needs to be acknowledged, though many of the studies are generalist in nature and do not necessarily cover in detail either the measures themselves (e.g. a description of targets, operation, etc.) or the evaluation findings. Nevertheless, some are worthy of closer inspection, and fortunately there have been some extremely useful reviews that we can use both to take on board the general points and to identify those studies for closer scrutiny.

4.2. Composite studies

A good starting point is reviewing the principal composite studies of the 1990s. These provide a particularly useful overview of policy and practice.

The study by Dar and Tzannatos (1999) is a comprehensive review of the evaluations of active labour-market policies, drawing on work as far back as 1979, though principally covering work done in the 1990s (up to 1999, the publication date of the study).

It has a bias towards studies from North America and, to a lesser extent, western Europe. This focus basically reflects the reality of the situation (there is a stronger track record of evaluations in North America). The work extends beyond training/retraining measures to include other active measures, though each is segmented for analysis.

For the training/retraining measures, the authors use the familiar three categories (discussed above) and the coverage of studies is quite extensive as follows:

- (a) training for the long-term unemployed – 23 studies covered:
 - (i) 6 experimental;
 - (ii) 13 quasi-experimental;
 - (iii) 4 non-scientific.
- (b) retraining for those laid off *en masse* – 11 studies covered:
 - (i) 5 quasi-experimental;
 - (ii) 5 non-scientific;
 - (iii) 1 using a variety of techniques.
- (c) training for youth – 7 studies covered:
 - (i) 5 experimental;
 - (ii) 2 quasi-experimental.

It is not possible from the report to determine how comprehensive this coverage really is of contemporary ALMPs in these areas. However, the review by Dar and Tzannatos is the most extensive in its coverage of individual studies.

In terms of those focused on training/retraining, the authors generally felt that, while popular, they displayed many shortcomings. Looking at their findings using the three categories already explained, a number of common themes emerge:

4.2.1. Training/retraining for the long-term unemployed

- (a) Programmes can have a positive effect on employment and earnings, but it is likely to be small;
- (b) programme success depends to a great extent on the business cycle. When the economy is buoyant, prospects for participants will be greater;
- (c) generally, programmes are more effective for women participants;

- (d) programmes can cost between USD 900 and 12 000 ⁽⁸⁾ per participant.

4.2.2. Retraining programmes for those laid off en masse

- (a) Retraining for those made redundant has a high dead weight negative effect;
- (b) programmes are most successful if they are small scale and targeted towards the most vulnerable groups;
- (c) programmes can cost between USD 3 500 and 25 000 per participant ⁽⁹⁾.

4.2.3. Training programmes for youth

- (a) Usually targeted at disadvantaged groups such as school dropouts;
- (b) in virtually all cases, programme participants did no better than their counterparts in the control groups at improving their employment probability or earnings;
- (c) where programmes had been subject to cost-benefit analysis, social rates of return tended to be negative.

Overall, the youth programmes gave the most disappointing set of results in virtually all the countries examined. However, the review found that, in general, training/retraining programmes were difficult to justify except for those targeted on certain subgroups. Another interesting conclusion was that most of the programmes were no more effective at improving job prospects or earnings than job search assistance measures, though this was qualified with the remark that, for the subgroups affected, the two types of programme were not necessarily substitutable.

Another composite study by Fay (1996) predates the former and is less detailed and less specific in its coverage of training/retraining measures. However, it does have the virtue of a comprehensive bibliography from which it has been possible to extract particular studies for more detailed analysis. For example, the Canadian employability improvement programme was covered by a study in 1995, and employment training in Sweden by a study in 1995 (Tamás et al., 1995). The review by Fay has the advantage of the including more European studies,

though with the disadvantage that only a few are focused on training/retraining.

Nevertheless, those that are reviewed provide sometimes conflicting signals as to the effectiveness of training-based active measures. However, in interpreting this difference, Fay chooses to attribute the reasons to either the evaluation methods or the programmes themselves (or presumably to a combination of both, though this is not really explored in the paper). In the former instance, he suggests three possible problems, summarised as follows:

- (a) the evaluation periods may be too short, because those on training programmes tend not to have the opportunities for job search that non-participants have, so the gap between completing a programme and evaluating the employment outcome needs to be adequate to reflect this;
- (b) the amount of training undertaken by the control or comparison groups needs to be taken into account, since even non-participation on a particular training programme does not exclude some other forms of training being done;
- (c) the fact that training sometimes leads to further training (and not employment immediately) is not really considered, but could be construed as a very positive outcome that in the longer term could lead to favourable job outcomes.

Unfortunately, the analysis of the possible problems is not necessarily matched by the potential solutions. So, for example, Fay cannot give any firm indication on what might be the ideal gap between programme completion and evaluation.

In terms of the problems arising from the programmes themselves, he sets out five possible areas to consider, summarised as follows:

- (a) the perceived quality of certain training programmes by employers may suggest that participants are not really increasing their employability;
- (b) training programmes that allow participants to requalify for unemployment benefit on completion may not offer the best image to

⁽⁸⁾ Costs shown here (and for subsequent categories) should be treated as indicative only and may relate to various years prior to 1998.

⁽⁹⁾ Indicative figures only – see previous footnote.

employers and may also encourage participation on the basis of prolonging benefit entitlement;

- (c) the type of training undertaken may not reflect the needs of the participant and this could lead to setbacks;
- (d) evaluations may not reflect the changes in the structure and content of training courses as they adapt to different circumstances (e.g. labour-market needs);
- (e) while training programmes can be among the most expensive of the ALMP options, expectations of a return for the individual (e.g. in earnings) should be modest.

These factors provide a useful input in the design of programme evaluation and Fay uses them to suggest how training programmes might be designed in the most optimal way. He sets out five main points to consider, not only in the design of programmes but also in how they should be evaluated, summarised as follows:

- (a) training programmes should not allow participants to requalify for benefits and nor should they be seen as a large-scale solution to unemployment;
- (b) small-scale, targeted programmes offer the best prospect of positive outcomes, and should reflect the needs of both employers and the job seeker;
- (c) better understanding of the best ways to design courses is needed, including the use of public or private providers and their duration (with longer courses normally leading to a recognised qualification);
- (d) measures aimed at youths should be considered in association with general policies on education;
- (e) evaluations should be carried out over longer periods to see if the short-term effects on earnings and employment prevail in the longer term.

As will be seen, some of the evaluation work in various countries, done subsequent to Fay's study, show some of these elements, though it is difficult to identify any that could be considered comprehensive in their coverage of the points.

The review by Martin and Grubb (2001) on OECD countries, despite its publication year,

covers national studies carried out to 1999. It is a wide-ranging review in that all types of ALMPs are considered and there is not much detail on individual programmes, which, of course, limits its usefulness. In addition, the authors' objectives were to highlight those components of ALMPs that seem to work and those that do not. There is a great deal of discussion on the use of the OECD statistics on active measures (see Box 1 for further details of this) and on the measurement of programmes in terms of, for example, negative effects.

The authors go into some detail on the problems and limitations of programme evaluation, citing the following factors as being particularly troublesome:

- (a) by focusing on specific programmes, evaluations tend to ignore other important policies (they call them active measures) such as eligibility for unemployment benefit, the registration and matching of job seekers to vacancies, and job search assistance;
- (b) during long spells of unemployment, in many countries job seekers are often obliged to participate in some active measure, the individual motivational effect of which is generally not captured by evaluations ⁽¹⁰⁾;
- (c) drawing inferences on the aggregate effects of active measures is difficult from the range of microeconomic evaluations that tend to take place.

The problem of frequent programme redesign and reinvention has already been alluded to and is a growing trend in many countries. While many of these new approaches put the individual unemployed person at the centre of a customised service, it does not always mean that they are making free choices from the menu of activities available.

In terms of training programmes, Martin and Grubb point out that they tend to be among the most expensive of the active measures (for an individual participant). This is reflected in their share of total spend on ALMPs (Figure 2) ⁽¹¹⁾. On average, spending on training measures in OECD countries in 2000 amounted to 23 % of all expenditure on ALMPs, and the authors point out that this proportion has changed little over the past 15 years.

⁽¹⁰⁾ The authors give the example here of the *Mutual obligation* in Australia, which required the young unemployed to participate in one or more of 15 different activities and programmes.

⁽¹¹⁾ This may not be the case everywhere. For example, in some of the transitional countries, individual direct training costs are modest when compared to some other programmes (Walsh et al., 2000).

Box 1: **Labour-market programmes database from the OECD**

The OECD maintains a database on public expenditure on labour-market programmes which provides the basis for its regular comparisons of expenditure in member countries (cf. the annual *Employment outlook*). The information is as comprehensive as possible in that it covers all types of spending, including national and regional, local, etc. insofar as this is available (there are problems in ensuring all levels of expenditure are included).

The information is presented in five categories of spending on active measures:

- public employment services and administration,
- labour-market training,
- youth measures,
- subsidised employment,
- measures for the disabled.

In addition, there are two categories for spending on passive measures:

- unemployment benefits,
- early retirement pensions paid for labour-market reasons.

The information on training is limited to public spending in the context of labour-market policies and therefore excludes private sector spending on apprenticeship and other training (which can be substantial in countries such as Austria, Denmark, Germany and Switzerland). Similarly, training financed through payroll tax is excluded.

The database is the subject of collaborative work with Eurostat aiming to extend the range of information available on public spending on ALMPs and participants, etc.

In their overall assessment of training and retraining programmes in selected OECD countries, the authors found that there were mixed signals on their efficacy when using the traditional measures of earnings and employment effects. Countries where programmes have yielded particularly low or even negative results include Canada, Ireland, Sweden and the US. This conclusion is derived from comparison of the rates of return for programme participants against the costs of achieving these effects (mainly the cost of programme provision and not the social or opportunity costs involved, which are generally not measured). Unfortunately, the authors do not go into great detail on where such programmes actually work, limiting their comments to the suggestion that some public training programmes show some useful outcomes.

However, the authors single out the US, where recent studies quoted have found more encouraging results. The authors mention work by Friedlander et al. (1997), Heckman et al. (2000) and

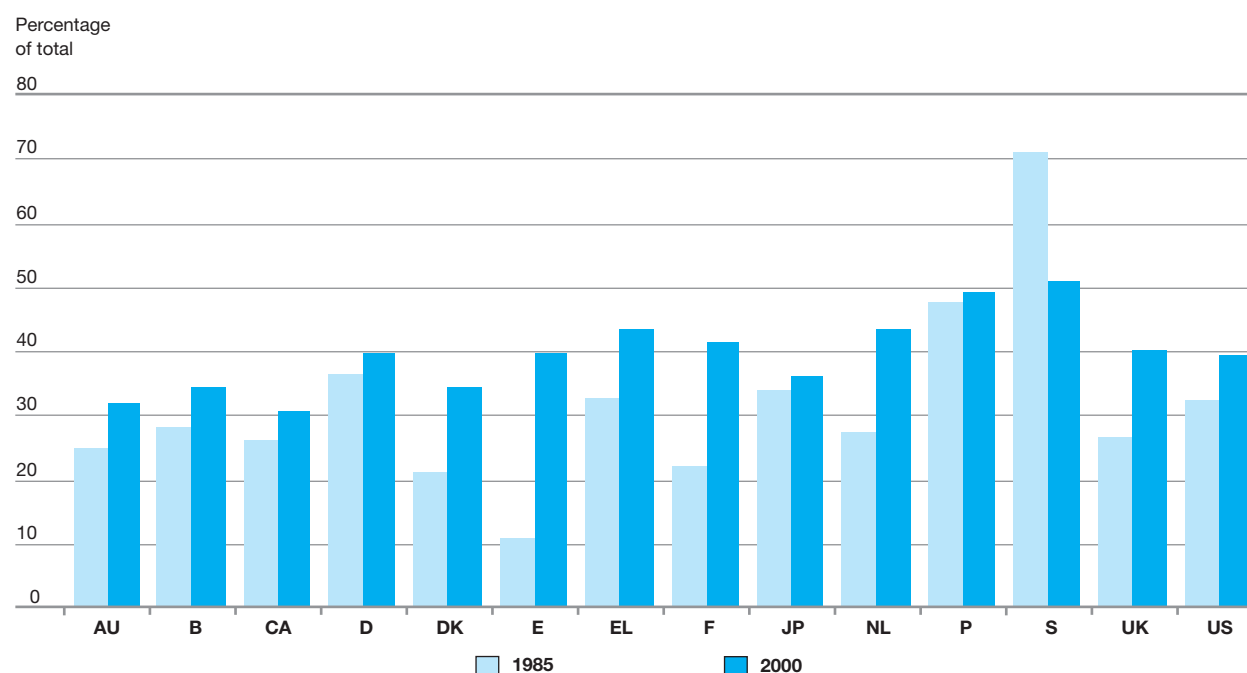
Stanley et al. (1998), which collectively suggest that there have been employment and earnings gains for some participants in training and retraining programmes. The authors point out that the studies also suggest that the labour force subgroup most consistently gaining from their participation in these programmes is adult women.

Martin and Grubb emerge from their analysis of the training/retraining ALMPs with the following generalised observations:

- (a) the subgroup gaining most from participation in programmes were adult women;
- (b) for out-of-school youths, virtually none of the training programmes rendered positive results ⁽¹²⁾;
- (c) most gains (for whatever subgroup) were in the form of enhanced employment potential rather than increases in hourly earnings;
- (d) where there was some observable positive rate of return for programme participants, the earnings gains were not sufficient to lift families from poverty.

⁽¹²⁾ The disappointing results for youth extend beyond training programmes, with Martin and Grubb suggesting that the majority of evaluations have shown that virtually none of the ALMPs work well for this subgroup.

Figure 2: Spending on ALMPs as proportion of total spending on labour-market policy



The authors find little in the evaluations to show why the different sub groups should derive different benefits. In other words, the evaluations fail to explore the determinants of the different outcomes, compared across subgroups of the labour market.

This leads to the conclusion that the evaluations are disappointing in their contribution to designing the most cost-effective public training programmes, though they are able to derive what they describe as crucial features in the design of such programmes, and these are as follows:

- programmes should be targeting tightly on participants;
- programmes should be kept relatively small scale;
- programmes should lead to a recognised qualification or certification that is recognised in the labour market;
- programmes should have a significant on-the-job component so that links with employers are established ⁽¹³⁾.

These are all sensible ingredients to look for in training/retraining programmes, though are no guarantee of success, and have the further advantage that they are broadly consistent with

the findings of other studies such as that of Fay (1996) referred to earlier.

Box 2: Key features and problems of programme design

Tight targeting:

- customisation costs more;
- need for competent personal advisers;

Small scale:

- causes problems with delivery;
- difficult to link with labour-market need;

Local focus:

- job opportunities may be elsewhere;
- local training provision may not be available;

Qualifications/certification:

- current system may not be able to cope;
- programme duration may be too short;

Employer involvement:

- can be difficult to get private sector involved;
- danger of substitution and displacement effects.

⁽¹³⁾ Here, the authors also allude to the problems that fostering closer employer involvement in training programmes could have in causing some displacement of existing workers.

4.3. Experience in the transitional countries

In theory, evaluations of ALMPs in transitional countries represent a purer basis on which to work, given that the programmes are often of the traditional sort, unencumbered by the trend in developed countries towards the coordination of active and passive measures. There is also the advantage (strictly from an empirical perspective) that unemployment is often high and so gives the prospect of a real test of efficacy in difficult labour-market conditions.

Those countries relatively new to the use of active measures also tend to present a more straightforward approach to their design and implementation. The labour market, social and political contexts in which they operate are often far removed from those found in the Member States, for example, and these factors need to be taken into account when interpreting the results, but active measures in any country are adapted to, and influenced by, such factors. It is therefore important that, in looking at individual national studies, these potentially influencing factors are assessed.

Fretwell et al. (1999) concentrates on the evaluation of programmes in certain transitional countries and includes evaluations up to 1999. It focuses on four countries, the Czech Republic, Hungary, Poland and Turkey. This is useful in that they display different size characteristics (in terms of population and territory) and socioeconomic indicators as summarised in Table 2 below. There are also labour-market policy contrasts; of the four, Turkey does not pay unemployment benefit.

The authors compare the results of evaluations in the four countries and give useful detail on the methodologies deployed in each case, covering

such important factors as sample selection. The limitations of the study include reliance on quasi-experimental methods only, limited to gauging the net employment and earnings effects of participation in a range of active measures (including training).

The overall findings from the analysis are helpful in coming to some notion of what works and what does not work. The authors broadly concluded that active measures could have some significant positive benefits on both employment probability and earnings potential, but only for some subgroups of the labour market. Some training programmes that were of longer duration and included group training were found to be more effective, though the reasons for this were only guessed at. The case for group training, for example, was thought likely to be influenced by the characteristics of those entering the training, which could not be accounted for in the simulations.

Furthermore, the case for longer duration training was far from clear-cut. In Poland and Hungary, there was some indication that shorter periods of training (under six months) could have greater impact on employment probability than some of the longer training courses, which must lead to the conclusion that it is more the design and content rather than just duration that determines its value to the individual participant. However, given that there tends to be a relatively high level of formal qualifications in these countries, it may be that shorter periods of training are more than adequate to adapt from the base qualifications held by programme participants. The authors also suggested that private sector provision may be more effective than public sector.

Other indications from the review suggested that there was some evidence (though perhaps not always conclusive) that certain subgroups

Table 2: **ALMP evaluations: country characteristics (1996)**

Indicator	Czech Rep	Hungary	Poland	Turkey
Population (millions)	10.3	10.1	38.6	62.7
Labour Force (millions)	5.1	4.5	17.6	22.2
GDP per capita (USD)	4 740	4 340	3 230	2 838
Unemployment (%)	3	11.2	13.6	6
Expenditure on ALMPs (% GDP)	0.14	0.43	0.32	na
Source: Fretwell et al. (1999) and OECD (2001).				

benefited more from participation in a training programme, summarised as follows:

- (a) men and women can benefit, but the impact may be higher for women;
- (b) young and middle-aged participants benefit more than older participants;
- (c) impact may be greater for the short-term unemployed;
- (d) those with primary and secondary education only benefit more than those with post-secondary educational attainments.

While the above findings generally concur with other cross-country reviews, the one possible exception is educational attainments, with some other studies referred to indicating that the more educational attainments the participants have, the more likely they are to benefit from the programme.

A particularly useful single country study of ALMPs in Poland by Kluve et al. (1999) is not featured in the composite study by Fretwell et al. (1999). Setting the scene, the authors show that Poland has a relatively long experience in the application of active measures, with training and retraining being particularly important. Seen as a way of solving skill mismatches in the labour market, as well as a way of moving the unemployed into jobs, training or retraining programmes were proposed as responsive to the

identified needs of employers. Training is one of three elements among the ALMP armoury used in Poland and it is also interesting to note that the authors ascribe some human capital development benefits to them all. They argue that even the intervention works ⁽¹⁴⁾ and public works programmes were designed to 'enhance or maintain the human capital of participants' (p. 5).

However, because of difficulties with accessing suitable data on the outcomes of programme participation, the extent (and quality) of evaluations has been severely restricted. For this particular evaluation, the authors took advantage of an enhancement to the Polish LFS to derive useable data (Box 3).

Training and retraining has better results than any of the other programmes. In particular, both male and female programme participants had higher employment rates post-programme than the control group, but only after local labour-market conditions had been controlled for. The figures are that average employment rates increase by 15 percentage points for men and 13 for women (but no significant effect on the unemployment rate). This leads the authors to conclude that participation in a training programme tends to prevent flows out of the labour force rather than lowering unemployment rates among the economically active. Neverthe-

Box 3: Use of the LFS in Poland for ALMP evaluation

The study by Kluve et al. (1999) made innovative use of the regular LFS by using a special supplement to gather retrospective information on respondents. The key question to be answered was:

- For those that participated in an ALMP programme, whether they find themselves in a better position in the labour market than would have been the case had they not participated?

This was done by comparing employment and unemployment rates of those who had participated in an ALMP programme (treatment group) with the corresponding rates of those who did not participate (in effect a control group). Comparability between the groups was achieved by matching persons with the same observable characteristics (e.g. age, gender, educational attainment, etc.) and labour-market history before participation in a programme.

In an effort to minimise any effects from the macroeconomic climate on labour-market outcomes, the authors were careful to select those from both groups at identical points in time and economic circumstances.

The Polish LFS has been held quarterly since May 1992 with a rotating panel structure since May 1993. There have been supplements on ALMPs in August 1994 and August 1996. The latter supplement provided a detailed monthly retrospective on the labour-market histories of participants over the period January 1992 to August 1996.

⁽¹⁴⁾ Intervention works are programmes that provide for wage or job subsidies to the level of the unemployment benefit that would have been received by participants.

less, this leads them to conclude that this measure appears to improve the efficiency of the Polish labour market and so should attract more resources.

However, the results should be treated with caution for a number of reasons, even if the use of the LFS managed to provide reliable data, as the authors claim. First, there is the problem of the dynamics of the policy arena, with programmes likely to be changed on a regular basis, so affecting aspects such as eligibility for participation and overall number of places. Second, in transitional countries in particular, the way in which the unemployed are assigned to programmes could distort the results of any evaluation.

For example, the selection of participants could be biased towards (male) heads of households who may be deemed (by the local labour offices) deserving of prolonged income support, as derived directly from the structure of the benefits system. In Poland at the time of the study, unemployment benefits were paid for a maximum of 12 months and so those who are still without work after the expiry of this period would tend to rely on social assistance. However, participation in an ALMP means that, provided the programme is completed, the participant could revert to a new 12-month period of unemployment benefit ⁽¹⁵⁾.

Another problem such evaluations have to grapple with is overcoming any distortions between treatment and control groups from their job search activities during the review period (a more general problem, not just for transitional countries). Those participating in training programmes would tend to have less time to search for work than those not on a programme, and this could influence the employment outcomes of both groups. However, this would be balanced, to some extent, by the training programme participants' greater prospects in the labour market due to enhanced skills ⁽¹⁶⁾.

The series of programme studies (largely supported by the World Bank) carried out in the late 1990s in such countries as Poland and Hungary (e.g. O'Leary, 1998a and b), established

a precedent for other transitional countries to follow under encouragement from the World Bank. The 2000 report on the situation in Bulgaria (Walsh et al., 2000), for example, essentially focused on two aspects of ALMPs, their net impact and their cost-effectiveness. This involved the use of a national survey of programme participants approximately 12 months after they had completed their active measure, alongside a control group of those who shared the same characteristics but who had not participated in a programme.

The survey was carried out through personal interview at the home of the respondent, and efforts were made both to ensure a high response rate and good coverage of all the regions. An important feature of the questionnaire design was to elicit quantitative and qualitative information, the latter covering such factors as the respondent's perceptions of how their participation in a particular programme helped them, their assessment of how well it was run, etc. This softer information was used extensively in the report to complement the econometric analysis.

Employment outcomes were tested under four different possibilities, as follows:

- (a) ever re-employed in a regular job or self-employment,
- (b) ever re-employed in any job or self-employment,
- (c) re-employed in a regular job or self-employment on the survey date,
- (d) re-employed in any job or self-employment on the survey date.

This was to distinguish between those moving into the regular labour market from those finding employment in another sphere such as within another active measure, which was quite common, particularly in the regions with higher unemployment ⁽¹⁷⁾.

The broad findings from the study showed that training programmes generally have positive net effects on employment, with the added advantage that they are among the least expensive option among the menu of active measures. In particular, they work very well for both men and

⁽¹⁵⁾ The unemployed participating in training and retraining programmes received an allowance equivalent to 115 % of the flat rate unemployment benefit.

⁽¹⁶⁾ The study also found that those targeted for the training programmes tended to have more existing human capital than those on other programmes.

⁽¹⁷⁾ In 1999, most regions of Bulgaria had double digit unemployment rates and many had over 20 or 30 % unemployment.

Box 4: **Bulgaria – participants' perceptions of the training programmes**

The response to the survey of participants from the training programmes provides a particularly interesting insight into the quality of provision and complements the rather one-dimensional econometric analysis. Some of the key points that emerged are summarised below:

- 23 % claimed that participation in the programme gave them more confidence;
- 43 % felt that their prospects of finding work were poor, but most attributed this to the generally low level of labour demand;
- over 69 % of those finding work did so in the private sector (which was far higher than for other programme areas);
- 73 % of those in a job felt that their new skills were being used, at least some to extent, and the figures were higher for those involved with additional training or retraining.

women aged below 30 and above 44, for virtually all educational levels except those with higher education, and best of all in those regions with medium to high levels of unemployment. For example, in the highest unemployment regions, the net effect was found to be around 16.8 %, which fell to just 1.9 % in low unemployment regions.

A review of the effects of ALMPs in Slovakia by van Ours (2000) focuses on the individual treatment effects of training and subsidised jobs programmes using regional data in selected districts. In these areas, information was collected on all the registered unemployed so that individual labour-market histories could be compiled (based on three possible states – employment, unemployment and out of the labour force), as well as any participation in the relevant active measures. The author goes on to explain that the information was sorted with respect to the duration of time the unemployed spent in the various states to capture the labour-market dynamics of these events over time ⁽¹⁸⁾.

In Slovakia, the use of training for the unemployed has been a relatively small part of the total resources devoted to ALMPs (the training or retraining of those still in employment was preferred). However, during the 1990s, it seems that there was a requirement that training for the unemployed should be conditional upon the promise of a job at the end of it. This being so, it is not surprising to note that the programme delivered a large positive employment effect in evaluation. The results in van Ours study show

that participation in training has a very high positive effect on employment probability, around six times the rate for others, though the findings are heavily qualified by the job guarantee provision.

Finally, we refer to a study by Schwegler-Rohmeis (2000) for the World Bank but focusing on Kyrgyzstan, a country in the early stages of its labour-market development. Here, the author was charged with the task of evaluating all active measures and this he tackled with a combination of qualitative and quantitative information. In the latter case, this involved using administrative data, in particular the following:

- (a) the proportion of ALMP of total expenditure from the Employment Fund (i.e. the government budget allocation for all passive and active measures),
- (b) the expenditure per capita in each of the active measures,
- (c) the average duration of participation in each measure,
- (d) the placement rates post-participation in a programme.

This was a case of making the best use of the information available and the author categorised the programmes' performance into three levels (strong, moderate or weak). Training and retraining attracted a moderate performance level as did most programmes; only special job placement activities and employment promotion agencies resulted in a strong performance.

The findings led the author to outline recommendations on how the programmes might be improved and in the case of training and

⁽¹⁸⁾ Here, the author was keen to overcome some of the inherent dangers in this type of analysis where those moving into an ALMP may have unobserved characteristics. To overcome this, transitional rate models are estimated that allow for the three transitional rates to be interdependent.

retraining, the principal suggestion was that provision needs to be labour market driven rather than relying on what has been provided in the past, or what clients prefer.

The evaluations carried out in the transitional countries are instructive in a number of ways. First, they show that useful evaluation of active measures is feasible in sometimes difficult labour-market conditions. Second, the actual results suggest that training and retraining programmes can have important positive effects on employment probability, albeit with some limitation imposed by the general state of the labour market (i.e. where the demand for labour is low, then employment probability will tend to be lower, though those job seekers with relevant training will tend to fare better). Third, training/retraining frequently emerges as a relatively low-cost option from the array of active measures, and this differs from the situation in the Member States, for example, where training is often at the upper end of the cost spectrum.

4.4. Selected national studies

The above studies provide a valuable overview of evaluations throughout the 1990s, particularly in Europe and North America. In this section of the report, we focus on a selection of national evaluations that we consider to be instructive in both the methods of ALMP evaluation and the outcomes from programmes.

The studies chosen are selected from a short list of relevant studies we have identified. They are biased in favour of the Northern Member States⁽¹⁹⁾ simply because this is where we have found the most relevant and robust work. This is not to say that relevant studies are not available in other Member States, and we make no pretence that this is an exhaustive examination of all sources. However, our research has pointed already to the lack of transparency of (or access to) some of these sources to external researchers. Consequently, we have not uncovered any particularly useful seam of information (notwithstanding language restrictions) in many Member States. Much of the evaluation effort across the EU is now stimulated by the requirements of the Euro-

pean Commission, and in particular the ESF and EES, and these have a wider constituency that is discussed in Section 4.5.

As a prelude to discussing some of these national studies, Table 3 contains a summary of some of the more prominent evaluations of training programmes in the 1990s. Again, it is not an exhaustive list but is, we feel, illustrative of what has been done and, more importantly, what has been found through these studies. Most have used a quasi-experimental methodology, though in the case of the study of various training programmes, reliance was placed on an analysis of follow-up surveys of participants, while in the US the classroom training element of the Job Partnership Act was subject to a random assignment experiment.

Looking at the outcomes from these evaluations, in Canada, Ireland and Norway the results were encouraging in that participation in training programmes had positive employment, and in some cases earnings, effects, particularly in Canada. In Ireland, it is interesting to note that the positive effects were not uniform across all sectors and, furthermore, were to some extent dependent on whether they led to recognised qualifications. However, the findings from the two programmes in the UK (Employment training and Employment action) were mixed, with the indication (perhaps obviously) that training involving job placement was more likely to lead to employment afterwards. The findings from the US study were the least encouraging, with no significant impact detected on earnings.

Here, we also make reference to an interesting study in Australia. Stromback et al. (1998) reviewed the effect of labour-market programme participation using the Survey of employment and unemployment patterns (SEUP) database published by the country's national statistical agency. This is particularly noteworthy in that it contains matched records of programme participants, employment support services and social security records, thus providing a ready source of information on assessing the effectiveness of programme participation.

In this paper, the authors considered the impact from three different perspectives: the effect on the probability of participating in the labour force at the end of the period; the conditional effect on partici-

⁽¹⁹⁾ Given the extensive coverage in the papers by Hujer et al. (2003b) of the situation in Germany in the third research report, we have chosen not to replicate them here.

Table 3: **National evaluation of training programmes in brief**

Country	Programme	Evaluation method	Outcome	Reference source
Canada	Employability improvement programme	Quasi-experimental	Significant effects on employment duration and earnings for job-related training	Human Resources Development Canada, 1995
Ireland	Various training and employment programmes	Follow up surveys of programme participants	Positive effects of training with labour market relevance on employment and wages	O'Connell et al., 1997
Norway	Labour-market training programmes	Quasi-experimental	Significant positive effects where training led to qualifications in some sectors	Raaum et al., 1995
United Kingdom	Employment training and Employment action programmes	Quasi-experimental	Employment training had positive effect on job probability but Employment action did not. Training with job placement better	Payne et al., 1996
United States	Job training partnership act – classroom training	Random assignment experiment	No significant impact of training on earnings	Bloom, 1994

pating in the labour force; and the effect on post-programme earnings. All types of active measure were covered by the 'Working Nation' initiative (introduced in 1994), one of which was employment training. Training emerged positively when the probability of working was considered, but interestingly this did not translate to actual positive job participation. Similarly, the authors could find no effect of programme participation on post-programme hourly earnings.

4.4.1. Sweden

There is a disproportionate amount of evaluation research coming out of Sweden, no doubt due to the commitment shown through the dedicated Institute for labour-market policy evaluation (IFAU) and the availability of a database going back to 1991 (Box 5). Recent work by Calmfors et al. (2002) is illustrative of this.

In their paper, they review previous evidence of ALMP evaluation and usefully plot the changes in the orientation of training programmes. Labour-market training originally concentrated on vocational training programmes, but the authors

point out that this has changed. There is now more emphasis on general education through these programmes and it includes such aspects as Swedish language training for immigrants, IT training (starting with Computer activity centres in 1995) and so on. This complicates any comparative evaluation of training effects.

Box 5: **Sweden: a unique labour-market data source**

For recent research on the labour market, it has been possible to make use of a longitudinal data set containing the event history of all the unemployed registered with offices of the National labour-market board (AMS) since 1991 (called Handel). This allows evaluators in particular to examine the background and participation in ALMPs over a long period, as well as facilitating the selection of control groups. Information is held on such characteristics as education, work experience and individual labour-market histories so the reasons for ending an unemployment spell are logged.

However, they reveal that studies that attempt to use quasi-experimental methods (mainly treatment to control group comparisons) to measure programme effectiveness can encounter the problem of finding a suitable control group. This is because a high proportion of the unemployed participate in one or more programmes during their unemployment spell ⁽²⁰⁾ and for the long-term unemployed it is common for a string of programmes to be followed. As they put it, 'the choice for an unemployed is to participate in a programme now or later, rather than now or never' (Calmfors et al., 2002, p. 26).

Looking at the long history of ALMP evaluation in Sweden (Table 4) the older studies of training programmes suggested that, in the early 1980s, there were positive effects observed on the employment and earnings potential of participants. However, by the 1990s, the evaluations were clearly tending to show insignificant or even negative effects. It is not wholly clear why this is the case, except to allude to the problems of getting usable data. Here, a study by Sianesi (2001) attempted to tackle this problem by estimating the effects of joining a programme at a certain point as opposed to later, with the control group selected from the unemployed who were not participating in an ALMP at that time.

In the event, the results were not wholly satisfying, in that the short-term employment and earnings effects of training were still insignificant or negative, though more encouragingly they were less insignificant (but still not positive) over a few years (of the 1990s).

To some extent, the data problems can be put to one side by considering other evaluation approaches. For example, Calmfors et al. (2002) mentions the more positive results emerging from surveys of employer attitudes towards the unemployed in Sweden. Here, there is a tendency for employers to ascribe some value to those who have participated in ALMPs, and labour-market training is given preference above other programmes.

However, this upbeat perspective has to be seen in the context of a generally disappointing performance from Swedish training programmes in the 1990s. Calmfors et al. come to the conclusion that training programmes 'seem not to have

enhanced the employment probabilities of participants' (p. 2). Moreover, it is suggested that part of this inefficiency was due to the scale of the programme, with a lack of infrastructure to cope with the expansion of training programmes in the 1990s. Part of the problem was ascribed to the low demand for labour in an economic downturn which inevitably had an effect on placement after training. Also, there were the usual problems of predicting not only the timing of the economic upturn but also where any skill gaps might be.

A different objective motivated the evaluation by Johansson and Martinson (2000), again in Sweden. They started off from the premise that they wanted to test whether increased employer contact and involvement within a labour-market programme had any measurable effect on participant outcomes, using survey-based data on participants to complement the administrative statistics on participation. As the test bed, they chose the Swit programme, introduced in 1997 to develop IT competences within the labour-market training programme (for the unemployed) ⁽²¹⁾, an integral component of which was the involvement of industry which would host elements of the training for the individual.

One specific programme was the Trainee replacement scheme. This allowed employers to receive subsidies for a maximum of six months to cover the cost of training for an existing employee, provided that they also recruited a replacement worker. The programme, therefore, provided training and new jobs.

The authors wanted to compare participation in the normal labour-market training programme and the Swit, and so used data from two main sources to carry out their evaluation. First, the database of the unemployed (Handel) was accessed for a sample of participants. Second, a telephone survey was carried out. This covered around 1000 individuals who participated in each of the relevant programmes during two months in 1999 and was conducted in June 2000 – about six months after the participation ⁽²²⁾.

Overall, the evaluation indicated that being on the Swit course as opposed to other labour-market training increased the chances of finding a job (six months) afterwards by as much as 20 %. The

⁽²⁰⁾ The authors suggest that at their peak in the mid 1990s, ALMPs covered more than 5 % of the Swedish labour force.

⁽²¹⁾ The background to the programme included a growing awareness in industry about the lack of workers with IT skills somewhere between specialists and users of IT.

⁽²²⁾ Response rates were high in both the Swit and LMT courses, with 79 and 80 % respectively.

Table 4: **Sweden: summary details of ALMP evaluations involving training in the 1990s**

Programme and date	Measure	Outcome
LMT, 1993	Regular employment six and two and a half months after programme	Positive effect only if potential selection is not considered
LMT, 1994	Regular employment two years after programme	Significant negative effect of training below 100 days; no significant effect above 100 days
LMT, 1989-91	Yearly income	Significant negative effect one year and insignificant negative effect three years after programme
LMT & Computer Activity Centres, 1996	Regular employment one year after programme	Significant positive effect of LMT; no significant effect of computer activity centres
LMT, 1992-93	Yearly income; and probability to a) obtain a job or b) proceed to regular education one to two years after programme	Significant negative effects
Swit, 1999	Regular employment six months after programme	Significant positive effect
LMT, 1998-99	Regular employment six months after programme	Significant, large positive effects
LMT = Labour-market training Swit = IT competence training for the unemployed Source: Calmfors et al. (2002)		

authors dismissed any effect on this figure arising from any differences in the way participants were selected for the programmes, and therefore attributed the good performance almost wholly to the employer contact that provided practical experience for the participants. However, what is not clear from the research is whether the Swit participants found jobs in IT (using their new skills) or in another unrelated job. Similarly, it is unclear if participants worked with the employers with whom they had established contact during their programme. If so, this suggests that the benefits of the programme extended beyond the acquisition of a skill in demand in the labour market, to job search and placement.

4.4.2. Denmark

Staying with the Nordic countries, but this time looking at Denmark, a study emanating from the Ministry of Labour (2000) provided a thorough

appraisal of the Danish employability enhancement programmes (EEPs) over the 1990s. The EEPs involve the usual range of ALMPs, including training, and a key objective is to bring about activation early in the unemployment period to prevent the drift into long-term unemployment, after which it becomes more difficult for the unemployed person to return to the regular labour market.

A number of studies were carried out during the 1990s, most using treatment and control group comparisons of various sorts drawing on specially commissioned surveys of participants as well as using administrative data. However, one approach for gauging the effect of upgrading the qualifications of the unemployed (a key part of the EEPs) was examining whether participation in a programme led to a reduction in the payment of benefits compared with non-participation (the so-called fixed-effect model ⁽²³⁾).

⁽²³⁾ The fixed-effect model takes account of the problem posed by the control group by allowing programme participants to represent their own control group. It adopts a counterfactual approach whereby assumptions are made about what would have happened to the individual if they had not participated in a programme.

The report also describes an evaluation carried out in 1997 that attempted to look at the effectiveness of programmes post-1994 when reforms shifted the emphasis towards decentralisation, individualisation and targeted initiatives. This involved using the national labour-market authority's (NLMA) administrative database on those registered as unemployed, alongside a special survey of participants in EEPs ⁽²⁴⁾ who were questioned about their perceptions of the benefits from the programme. Further surveys were carried out for the NLMA in 1997 and 1999 and the most recent results tend to corroborate what emerged from earlier studies, with the effects summarised as follows:

- (a) overall, there were positive employment effects from participation in EEPs;
- (b) while both public and private sector training programmes have significant positive effects, that for private training programmes is better;
- (c) training programmes under EEPs reduce gross unemployment;
- (d) by 1999, the positive effects of programme participation had increased to the extent that some 32 % of participants eventually entered a job;
- (e) the positive effects were less significant as the age of the participant increased;
- (f) the positive effects increased with higher levels of education among the participants.

The better performance in finding employment of those following training programmes in the private sector was largely due to more of the participants finding work with the employer where they did their training. Furthermore, one study confirmed that better outcomes came from private sector training when it was initiated relatively early in the individual's unemployment period, whereas it was the opposite in public sector training. The reasons for this are far from clear, though in the former case it is likely that those selected for training in the private sector are likely to have short unemployment experience and so may be able to settle in with their employer much more easily.

4.4.3. Belgium

A much wider cost-benefit analysis of the Belgian TOK programme by Nicaise (2000) draws together information from various evaluations of the programme. The TOK programme has been running for some years and aims to offer employment and training opportunities for the underprivileged, most of whom are the long-term unemployed. It principally involves participants being offered temporary employment contracts on such tasks as construction, building renovation work, assistance to families and the elderly, all administered by local welfare centres. A review of the programme in 1989 discovered that the numbers of programme participants moving into regular employment were not encouraging, and so the programme was revamped to include more emphasis on counselling and training ⁽²⁵⁾.

Various evaluation methods have subsequently been deployed to examine the performance of the programme, with perhaps the most thorough being that of Wouters et al. (1994). This study involved interviews with a group of TOK participants from 1990 (in effect, around two years after completion of the programme) and included some who had failed to complete their programme (for various reasons). A control group was selected from non-participants but with similar characteristics based on age, gender, level of education, nationality, marital status and duration of welfare support, and matching with the treatment group was carried out.

The results of the analysis showed that TOK participants had performed much better than non-participants, in both employment opportunities and earnings, in the two years after they completed the programme. Furthermore, the profile showed that the programme participants tended to have a weaker employment history pre-programme than the control group, which added to the positive outcomes from participation. However, the findings were tempered by the fact that only just over two-fifths of the programme participants were in work 12 months after completion of the programme, a situation largely attributed to the relatively poor labour-market conditions prevailing at the time.

⁽²⁴⁾ A representative sample of 5000 unemployed participants were selected from the administrative records with a response rate of over 84 %.

⁽²⁵⁾ The programme combines 400 hours of general training, 400 hours of practical professional knowledge and 40 hours of familiarisation with new technology, with an average programme duration of 14 months.

The author attributes much of the success of the TOK programme to the fact that it offers training geared to labour-market needs and fulfilling work for the participants, which is reflected in aspects such as low dropout. However, it is considered to be an expensive programme (partly because of its relatively long duration) in strictly financial terms, but with much wider social benefits. These wider benefits are discussed in the report rather than quantified, and include the following:

- (a) programme participants can fill vacancies that are not liable to be filled by other job seekers;
- (b) the sorts of training given can lead to efficiencies in the labour market by helping avoid skill shortages which, in turn, could reduce wage pressures and lead to aggregate employment benefits;
- (c) the training of programme participants can lead to the creation of jobs in related fields;
- (d) productivity gains for employers from the training can lead to lower costs and prices, etc.;
- (e) overall the returns to government in terms of welfare benefits saved, income tax paid, etc., can be positive.

The point being made is that a thorough cost-benefit appraisal of the effects of the TOK programme would bring together all these (and possibly more) issues, but this is never done.

In a similar way, the extended benefits accruing to the programme participants (aside, that is, from the real benefits of income) are seldom assessed in evaluations. With the TOK programme, aiming as it does at particularly disadvantaged groups, benefits were identified as including increased self-confidence, greater social contact, follow-up training, the regularisation of social security rights, etc. Furthermore, there are benefits for the municipality in terms of a reduced workload for the welfare centres and (probably) a lower incidence of crime and health problems.

4.4.4. Germany

A number of other studies that we have come across tend to dwell less on the actual programmes and more on the methodological approach to evaluation. We have not gone into great detail on the German examples because this is the subject of a separate focused paper by Hujer

et al. (2003b) in the third research report. However, Fertig and Schmidt (2000), for example, begin their paper by outlining the lack of proper evaluation of German ALMPs, even though the process of gathering data through local labour offices has undoubtedly improved. However, the point they make is that this information is not systematically used to evaluate programmes, and so they then go on to describe what should be done.

Their basic requirement for effective evaluation is to establish what they call a credible counterfactual situation (p. 17), or what would have happened in the absence of the intervention (this, of course, is a general requirement for most evaluation approaches where control groups or before-and-after estimates are used). Nevertheless, this is easier said than achieved and the authors admit that 'at best the effect can only be estimated with confidence, but never measured with certainty' (p. 17).

When looking at the costs of German ALMPs that aim to improve the skills of the unemployed, they outline three strands as follows:

- (a) costs of treatment (expenditures incurred by the participants such as course fees, transport, subsistence, etc.);
- (b) time costs of participation (the opportunity cost foregone by the individual);
- (c) time costs involved with programme administration and delivery (e.g. the opportunity costs of administrators).

The problem is that opportunity costs are always difficult to quantify and so tend to be ignored in any evaluation exercise.

4.4.5. Ireland

A more divergent approach to evaluation is taken by Conniffe et al. (2000) in a study delving into past evaluations in Ireland. Here, they explore the use of natural experiments and propensity scores as alternative (or parallel) activity. The authors point out that the propensity score approach is often used in the field of epidemiology (and others) and it rests on the notion that matching individuals in groups should be compared with each other, with the usual basis for inclusion being the prior probability of programme participation. The approach is seen as an alternative to the use of control groups with all the attendant problems of making assumptions on who should be in them. The natural experiment occurs through using observational data on what are, in

effect, treatment and control groups, but without what the authors call deliberate randomisation of individuals to groups.

In order to test the effect of their approach, the authors apply the technique to previously gathered data on training programme participants (and specifically those following general training) ⁽²⁶⁾ and reveal that their findings correspond with those of the traditional evaluation. The advantage in this, they argue, is that the propensity score approach makes fewer demands on the evaluator to make assumptions about the control group in particular and so should lead to less spurious results.

4.4.6. United Kingdom

While the UK has a fairly consistent track record of programme evaluation, much of it is of the qualitative sort with few quasi-experimental studies in evidence. Nevertheless, a key strength of the work here is its attention to all stakeholders involved in programme take-up and delivery, approaching the holistic perspective that is now becoming recognised as desirable.

A good example of this approach is the evaluation of the prototype employment zones (PEZs) by Haughton et al. (2000). These were set up on an experimental basis in 1998 in five areas of high unemployment across the UK, and the evaluation was commissioned at the same time to run alongside the development of the PEZs. The basic idea behind them was to bring greater flexibility and local innovation to helping the adult unemployed (those over 25 years old) return to the labour market and was the first real attempt at turning the provision of employment services round to a more client-focused approach.

The evaluation was essentially a longitudinal study tracking the development of the PEZs and involved specific fieldwork at various points in the two years of research. Interviews with key stakeholders – including clients (mainly in focus groups) – was the core activity and the results provide some interesting conclusions on the pilot activities. However, one problem encountered (which is consistent with many complex evaluations of this sort) was that it was difficult to separate out the relative effects from such elements as programme design, rules of engagement and

the prevailing labour-market conditions, for example. Nevertheless, they were able to conclude that the new approach tended to overcome a key problem of the traditional approach that tended to offer training for training's sake. Under the client-centred approach in the PEZs, learning for work became the most popular option and flourished partly because local provision developed to meet the challenge, with new courses and greater flexibility offered.

4.5. EU Evaluations

While in some of the Member States there is a tradition of rigorous ALMP evaluation, in the majority this is not the case. However, the emphasis now given to the evaluation of projects in the ESF and to reviewing progress with the EES has introduced a greater discipline to Member States, such that all provide some form of evaluation. There are, however, still substantial differences between the rigours applied to the evaluations across the EU. In this section of the report, we look at some of the recent studies done both individually and cross-EU in ESF, and in the next section for EES.

4.5.1. European Social Fund (ESF)

The various labour-market programmes funded under the ESF should, in theory, provide a rich seam of evaluation material on three levels:

- (a) project level: each project funded is required to have an explicit monitoring and evaluation strategy, with resources attached to make sure it happens;
- (b) national level: Member States were involved in mid-term and final evaluations of their national ESF programmes in the 1990s;
- (c) EU-wide: the European Commission, drawing on the national reviews, provided EU-wide perspectives.

As far as the individual project evaluations are concerned, these will inevitably be variable and would be much too detailed for use in a meta-analysis of this nature. However, they should contribute to the national studies and so it is reasonable to assume that in those Member

⁽²⁶⁾ For a discussion of the more traditional approach and the data mentioned here see O'Connell and McGinnity (1997).

Table 5: **ESF evaluations: summary of main points**

ESF programme	Main points
Objective 1	<ul style="list-style-type: none"> • Net impact was greater when programmes concentrated on the most disadvantaged groups; • In some cases, combining measures increased their net impact; • Programmes offering work experience are best when combined with some form of skills training.
Objective 3	<ul style="list-style-type: none"> • overall, gross employment impacts ranged from 30 % to 80 %; clients showed high levels of satisfaction with their programmes; • the chances of findings work after a programme depended less on the beneficiaries' personal characteristics than the availability of jobs in the labour market and the type of project.
Objective 4	<ul style="list-style-type: none"> • some evaluations suggested that employers benefited more than workers from supported activities; • there was a lack of attention to identifying those skill areas of most need in the future and applying this knowledge to project support; • some of the training supported through projects was considered to be too general or, in some cases, not sufficiently transferable between employers.
Source: European Commission (2001)	

States where this was given a strong profile, the national studies would be stronger as a result.

The national studies provide useful material despite the fact that they were not generally executed to a consistent set of methodological guidelines. The Portuguese evaluations, for example, focused on measures rather than programmes, while in Ireland the attention was on continuous evaluation. The range of techniques deployed also included quantitative and qualitative methods, with the widespread use of discussions (interviews and focus groups) with the key stakeholders. The main outcome measured was employment, though not exclusively so, with other issues such as the impact on beneficiaries and systems also receiving attention in some studies. Furthermore, the reviews were much more wide-ranging than our focus in this report on training and retraining measures.

Unfortunately, accessing the national studies is hampered by their availability only in the languages they were written in and the fact that

they have not been uploaded to the Internet. We have, therefore, largely relied on the composite cross-EU reports for our information, notably European Commission (1998) for the mid-term evaluation, consolidated in the European Commission (2001) report that covers measures under Objectives 1, 3 and 4 ⁽²⁷⁾. Table 5 below summarises some of the main findings relating to the impact on beneficiaries.

The ESF interventions are generally more broad ranging than simply focusing on training and retraining, which should be seen as one of their strengths. Furthermore, they do not necessarily apply exclusively to the unemployed, though a high proportion of the beneficiaries will be without work or face the threat of redundancy. Nonetheless, the findings indicate some of the same problems that have emerged from national and other evaluations, namely that the targeting of policies always works better and linking training to what employers and the labour-market need is always likely to improve the impact.

⁽²⁷⁾ Objective 1 – to develop regions which are currently underdeveloped;

Objective 3 – to tackle long-term unemployment, promote equal opportunities, improve lifelong learning, encourage entrepreneurship and adaptability and improve the role of women in the workforce;

Objective 4 – to improve the qualifications and prospects of all those in employment.

4.5.2. European employment strategy (EES)

The EES began in 1998 with the aim of improving the performance of labour-market policy in Member States. It achieves this through what are sometimes referred to as soft learning instruments, essentially based on peer reviews and benchmarking policy and practice between Member States. Within this, there is a requirement that Member States review their labour-market policies on a regular basis, the first thorough review being carried out in 2001-02 and covering the first three years of the EES.

Each of the Member States submitted a review to the European Commission ⁽²⁸⁾. The papers are of variable depth and quality and not all could be considered evaluations, with some simply descriptive reviews of what has been going on in labour-market policy, without any critical appraisal.

These papers have a much wider coverage than ALMPs and our concerns tend to be concentrated in the discussion of Pillar I: Employability ⁽²⁹⁾. Nevertheless, they provide a useful insight into the approach to ALMPs, and help fill the large gap between those Member States with a tradition of ALMP evaluation and those where this is still an underdeveloped activity.

4.5.2.1. Spain

The Spanish EES review is a fairly thorough attempt at evaluating the main measures funded by the public employment service (see Box 6 for details of training measures in Spain). It includes an econometric analysis of the administrative database in order to derive the impact of training measures using two key indicators:

- (a) the chances of participants having a job at the time of the analysis (called the hiring rate);
- (b) the chances of participants having had a job at one point during the accumulated observation period (called the employability rate).

The report claims that the two measures offer complementary information on the success of participation in the programme, with the better of the two being the employability rate, which offers a better indicator of the longer-term job prospects of the participants. This is considered particularly important in the context of the Spanish labour market, where there are relatively

high levels of labour turnover making categorisation difficult.

The EES evaluations for Spain involved two key approaches, the first of which relied on an interpretation of the hiring and employability rates from the administrative data alone (but including programme participants and non-participants), while the second used estimation techniques to measure the performance of the treatment group against a control group. The former analysis gave disappointing results, albeit positive, but the econometric analysis was more encouraging, suggesting that training significantly improved the employability of certain subgroups.

Those most benefiting from the occupational training programmes were the disadvantaged youth, disabled persons and ex-convicts, which equated to those with the lowest levels of educational attainment. However, the report indicates that there was some positive effect for most participants in the training programmes.

4.5.2.2. The Netherlands

The Dutch review of the EES also provides a thorough overview of the performance of ALMPs in the context of a strong tradition of evaluation. However, within the paper, there is a lengthy discussion of evaluation methodology and how this has been used in the Netherlands. This leads to some critical comment on the track record, with the suggestion that too many of the previous

Box 6: Training measures in Spain

Recent changes in the approach to professional training have been based on decentralisation, with the management of programmes done through accords between the government and the key social actors. Similarly, the decentralisation of the public employment service has also led to regional authorities becoming actively involved in the design and delivery of training for the unemployed. Alongside this has been a more targeted approach towards the more disadvantaged subgroups of the labour market, such as the short-term unemployed youths and adults.

⁽²⁸⁾ Available from Internet: http://europa.eu.int/comm/employment_social/news/2002/may/eval_en.html.

⁽²⁹⁾ Theme 1: Prevention and activation policies for the unemployed, being particularly relevant within the first Pillar.

evaluations of policy have relied on a simplistic approach, providing only measures of gross effectiveness and not net effectiveness.

The report itself does not engage in any new evaluation of ALMPs, but instead provides an overview of the wide range of training measures that have been tried (and often tested). These include programmes aimed at individuals and employers, with some involving private funding as well as public (such as direct payments, tax subsidies, etc.) and this leads the report to conclude that these factors contribute to the complexity of the task for the evaluator.

Drawing on previous evaluations (and here the overview by De Koning (1998) is useful) and particularly those of the quasi-experimental sort, the report suggests that the effects of participation in a training programme have changed significantly throughout the 1990s. In the first few years of the decade (to 1993), the indications are that there were important positive effects, especially for the long-term unemployed where the chances of finding work were around 10 % higher. However, by 1997, the evaluation literature was indicating that there was no significant effect of programme participation.

4.5.2.3. Ireland

The review for Ireland provides a thorough appraisal of current ALMPs implemented under the national employment action plan (NEAP). Recent emphasis has been on giving support to the unemployed at an early stage in their unemployment period, and this can include a place on a training programme. However, the emphasis is initially on the provision of a job (if suitable and available), followed by guidance and counselling, and it is within this process that a place on a training programme might be offered.

The Irish review uses administrative data gathered through the NEAP, as well as consultations with key players in the social and labour-market fields (the latter particularly to understand the effects of the EES itself), to assess the effects of policy. In the case of ALMPs, the report affirms the country's commitment to an array of such measures and their contribution to helping alleviate social exclusion, labour shortages and skills development, though at the same time questions whether they always work. As the labour market has become tighter, the report claims that the probability of leaving unemployment becomes

more dependent on an individual's capacity to compete in the labour market, citing the main exits from unemployment as evidence of this. Those faring best include the following:

- (a) younger people;
- (b) those with educational qualifications;
- (c) those who had recently participated in vocational training;
- (d) those with previous work experience;
- (e) those who began with a short spell rather than a longer spell of unemployment.

These factors combined provide a blueprint for moving people from unemployment into regular work and are evidenced in the Irish approach to ALMPs. Furthermore, training programmes have assumed greater importance in the recent low unemployment scenario, offering some palliative for skill shortages.

4.5.2.4. United Kingdom

The UK has also faced similar problems to the Irish labour market, with relatively low unemployment and skill shortages, but with the unemployed needing to be equipped to compete in this dynamic job market. The EES review for the UK provides a useful overview of the evolution of current policy, drawing on some previous evaluation work, but providing no new analysis.

The foundation for ALMPs is the New Deal programme, launched in 1998 and continually developed ever since, with the introduction of different strands targeting different labour-market subgroups. With some exceptions, New Deal kicks in for young people (aged 18-24) once they reach 6 months' unemployment, whereas for those over 25, the trigger is 18 months.

One exception to the rule is the New Deal 50 Plus, which, as the name suggests, is targeted at those unemployed aged 50 and over with the aim of moving people back into sustainable jobs. In this case, participation in the programme is voluntary and eligibility is after six months of unemployment. It includes the usual customised support package, and in this case one of the options is an in-work training grant. Early research on the programme suggested that most participants were male, but there were reasonable signs of success with 57 % of the sample in work, the majority of who were towards the younger end of the age group, had shorter spells of unemployment, and with a higher representation of women (Employment Service, 2001).

4.5.2.5. *Austria*

A distinctly quantitative approach was taken in the EES review for Austria. This made use of the considerable database available to the researcher that contains information on the workforce and employers, as well as those unemployed participating in active measures. Using some of this information, the report concentrated on a micro-analysis of programme participants and non-participants, adjusting the gross findings by the application of econometric techniques to arrive at estimates of net impact. Individual findings were also used as a basis for estimating the macroeconomic effects of policies.

The impact of participation in training programmes was found to be positive in the macro sense, with the upgrading of the skills of the unemployed responding directly to employer needs. This leads to the conclusion that the programmes had increased aggregate employment by over 9 800 each year which worked to a contribution of 0.32 % to GDP growth. Over 74 000 of the unemployed had benefited from a public employment service qualification enhancement programme and participants had managed to increase their earnings potential by some EUR 2 870 per annum, compared to those with similar characteristics who did not participate. This was also expected to have added to GDP growth.

4.5.2.6. *Finland*

The Finnish evaluation of the impact of the EES (Finnish Ministry of Labour, 2002) is a particularly thorough appraisal of all four pillars. Persistently high unemployment has meant a significant

number of those affected have participated in active measures which, at their peak in 1996, affected around 5 % of the labour force. The evaluation of these active measures essentially uses administrative data combined with sources such as the LFS and other surveys, with various manipulations (including quasi-experimental techniques) carried out by independent researchers.

Different studies tended to show slightly different results on the effects of training measures, but the overall employment effects were only modest for the individuals concerned. Longer-term job impact was assessed from the extensive panel data available to the researchers using matched control groups (to minimise selection bias). However, labour-market training (as well as subsidised jobs in the public sector and certain other measures) had a weak net impact on the employment probability of participants, though the outcomes were slightly better for those with lower than average employability at the start of the programme.

The Finnish study draws some interesting conclusions. It suggests that interview-based surveys of programme participants show considerable social benefits to them, though these can be short-lived if they do not eventually find a job. Also, there needs to be a distinction between labour-market training designed for immediate employment and that for developing long-term competence. In the former case, the argument is that this type of training should be responsive to the economic cycle, being reduced when there are fewer jobs available. In contrast, training that aims to increase skills such as language or IT, or

Box 7: **Work-based learning for the unemployed in the UK**

Work-based learning for adults (WBLA) has been an important plank of active policy in the UK since the late 1990s. Its primary aim is to assist unemployed adults (within the age range 25-63) into sustainable jobs through participation in training programmes that are responsive to local labour-market needs. Participants must have been unemployed for at least six months, though there is a long list of special groups that can be considered before this threshold, such as people with disabilities, those needing help with basic skills, lone parents, ex-offenders, etc.

The programme is delivered by the Employment Service through its local offices. A key feature of the programme is its flexibility and customisation to the client's needs. So the training can be job-specific, working towards a national qualification, developing basic employability, work experience or self-employment. Participants receive an allowance equivalent to their benefit entitlement, plus an additional GBP 10 per week and they are also eligible to claim assistance with expenses such as childcare and travel to their training.

gain qualifications, should move inversely to the economic cycle. It is argued that introducing such responsiveness into this aspect of labour-market policy should lead to greater programme effectiveness.

4.5.2.7. *Other Member States*

Some of the other Member State EES reviews were disappointing in their lack of specific coverage of ALMPs and attention to detail. For example, the Greek review was principally a list of current and previous legislative instruments with no attempt at evaluation. However, one of the main conclusions of the report was that proper investigation of the policies was required. The Italian review is a little more detailed in terms of its investigation into policies, but is rather too broad for our use, failing to cover ALMPs in sufficient detail. Nevertheless, it makes the point that the EES may have put undue emphasis on the role of the public employment service in solving the structural problems of the Italian labour market rather than seeing it as part of a wider network of organisations, local and national, and policies, social and economic, that should be integrated.

4.6. **Lessons to be learnt**

The foregoing analysis of evaluation studies is, of necessity, selective. However, there is sufficient breadth of coverage in terms of countries to allow some useful issues to be raised.

Methodologically, the evaluations tend to fall into the quasi-experimental sort, with an emphasis on the econometric elaboration of programme outcomes. However, there is some evidence of the innovative use of administrative and available survey-based data (such as from LFSs) to underpin these analyses, which is important. The quality and validity of these evaluations will be significantly dependent on the quality of the data.

It is interesting to note that the studies carried out in the transitional countries, where it might be postulated that ALMPs are less complicated in

their design and operation, in general tend to show more positive impacts than, for example, in the Member States. The literature does not fully explore the likely reasons for this, though one factor is certain to be the generally more difficult labour-market conditions found in the transitional countries (as proxied by higher levels of unemployment – particularly long-term unemployment). However, there are also plenty of similarities in the evaluation findings, relating to aspects such as which subgroups do best out of participation in training programmes.

This, to some extent, reinforces the problems in comparing programmes across countries. Exogenous circumstances will greatly affect the relative effectiveness of programmes. This is particularly so for training/retraining measures, where a commitment can involve a substantial lead-time for a forecast future skill need. Effectiveness will, therefore, depend on factors such as:

- (a) the accuracy and timeliness of labour-market information;
- (b) the ability of employers to assess and communicate their future needs;
- (c) the ability of training providers to meet the skill needs articulated within an appropriate learning context;
- (d) changes in business and political circumstances.

Endogenous variables that might influence programme outcomes also need to be taken into account and this depends on how much detail the individual evaluations have on the structure and operation of the programmes. From the evaluations accessed here, there was often a disappointing level of detail on the actual programmes.

This raises the issue of how the approach to ALMPs is changing in many countries, with the growing emphasis on activation measures and the coordination of active and passive measures. It leads to a lack of clarity about the structure and objectives of individual programmes and associated difficulties in gathering reliable information on participation. It suggests the job of the evaluator in the future will be that much more difficult.

5. Summary and conclusions

5.1. Introduction

In this final chapter of the report, we reflect on the preceding analysis of the evaluations and attempt to extract the key messages for both the methodology of evaluation and the design of training and retraining programmes within the context of ALMPs. This is inevitably a difficult task given the diversity of the studies examined, the contrasts in scope (and robustness) and their national backgrounds. Drawing out the common denominators is therefore tricky, but necessary if we are to make a contribution to improve future evaluation.

In general, it can be said that evaluation has a somewhat mixed perception among the various interest groups. To those being evaluated, it can seem to be an intrusive activity that is demanding of time and resources, the end result of which is inevitably some criticism. To government agencies responsible for ALMPs, it is often referred to as an integral component of a programme, yet can often have few resources devoted to it. Results can be ignored or often dismissed on the basis of their timing or design. For many here, it may be a process of accountability more than policy improvement. To the evaluators, there is normally some intrinsic attraction in the work, offering the opportunity to experiment with social data. Unfortunately, this can lead to the results of some evaluations being too impenetrable for those who really have the power to change the way a programme is structured. There is also the dual problem of policy-makers wanting quick results from evaluations that might be best conducted over medium to long periods.

The overwhelming need is to balance these potentially conflicting perceptions to ensure that policy evaluation is both integral and useful, with the benefits to current and future programme participants being the primary focus.

Here, there seem to be growing tensions between accountability-led evaluations - justifying the value secured from public funds - and the continuous improvement model. The latter is more in accord with the emphasis in some countries for evidence-led public policy developments,

but is not apparently well served by the sorts of evaluation shown in this review. In short, evaluation frameworks and/or research designs seem to have a narrowness of focus (e.g. accountability evidence) built into them. This does not encourage the sort of breadth of scope and analysis needed to provide the quality of feedback on VET impacts with ALMP needed to policy-makers, national or transnational.

5.2. Methodologies of evaluation

The analysis has shown quite clearly that training programmes are subjected to both monitoring and evaluation, both of which have their place. However, there is perhaps too much attention in the literature to the differences between the two, with the basic point that only experimental, or the more likely quasi-experimental, approaches are likely to have the necessary rigour.

This is disappointing, since there is a strong case to make (for understanding VET effects in particular) that any single approach to evaluation is limiting. Some of the best studies are those that take a wider methodological perspective, certainly using experimental approaches where feasible, but complementing this with the use of administrative data and more qualitative information on, for example, processes and the perceptions of programme participants. It suggests that evaluation hitherto has been more academically driven rather than policy driven, which is not so much a criticism of the former as a lack of proper attention in the latter.

On a number of occasions, this report has alluded to the lack of an evaluation culture in some countries to the extent that it is not conducted effectively. This is certainly the case in some Member States, where we could find little evidence of useful programme evaluation. Alternatively, there are other cases where ALMP evaluation has been carried out in countries under the auspices of international agencies such as the World Bank, and this is probably the case with

most of the transitional countries with evaluations to show.

In our analysis, it was disappointing to note that there was little evidence of what might be called a holistic approach to programme evaluation. Here we are not so much referring to a fully blown cost-benefit analysis (though there may be a strong case for this approach) but more to a wider evaluation that attempts to measure some of the effects other than employment probability or earnings. Additional benefits that might accrue to the programme participant include, for example, measurable things such as hours of work (and other conditions such as holiday entitlements, etc.), non-pecuniary benefits, and the components of earnings (such as bonus payments, etc.). Similarly, there are the less tangible benefits that might accrue such as increased self-worth, better health, wider social and behavioural gains, etc. These are more difficult to measure and compare (with non-participants), and are explored in greater detail in the contribution by Green et al. (2003) in this third research report.

However, as with full cost-benefit appraisals, these wider evaluations are often too easily dismissed as impossible to measure, and so the challenge remains largely untouched. This seems a particularly important limitation in understanding VET impacts. Furthermore, there is little evidence of empirical support to say whether these assumptions on measurement are valid.

Of course, one of the major problems preventing more extensive evaluation of ALMPs is the volatile environment in which they are currently operating in many (though not all) countries. As the mix between active and passive measures becomes blurred, the focus of evaluation is also likely to suffer. In any case, some of the existing studies have drawn attention to the fact that evaluations are often only focused on pilot or demonstration projects, to the extent that they are never given the opportunity for extensive (wider and longer-term) application. This probably arises from the perception by some that evaluation has this limited role, whereas the need is for evaluation to become in-built to programmes from their outset so that the requisite information is gathered in an ongoing process.

Information is a key to effective evaluation and some of the foregoing studies have demonstrated

that there is potential in accessing useful data from regular sources. Supplementary questions to a regular LFS (e.g. in the form of repeated cross-sections) offer a particularly effective (and relatively cheap) way of gathering relevant data, yet it is surprising how little this is done (notwithstanding the inherent methodological problems). Special surveys are also an option, but to be most cost-effective, the best examples incorporate attitudinal information alongside the factual, opportunities that are often missed by evaluators or those specifying evaluation frameworks.

5.3. Programme structures

It is difficult to extract the best elements from the different training programmes covered by the evaluations referred to in this paper. Part of this is due to the lack of detail given on the programmes, though even with sufficient detail it is not always appropriate to transfer models. Local circumstances, including the prevailing labour-market and administrative conditions, limit the degree of transferability and we are really left with identifying common denominators that hint at best practice.

However, one important and clear issue for effective training relates to the quality of training provided under the active measures. Indications from the evaluations are that this is not always as high as it should be, to the extent that it compromises the individual outcomes. Most studies that have tackled this issue point to the need for programmes to have labour-market relevance. This might best be achieved in two ways.

First, good forward-looking labour-market information can provide strong indications of what the characteristics of the demand for labour are likely to be, and this can help inform provision (and individual choice). However, the inherent difficulties in predicting future needs, coupled with the lead times involved in training, mean that it is never going to be a precise activity. At best, such information can be indicative of future demand and can lay the foundations for an informed choice.

Second, and complementary to the first point, the involvement of employers (or the social partners where this is feasible) in the design and delivery of training programmes provides a more direct way of

ensuring that the skills acquired by programme participants are likely to meet some real need. The very few evaluation studies that have examined programmes where there is employer involvement have been clear in their conclusions that it leads to a better quality programme (whatever the measure of success). However, it is true to say that the involvement of all parties (or as many as possible) will raise the profile and ultimately the validity of programme evaluations.

However, this positive outcome is not simply confined to the particular employers involved in the programme. The indications are that programmes with strong employer involvement can lead to skills that have a certain currency in the labour market, thus enhancing participants' longer-term employment prospects measured in terms of job progression as well as employment sustainability. This is further enhanced when the programme training leads to a recognised national qualification, though this tends to be only possible for the longer periods of training (usually in excess of six months).

It is difficult to discern any clear, overriding effects across the various studies on any particular subgroup of the labour market, with perhaps the exception of adult women, who feature consistently in those gaining most from participation in training programmes. Few of the evaluations go into great detail about the reasons why women should do better, but it must be influenced by the nature of labour demand that in most countries has seen a disproportionate growth in service sector jobs, many of them offering fractional time contracts. Here, there may be tensions between success in terms of job outcome and quality of employment.

However, it is by no means obvious that those ALMPs conducted in a more favourable labour climate (i.e. low or moderate unemployment, improving economic cycle, etc.) will be more likely to show stronger effects related to training interventions. The evidence of evaluations from the transitional countries clearly demonstrates that participation in training programmes produced significant positive employment effects in the presence of (and maybe because of) higher unemployment.

Nevertheless, the evaluations generally agree that the best programmes are those that are small in scale and highly targeted, and this ties in

with some key developments in the approach to ALMPs, most notably the trend for offering customised support to the unemployed. Typically, this will offer a menu of active measure options, one of which is normally training of various sorts. However, offering choice is not without its problems, notably the increased costs of meeting individual needs (measured in terms, for example, of the advice and counselling given and the actual cost of training provision) and the greater difficulty in organising the provision. The key in all this is balancing labour-market needs with individual expectations, which is again an area where evaluations can display programme weaknesses.

There is also an issue around programme design reducing participants' sense of risk. For example, those training programmes with job guarantees seemed to show more positive outcomes, and perhaps this engenders greater participant engagement (motivation and commitment) in the learning processes involved. If so, this also raises issues of how such interventions need to allow for the socialisation of skills development and learning in programmes, questioning the effectiveness of some intensive programmes and suggesting that shorter rather than longer programmes, or those with follow up/after care, will produce stronger positive impacts.

5.4. Forward perspectives

In summarising how to move forward with the evaluation of training active measures, we consider the options from two different perspectives as follows:

- (a) developments in methods of evaluation;
- (b) emphases in future research.

The key issues as we see them are summarised below and presented as a stimulus to further debate outside the confines of this paper.

5.4.1. Developments in methods of evaluation

Some of the common issues arising appear to be:

- (a) covering the correct programme, though not too tightly focused to restrict consideration of knock-on effects or wider benefits;
- (b) the gap between completing the programme and concluding the evaluation needs to be sufficiently long for the labour-market effect

- to have worked and for gains other than short-term ones to be observed;
 - (c) the need to capture or allow for how participants decide on their participation in a programme (motivational factors);
 - (d) the evaluation has to be seen as independent, objective and credible to all relevant stakeholders, placing demands on evaluators/contracting bodies which go beyond robustness;
 - (e) there needs to be evidence that evaluation findings will be, and have been, followed through by policy-makers (and social partners – particularly employers) if the profile and perceived value of the work is to be increased;
 - (f) information on programmes needs to be systematically kept from the beginning, with the needs of the evaluation in mind;
 - (g) those specifying evaluation frameworks need to be clear about the different design implications of formative and summative approaches.
- (b) how and to what extent evaluations are used by policy-makers, programme managers, training providers, etc., and what the obstacles are to more effective use of them;
 - (c) greater analysis of the reasons why some labour-market subgroups gain more from their participation in training measures to inform how future programmes can be optimally structured;
 - (d) what the longer-term gains (e.g. over three to five years) are from programme participation in terms of job and learning progression, as well as earnings and related benefits;
 - (e) what scope there is for further work with the newer approaches to evaluation, such as natural experimentation/epidemiology and for more holistic studies.

This review has provided a valuable and timely opportunity to assess the extent and nature of the evaluation of those ALMPs with a training/retraining focus. It shows that, while evaluations are taking place, it is neither a consistent nor uniform activity. We conclude that policy and policy-makers, looking to improve the quality, efficacy and cost-effectiveness of VET interventions in ALMPs, are not being very well served by current evaluation approaches.

This raises serious questions about just how much we know concerning the effectiveness of these mechanisms, and calls for reform of current practices involving not just evaluations, but crucially those specialising in evaluation frameworks and selecting/commissioning evaluations.

5.4.2. Further research

Some of the issues arising include the need for a search on and around evaluation methods to look at and provide:

- (a) more understanding on those conditions that affect how evaluations are determined, such as commissioning arrangements, management, design and dissemination, the competences of evaluators and the elaboration of and agreement on evaluation standards;

List of abbreviations

ALMP	Active labour-market policy
AMS	National labour-market board
EEP	Employability enhancement programme
EES	European employment strategy
ESF	European social fund
ILO	International labour office
IT	Information technologies
LFS	Labour force survey
LMP	Labour-market programmes
LMT	Labour-market training
NEAP	National employment action plan
NLMA	National labour-market authority
OECD	Organisation for economic cooperation and development
PEZs	Prototype employment zones
SEUP	Survey of employment and unemployment patterns
VET	Vocational education and training
WBLA	Work-based learning for adults

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The impact of human capital and human capital investments on company performance

Evidence from literature and European survey results

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Abstract

This study consists of a literature review and an analysis of an existing database on human resource management (HRM) (the Cranet survey). It focuses on research that connects human capital with the firm and asks whether education, skills/competence and training have any impact on company performance. The main results may be summarised as follows.

It appears that training provided by firms for employees is not characterised by being general or specific but by what is needed to stay ahead of competitors. There is a growing body of literature suggesting that firms are financing both types of training.

More recent research also suggests that investments in training generate substantial gains for firms even if employees can use this training in other firms. The evidence that employers profit from training investments comes from different countries including Britain, France, Ireland, the Netherlands, Sweden, and the US. Most of these studies indicate that training affects performance and not the other way around.

The effects of education and skills/competence on aspects such as productivity and innovations are generally found to be positive and significant, though the connection with profitability might be less expected. Firms can also extract profit from prior education as they do from general training investments. Supporting employee development through training policies and methods for analysing training needs is important to explain the provision of training and training outcomes. Similarly, innovative (and comprehensive) HRM practices tend to be associated with positive company performance.

Innovation and information technology (IT) both result in greater investment in training and also depend on education and skills in generating profits. Other findings suggest that training and comprehensive HRM practices are closely related to firms' innovative capacity.

The lack of studies connecting small and medium enterprises (SMEs), labour market conditions (systems), and social partners with company training policies and performance measures such as productivity or profitability, makes it difficult to draw conclusions on these aspects. This suggests an incentive to research such matters more thoroughly in the future.

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1. Introduction

Human capital is a major factor in generating future growth and prosperity. Human capital investments such as education and training are, therefore, a main concern for individuals, firms and governments. According to Becker (1993), human capital is the key determinant in explaining the rise and fall of nations as well as a main factor in determining individual income. The impact of human capital on enterprises is less clear. This is because the attributes of human capital and human capital investments are ascribed to the individual and not the firm. This study concerns research that connects human capital with the firm. The question is whether education, skills/competence and training have any impact on company performance. The focus is on continuous vocational training that takes place inside companies and is paid for, in part or whole, by the employer.

A considerable volume of employer sponsored or company training takes place each year. The European Union continuing vocational training survey 1994 suggests that more than half of all firms with 10 or more employees provided some training during 1993 and that about 1.6 % of labour costs are spent on training (European Commission, 1999). More recent figures from Sweden suggest that company training plays an increasingly important role in creating new knowledge and skills in society. Working time spent on company training in Sweden has increased considerably in recent years, from about 2.5 % in 1999 to roughly 3.5 % in 2001. A Norwegian study estimates the time spent on formal and informal training as high as 4-6 % of working time (Hagen et al., 2001).

Although these investments amount to considerable sums, until recently little has been known about the return for firms (¹). The impact of education and training on company performance is an important issue not only because of the large amount invested each year in knowledge and skills, but also because it is pertinent to know who benefits from these investments. The latter question has a bearing on who should carry the costs of training investment, to what extent we have under-investment in training, whether there is a need for policies to improve the current situation in regard to company training, etc.

The aim of this study is to provide an overview of research that connects education, training or skills/competence with the impact of these activities on productivity, profitability or other variables of firm performance. Besides reviewing associated literature, the study also involves an analysis of an existing database (Cranet survey) with regard to education and training.

The remainder of the paper is organised as follows. The next chapter introduces the method used in gathering studies for this review and provides a short introduction to some statistical problems encountered in this line of research. Chapter 3 gives an overview of findings in different research disciplines. Chapter 4 takes a closer look at a European human resource management (HRM) survey (Cranet survey) in relation to employee development issues. Chapter 5 gives the combined findings of this paper and presents the major results in regard to the impact of training on company performance. Chapter 6 suggests some policy and future research implications based on the main findings of this study.

(¹) An estimate by SCB (Statistics Sweden) considers as much as 3.8 % of GDP was spent on company training in 2001 which is roughly SEK 80 billion or in the order of EUR 9 billion. The amount spent on company training is close to what is spent on compulsory and secondary school in Sweden 2001 (SEK 88 billion). Source: The National Agency for Education. The amount spent on formal training in the US was close to USD 59 billion in 1997 (Bartel, 2000).

2. Method and research problem

Literature on the impact of education, training, and skills/competence on firm performance has been reviewed from several different sources, including published material. We have scanned published literature mainly through channels such as ABI/Inform and other university library databases. In collecting the most recent research papers we have also surveyed different web based databases, the best known being the social science research network (SSRN). This is a major source of information with over 3 million downloaded working papers since the start. Another important source is the IDEAS (UQÀM – *Université du Québec à Montréal*) database with over 100 000 working papers and articles from 1 000 universities and research centres around the world. It includes papers from IZA (Institute for the study of labor), NBER (National bureau of economic research), CESifo (Center for economic studies and institute for economic research), and several other important institutions. Other sources of information include the Cedefop bibliography on impact research. We have also collected research papers directly from different universities and research centres. These efforts have been made to provide the latest working papers on the matter.

The focus of the survey lies on more recent studies and on European based research. While this is an area that clearly needs much additional research, we have included all papers that we have come across that connect education, skills, and training with measures of company performance. In addition to labour economics literature, we also include findings in areas such as HRM, high performance work systems (HPWS), innovation studies, accounting and finance based studies, SME based research, as well as other reviews and meta-analyses. The focus in the review has been on quantitative research from the economic perspective of training. For instance, we have not surveyed literature on psychological aspects of training nor with a more ad hoc approach to training issues. A prerequisite of inclusion is that the paper uses a statistical approach and is concerned with economic aspects of human capital and human capital investments. We have also made an effort to find

research published in other languages, though most research papers included in this review are in English.

The review of the literature is divided into different sections. Labour economics forms a main segment since human capital and human capital investment has been a major research question for a considerable time. The contribution of HRM literature in regard to education and training is also given a section of its own. In this section, the literature on HPWS plays an important role because of the ability to connect HRM practices with company performance measures. We also decided to give national, cross-national, and SME based research their own sections. Since the focus is on empirical findings, theoretical considerations are (briefly) dealt with in connection with empirical findings or in relation to their respective research area.

A brief description of previous work in each research area is provided, followed by in-depth coverage of more recent papers with an analysis of methods used, data, and results. The tables that summarise each section include only the more recent papers and those that we regard as contributing substantially to the existing literature.

A short description of statistical problems typical of this type of impact research follows to provide an understanding of the problems dealt with in the review.

2.1. Inference and causality problems

Heterogeneity problem poses statistical difficulties in estimating the impact of training on any outcome variable. Differences between those who receive and those who do not receive training make it difficult to maintain that training alone causes the entire effect on a dependent variable. In labour economics, heterogeneity among workers is typically controlled for by including proxies for differences in human capital accumulation and other variables (age, tenure, education, occupation, etc.).

In addition to factors that we normally can control for in empirical work, we have a number of factors for which it is hard to attain estimates (unobservable factors). The main concern in statistical analysis is unobservable factors that are correlated with the regressors of the estimated equation. There are several remedies for this problem. One is to find some broad approximation for the unobservable factor, as in firm-level data which typically includes industry dummies to control for differences in productivity, profitability, market valuation, etc., between firms in different industries.

If the effect on the uncontrolled (unobserved) variable is considered fixed over time, it is normal to use changes in the variable, instead of the original, level data. This procedure needs data over time (panel data). An example of a fixed-effect problem that can be solved by using changes in the variables (first difference) is that of unobserved ability among individuals. For instance, if more capable individuals are more likely to receive training, the return on past training will be upward biased, measuring, in part, ability instead of human capital investments. As long as the effects of the unobserved variable (in this case ability) are stable over time (time invariant) taking the first-difference (the change in the variables) will mitigate the problem.

Another problem is that not all explanatory variables in an equation can be considered to have a one-way relationship with the dependent variable. Explanatory factors that also are determined by the dependent variable (the variable we try to explain) are called endogenous and pose a problem in estimating the returns on training. The following example, given in Dearden et al. (2000), details the problem with mutually dependent variables (endogenous variables) when trying to assess the impact of training on aggregated industry productivity.

‘Transitory shocks could raise productivity and induce changes in training activity (and of course other inputs, labour and capital). For example, faced with a downturn in demand in its industry, a firm may reallocate idle labour to training activities (the pit stop theory). This would then mean that we underestimate the productivity effects of training because human capital accumulation will be high when demand and production is low. If firms train when production and demand is high then the opposite applies.’ (p. 25).

The remedy here is usually to estimate the equation in a system that considers the two-way relationship between the dependent and explanatory variables. Typically this procedure includes a search for instrumental variable(s) that are correlated with the explanatory variable but not with the dependent variable. Another way to mitigate the problem is to include lagged variables of the endogenous variable, as the lagged variable can partly alleviate the problem of simultaneity.

Few studies have been able to explore the effect of mutual dependence between training and productivity or profitability. While this is a potential problem in most impact research, the results of Dearden et al. (2000) are particularly interesting, assessing the impact of training on productivity from different estimation procedures. In their study, the impact from increasing the proportion of workers trained by 5 % would result in a 31 % increase in productivity using only the raw correlation between training and productivity. ‘We account for an overwhelming proportion of this correlation, however, by our control variables. The 31 % effect in model A (no controls) falls to 8.5 % in model B (some controls) and 2.6 % in model C (include controls for occupation). Dealing with endogeneity through general method of moments (GMM) (model D) increases the effect to 4.1 %.’ The results in Dearden et al. (2000) suggest that a well-specified regression model with adequate controls works quite well even in the presence of simultaneity problems. Given the data set used in their study, the main issue in a well specified regression model is not whether there is an overestimation of the impact of training but to what extent the model underestimates the impact (due to the assumption that training is determined exogenously).

It is important that studies address the question of heterogeneity by including adequate control variables in statistical models. Using changes in variables instead of level data normally gives a better base for conclusion. Lagging the effect of the impact of training further strengthens the basis for cause and effect relationships. The results of Dearden et al. (2000) suggest that the problem of endogeneity in training might be of a lesser concern, at least in a well-specified regression model. In our review of literature we have made an attempt to address these issues by examining the regression models used and by examining the variables included in the estimates.

3. Overview of research and findings

3.1. Labour economics

There has been continuing debate in labour economics literature on the subject of whether firms can profit from training investments. Before Becker's (1962) theory on company training, most economists saw education and training as the investment decisions of individuals. From a company perspective, investments in human capital (on-the-job training) differ from investments in other assets because the employee has an option to leave the firm, engage in wage bargaining and, in other ways, influence the outcome of the investment decision. Becker (1962) advanced a theory on investment in human capital, explaining levels of investment and predicting who should pay for, and who will benefit from, the completed training.

Becker divided on-the-job training into general and specific. General training is useful not only to the firm providing the training but to other firms as well. Because of this, employers are less inclined to invest in this type of training. In a competitive labour market, general training would lead to a wage increase for the employee and would offset the profit for the firm providing the training. In other words, general training increases the market value of the employee, suggesting that the employee should pay for this type of training, for example, by receiving wages below his or her productivity. Specific training, on the other hand, does not benefit other firms and, subsequently, the trainee's market value is not affected. Because specific training does not influence wages, the employee is not willing to pay for it. The firm pays for specific, on-the-job training and increased productivity is accrued by the firm providing the training. The employer may share some of the increased productivity with the

employee to prevent the trainee from leaving the firm before the specific training investment is recouped ⁽²⁾.

The main idea of Becker's theory is that the party that is most likely to benefit from the investment also pays for it. The basic reasoning that employers are unable to benefit from general human capital such as schooling, apprenticeship programmes, and company training that are also useful to other firms, might be mitigated by the function of different labour markets or the degree of competition for the skills in the market ⁽³⁾.

Theoretically, specific training poses no problem for firms as these investments are not transferable to other firms. However, most of the training provided by companies is to be considered general in nature. About 60-70 % of all company training is classified as general training (e.g. Barron et al., 1999; Loewenstein and Spletzer, 1999). The study by Loewenstein and Spletzer (1999) also indicates that the generality of training increases with more complex jobs, which suggests that most of the training completed in human capital-intensive firms is useful to other companies. While research indicates that most company training has a value to other employers, the question is who is actually paying for this type of training?

Because most training has a value to other employers, theory predicts that the individual should pay directly (by bearing the full costs) or indirectly by accepting a wage below his or her productivity. So even if firms pay for all explicit costs such as trainers, course fees, allowances, the individual still has the potential to pay through wages below productivity. Testing the theory directly requires not only data about wages but also, more importantly, information about productivity.

⁽²⁾ If one introduces turnover into the equation, this will result in joint investments in firm specific human capital. This is because the higher wage for employees receiving specific training leads to an excess supply of workers willing to be trained. To bring supply more in line with demand some of the costs for specific training are shifted onto the workers.

⁽³⁾ The division into general and specific training may be too rigid. Company training might better be viewed as training with differing degrees of generality (marketability), from benefiting only the current employer, to benefiting competitors, industries and companies in general. Company training that has varying potential to suit other employers is of interest when considering the ability of employers to benefit from general (marketable) training investments.

The absence of measurement of individual productivity guides labour economics studies to using data on wages to examine the question of payment for company training. Asking who pays for company training also implies an answer to the question of who will benefit from the training, i.e., if firms pay for general company training it also suggests that firms are able to capture the returns from such investment. By this reasoning, a first step in establishing whether training has any impact on performance is to establish whether firms fund such investments.

Empirical studies that focus on wage profiles appear to confirm the general human capital prediction (Neumark and Taubman, 1995; Reilly, 1995), as well as the specific human capital prediction (Topel, 1991). In addition to the division into general and specific human capital, Neal (1995) suggests that an industry-specific factor constitutes an important component of the human capital stock. Neal (1995) investigated displaced workers and found that wages partly reflect compensation for industry-specific skills.

Observations made on wage profiles seem to support predictions of human capital theory. The problem with inferences from wage profiles is that a number of other theories and explanations also predict an upward sloping wage curve. For instance, wage growth is produced in job-matching models because of imperfect information about the employee's productivity (Jovanovic, 1979). Self-selection models use back-loaded compensation to discourage 'movers' from applying for jobs (Salop J. and Salop S., 1976). Implicit contracting models explain the firm's future wage commitment (rigidity) as a consequence of an income insurance agreement between the employer and the employee (e.g. Azariadis and Stiglitz, 1983; Marcus, 1984). The forced savings explanation justifies an upward sloping wage curve by workers' preferences (Loewenstein and Sicherman, 1991).

Apart from the problem of alternative theories of wage growth, empirical studies that used a more direct test by utilising training data have failed to support the predictions of human capital theory. Indications that firms invest in general training are

sometimes indirectly revealed in studies on the impact of training on wages. For instance Lengermann (1996) found that recipients of what appears to be general company training benefited from increased earnings during the training period. Veum (1995), after studying more recent data from the national longitudinal survey of youth (NLSY), came to the conclusion that firms pay for general training. Loewenstein and Spletzer (1998) conclude that employers pay for general training and contend that firms are able to obtain some return from general training investments ⁽⁴⁾. More recent studies (Loewenstein and Spletzer, 1999; Barron et al., 1999) argue convincingly that firms pay for general training and that firms are also able to benefit from these investments. Other studies that also suggest that employers pay for general training include Acemoglu and Pischke (1998; 1999a) on apprenticeship programmes and Autor (2001) on temporary help firms. Literature connecting training with wage effects indicates that firms pay for general training. This is an important finding because it suggests that firms benefit from all types of training investments (specific as well as general training).

Whether this is the case is the main question of this review of literature. A prerequisite for a direct test of Becker's theory is performance data such as productivity or profitability, though data connecting training with productivity or profitability is hard to come by. The absence of company data is striking and few studies have had access to performance data until very recently. These studies will be examined in greater detail below.

3.1.1. Recent advances on the effect of training for firms

In a review of the literature on effects of company training for employers, Bartel (2000) concludes that econometric analysis of a large sample of firms provides little guidance on the question of the employer's rate of return on training. The reason given by the author is that few data sets include the cost of training, that few studies have been able to control for heterogeneity among firms or addressed the question regarding the endogeneity of training.

⁽⁴⁾ In the shared investment model of Loewenstein and Spletzer (1998), the employer shares general training investments with the employee as a consequence of the employer's inability to commit credibly to future wages. The employer, instead, commits to a minimum guaranteed wage and shares the investment in general training and realises the returns if the minimum wage guarantee is binding. The wage floor is only binding for less productive workers. If the wage guarantee is not enforced, the worker then realises all returns and incurs all the costs of the training.

One reason for this lack of research results is the difficulty in estimating the amount invested in training. The definition of what to include in estimates of the time spent on training is unclear (e.g. informal/formal training). Similarly, the costs to be included in calculating training investments (e.g. direct/indirect costs) are not standardised. The lack of a coherent definition of training and of a standardised way of measuring training investments hampers efforts to address the question of the actual benefit of training. In many cases training is measured as the proportion of employees being trained in a year instead of the actual amount invested.

The review by Bartel (2000) is concerned with the return on investment (ROI) in training. The present overview of training literature is focused on whether there is an impact on performance and is less concerned with estimating the rate of return on these investments. However, the issue of the return on training investments is still very much an open question as few of the studies cited include the cost of training.

European research has made some important advances by incorporating measures of productivity in the statistical models. The major studies are summarised in Table 1. The results of an Irish study by Barrett and O'Connell (1999) suggest that the amount of general training has a significant positive impact on productivity, in contrast with specific company training. These results come from a first-difference approach that cancels out time-invariant effects. Barrett and O'Connell argue that a plausible explanation why only general training is significant is that general training provides a greater incentive for employees to spend more effort in the learning process.

It is worth noting that these results are realised in a model with controls for changes in corporate innovations and the introduction of new personnel policies. These two control variables show no significant relationship to changes in productivity. Because few HRM studies have used the change in HRM policies, this study also contributes to discussion of whether personnel practices or human capital investments are the main factor in generating the effects on company performance. Other interesting findings in the study by Barrett et al. (1998) include:

(a) that training and the change in productivity is significant whereas training and the level of productivity is not;

- (b) that the correlation between training and tangible investments is relatively low (R_s 0.13) which suggests that tangible investments can only explain a small part of the impact of training in a first-difference model;
- (c) an interaction term between tangible investments and general training renders the tangible investment coefficient insignificant while the general training variable remains significant.

The combined result of the study by Barrett and O'Connell suggests that training has a major influence on productivity and that other plausible and normally uncontrolled factors have little or no influence on productivity effects ascribed to training.

A study by Dearden et al. (2000) suggests that company-sponsored training generates substantial gains for employers in terms of increased productivity. Different methods are used to control for unobserved heterogeneity and potential endogeneity of training, including GMM system estimation. Their estimates consistently show that the impact of training on productivity is about twice as large as the impact on wages. Their results also suggest that formal training has a larger impact on productivity than informal training. These results are obtained by examining the direct impact of training on industrial production. They also argue that treating training as exogenous leads to an underestimation of the returns on training for employers. This is an important observation since few studies have controlled for the possibility of two-way relationships between training and company outcome variables such as productivity and profitability.

The results from Groot (1999) suggest that there is a rather weak connection between who contributes to training investment and who benefits from it. The study by Groot is based on telephone interviews with 479 Dutch firms. In about 43 % of all cases the workers either contributed through use of their leisure time and did not receive benefits or did not contribute to the training but reaped some of the benefits. Only 5 % of the workers contributed financially but more than 75 % of the workers contributed with leisure time. Groot concludes that the benefit of enterprise-related training is high, both in terms of productivity and wage effects. Average productivity growth following training was found to be 16 % while average wage growth was 3.3 %. The difference in productivity between trained and non-trained

workers was 8 %. These effects are based on estimates (0-100 % scale) of productivity growth by company personnel. The average length of training was found to be close to six months.

In a study of programming consultants in Sweden, Hansson (2001) found strong evidence that the employer paid for all programming training even though the resultant skills were highly attractive to other firms. This study is unique in the sense that it had access to employee measures such as profitability, amount of training, wages, and each employee's acquired human capital stock (approximated by the individual's competence profile). The results indicate that the employer not only paid for all direct costs associated with the training (course fees, travel expenses, etc.) but also lost a considerable amount of profit during the training. Hansson found no evidence that the individual contributed to the training investment by receiving a wage below his or her productivity. The findings also suggest that the employer recovered the investment in programming training in the long run, as individual programming skills (competence) were significantly associated with profitability. These results were realised in an environment with similar working conditions such as type of job, customer base, etc., and with a number of control variables (including a control for differences in ability among employees). Hansson argues that the investment in general human capital largely looks like any other investment scheme that firms normally undertake in their business operations (with an initial investment and a payoff in the future).

The work of Gunnarsson et al. (2001) suggests that the increased educational level of the Swedish workforce between 1986 and 1995 is an important factor in explaining IT-related productivity growth during these years. Gunnarsson et al. examined the IT productivity paradox by including measures of interaction between IT and educational level in 14 industries (manufacturing sector). The IT productivity paradox relates to the fact that massive investments in IT in the 1980s did not have any positive effects on productivity until the beginning of the 1990s. The interaction between IT and educational level is significant and contributes significantly in explaining productivity growth during this period. As the inclusion

of the human capital measures increases the explanatory power substantially, the authors conclude that human capital is a key in explaining the IT productivity paradox. Other interesting findings in Gunnarsson et al. are that a marginal skill upgrading has the same effect across different levels of education and that IT-related productivity growth occurs in several industries outside the IT sector.

Other European based studies include those of Kazamaki Ottersten et al. (1996) who studied the impact of training in the Swedish machine tool industry, using an evaluation drawn upon cost functions and productivity estimations. Their analysis is based on a formal model that was applied to the panel data of eight Swedish machine tool firms between 1975 and 1993. Their results imply that training expenditures result in net decrease in total costs. The estimates of productivity effects are also positive, but smaller in magnitude (also Kazamaki Ottersten et al., 1999).

US studies that have had access to performance data on either employees or firms are mainly from the mid 1990s ⁽⁵⁾. Some results are given next.

Krueger and Rouse (1998) investigated workplace education programmes in two American companies in the service and manufacturing sectors respectively. The programmes included learning of generic skills such as reading, writing, and mathematics as well as more occupational skills such as blueprint maths and blueprint reading. The results indicated that participating in generic training classes had no significant impact on employee wage growth. Occupational training classes, on the other hand, yielded a positive impact. Training influence on the available performance measures was generally weak. In the service company, classes had no significant impact on whether employees received performance awards or not. The effect on absenteeism during the training period was positive in both companies but not statistically robust. The authors also conducted a survey of the personnel at both companies. With two exceptions, the variables showed no difference between employees participating in the programme and the non-participants. Participants were more likely to report that they would take additional training

⁽⁵⁾ Since we have not been able to find more recent papers we are uncertain whether this is caused by a lack of research or whether we have missed out on important publications or working papers.

classes in the future and they were also more likely to report that their supervisor would say that they were doing better than a year ago. The latter result might be interpreted as an improvement of self-reported job performance.

Another study focused on basic skills training is the investigation by Bassi and Ludwig (2000) of different school-to-work (STW) programmes in the US. The purpose of the study is to analyse whether those programmes providing general training also can be cost-effective for firms sponsoring them. Data comes from case studies of seven STW programmes representing a diverse set of industries and regions. Data was collected through interviews. The authors found that most of the STW firms studied were willing to pay for general training, though it is less clear whether firms would be able to recoup the full costs of this training, given labour market institutions and public policies in the US. Contrary to the predictions of the classic Becker model, the authors found that in all but one case the firm paid for some or all of the costs of general training. The results show a substantial variation in cost/benefit ratios across the STW programmes. The discounted cost/benefit ratios varied between 0.69 and 1.81. One explanation for this variation is that firms with relatively high ratios may be the ones that provide little training. Other explanations for the large variation in ratios are the ability of students to pay for training and the ability of firms to extract profits from trained workers. The findings also suggest that American labour markets are imperfect enough to motivate firms to participate in STW programmes.

The findings of Black and Lynch (1996) indicate a somewhat mixed result with regard to human capital and productivity. This study used level data in estimating the impact of human capital investments on (log) sales and a regression model with a number of control variables included in the regression. The results indicate that human capital in the form of education had a substantial impact on productivity. Formal training conducted outside the company had a significant impact on productivity for manufacturing firms whereas computer training had a significant impact for non-manufacturing firms. The proportion trained did not yield any significant relationship. Their results also indicated that training appears to have a lagged impact on

productivity. Black and Lynch (1997) reworked their regression model with access to longitudinal data on productivity. The results in this estimation procedure indicated no significant relationship between training and productivity. The authors attributed this insignificant impact to increased measurement errors.

The results of Bartel (1995) indicate that receiving training increased the probability of a positive change in performance the following year. Bartel investigated 1 487 professional employees in a manufacturing firm. Different types of training and the amount of training (days) showed no significant impact. The author attributed the rather weak impact on employee performance to the sample and scale used in this specific case. The sample consisted only of employees who remained in the same job (e.g. employees who got promoted were excluded from the sample). The performance rating was executed on a single item (7-point scale). Because of these two constraints the author argues that training effects probably underestimate the real impact that training has on employee performance.

Another study by Bartel (1994) suggests that implementing training programmes generates considerable productivity effects measured as the change in log sales. This finding is robust for different personnel categories (professionals, clerical staff, etc.) and changes in personnel policies (the results are not caused by a Hawthorne effect). In addition, the results are robust to mean reversion of productivity between firms and show that low productivity firms were more likely to implement training programmes. That low productivity firms implement training programmes to a larger extent than other firms can produce downward biased or insignificant effects of training programmes in cross-sectional regressions. The effect of using cross-sectional data appears to underestimate the impact of training on productivity growth. It is important to note that the training effect on productivity is achieved in excess of changes in personnel policies, indicating once again that training is a major factor to consider in HPWS literature.

The main findings in labour economics with regard to the impact of human capital on company performance can be summarised as follows. Previous research on training and wage effects has established that firms pay for all type

Table 1: **Labour economics**

Study	Database/ survey	Data	Sample and size	Aim/ subject	Method
Dearden et al. (2000) UK	British labour force survey (LFS), COP consensus of production	Incidence of training, informal and formal training, longitudinal –industry level data	94 industries, maximum 12 years, 818-970 industry years	Impact of training on productivity and wages	First difference, fixed effect, GMM system equation
Barrett and O'Connell (1999) IRL	EU survey and a follow up survey of Irish business	In company training (continuous vocational training), general and specific training, panel data	215 firms, two points in time	Impact of training on productivity, impact of general and specific training	First difference regression
Groot (1999) NL	Telephone and questionnaire survey	Duration of formal training	479 firms with 10 or more employees	Impact of training on wages and productivity growth	Frequency/ ordinary least square (OLS) difference approach
Hansson (2001) S	Company database	Type of training, training days, competence, education	132 programming consultants	Impact of training and competence (skills) on profitability and wages	OLS
Gunnarsson et al. (2001) S	Labour force survey, employment register, investment survey, etc.	Proportion with different educational levels	14 industries over 10 years	Impact of human capital and IT on productivity growth	Industry weighted least square regression, interaction education and IT
Black and Lynch (1996) US	EQW national employers' survey	Company training. Number trained, type of training, level data	1346 manufacturing and non- manufacturing establishments	Impact of training on productivity, impact of types of training	OLS
Bartel (1994) US	Columbia Business School survey and compustat	Implementation of formal training programmes (manag., profes., clerical, produc. workers) paneldata	180 firms in manufacturing sector over three years	Impact of training programmes on productivity	Level and first difference regression
Krueger and Rouse (1998) US	Company personnel record (manufacturing and service	Type of training, basic skills education, occupational courses,	800 (of which 480 workers attending training)	Impact of training on wages and employee performance	OLS, Probit, random and fixed effect models
Bartel (1995) US	Company personnel records (manufacturing firm)	Incidence of formal training and days in formal training, type of training	1 478 professional employees	Impact of training on productivity and wages	First difference. Two-step multinomial logit model

Control variables	Outcome measures	Strength/weakness	Findings
Tenure, age, education, occupation industry, R&D, capital intensity, firm size, etc.	Productivity measured as change in log real value added per employee	Extensive robustness tests and econometric modelling/data on incidence of training (not days in training)	Training has a positive impact on productivity and wages, with a twice as large effect on productivity. Formal training has larger impact on productivity than informal training.
Change in personnel policy, corporate restructuring/organisation, assets, employees, etc.	Log sales growth	Days in training, panel data, important control variables	General training has a positive impact on productivity, specific training has no impact.
Tenure, age, time since training, education, mobility, etc.	Estimates (100 % scale) of productivity growth before and after, trained and not-trained	Direct estimates of differences in productivity/estimates of productivity	Average productivity growth about 4-5 times larger than wage growth. Weak connection between who contributes to training investment and who benefits from the training
Tenure, age, gross contribution, ability, education, gender, etc.	Profitability, (revenues net of wage and overhead costs)	Direct measure of profitability and human capital stock/level data, single employer	The concurrent impact of training on profit is negative and impact on wages positive. The skill/competence of the individual is significantly related to profitability
Business cycle, non-computer equipment, IT growth, gender, etc.	Total factor productivity	Lagged IT and human capital effects	Interaction term IT and educational level is highly significant indicating that the increase in productivity growth is largely tied to increase in higher educational level
R&D, capital, TQM, multiple establishment,	Log sales growth	A number of control variables, type of training/level data	Education positively related to productivity, formal training off working hours and other training variables computer training significant with productivity, not (number trained)
Capital assets, no. employees, unions, raw material, age of firm, industry, change in personnel policy	Log sales growth	Controls for personnel policy, relation between training programme and productivity/weak training measure	Implementing training programmes positively related to change in productivity, not due to mean reversion or change in personnel policy. Low productivity firms more likely to implement training programmes
Education, tenure age, gender, company) type of department, type of work, etc.	Performance awards absenteeism, self-reported performance	Homogenous workers, compare results at two companies/weak performance data	The work place education programme had generally a weak effect on the employee performance measures, except for perceived performance. The effect of the training was positive but not significant in many cases.
Occupational dummies, education, tenure, etc.	Change in performance rating	Controls for determinants of training/weak outcome variable (rating by managers)	Individuals receiving training significantly associated with probability of increased performance score. Days in training and type of training not significantly associated increased performance.

of training no matter whether it is general or specific. More recent findings also indicate that firms benefit from such training investments. There are even signs that general (formal) training produces greater benefits than specific training. There are also some indications that the education and skills of the individual are associated with productivity and, in some cases, with profitability.

3.2. HRM and HPWS literature

The impact of human resource management (HRM) practices on company performance has attracted considerable attention. Many special issues of management literature are devoted to HRM practice and company performance, for instance the *Academy of Management Journal* (Vol. 39, No 4, 1996), *International Journal of Human Resources* (Vol. 8, No 3, 1997), *Human Resource Management* (Vol. 36, No 3, 1997), *Human Resource Management Journal* (Vol. 9, Issue 4, 1999). The argument put forward in this line of research is that advanced HRM practices produce a higher level of productivity. The findings suggest that there is a connection between HRM practices or what is often referred to as high performance work systems (HPWS), and company performance indicators such as sales, market values, market-to-book values, profitability, productivity, etc. ⁽⁶⁾.

Generally, this research area has good access to company based performance measures. The disadvantage is often that the statistical methods are based on level data, which makes it difficult to establish causality. That most of the research is based on level data is largely a consequence of the fact that firms seldom make any large changes to their HRM policies. Measuring changes in HRM practices, therefore, requires extensive measurement periods (longitudinal data). Much of the inference about the impact on firm performance is thus confined to cross-sectional data. However, many papers use a research design that accounts for the heterogeneity among firms, which makes the statistical models more robust.

In HPWS literature, education and training is part of a larger package of the activities of a

human resource function. The areas that are typically covered in these studies are screening and employee selection, compensation systems, employee communication, teamwork practices, etc. In many cases studies also examine how aligned or integrated these practices are with the objectives or strategy of the company. Much of the current debate centres on whether bundles of human resource practices are the source of value creation in firms or whether certain practices contribute more than others. There is also the question of whether there is a HRM practice that is generally applicable to most enterprises or whether HRM practices are firm-specific or country-specific.

For instance, a Dutch study by Boselie et al. (2001) argues that the institutional setting in Europe affects the potential to create high performance work practices because of the presence of strong labour regulations and the interaction of social partners. They maintain that to apply research on high performance work practices we need to adjust the theoretical framework to suit the European situation. Boselie et al. (2001) also provide an overview of the findings that HRM research has produced in the last decade. The results with regard to the effects of training on company performance are reproduced below. Some of these papers will be examined in greater detail in this section:

- (a) training has a positive impact on the different dimensions of the performance of the firm: product quality, product development, market share and growth in sales (Kalleberg and Moody, 1994);
- (b) higher investment in training results in higher profits (Kalleberg and Moody, 1994; d'Arcimoles, 1997);
- (c) higher investment in training results in a lower degree of staff turnover (Arthur, 1994);
- (d) training has a positive impact on the relationship between management and the other employees (Kalleberg and Moody, 1994);
- (e) training has a positive impact upon perceived organisational performance (Delaney and Huselid, 1996);
- (f) management development is positively related to profit (Leget, 1997);

⁽⁶⁾ These human resource management practices are sometimes referred to as human capital enhancing systems, or high commitment policies (systems).

- (g) focus on training is positively related to perceived profit, market share and investment in the near future (Verburg, 1998);
 - (h) training practices affect perceived organisational performance positively (Harel and Tzafrir, 1999).
- (Boselie et al., 2001, p. 1112)

Besides the issue of whether there is a generic HRM practice, there is continuing debate about whether employee development is the key factor in the HRM bundles (e.g. Barnard and Rodgers, 2000). The results presented in the previous section of this review suggest that training is a main factor in generating productivity effects, as training yields a significant impact while controlling for changes in personnel practices (Bartel, 1994; Barrett, 2001). Other studies maintain that the impact on company performance is caused by the combined effect of HRM practices (Becker and Huselid, 1997; Huselid, 1995; Becker and Gerhart, 1996). This controversy is also reflected in the selected studies of our review of this research area.

HPWS might appear to be connected mainly with the knowledge intensive sector, but human resource policies to enhance efficiency and worker commitment can work equally well in more mature sectors of the economy. Ichniowski et al. (1995) investigated HRM policies in the US steel industry. Their findings indicate that innovative human resource practices have a significant effect on productivity. Ichniowski et al. (1995) was one of the few studies to examine the productivity effect of firms changing their human resource practices. Interestingly, the impact of the first-difference (change) approach supported the results of original estimates on level data. The benefits, in the form of increased revenues, far out-weighted the costs associated with these human resource programmes. Ichniowski et al. (1995) also argue that complementarity between different human resource practices has a significant effect on worker performance, while changes in individual employment practices have little or no effect (training by itself is not enough).

D'Arcimoles (1997) utilises the disclosure of information in French company personnel reports. These reports are sanctioned by law and include unmatched firm-based information on the main aspects of HRM such as compensation, training, recruitment, dismissal, and general

working conditions. Apart from having access to data on variables that researchers normally have a great difficulty in obtaining through surveys, this study also has access to data over time (panel data). The panel with training and HRM measures includes six two-year periods. The main results with regard to training are that the level of training investment is consistently associated with both the level of, and changes in, current and future productivity and profitability. Profitability is approximated by the return on capital employed and productivity by value added per employee. The impact from the change in training on the change in productivity seems to appear with a considerable lag. The results presented by d'Arcimoles suggest that the effect of training investments might take as long as two to three years before they emerge in form of increasing productivity. The results between the change in training and change in profitability are less precise. Still, these findings indicate that there exists a causal link between training and firm performance in the sense that firms invest in the current period and harvest the benefits in future periods. One might add that these results are achieved while controlling for absenteeism, hiring/dismissal, work accidents, and total rate of resignation (all control variables are considered proxies for working and social climate at the firm).

Laursen and Foss (2000) studied the relationship between HRM practices and innovation performance based on the data of the DISKO project, a large survey on innovation behaviour in 1 900 Danish firms, cofunded by the OECD. The sample includes nine sectors in manufacturing and service industries. Laursen and Foss also propose some theoretical explanation as to why HRM practices influence innovation performance, e.g. new HRM practices often increase decentralisation, in the sense that problem-solving rights are delegated to the shop floor, which might facilitate the discovery and utilisation of local knowledge and thus enhance innovation. Due to the complementarities between HRM practices, they also state that systems of HRM will be significantly more conducive to innovation than individual practices.

Laursen and Foss used principal component analysis based on nine HRM factors and identified two different HRM systems that are conducive to innovation. In the first system all

Table 2: **HRM (HPWS) studies**

Study	Database/ survey	Data	Sample and size	Aim/ subject	Method
Ichniowski et al. (1995) US	Interviews and al. company specific data	Proportion employees received off-the-job training (dummy variable)	Longitudinal data on 36 steel production lines, 2 190 monthly observations	Impact of HRM practices on productivity	Level and first difference (fixed effect) regression
d'Arcimoles (1997) FR	French company personnel report	Formal training expenses, level and change data (panel data)	61 firms level data, 42 firms panel data (7 years)	Impact of HRM, wage growth, and training on firm performance	Level regression and first difference OLS regressions
Laursen and Foss (2000) DK	Data exaggerated from the DISKO project (Database)	Classification of two HRM practices	1 900 firms	HRM Practices and their impact on innovation performance	Probit model to explain the probability to be an innovator

nine HRM variables are relevant; in the second only performance-related pay and internal training are dominant. In the latter system only these two factors out of nine have individual impact, but when all factors are combined into a single variable this is highly significant. This finding supports their thesis of the complementarities of HRM practices. In addition, they also identified some sector-specific patterns, such as the fact that firms in wholesale trades tend to belong to the second system. They conclude that the application of HRM practices is important to the likelihood of a firm being an innovator.

Table 2 presents the studies by Ichniowski et al. (1995), d'Arcimoles (1997), and Laursen and Foss (2000). These studies have made an effort to disentangle training effects from other HRM practices and two of them have also been able to examine the impact on company performance of changes in HRM and training.

Other HRM studies also measuring the effect of training separately from HRM practices include Delaney and Huselid (1996) based on US data. The training measurement in their study shows a consistent and significant relationship with perceived organisational performance (irrespective of the statistical model). The results for perceived market performance are less clear but suggest a significant influence of at least 10 %.

These training effects are demonstrated in the presence of other HRM aspects such as staffing, compensation, degree of internal labour market, etc. Delaney and Huselid used cross-sectional data on 590 firms to estimate organisational performance and 373 firms to estimate stock market performance. Because this study is based on cross-sectional data it is difficult to establish the relationship between organisational performance and training measurement.

Michie and Sheehan (1999) studied the data of the UK's workplace industrial relations survey (WIRS) with regard to the impact of HRM practices on innovation. They separated three different types of HRM practice using variables such as payment, worker involvement in teams, incentives, information sharing, etc. However, they did not explicitly integrate the degree of training. Innovation is measured by research and development (R&D) expenditure and the introduction of new micro-electronic technologies. The workplace industrial relations survey contains information on 2 061 firms with more than 25 employees in various sectors. Michie and Sheehan were able to use 274 data sets that contained information on HRM as well as innovation. Based on an econometric model, which explained the probability of innovating, they were able to identify some significant HRM factors. Their results suggest that low road HRM practices – short

Control variables	Outcome measures	Strength/weakness	Findings
HRM controls, controls for production line (maintenance, age, raw material, etc.)	Productivity measured by uptime of production line	A number of robustness tests, same production process, panel data/weak training data	Adopting a coherent system of HRM practices produces significant productivity effects. Adopting individual work practice in isolation has no effect on productivity (training).
Wages, social climate (absenteeism, work accident, social expenditures), employment variables, etc.	Productivity (change in value added), profitability (return on capital employed)	Impact of change in training measured with lag, HRM controls/ weak firm and industry controls	Level of training is consistently correlated with level and change in productivity and profitability, change in training is associated with change in performance with a two to three year lag (less stable result)
Sector, firm size, cooperation	Innovative performance	Only innovation performance is the dependent variable	The application of HRM practices does matter for the likelihood of a firm being an innovator

term contracts, etc. – are negatively correlated with investment in R&D and new technology, whereas high road practices are positively correlated with R&D investment and the introduction of new technology. This study also shows that skill-shortage is a serious obstacle for innovation and for movement towards differential and higher-priced products. Their findings also deliver evidence that the strategy to increase employment flexibility by short-term contracts, weakening trade unions, etc., does not enhance the innovation performance of firms.

MacDuffie (1995) tested the impact of human resource activities in automotive production. The sample consisted of 62 car assembly plants in the US, Asia, Europe and Australia. The study was influenced by the organisational contingency theory and the hypothesis that the internal fit between different organisational strategies and characteristics affects performance ⁽⁷⁾. MacDuffie separated two production systems, mass production and flexible production. Disruptions to the mass production process prevent the realisation of economies of scale with the use of buffers as an indicator for the prevalence of this system,

whereas under flexible production buffers are seen as costly.

Within flexible production, the link between minimisation of buffers and the development of human capabilities is driven by the philosophy of continuous improvement. MacDuffie separated production organisation, work systems and HRM policies as three interrelated independent variables and creates corresponding indices to capture systemic differences in organisational logic between mass production and flexible production. He used different human resource variables such as job rotation, recruitment policy, training of new employees, etc., based on a cluster analysis, to classify human resource practices characterised through a consistent bundle. Performance has measured by labour productivity and quality, expressed as defects per 100 vehicles.

Regression analysis indicated that indices of mass production, flexible production, transition, and intermediate stage, were statistically significant predictors of productivity and quality. High-commitment human resource practices, such as contingent compensation and extensive training, in flexible production plants, were char-

⁽⁷⁾ The contingency theory stresses the importance of the link between human resource practices and other factors such as organisational strategy. In contrast, the universal approach maintains that human resource management practices have a positive effect on performance in general (independent of other factors).

acterised with low inventories and repair buffers, and consistently outperformed mass production plants. MacDuffie found empirical evidence that bundles of interrelated and internally consistent human resource practices, rather than individual practices, are better predictors of performance. Overall, evidence supports the thesis that assembly plants using flexible production systems, which bundle human resource practices into a system that is integrated with production strategy, outperformed plants using more traditional mass production in both productivity and quality. While other academics believe that either mass or flexible production will perform well if there is a good fit between their human resource and production strategies, MacDuffie found that flexible production leads to better performance for automotive plants.

A similar matter was raised by Arthur (1994) in studying the impact of human resource systems across steel mini-mills in the US. His main hypothesis was that specific combinations of human resource policies and practices are useful in predicting differences in performance and turnover. In the tenor of the contingency theory, he stated that congruent human resource and organisational policies are more significant than separate human resource practices. He separated two human resource systems, control and commitment, which stress the importance of cost reduction and commitment maximisation respectively, and shape employee behaviour and attitudes at work. Despite the contingency view of human resource systems, he stated that, in general, commitment human resource systems will be associated with higher performance, especially because of the high control and monitor cost in the control system. In addition, he was interested in the question of the impact on turnover.

Arthur expects higher turnover in firms with control systems because of the lower cost for wages and training. Empirical data were based on a questionnaire from human resource managers of 30 US steel mini-mills. Based on a cluster analysis, he separated the two human resource systems, using labour efficiency, scrap rate (number of tons of raw steel to melt one ton of finished product) and turnover as performance measures. Regression analysis indicated that the presence of commitment human resource systems was significantly related to fewer labour

hours per ton and lower scrape rate, whereas turnover was higher in control systems. Arthur also found, that human resource systems moderate the relationship between turnover and performance, since there is a negative relationship between turnover and performance in commitment systems. However, the results have to be treated with caution due to the small sample size.

Baldwin and Johnson (1996) studied business strategies in Canadian small and medium-sized firms, with less than 500 employees, demonstrating varying degrees of innovation. Besides marketing, finance, and production strategies they also investigated whether innovative firms also followed specific human resource strategies. The sample size was 850, including all major industrial sectors. Innovation classification was based on the traditional question of R&D intensity and additional variables regarding innovation behaviour (patenting, source of innovation, etc.).

Baldwin and Johnson were able to verify their thesis that greater innovation accompanies greater emphasis on human resources, stressing training. They found statistical evidence that more innovative firms offered formal and informal training more often and with greater continuity, accompanied by innovative compensation packages. While almost three-quarters of the group of more innovative firms offered some form of training, just over half of the group of less innovative ones engaged in training. The authors also used quantitative data to estimate the amount of training and found that the more innovative ones spent CAD 922 on average per employee, significantly more than the CAD 789 spent by less innovative firms. Moreover, the former firms used production employees more often as a source of innovation.

In addition to linear correlation analysis, the authors used multivariate models to establish whether certain combinations of factors or all factors combined contributed to a given human resource strategy. A probit model and principal component analysis indicated that the firms that followed the most comprehensive human resource strategy (stressing all factors simultaneously) are most significant. Considering all factors studied (human resources, marketing, etc.) they found that all areas are important for innovation success and that more innovative firms take a balanced approach to their business by striving

for excellence in a number of different areas. However, Baldwin and Johnson did not carry out analysis of how far specific human resource strategies are related to other business strategies. Finally, they analysed the relationship between innovation behaviour and company performance, based on administrative data sources. Various performance criteria and indices (sales, profitability, market share, employment, and assets) suggested that more innovative firms performed better. Thus, the study delivers evidence for a relationship between sophisticated human resource strategies and company performance.

In conclusion, HRM literature stresses the importance of comprehensive HRM practices in generating effects on company performance (training by itself is not enough). However, few studies measure training separately and few studies have had the opportunity to examine changes in HRM practice and in performance. Nevertheless, there are indications that training is more efficient or generates larger effects in connection with other HRM practices.

3.3. National European surveys and cross-national comparisons

Many surveys and studies conducted by national institutions attempt to answer questions such as what generates innovation and what creates growth in their respective countries. Similarly, many cross-national comparisons are aimed at understanding the reasons for differences in growth and innovation between countries. Measurements of training and education are typically included in these types of study as part of the firm's innovative capacity. Besides human capital, studies typically include variables that are assumed to generate innovations and growth, such as investments in IT, R&D, technology, capital intensity, etc., and a number of control variables. The aim in many instances is to understand the innovative capacity of firms and not human capital per se, though this is an advantage as the results for education and training are generally more robust (as the inclusion of other variables controls for the influence of these factors).

A study by a Swedish business development agency (NUTEK, 2000) on different learning

strategies shows that competence development activities are associated with both productivity and profitability. Training is measured in a broad sense by three establishment level activities (planning, learning at the job, and proportion of employees trained). In this study the effects of training activities are observed after holding other learning strategies constant (e.g. R&D, innovations, cooperation, etc.). Other findings indicate that the effect is more pronounced for larger firms and that higher educated personnel is associated with both productivity and profitability. This study uses level data, which render causality difficult to achieve. However, since both profitability (which is net of investment costs) and productivity are significantly influenced by training activities, it strengthens the interpretation that training increases productivity and that employers are able to capture some of the returns generated.

In a study of Finnish companies, Leiponen (1996a) finds a significant association between educational level and profitability. Other findings suggest that strong complementarities exist between different educational factors. It appears that a sufficient number of more highly educated employees is a prerequisite for the profitability of doctoral level researchers. The results also suggest that innovative firms are more dependent on educational competence in generating profit. The sample used in this study consists of panel data for 209 firms. The author deals with the endogeneity problem (caused by the effect of previous economic performance on the explanatory variables) by applying a two-stage regression procedure. An interesting finding is that without addressing the problem of endogeneity between profitability and other human capital variables, the results are largely insignificant. Leiponen concludes that general competences acquired in education, notably higher and post-graduate education, are beneficial for the profitability of the firm. In another study of Finnish companies, Leiponen (1996b) comes to the conclusion that innovative firms have a more educated workforce and that they are more profitable than non-innovating firms.

The German Institute for employment research (IAB) has, since 1990, conducted a large establishment survey with over 9 200 participating establishments. This is one of the most comprehensive establishment panel surveys in Europe (Bellmann, 2001).

Table 3: National and cross national studies

Study	Database/ survey	Data	Sample and size	Aim/ subject	Method
NUTEK (2000) S	Flex-2 survey (telephone and questionnaire survey)	Learning strategies, competence development activities (measured 0-3 scale), level data	911 establishments	The impact of learning strategies on firm's competitiveness	OLS level regressions
Leiponen (1996a) FIN	Survey data, compiled by Statistics of Finland (15 manufacturing industries)	Educational level, type of education (technical, natural science)	209 firms, time-series data (1985-93)	Impact of education on profitability and innovations	First difference GMM, two-stage weighted least square regression
Bellmann and Büchel (2000) D	IAB 1997 Survey	Amount invested in training	3 400 cross-sectional observations	Impact of training on productivity	OLS level regressions, two stage least square
Doucoulagos et al. (2000) AU	Case study	Cost and benefits of training programmes	7 cases	Application of a four-step evaluation process of training investments	Design of a cost-effective training evaluation model
Blandy et al. (2000) AU	Questionnaire similar to UK CEP survey by the LSE	Training quantity in hours	41	Effects of the on-the-job training on productivity and earnings	Regressions 'matched plant' methodology between hotel and kitchen furniture manufacturers
Maglen et al. (1999) AU	Case study based on interviews with managers and employees	Training expenditure	30 case studies in four sectors	Evaluation of the return on training depending on other factors	Comparative case studies

However, the research that has come out of the IAB survey so far is less focused on the effects of training investments for firms and more on the effects for individuals. An exception is the study by Bellmann and Büchel (2000) examining the effects of continuous vocational training on productivity. Their result is based on 3 400 cross-sectional observations from the 1997 IAB survey. The authors apply different models in estimating the impact of training, including an OLS and a two-stage regression model as well as including controls for industry, size, and employee characteristics. The initial regression results for both parts of reunited Germany indicate a significant relationship between how much is invested in training and

productivity (log annual sales per employee). However, the authors argue that this finding is largely a consequence of a selection problem, such as the individuals receiving training having more ability and that certain firms are more capable providing adequate training for their employees. Bellmann and Büchel stress the importance of strategic HRM practices in generating productivity effects from training investment.

Some interesting studies have also been carried out in Australia. Blandy et al. (2000) found a positive relationship between a firm's profitability and the quantity and quality of training offered by the firm, the latter also being correlated with other forms of investment. A profitability index, based on

Control variables	Outcome measures	Strength/ weakness	Findings
Other learning strategies, R&D, IT, innovations, cooperation with partners, decentralisation, etc.	Productivity (value added), profitability (revenues to cost ratio)	Includes a large number of control variables and competing learning variables/level data, weak training data	Competence development activities have a significant effect on productivity and profitability. Larger effects for larger firms. Education is associated with profitability.
Sales, market share, capital intensity, industry dummies	Net profit margin, innovations such as patents, improvements, etc.	Use first difference, control variables, two-stage weighted least square to handle simultaneity problems and GMM	Educational competence is significantly associated with profitability. Complementarities exist between different general skills acquired in higher education. Innovative firms are more dependent on educational level in generating profitability.
Industry, size, employee characteristics	Productivity measured by log annual sales	Large number of observations/ level data	Initial results indicate a strong association between training and productivity. However, the results are likely driven by ability. Authors stress HRM practices as main factor.
(case study)	Calculations of return on investment	Quantitative estimation of returns on training investments	Return on investment (%) calculated is between 70 and 7000
Industry	Productivity and profitability	The study uses quantitative data on training and performance/ small sample size	Profitability is directly related to i) quantity and quality of training, ii) firms paying above market wage rates, iii) firms' difficulties in finding suitable employees iv) no clear picture regarding the impact of training on the productivity
Firm strategy and human resource policy	Labour productivity	Control variables are only used for a qualitative interpretation of the differences	In most cases training investments had led to positive returns, though dependent on human resource practices; the bundling of human resource policies is crucial; better performers also planned strategically

firms' statements on profitability compared with their main competitors, was found to be positively associated with indices of volume (expenditure on training relative to main competitors) and the quality of company training (existence of a formal training strategy, written commitments to training in workplace agreements, etc.). In addition, the more profitable firms pay above market wage rates and operate in labour markets where suitable labour is hard to find and keep. The authors conclude that the principal reason why training is profitable for firms is that it increases the productivity of their employees more than it raises their employees' wages.

In another Australian study, Maglen and Hopkins

(1999) integrated variables such as work organisation, job design, employment practices and other company-specific variables to analyse returns on training. They compared enterprises that produced similar goods or services, and were similar in size. Their findings suggest that there is no key set of relationships that could be translated into a series of best practice procedures, but that the main factors in optimising business performance are links between strategic objectives and practice within the enterprise itself. This means that the effectiveness of training is contingent upon the idiosyncratic circumstances of the firm, a theory based on Becker et al. (1997) and known as 'idiosyncratic contingency'. A comparison between seven firms in four sectors

found that better performers, measured by labour productivity, included training as an integral part of strategic planning. In contrast, the poorest performers lacked these characteristics.

Doucouliafos and Sgro (2000) developed a training evaluation model, which they tested on seven Australian firms with longitudinal firm-level data, aiming to calculate the return on investment in training, both financially and non-financially. Collected data indicated that the return on investment in training programmes varied between 30 and 7.125 % for seven different training programmes. Performance and benefits were estimated by indicators such as the saving of energy after training of train drivers or increase in sales growth after the training of store managers.

Carr (1992) studied productivity differentials in the automotive sector between Britain, Germany, the US and Japan and the impact of skills differences. He based the investigation on 56 matched vehicle component manufacturers in the four countries in 1982. The study included interviews with chief executive officers and other personnel down to shop floor level. In 1990 Carr carried out 45 more interviews to gauge the effects of past differences and to capture the impact of increased labour flexibility in Britain. Despite differences in product and technical characteristics between the product areas studied, the data clearly showed productivity differentials between Britain, Germany, the US, and Japan. In nearly all areas Britain lagged behind, measured by sales per employee. The study provides some evidence that the highly educated and trained German workforce (craft apprenticeship, the high qualification of the foremen, and vocational training organised by firms) explains the productivity advantage of Germans firms. However, Carr was not able to carry out a statistical analysis regarding the relationship between specific training and its volume, measured by factors such as expenditure, and its impact on productivity. Compared with the 1980s, the data showed the UK to be catching up slowly, which he ascribes to an increase in labour flexibility in Britain, though unable to verify this statistically. Finally, he concludes that the UK has to place more emphasis on high standards of basic education and programmes aimed at continuous employee development.

Mason et al. (1992) carried out a study similar to Carr (1992), where they compared the productivity differences between Britain and the Nether-

lands and the impact of vocational education. Like other studies, their investigation deals with lower workforce qualifications in Britain. Mason et al. compared the skills and productivity in a matched sample of British and Dutch manufacturing plants. The study was conducted on 36 plants in two industries, engineering and food-processing. The authors also summarised the main specifics of the Dutch vocational education and training system, which relies principally on full-time vocational colleges. This system is nearer to the French schooling-based system than to the German apprenticeship system. They concluded that the higher average level of skills and knowledge in the Dutch workforce contributes to higher productivity through better maintenance of machinery, greater consistency of product-quality, greater workforce flexibility, and less learning-time on new jobs. These findings are not based on a statistical analysis regarding the two samples, but rather comparing the general profiles and characteristics of workforces in the two countries. Substantially higher proportions of vocationally qualified personnel were found at virtually all levels in Dutch plants in both industries.

Concluding, the indications are that the educational level appears to be a factor in profitability of firms. There are also some indications that differences in educational level (system) between European countries might explain productivity differentials among the countries. Most studies stress the importance of training as an integral part of strategy and other HRM practices.

3.4. Small and medium enterprise (SME) surveys

Even though some of the above mentioned studies include smaller firms in their sample and use firm size as a (control) factor, few studies exist which deal explicitly with the impact of training investment on SME performance.

Leitner (2001) carried out a study on Austrian SMEs (between 20 and 50 employees) with the aim of investigating the impact of different strategic investments on company performance. He also analysed training investments, measured with an ordinal variable, in the context of various internal strategic factors, endogenous factors and their impact on performance. He found that

the amount of training was one of the few internal factors that had a direct impact on company earnings, this correlation being highly relevant for smaller firms with less than 50 employees. In general, smaller firms invested less than bigger firms. However, no positive relationship between the different kinds of strategies pursued and the amount of training could be identified.

Furthermore, Leitner discovered a positive relationship between training and the corporate culture and communication within the company. Given the impact of external (endogenous) factors, he found that training was an essential aspect of profitability for firms in dynamic environments. He concluded that, in general, training investments allow firms in different competitive and rather hostile environments (mature product life cycles, conjuncture-dependent life cycles, dynamic environment) to perform better than other firms in similar environments. His findings partly support the idea that the impact of training on company performance depends on endogenous and firm specific factors.

Romijn and Albaladejo (2000) investigated the role of various internal and external sources of innovation capability in SMEs in the UK. Besides factors such as R&D investment and interaction with research institutions, they found that a range of internal factors, including the owners' technical education and their prior work experience, the technical skills of the workforce (measured by university-trained engineers as % of total workforce) and training (measured as training expenditure per employee and % of sales) have a significant effect on innovation capability. Furthermore, a close link to nearby training institutions also had a positive impact. Innovation capability was measured by the presence of innovations during the preceding three years and their technological complexity. However, the authors did not report any specific analysis regarding firm size and its impact.

There is considerable literature on the importance of human capital for the success of business start-ups (e.g. Trouvé, 2001). In these studies formal education, skills and experience and the talent of the founder are integrated to explain business success. However, the role that the training of the workforce or teams plays for a company's success is scarcely investigated. Bosma et al. (2002) studied the value of human capital for start-up companies in the Netherlands. The study separated general,

industry-specific and entrepreneurship-specific human capital investments by the founder and measured performance according to survival, profit and employment generated. The main findings are that investments in industry-specific human capital, such as former experience, and entrepreneurship-specific human capital, such as experience in business ownership, contribute significantly to the performance of small firm founders. General investments, such as the level of higher education, play a minor role. A methodological problem of the study is that investments are only operationalised by the experience of the founder, without a direct analysis of training expenditure during the firm's life.

The Irish study by Barrett and O'Connell (1999) cited in Section 3.1.1, also analysed whether a firm's size had an impact on the relationship between general or specific training and performance but they did not find any significant differences based on the size of the firm. The study by Mason et al. (1992), carried out in British and Dutch SMEs with up to 400 employees, indicated that the Dutch productivity advantage was greatest in product areas where small- or medium-sized batches were in demand by the market. In engineering plants they found no variation in productivity with firm size, but in the food-processing industry (biscuits) they found some differences. While the largest British biscuit plants, which were highly automated, had the same productivity as the Dutch firms, smaller Dutch plants were almost twice as productive as corresponding British plants. Mason et al. ascribe this difference in productivity to the lack of technical competence of the workforce.

While few studies have examined the effects of human capital and human capital investment on the performance of smaller firms, there is nothing indicating that experience, skills and training should have any less impact on company performance. On the contrary, many of the studies emphasise the importance of these factors for smaller firms.

3.5. Other training and impact studies

The research done at the American society of training and development (ASTD) is an important source of information. ASTD perform annual benchmarking studies on employee development

Table 4: **SMEs and other training studies**

Study	Database/ survey	Data	Sample and size	Aim/ subject	Method
SME					
Leitner (2001) A	Empirical study based on a questionnaire	Importance of training	100 SMEs	Intangibles, strategy and firm performance	Correlation and Anova- Analysis
Bosma et al. (2002) NL	Panel survey among 1 100 new business founders between 1994-97	General, industry-specific and entrepreneurship- specific investment in human capital	1 100 firms	Does human capital investment enhance entrepreneurial performance?	Regressions
Romijn and Albaladejo (2000) UK	Survey of 50 SMEs (interviews)	Skills of workforce	50 information and computer technologies (ICT) and electronic firms	Internal and external sources of innovation capability in SMEs	Correlation analysis
Other studies					
Bassi et al. (2001) US	ASTD survey, Compustat	Training investment per employee	314 publicly listed firms	Impact of training investment on firm's (stock market) performance	OLS, first difference regressions
Büchel (2000) D	German Socio-economic panel (GSOEP)	Educational level	800-1 900 individuals	Impact of overeducation on productivity	Logit, survival model

and training. A clear advantage of the data collected by ASTD is the quality of the information on training. All companies subscribing to ASTD's benchmarking survey gather information on types of training, amount spent on training, etc. All measures of training are clearly defined and companies participating in this survey provide training information that is collected in a similar way. Studies based on ASTD data thus have far less variance caused by measurement errors in training than most other studies. The importance of committing firms to a common definition and standard of measuring training cannot be overstated. The lack of a common definition of what to regard as training will be discussed in more detail in the last chapter of the present study.

The possibility of connecting training data with company outcome measures is also an important advantage of the ASTD database and offers advantages to investigations of company training. The study by Bassi et al. (2002) shows that firms with higher training investments also have higher stock returns the following year, higher gross profit margins, higher return on assets, higher price to book ratio, as well as higher income per employee. The results are very similar when examining changes in performance measurements. An important aspect of being able to connect training investment with profitability and stock market performance is that we are measuring the impact net of the cost of the investment. The study by Bassi and van Buren

Control variables	Outcome measures	Strength/ weakness	Findings
Industry, size, strategy	Earnings, sales and employment growth	No quantitative measurement of training investments	Firms with regular training have higher returns
Various controls such as industry, gender, labour market histories	Survival, profit, employment	Human capital is measured only through experience	Human capital (experience of the founder) influences the entire set of performance measures
None with respect to training and performance	Innovation capability (index)	Captures various indicators to explain innovation performance, not possible to relate training directly to performance	Skill of workforce (share of university-trained) has a positive impact on innovation performance
Industry, R&D, assets, investment, price to book, beta price/earnings, previous performance, etc.	Stock market returns, income-, Tobins Q-, and sales per employee	Good quality training data, firm performance measures, and control variables	Training investments are associated with next year's stock market performance. Same result for level and change data. Changes in training investment can predict future stock returns
A number of employee characteristics, age, gender, health status, etc.	Job satisfaction, tenure, participation in on-the-job-training, health	Large number of observations/ self-reported variables	Overeducated employees are healthier, have longer tenure and are more work and career minded.

(1998) indicates a similar result, that training has positive effects on company performance.

That training investments are associated with stock market performance is more rigidly demonstrated in Bassi et al. (2001). In a well-specified regression model the authors demonstrate that the level of training expenditure (investment) per employee is associated with next years' stock market return. This training effect is demonstrated in the presence of variables capturing stock market risk and known stock market anomalies such as momentum and the book-to-market effect. While controlling for momentum effect by including a lagged dependent variable, the authors also account for (eliminate) the potential effect that training might have had on stock

returns during the investment period. It is also important to note that a first difference approach (change in training investment and stock market return) gives substantially the same result. The results also indicate that the effects of training emerge with some lag and that training appears to have long-term effects on profitability.

An important aspect of training and the impact on stock returns is that this information is value relevant and that investors are currently unable to get hold of this type of information. In a perfect world, a well-informed investor would anticipate the increased earnings and returns from such human capital investments at the moment they were made. Because of the absence of information on human capital investments in corporate

reports it appears that investors are unable to gather this type of information. However, if investors had knowledge of these investments and anticipated the impact on the share price, we would be unable to document any effect on share performance the following year.

Another study that connects human capital with stock market performance is Hansson (1997) on Swedish stock market information. Because of the unavailability of training data, the author created three stock market portfolios reflecting dependence on human resources and investment in training. One portfolio mainly consisted of knowledge-intensive firms, a second reflected less dependence on human resources and consisted largely of capital-intensive firms. The third portfolio contained a mix of firms from both knowledge- and capital-intensive sectors. The basic idea of the study was that these portfolios would mimic unobserved training expenditure, with relatively higher human capital investment in knowledge-based firms compared with capital-intensive firms. The findings indicated that knowledge-based firms consistently earned higher risk-adjusted returns than the more capital-intensive firms. The author ascribed the higher returns in the portfolio with knowledge-based firms to greater investment in unaccounted (unobserved) human capital.

In a German study on overeducation and employee performance, Büchel (2000) comes to the conclusion that overeducated employees in low-skill jobs tend to be more productive than their correctly positioned colleagues. Büchel used questions from the German socio-economic panel (GSOEP) and found that overeducated personnel had better health, received more on-the-job training, had longer tenure, and were not more dissatisfied with their job than personnel with the right educational level. This study used self-reported questions on productivity. The results indicated that the risk of employing too highly educated personnel might be exaggerated since there are no indications that overeducated personnel are more negative towards their work. These findings also suggest that we may possibly be less concerned with the potential negative

effects that education can have on company performance, i.e., education might have an upside but a less pronounced downside effect.

The effects of web-based training are studied by Schriver and Giles (1999) within a nuclear facility, Oak Ridge, Tennessee, US. The organisation has about 14 000 employees, with a training budget that reflects their high qualification requirements. The training for Oak Ridge is mainly organised by the centre for continuous education, which serves as corporate university. In 1995 the management decided that significant savings could be realised by using the Intranet to deliver selected courses and qualification tests. Schriver and Giles evaluated this new project, introduced in 1997. Calculating the investments in the new system such as technology, download costs, etc., and savings such as travel costs, fewer instructors, physical copies, classrooms, etc., they found that the cost-benefit ratio was 1:9.5. The return on investment was calculated at 845 %. However, despite this convincing data, the analysis should be taken with caution, since it did not assess the effectiveness of training and any intangible effects, such as networking opportunities. Neither did it calculate how much time the employees spent in front of the computer.

In summary, studies based on stock market data suggest that human capital and investment in it are important factors in understanding stock returns. Some of the studies based on the ASTD data provide convincing evidence that training generates substantial gains for firms. The study by Büchel (2000) also suggests that we might be less concerned with the potential negative impact of overeducation on firm performance.

It is important to point out that additional references to impact research can be found in Barrett (1998, 2001). While these overviews also largely cover the impact that training and skills have on firm performance, there are some overlaps with our study. We have, however, tried to distinguish our review not only by including other research papers but also by looking at some of the problems associated with this kind of research from a different perspective.

4. Cranet survey results

The Cranet network was established in 1989 by five founder countries (Germany, Spain, France, Sweden and United Kingdom). It is coordinated by the Centre for European Human Resource Management at Cranfield School of Management. The Cranet survey is now the largest and most representative independent survey of HRM policies and practices in the world. The network itself is a collaboration between 34 universities and business schools, which carries out a regular international comparative survey of organisational policies and practices in HRM across Europe.

Cranet has been running the survey since 1990 using standardised questionnaires sent to private and public organisations in different countries. The standardised questionnaire is translated into each member country's language and adapted to the different national contexts (taking into consideration such factors as legislation, labour markets and culture). During each round of the survey, amendments are made to capture new developments but the questionnaire stays mainly unchanged in order to observe developments over time.

The questionnaire is distributed by post, except in Greece where interviews are used to gather the information. The questionnaire is distributed to organisations with 200 or more employees and is addressed to the most senior human resource/personnel specialist in the organisation. The 1999 survey was distributed to over 50 000 organisations and 8 050 responses were received giving a total response rate of 15 %. The willingness of companies to respond was higher in Scandinavian countries than in Southern European countries. The current version of the 1999-survey database includes 8 487 observations from 27 countries, 17 of which are European countries. The number of observations in the forthcoming tests varies because not all companies have answered all questions. The survey is sent to both private and public organisations. The descriptive statistics in the present investigation include responses from both public and private organisations. For the analysis that includes performance variables, the sample is restricted to private organisations.

It is also important to note that the provider of

the information in this survey is the firm and the figures presented here can deviate from other studies. As noted by Barron et al. (1997) employer-based surveys typically report more training than individual-based surveys. Because the survey is focused on larger organisations it is expected that the incidence and amount of training will be higher than in surveys conducted on a more distributed population.

4.1. Selected Cranet survey questions

A clear advantage of the Cranet survey is the access to two direct questions on company training. The first question concerns the amount spent on training in proportion to annual salaries. The second question is related to the proportion of employees that participated in training during the year. As with most training studies, we have very little knowledge of what the respondents regard as training. It can be anything from continuing vocational training, initial training, to in-company apprenticeship training. Other questions related to employee development include whether the organisation has a written policy for training and development, whether it analyses employees' training needs, and whether it monitors training effectiveness.

Questions related to company performance are weaker. Variables are perceptions of organisational performance (fairly common in studies) typically measured at different levels. One question is related to the performance of the organisation for the past three years. This variable is measured at five levels and could be included in the analysis as a measurement of whether profitability affects the provision of training. The most interesting performance measurements are questions on the rating of the organisation's performance compared with other firms in the same sector. These industry-adjusted questions concern productivity, rate of innovation, service quality, profitability, and stock market perfor-

mance. Variables are measured at three levels, according to whether the firm belongs to:

- (a) the top 10 % of the firms in the sector;
- (b) the upper half of the firms in the sector, or;
- (c) the lower half of the firms in the sector.

Preferred outcome variables in this survey are measurement of stock market performance and profitability, as these are net of the investment cost of training. It is important to note that we are not working with actual performance but with perceptions of performance, which are both a 'noisier' measurement and demonstrate less variation than actual performance. Performance measurement in the survey has the advantage of being relative to other firms in the same sector (industry). Controlling for heterogeneity between industries or sectors has proved to be important in most firm-based studies of company training.

Two variables related to internal market and unionisation are utilised in the survey. The variable on unionisation is measured at six levels from 0 % to 100 %. A measure of internal market can be constructed from the question on how managerial vacancies are filled. The respondents are asked how three different levels of managers are recruited: senior, middle, and junior managers. As with most proxies this variable is only a rough measurement of the actual construct, which also includes other characteristics such as promotion, seniority, on-the-job training, etc. The respondents can select from four different types of recruitment:

- (a) internally;
- (b) head hunters or recruitment consultancies;
- (c) advertising in newspapers;
- (d) word of mouth.

From this it is possible to construct a rough measurement of the extent the firm's internal market. The number of ticked suggestions in option (a) (maximum three) related to the total ticked suggestions (maximum twelve) can work as an approximation for the degree of internal market. It is arguably a coarse measurement but it indicates whether the recruitment of managers is focused on internal employees or whether it is focused on attracting employees externally.

Other variables that can be used in explaining training are educational structure (% graduates), age structure (% above 45 years), proportion of

manual workers, number of employees, and the importance of innovations. The questions used in the present study involve mainly those from the employee development section, organisational details and some questions on unions, staffing practices and the human resource function in general. The Cranet database is a rich source of information and only a small section is analysed in this report. Please refer to Annex 1 for the exact wording of all variables included in this analysis.

4.2. Cranet survey results

4.2.1. The scope of training

Table 5 provides descriptive statistics on the training variables used in this study. The table shows the mean values for the percentage of wage bill spent on training and the proportion of employees trained in each country. The average amount of wage bill spent on training in 1995 survey was 3.1 %; the figure was 2.94 % in the 1999 survey. The proportion trained in 1999 is somewhat lower than the figures given by Eurostat in the second continuous vocational training survey ⁽⁸⁾. The countries that deviate most from the Eurostat figures are Belgium (-14 %), Norway (-11 %), and Ireland (-10 %) while other countries show more or less the same result. The restricted sample in the Eurostat survey is slightly different because it contains enterprises with 250 employees or more compared with 200 and above in the Cranet survey. The difference in the amount of training between the original (European) countries in 1995 and the new countries in 1999 is also marginal. More striking is the fact that the proportion of employees trained has increased quite dramatically in all countries, the overall increase being 11 % since 1995 to about 45 % of the employees receiving training each year in 1999. Again there is no marked difference between European countries and other countries in the proportion of employees trained.

The number of firms answering each question is given in parenthesis. In the 1999 survey, (which is the foundation for this investigation) 5 463 public and private organisations answered the question on the amount spent on training and

⁽⁸⁾ Eurostat: *The second continuous vocational training survey, 1999* (Newcronos).

Table 5: **Cranet survey, descriptive statistics**

Country	Code	1995 % spent on training	1999 % spent on training	Change	1995 Proportion trained %	1999 Proportion trained %	Change
United Kingdom	UK	2.6 (813)	2.9 (644)	+ 0.3	42.1 (903)	52.9 (784)	+ 10.8
France	F	4.8 (499)	4.2 (374)	- 0.6	44.2 (471)	49.5 (355)	+ 5.3
Germany	D	2.8 (321)	2.8 (311)	UNCH	26.4 (357)	32.8 (415)	+ 6.4
Eastern Germany	D (east)	3.2 (155)	2.5 (151)	- 0.7	27.7 (189)	31.8 (218)	+ 4.1
Sweden	S	4.3 (186)	3.7 (157)	- 0.6	51.5 (266)	66.1 (239)	+ 14.6
Spain	E	2.1 (213)	2.0 (241)	+ 0.1	37.6 (247)	51.1 (268)	+ 13.5
Denmark	DK	2.8 (427)	2.8 (306)	UNCH	37.2 (496)	49.6 (355)	+ 12.4
Netherlands	NL	3.8 (238)	3.4 (202)	- 0.4	34.0 (258)	42.2 (193)	+ 8.2
Italy	I	1.9 (65)	2.2 (63)	+ 0.3	21.4 (86)	36.2 (71)	+ 14.8
Norway	NO	2.7 (331)	3.3 (325)	+ 0.6	40.0 (317)	41.5 (344)	+ 1.5
Switzerland	CH	2.9 (170)	2.6 (113)	- 0.3	36.0 (189)	42.8 (128)	+ 6.8
Ireland	IRL	3.7 (249)	3.2 (278)	- 0.5	36.2 (308)	47.1 (381)	+ 10.9
Portugal	P		3.0 (128)			36.9 (128)	
Finland	FIN	2.7 (262)	2.5 (215)	- 0.2	45.2 (269)	61.1 (229)	+ 15.9
Greece	EL		2.5 (81)			36.0 (111)	
Austria	A		2.2 (153)			36.4 (181)	
Belgium	B	2.4 (252)	3.3 (182)	+ 0.9	27.9 (311)	45.5 (223)	+ 17.6
Northern Ireland	NI		3.1 (107)			54.4 (157)	
Estonia	EE		4.3 (304)			47.0 (388)	
Bulgaria	BG		2.9 (70)			17.4 (107)	
Czech Republic	CZ		2.3 (141)			45.3 (176)	
Cyprus	CY		1.4 (52)			34.1 (73)	
Turkey	TR	3.8 (96)	3.9 (128)	+ 0.1	27.9 (148)	49.4 (191)	+ 21.5
Tunisia	TN		4.3 (45)			24.6 (54)	
Israel	IL		3.3 (89)			47.5 (148)	
Japan	JP		1.7 (423)			31.6 (582)	
Australia	AU		3.0 (180)			56.3 (186)	
Average		3.10 (4277)	2.94 (5463)	-0.08	35.7 (4815)	45.22 (6685)	+11.0
NB: The table shows the average percentage of wage bills spent on training in each country (% spent on training) and the average proportion of employees trained during the year (Proportion trained %) in the 1995 and in the 1999 Cranet survey. Number of firms answering each question in parenthesis.							

6 685 organisations answered the question on the proportion trained during the year. For some countries the number of observations is low. That some countries have too few observations is evident when the sample is restricted to private firms in the analysis of training and performance. As can be seen in Table 5, the survey is mainly

focused on European countries with most of the answers from countries within the European Union.

If one compares these figures with the 1999 ASTD survey it appears that European companies spend considerably more on training than their American counterparts. In 1999 US firms spent

1.8 % of payrolls on training (van Buren and Erskine, 2002) compared with 2.9 % for the firms included in our sample. It is important to note that both surveys are completed by companies and that the question regarding the amount invested in training is similar in both studies. The measurement errors in the Cranet survey are probably larger because of less rigorous training definitions in the questionnaire. Whether this measurement problem inflates or deflates the reported figures in the Cranet survey compared with the ASTD survey is difficult to determine.

4.2.2. Correlation between variables

The investigation that follows is based on the sample of private companies for which there are performance measurements. The remainder of the analysis in this section is restricted to 5 824 private companies that answered the 1999 survey. Table 6 shows the correlation between the main explanatory variables used in the present study (number of observations in parenthesis). We have chosen variables in an effort to reflect factors used in both labour economics and human resource literature. To increase readability, only significant correlations are shown in the table. A number of interesting initial observations can be made. First, the amount

spent on training is positively correlated with personnel turnover. This is an observation that goes against common knowledge that turnover reduces training. The proportion of employees in trade unions is negatively correlated with amount of training and staff turnover. That training is less in more unionised companies is possibly the result of a greater proportion of manual workers. More interesting is that turnover appears to be lower in more unionised establishments (especially since % manual workers are positively correlated with turnover). This result is in line with the argument that unions reduce personnel turnover and thereby promote more training (e.g. Booth et al., 1999).

The internal labour market measurement is negatively related to the amount of training and proportion trained, contradictory to expectations which assume that firms invest in training because internal labour markets reduce the risk of poaching. However, the prediction that turnover is lower in firms with more focus on internal promotion appears to be confirmed in the present material (negative correlation between turnover and internal market). That the internal labour market is positively correlated with the proportion of graduates and negatively correlated with the proportion of manual workers seem

Table 6: **Correlations between main explanatory variables (private sector)**[illegible]

plausible. While our measure of internal labour market is at odds with the prediction related to training, the remaining correlations appear to be in line with expectations. However, a more rigid analysis of what determines training will be performed in Section 4.2.3.

Other correlations that are also less consistent with prior expectations relate to graduates and manual workers. The size of the organisation, measured by the number of employees, is not correlated with the two training variables. This apparent inconsistency with prior findings might be due to restricting the sample to firms with 200 or more employees. A somewhat surprising result is also the very low correlation between the proportion of wage bills spent on training and the proportion of employees trained. This result suggests that these two factors measure different aspects of training. We will elaborate on this argument in more detail in the next section. In conclusion, the results of Table 6 indicate that there is also little or only moderate correlation between our explanatory variables.

4.2.3. What determines training?

A number of questions in the Cranet survey offer interesting perspectives on the amount or incidence of training. As well as including customary factors such as education, age, company size, unionisation, and manual labour, the Cranet questionnaire includes variables that might provide a better understanding of what influences the decision to train people. First are questions of whether the company has a written training policy, analyses employee training needs, and has an internal labour market. Other variables include personnel turnover and whether innovations are important. Perhaps the most interesting variable is the one that indicates prior profitability, as this describes the impact of prior performance (profitability) on the decision to train. This variable may assist in understanding the causality of training, i.e., whether profitable firms can afford training or whether training generates profitability. Finally, two different training measurements (proportion trained and proportion of wage bills spent on training) might provide some idea of whether these two common estimates of training

measure the same thing. To account for what determines the amount of training and proportion trained in a company the following training regression is estimated ⁽⁹⁾:

$$\text{TRAINING} = \text{POLICY} + \text{NEEDS} + \text{INTERNAL} + \text{UNION} + \text{AGE45} + \text{MANUAL} + \text{GRADUATES} + \text{TURNOVER} + \text{SIZE} + \text{PRIORPROFIT} + \text{INNOVATION} \quad (1)$$

where:

TRAINING is the amount of training or proportion trained (all subscripts suppressed);

POLICY is a dummy variable taking the value of one if the firm has a written training policy;

NEEDS is a dummy variable equal to 1 if the firm analyses employee training needs;

INTERNAL and UNION are internal labour market and degree of unionisation;

AGE45 is the proportion of employees 45 years or older;

MANUAL, GRADUATES, TURNOVER, SIZE are percentage of manual employees, percentage of graduates in the workforce, percentage of personnel turnover and number of employees at the firm;

PRIORPROFIT is the measurement of the performance over the past three years;

INNOVATION is a dummy variable taking the value of 1 if the firm considers innovation as very important to the organisation.

The results for estimating equation 1 are shown in Table 7. We have chosen to analyse the results of Table 7 in the light of the findings in literature that employers pay for all types of training no matter whether the training is specific, industry-specific (occupational) or general in nature. The first variable indicates that firms with a written training policy are more likely to provide training to their employees (proportioned trained) but having a written training policy is not associated with how much training is provided. The second variable indicates that firms that analyse their employees training needs also train their

⁽⁹⁾ Because less than 1 % of the firms answered that no employees received any training and just over 1 % of the firms answered that 0 % of salaries is spent on training, an OLS regression is estimated in the training regression.

employees to a greater extent than firms not conducting this type of analysis.

The impact from the internal labour market measurement is negative on both the amount of training and number of people trained, which indicates that firms focusing more on internal promotion provide less training. This is contrary to the findings of Delaney and Huselid (1996) for the US market. The correlation between training and their measure of internal labour market was high (0.56) indicating that firms with a higher degree of internal labour market also provide more training. Whether this deviation in our result is caused by different measures of internal labour market or whether there exist differences between US and other (predominantly) European countries is difficult to gauge. However, the negative impact of the internal labour market measurement in our study might also be interpreted along the lines that these types of internal structures do not provide enough incentive to train or to be trained. Internal labour markets are typically based on seniority in promotion and pay levels are based on position (post occupied) rather than on competence and skills. Both the employee and the employer have less incentive to invest in training. For a more thorough discussion on the subject see Hanchane and Méhaut (2001).

The degree of unionisation at the firm has a negative impact on the proportion of the wage bill spent on training whereas the impact on the number of employees trained is positive (but not significant at 5 % level). Though we have controls for both educational level and the proportion of manual workers at the firm, the negative association between unionisation and the amount invested in training is probably caused by our inability to control for industry differences in the training regression. The impact from having more old employees in the organisation is negative on both training measures but not significant. This result might be taken as an indication that company training persists throughout the employee's career. The proportion of manual workers is associated with fewer workers being

trained but not with the amount of training provided at the firm. The proportion of graduates at the firm has a positive but not significant impact on training measurements. The size of the organisation is not associated with any of the training measurements, possibly explained by our sample of larger firms.

Personnel turnover appears not to be a factor determining training since it is not significant in the training measurements. This result is qualitatively similar to those presented in Goux and Maurin (2000) for France and in Green et al. (2000) for Britain. Both studies indicate that training measured at an aggregated level had little impact on mobility. Considering the importance of staff turnover to the potential for companies to benefit from training investments we also conducted a simple analysis of aggregated country data and found a positive relationship between average personnel turnover and average proportion of wage bills spent on training. This outcome is slightly contrary to what is expected, as turnover of personnel is normally considered to lower firms' willingness to invest in training. However, turnover might force firms to increase their spending on training newly hired employees. A division of what type of training is provided by the firm might thus give a different result ⁽¹⁰⁾.

The variable that indicates past profitability shows an interesting division in the impact on the two training measurements. Prior profitability is positively and significantly associated with the proportion of employees being trained but not associated with the proportion of wage bills spent on training. This result indicates that the proportion trained in a firm is largely conditioned by past performance. It seems that measurements of training based upon proportion of employees being trained contain an element of reward or, at least, dependence on past performance. That the decision regarding the number of employees being trained is endogenous to, or mutually dependent on, past profitability makes it important to address the problem of endogeneity in studies using this measure of training.

⁽¹⁰⁾ The country comparison is based only on univariate regression and there could thus be several factors such as economic conditions, unemployment rate, etc., that might drive this outcome. However, Green et al. (2000) also come to the conclusion that different types of training have different impacts on the individual's decision to search for a new job. The large difference in personnel turnover between different countries might still indicate that this is an important variable to consider in cross-country comparison. There are considerable differences in personnel turnover between European countries, with the lowest turnover in the Netherlands (4.69) and Germany (5.70) and the highest turnover in the UK (15.06) and Portugal (13.24).

Table 7: **Training regression (private sector)**

Dependent variable	% spent on training	Proportion trained
INTERCEPT	2.795 ^(a) (5.53)	14.637 ^(a) (3.25)
POLICY	0.233 (1.22)	9.434 ^(a) (5.60)
NEEDS	0.844 ^(a) (4.05)	17.575 ^(a) (9.51)
INTERNAL	-1.501 ^(a) (-4.92)	-6.883 ^(b) (-2.51)
UNION	-0.126 ^(a) (-2.74)	0.725 (1.75)
AGE45	-0.004 (-0.85)	-0.072 (-1.88)
MANUAL	-0.003 (-0.84)	-0.135 ^(a) (-4.53)
GRADUATES	0.008 (1.89)	0.070 (1.79)
TURNOVER	0.005 (0.70)	0.090 (1.40)
SIZE	-0.000 (-0.27)	-0.000 (-0.30)
PRIORPROFIT	0.099 (1.21)	4.465 ^(a) (6.02)
INNOVATION	0.169 (1.03)	0.637 (0.43)
F-statistics	7.827	29.556
R ² (adjusted)	0.05	0.167
N	1359	1566
T-values are in parentheses. (a) Denotes significance at the 1 % level. (b) Denotes significance at the 5 % level.		

Because the proportion of wage bills spent on training is not associated with past performance, it might indicate that how much firms invest in training their employees is not dependent on whether they can afford training or not. Taking this reasoning a bit further suggests that the investment volume is not a reward for past performance but more likely seen as an investment with future benefits for the firm. That the amount spent on training is not associated with the dependent variable (prior profitability) also gives us a better basis for making interpretations

in, for instance, cross-sectional estimates. In other words, examination of the amount invested in training might suggest that it is not profitable for firms that can afford training but it is training that generates profitability.

The last variable, the importance of innovations, shows a positive but not significant impact on training measurements. Given the general level of analysis used in this study, the results should be interpreted with some care, particularly because the regressions do not include important variables such as controls for industries or controls for countries. However, an impression of the results presented in Table 7 is that training appears to be discretionary within firms. The measurements that show the strongest influences on training are largely determined by the firm itself. The difference between what determines the proportion being trained and what determines the amount of money spent on training is also worth noting. The large difference in impact among the explanatory variables indicates that these two measurements indicate quite different dimensions of training decisions. This finding is in line with the arguments in Orrje (2000) that the determinants of the probability of receiving training and the determinants of the amount of training are not the same.

4.2.4. What factors are indicative for top (10 %) performers?

This part of the analysis utilises the questions on how the organisation is performing relative to other firms in the same sector. Table 8 shows the mean difference between organisations belonging to the top 10 % of performers and organisations considered performing below average in the sector. Five industry-adjusted performance measures are shown in Panel A (profitability, productivity, innovations, service quality and stock market performance). The minimum and maximum number of observations used in the analysis is given in brackets in the first column. We have chosen to examine whether top performers show any differences with respect to variables normally considered in studies. The mean difference between top performers and those performing below average is shown in the table together with t-values (in parenthesis).

Panel A gives the results for the whole sample of private organisations and Panel B gives the results on profitability for United Kingdom, France

and Germany. The lack of observations for other European countries rendered further divisions unworkable. Since we are not working with actual performance but perceptions of performance we need to be cautious with interpretations. One problem with the data is that around 30 % of the firms responded that they belonged to the top 10 % of the firms in their sector, suggesting that we either have a response bias or that we have over-sampled firms performing well. To what extent this caveat influences the results presented in Table 8 is difficult to gauge, but a response bias is likely, rendering the statistics less significant.

The first column shows that top performing firms spend more on training compared with firms performing below average. This is true for all performance measurements except for service quality where there is no significant difference. For instance, firms belonging to the top 10 % with regard to profitability on average spend 0.6 % more of their wages on training than firms having a profitability below average in their respective industry. Considering that prior profitability did not have any significant impact on the amount spent on training (Table 7) it might be assumed that top performing firms are top performers in part because of their investment in training ⁽¹¹⁾.

The difference between top performers and the below 50 % performers with regard to the proportion trained in a year is significant for all performance measurements (including service quality). That high performers in service quality train significantly more of their employees each year most likely indicates that achieving top service quality requires all staff to undergo regular training. Top performers train close to 10 % more of their staff in a year compared with firms performing below average on service quality.

Having a written training policy and analysing employee training needs appear to be indicative for top performing firms regardless of performance measurement. These two variables are important determinants of training, training policies and support functions to provide the right type of training, and they are characteristic of high performing firms whether measured by prof-

itability, productivity, innovations, service quality, or stock market performance.

The next column indicates that firms considered as more innovative also employ more highly educated personnel (percentage of graduates in the workforce). This result is reasonably expected because of the complementarity between innovation and education (e.g. Leiponen, 1996b). That firms with better profitability and stock market performance also employ more graduates compared with firms performing below average is more interesting. This result is in line with the findings presented earlier that the educational level of employees is positively associated with productivity and profitability (Black and Lynch, 1996; NUTEK, 2000; Gunnarsson et al., 2001). That firms are able to extract higher profitability from more skilled or more educated workers is an argument put forward by those who propose that wage compression is a major reason for firms to invest in general skills (Acemoglu and Pischke, 1998, 1999a; Booth and Zoega, 1999; Brunello, 2002).

The last columns indicate that staff turnover does not vary between high and low performers, but that high performing firms have significantly less absenteeism among employees than low performing firms. An exception occurs in the results for service quality where there is no difference between the two groups with regard to absenteeism.

Panel B indicates that some of the results in Panel A might be driven by country specific circumstances since not all of the three countries shows the same response on profitability. However, the lack of significance between profitability and some of the variables is possibly more a consequence of fewer sample cases. France, with few cases shows a significant difference only in the proportioned trained whereas the UK and Germany, with more cases, also show more significant results. It is interesting to note that staff turnover is significant in Germany yet not for the total sample or for France and the UK. Another observation is that absenteeism is only significantly different in the UK. Because of the low numbers it is difficult to draw any general conclusions regarding differences between the three countries. One lesson that can be drawn from the Cranet survey is that when the respon-

⁽¹¹⁾ Because it appears that the decision on how much to spend on training is not conditioned by how profitable the firm has been, it is more likely that training generates profitability and not the other way around that profitability generates training (since there is no association between amount of wage bills spent on training and past three years profitability in Table 7).

Table 8: **Mean difference between top 10 % and lower half of firms in sector (private sector)**

	% wages spent on training	Proportion trained %	Written training policy	Analyse training needs	% graduates	% staff turnover	Absenteeism days
Panel A All countries							
Profitability	0.60 ^(a)	9.21 ^(a)	0.08 ^(a)	0.06 ^(a)	2.46 ^(b)	–	-1.22 ^(a)
N (1498-2795)	(4.29)	(6.81)	(4.26)	(3.58)	(2.23)		(-3.21)
Productivity	0.43 ^(b)	7.46 ^(a)	0.05 ^(b)	0.06 ^(a)	–	–	-1.84 ^(a)
N (1243-2389)	(2.27)	(4.36)	(2.12)	(2.65)			(-3.67)
Innovations	0.73 ^(a)	9.80 ^(a)	0.12 ^(a)	0.09 ^(a)	6.62 ^(a)	–	-1.26 ^(a)
N (1253-2375)	(4.52)	(6.63)	(6.00)	(4.90)	(5.31)		(3.05)
Service Quality	–	9.92 ^(a)	0.10 ^(a)	0.11 ^(a)	–	–	–
N (1549-2983)		(3.90)	(3.16)	(3.48)			
Stock Market	0.55 ^(a)	6.34 ^(a)	0.06 ^(b)	0.06 ^(b)	6.04 ^(a)	–	-1.87 ^(a)
N (617-1174)	(2.74)	(3.04)	(2.26)	(2.23)	(3.42)		(-2.95)
Panel B Specific countries							
UK – Profitability	0.63 ^(c)	10.17 ^(a)	–	0.10 ^(b)	–	–	-1.19 ^(b)
N (189-381)	(1.79)	(2.64)		(2.52)			(-2.18)
F – Profitability	–	15.14 ^(a)	–	–	–	–	–
N (91-184)		(3.79)					
D – Profitability	–	13.26 ^(a)	0.25 ^(a)	0.15 ^(b)	–	-2.60 ^(b)	–
N (127-196)		(3.39)	(3.68)	(2.36)		(-2.40)	
T-statistics (parenthesis) whether the mean is different from zero. (a) denotes significance at 1 % level (b) denotes significance at 5 % level (c) denotes significance at 10 % level							

dents are requested to provide actual figures on, for instance, training, staff turnover, absenteeism, etc., the response rate drops dramatically.

4.2.5. Main findings

The investigation is based on a crude statistical analysis, compounded by the problem of perceptions of organisational performance, which tend to increase measurement errors and decrease the true variation among firms. This analysis of the Cranet data should, therefore, be seen as a first rough attempt to explore this database. However, some interesting indications have emerged from the present analysis, as summarised below:

- the proportion of the wage bill spent on training and of employees being trained appears not to measure the same thing because the determinants of these two variables are quite different (the correlation between the two training measures is also weak);
- the proportion of employees trained appears partly dependent upon whether the firm can afford the training, as indicated by the annual number of employees being trained correlating with prior profitability;
- the proportion of the wage bill spent on training does not correlate with past profitability, which might indicate that it is not a profitable firm that can afford training but it is training that generates profit;
- analysis of employee training needs and existence of a written training policy are two

important factors associated with the number of employees trained at the firm and, for the former, also the amount of training provided by the firm;

- (e) most education and training-related measurements are significantly higher or more frequent in high performing firms compared with firms performing below average in their respective sector.

An interesting aspect of these results is that the decision to train is largely determined by company specific factors. Without taking the interpretation of the results too far, a general picture seems to

emerge where factors that one can consider as approximations for good working conditions or the 'good employer' are also largely connected with performance measurements such as productivity and profitability. It is also important to note that firms with better profitability and stock market performance also provide more training, and train more of their employees, compared with firms performing below average in their respective industry sector. Another notable observation is that firms with better sector-adjusted profitability and stock market performance also have more educated employees.

5. Results

The amount of money spent by companies on wages (the rent for human capital) suggests that more efficient use of this production factor would have a significant impact on most firm-based performance measurements. The flaw in this reasoning is that firms do not own the labour of their employees but pay a rent for its hire. The question is whether increased efficiency arising from company training benefits the hirer of the labour or the provider. That at least some of the increases in efficiency are captured by firms is a prerequisite for any impact on company performance measurements such as profitability or stock market performance.

Research on the effects of education, training, and skills/competence on company performance has made some important advances in recent years. Increasing evidence that employers benefit from human capital, and investment in human capital, has led to a substantial increase in the number of theoretical papers seeking to explain these findings. In the following section we provide information on what empirical research has achieved in different areas.

5.1. The effects of training on company performance

5.1.1. The impact of training

A somewhat crude description of the research agenda is that the general understanding has moved from regarding all investments in employee training as unprofitable for firms, to regarding specific training as viable, and now to considering all types of training as potentially profitable. Considering that 40 years have passed since Becker (1962) wrote his seminal paper on human capital investment, research has moved slowly on the question of whether firms can benefit from training their employees. Only very recently have we seen papers showing that employers profit from investment in all kinds of training.

The majority of the papers included in this

review point toward substantial gains for employers from continuous vocational training. The absence of studies indicating that employers do not profit from training investments may generate some concern over whether we have a potential bias in reporting only significant and positive results for company training. However, because research on training has largely accepted that employers pay for company training (no matter how general) the finding that employers also benefit from such investment seems progressively more plausible. Despite acceptance that firms pay for (general) training, there is still a need for additional research on the effects of training to understand better the complexities of company-provided training.

Increasingly, studies provide evidence that training generates substantial gains for employers. The most compelling evidence is presented in several recent papers connecting training investment with changes in productivity, profitability and stock market performance. The majority of these studies also establish the direction of the relationship, i.e., we can, with reasonable confidence, maintain that training generates performance effects and not the other way around. The studies that provide the strongest evidence of this are (dependent variable in parenthesis):

- (a) Barrett and O'Connell (1999) based on 215 Irish firms (sales growth);
- (b) Dearden et al. (2000) based on 94 British industries over 12 years (value added);
- (c) Groot (1999) based on 479 Dutch firms (productivity estimates);
- (d) Hansson (2001) based on a Swedish case study of programmers (net profitability);
- (e) d'Arcimoles (1997) based on French firm-level data (value added, return on capital employed);
- (f) Bassi et al. (2001) based on 314 US firms (stock market return, sales per employee, etc.).

There are also studies that have only been able to demonstrate a weak connection between company training and company performance (Black and

Lynch, 1997; Bartel, 1995). However, the authors of these studies attribute weak or insignificant results to measurement problems. The main impression from research is that firms profit from training their employees regardless of whether the training provided is useful to other firms. Other tentative conclusions that can be drawn from the review are briefly presented below.

5.1.2. Formal/informal and general/specific training

Few studies have been able to examine the effects of different types of training. Besides difficulties in acquiring more specific training information, the distinction between different types of training appears somewhat arbitrary since most definitions are not mutually independent. Nevertheless, the results concerning formal and informal training suggest that formal training courses have more impact on productivity than informal training (Dearden et al., 2000; Black and Lynch, 1996). This finding is puzzling, because it is likely that formal training relates more to general training and informal training more to specific training. This result would indicate that general training might be more profitable for firms to invest in than specific training. The study by Barrett et al. (1998) suggests that this might be the case. The results of Barrett et al. show that general training has a significant positive impact on productivity whereas specific training appeared to be insignificant. The authors explain this result by reasoning that general training provides greater incentive for employees to spend more effort in the learning process.

However, the results are not entirely consistent. Bosma et al. (2002) conclude that their findings support the thesis that specific investments are more influential for company success in start-ups than general investment. This difference in results with regard to general and specific training can be affected by weak definitions and measurement problems, or the difference between entrepreneurial performance and employee performance.

Other studies that can be distinguished in terms of type of training are the studies focused on teaching basic skills to employees (work place education programmes) or students (STW programmes). The impact of generic skills programmes is ambiguous in that it is difficult to assess the real pay-off for employers from this type of training investment. Though much

research is needed on this subject, there are indications that basic skills training can influence firm performance positively (Bassi and Ludwig, 2000; Krueger and Rouse, 1998).

5.1.3. Timing of the effects of training

An important issue related to the impact of training is when one can expect to see the effects of the training investment. There is evidence that effects of training emerge some time after it takes place. The results and arguments forwarded in Black and Lynch (1996) and Bassi et al. (2001, 2002) based on US data, d'Arcimoles (1997) based on French data, and Hansson (2001) based on Swedish information, suggest that the effects of training materialise one to two years after the training period. The results presented in these studies suggest that we should measure the effects of training after at least one year from the point of the investment and possibly also over a longer time horizon.

However, typically the effects of training are registered in cross-sectional estimates, which implies an instant effect of the training investment. The question is whether this impact is caused by an immediate effect from the training or whether cross-sectional estimates capture the return on past training investments. This question is valid because it is likely that the level of training is continual in firms. In other words, firms that invest more in training in one period ($t-1$) continue to invest more in training in the following period (t). Because of delayed training effects, we might measure the effect of prior training investments in cross-sectional estimates. The question of when to expect the effects of training investment to materialise is by no means clear and it would be beneficial to have this matter determined in future research.

If the productivity effects from training lag, this has implications for the conclusions we can draw on instant wage effects from training. It has generally been accepted that wage increases in connection with training arise from resulting increased productivity. The results of the above studies imply that wage increases during training might have some other basis. Recent access to data matching employees' and firms' characteristics will possibly shed more light on this question.

5.1.4. Timing of training investments

The amount of training firms undertake is possibly affected by the economy. The general

understanding is that expansionary economic conditions, with firms hiring new employees, also are associated with an upsurge in firm-sponsored training. The results of Dearden et al. (2000) and Bartel (1994) imply the opposite – that firms train when production is low (the pit stop theory). One reason why favourable economic conditions do not produce more company training may be that only a portion of all company training is geared towards new employees. For instance, only 18 % of all training provided by publicly held companies in Sweden was introductory training for newly hired employees ⁽¹²⁾. Since firms train when they have slack time, we also typically underestimate the impact of training on productivity in cross-sectional analyses ⁽¹³⁾.

Another important finding is that the timing of training appears not to depend on tangible investments (Barrett and O'Connell, 1999). The finding that investments in training and investments in tangible assets are only weakly correlated suggest that tangible investments do not cause the training effects observed at company level (industry level). Apart from tangible investments and training, the Cranet survey results also indicate that the amount of training provided by firms is not dependent on previous profitability. Both results indicate that the decision on how much training to provide has little to do with whether the firm has done well in the past or whether the firm increases its tangible investments. These findings have importance for what conclusions that can be drawn from statistical models, especially cross-sectional regression estimates.

5.2. The effects of education, skills and competences on company performance

The effects of education or skills/competence on company performance are generally more difficult to establish, as these factors are accumulated measures of human capital stock. Compared with company training that normally varies from year to year, educational levels are much more constant. Because of this we are typically restricted to level data (with some exceptions) in analysing the impact

that human capital stock might have on company performance. Educational or skills levels are normally included as control variables in most impact research but less frequently used as a main variable (at least in firm-based research). Still, this is possibly one of the more interesting areas in explaining company performance as the studies included in this review indicate that education and skills are important factors in understanding differences in performance among firms.

There is research to connect the effect of educational level or skills/competence level with productivity, with positive association in the work of Black and Lynch (1996) and NUTEK (2000). Indications that skills are an important factor in productivity are presented in Carr (1992) and Mason et al. (1992). A significant paper not restricted to cross-sectional data is the study by Gunnarsson et al. (2001) examining educational level and productivity growth over a ten-year period. Their findings suggest that the increase in the educational level between 1986 and 1995 explains a large part of the IT-related productivity growth. Their results also suggest that a marginal skill upgrading has the same effect across different levels of education. Gunnarsson et al. conclude by stating that 'measures to promote increased use of IT should be followed up by measures promoting skill upgrading. Our results actually show that, in general, upgrading skills at a given level of IT (i.e. share of computers in total capital) has a much stronger growth-enhancing effect than increasing IT investments at a given human capital structure.' (p. 44).

The findings of Leiponen (1996b) indicate that innovative firms have a more educated workforce and that innovative firms are more dependent on educational competence in generating profit (Leiponen, 1996a). The study by Michie and Sheehan (1999) also suggests that skill shortage is a severe obstacle to innovation. Similarly, the findings of Romijn and Albaladejo (2000) in SMEs propose that the owners' technical education and their prior working experiences, in addition to the technical skills of the workforce, have a significant effect on innovative capability.

Taken together, the results indicate that we have complementarities between different types of

⁽¹²⁾ IPF – Institute of personnel and corporate development. *The human capital survey 2002*. Uppsala: IPF, Uppsala University (please contact the authors for results).

⁽¹³⁾ However, as noted in the previous section this conclusion depends to some extent on when the training effects materialises.

education (Leiponen, 1996a) and between education and IT investments (Gunnarsson et al., 2001) that generate significant synergies or externalities. The evidence that the level of education or skills is related to innovation and productivity might not be too surprising since education and skills are generally considered as associated with more complex jobs and increased flexibility. What is more surprising is that we start to see studies relating education and skills to profitability.

The results of Leiponen (1996a) show that educational level is associated with profitability (net profit margin). Leiponen uses panel data and a two-stage procedure to handle problems of endogeneity, providing results that are more robust than ordinary cross-sectional estimates, especially on arguments that profitability causes firms to hire more highly educated personnel. The study by NUTEK (2000) shows that the proportion of higher educated employees is significantly associated with both productivity (value added) and profitability (revenues to cost ratio). Because educational level is associated with both productivity and profitability it gives us a more solid basis for inferring that higher education generates higher productivity and that firms are able to capture some of the benefits.

The idea that skills in the form of programming competence are associated with how much the individual produces in net contribution (profit) to the firm is presented in Hansson (2001). This investigation is based on a single firm and it is thus difficult to draw any far-reaching conclusions. Nevertheless, because the examination is based on differences in employees' net contribution this study avoids the argument that only profitable firms can afford to hire more skilled workers. Similarly, the results of the Cranet survey suggest that the more profitable firms and firms with better stock market performance in their respective industry sector also have more highly educated personnel than firms performing below average in their respective industry sector.

From the above, it is possible to speculate on the degree to which firms are able to capture returns on human capital investments that normally are considered to belong to the individual. Because prior education is a function of

the individual it is assumed that the individual accrues the benefit of these investments through higher wages. However, indications that investors and beneficiaries are not always the same are presented in Groot (1999) who points out the weak connection between those who contribute to training investment and those who benefit from it.

That firms are able to extract higher profitability from more highly skilled or educated workers is an argument put forward by those proposing that wage compression is a major reason for firms to invest in general skills (e.g. Acemoglu and Pischke, 1998, 1999a). The basic reasoning is that individuals are not paid their marginal product and that firms are able to extract higher profits from more skilled workers who are not paid what they are worth for the company. Wage compression is not only a European phenomenon but can also be found in the US (Bewley, 1998). The findings of Bewley suggest that the internal equity (fairness and moral) in firms' pay structure restrains managers from paying employees the full value of their contribution. Consequently, high performing employees are more valuable to the firm. Bewley takes this reasoning one step further by arguing that low performing employees are seldom fired and, if they are, it is for gross misconduct rather than for under performance ⁽¹⁴⁾. Wage compression is one of several recent theories that try to reconcile the empirical findings that firms both invest in, and extract profit from, general human capital. The next section provides some further explanation.

5.3. How firms profit from general human capital

Explanations of why firms invest in, and are able to profit from, marketable human capital are abundant. Based on differences in bargaining power, Glick and Feuer (1984) propose that general training is superior to straight money payment as an insurance against personnel turnover and that firms should invest in general training to safeguard joint investments in specific training. In the shared investment model of Loewenstein and Spletzer (1998), the employer

⁽¹⁴⁾ However, low performers are the first to be laid off when firms are reducing their workforce and the pay for low-performing employees is often allowed to fall behind the rate of inflation. Bewley interviewed over 270 executives and managers of US based firms about wages and layoffs.

shares general training investment with the employee as a consequence of the employer's inability to commit credibly to future wages. The employer, instead, commits to a minimum guaranteed wage, shares the investment in general training and realises the returns on the training if the minimum wage guarantee is binding. Autor (2001) proposes a model in which firms offer general training to induce self-selection and perform screening of worker ability. In this model general training and ability are complementary and it is assumed that more able workers self-select to receive general training to a greater extent than low ability workers. In the model of Acemoglu and Pischke (1999a) firm-financed general training is a result of compressed wage structure. Wage compression makes employers more willing to invest in general training as firms extract higher profits from more skilled workers with increased human capital.

Another response to rent extraction from general human capital investments is that mobility thresholds reduce the ability of the individual to capitalise on such investments. Arguments against turnover (mobility) include:

- (a) the loss of firm-specific investments for the individual when changing work (Glick and Feuer, 1984). Or that a recruiting (raiding) firm needs to make additional investments in firm-specific knowledge;
- (b) firms use back-loaded compensation schemes that induce costs for individuals who change employer (Salop J. and Salop S., 1976). Back-loaded compensations are typically detected or defined as increasing wages with seniority over and above productivity increases;
- (c) workers have incomplete information about pay elsewhere (Polachek and Robst, 1998; Bewley, 1998);
- (d) individuals are constrained by liquidity or aversion to risks, forcing firms to carry these investments (Bishop, 1994);
- (e) firms have superior information about the profitability (payoff) of training investments (Green and Kahn, 1983).

If it is possible for firms to redistribute investment risk through capital markets, this might cause employers of larger firms to be more willing to invest in general human capital. However, Katz

and Ziderman (1990) ⁽¹⁵⁾, have attracted attention with the argument that information asymmetry between the training firm and a recruiting (raiding) firm about training received reduces the potential benefits that a worker with general training can obtain by moving to another firm. Consequently, information asymmetries render general training specific in the sense that the investment is not observable (verifiable) to other firms.

Less attention has been given to findings that both employers and employees benefit from these investments and both parties would be worse off if they did not take place. It is tempting to assume that employers increase wages for individuals receiving marketable training sufficiently to offset the increased probability of turnover. That both the employer and the employee benefit from these investments also implies that individuals employed in firms that provide training receive higher wages in the long run compared with employees of firms that do not provide training. Higher growth in wages provides a strong incentive to stay with an employer who continuously upgrades human capital instead of possibly moving to a new employer with an unknown human capital investment strategy.

Also, the employer-employee relationship is complex and it might be myopic to focus only on monetary gains. Part of the rent extraction consideration might be that these investments represent good working conditions and that the employers are committed to their employees. In this sense, training, no matter how general, is a measure of employer commitment, which is likely to reduce the probability (threat) of changing employers.

5.4. Training and HRM practices

The basic question of whether the combined effect of human resource management (HRM) practices produces good performance or whether certain practices, such as employee development, generate effects on company performance is not easy to answer. In general, there is evidence that training has a greater impact when undertaken in connection with supporting HRM practices, in particular existence of a formal

⁽¹⁵⁾ Schlicht (1996) has also covered asymmetric information and its impact on a firm's training decisions.

training strategy, written commitments to training, methods for analysing training needs, linking training and strategic objectives (e.g. Maglen and Hopkins, 1999; Blandy et al., 2000; Baldwin and Johnson, 1996). The Cranet data also indicates that support functions are important to training, with the variables on training needs and written training policy significantly associated with training provision and industry-adjusted performance measurements (profitability and stock market return) ⁽¹⁶⁾.

Whether training has an additional effect over and above high performance work practices is difficult to determine. In high performance work system (practice) literature, training is generally incorporated as a factor in the larger construct of HPWS (with some exceptions). The bundling of different human resource practices is typically based upon factor analysis or analysis of the internal consistency of the total HPWS measurement. Because training is generally part of a larger construct it is difficult to find studies that measure the additional effect of each individual variable. However, some studies account for the impact of different variables. The study by Laursen and Foss (2000) highlighted training and performance-related pay as important factors for innovation. However, the combined effect of all nine factors proved highly significant, indicating the existence of complementary HRM practices.

Other studies also concluded that internally consistent or congruent HRM practices are better predictors of performance than individual practices, for example MacDuffie (1995) and Arthur (1994). These findings do not mean that training by itself does not have a predictive ability for performance, but only that the whole set of practices combined were more informative. The study by Delaney and Huselid (1996) illustrates the problem of focusing solely on the effect of total HRM practices since the training measurements in their study constantly appeared to be related to performance measurements, even with a significant volume of variables capturing other HRM practices.

High performance work system (practice) literature is normally restricted to level data, which makes it difficult to establish the direction of the relationship. There are some exceptions to this rule. The

studies by Barrett and O'Connell (1999), d'Arcimoles (1997), Ichniowski et al. (1995), and Bartel (1994) all have measurements of HRM practices and training over time. The results do not agree on whether training or HRM generates the effects on company performance. The study by Barrett and O'Connell suggests that training causes productivity effects whereas introduction of new personnel policies did not show any significant impact on productivity. The results of Bartel propose that training programmes generate considerable productivity effects, in excess of changes in personnel policies. The main results of d'Arcimoles indicate that training produces substantial effects on both productivity and profitability. The study by d'Arcimoles included controls for working and social climate at the firms investigated. A contradictory view is presented in Ichniowski et al. where innovative HRM practices have a large effect on productivity while individual employment practices had little or no effect. This result suggests that training by itself is not enough.

The common denominator of these studies is that we can, with reasonable confidence, maintain that a cause and effect relationship exists between the variables studied (training and HRM) and performance measurements. The line of research or the tradition within which the study was performed might explain the somewhat contradictory results. For instance, researchers in labour economics are possibly more used to modelling training compared with HRM variables, the converse being true for researchers in the HRM tradition. In conclusion, it seems appropriate to reason that both training and other HRM practices are important factors in explaining why some firms do better than others.

5.5. Innovation, technological change and training

There is a multiple relationship between innovation behaviour, innovation performance and training investment. The consequences of technological change and the introduction of process and product innovation, and the relationship with training investment, are important issues. The internal organisation and human resources were

⁽¹⁶⁾ With one exception, the variable 'written training policy' was not significantly associated with the amount of wage bills spent on training.

neglected for a long time in traditional, economic-oriented innovation literature. In more recent literature attention to the role of HRM and its impact has increased. In the knowledge-based economy, training investment and HRM practices are prerequisites of innovation and are necessary to realise the productivity potential of new information or advanced manufacturing technologies. In order to use the potential of new technologies, complementary investments in training are crucial. There is a growing awareness of the role of internal or organisational factors that mediate the relationship between innovation and company performance. Some authors, such as Laursen and Foss (2000), stress the importance of the complementarities between technology and learning.

A similar view is presented by Baldwin and Johnson (1996). Their findings suggest that more innovative firms place greater emphasis on human resources. Innovation requires a human-resource strategy that stresses training. They found statistical evidence that more innovative firms offered formal and informal training more frequently, that the training was more often continuous in character, and that these firms had a greater tendency to innovative compensation packages. The study by Michie and Sheehan (1999) also stresses the importance of HRM in generating an innovative environment.

That both training and skills are important determinants of innovative capability is offered in Romijn and Albaladejo (2000). The owners' technical education and their prior working experience, the technical skills of the workforce, and the amount of training provided proved to be important aspects of innovation capability. Their findings also suggest that interaction with research institutions and a close link to nearby training institutions enhance innovation capacity. As noted earlier, the composition of the workforce is important for innovating firms (Leiponen, 1996a). The findings of Leiponen indicate that innovative firms are more dependent on educational competence in generating profit.

Training associated with the introduction of new technologies or new work practices is likely to have high productivity effects. Blandy et al. (2000) found evidence for this relationship within the case studies they carried out in addition to the questionnaire survey. That IT generates a

substantial amount of training is clear. In the Institute of personnel and corporate development's (IPF, Uppsala University) human capital survey 2002 (see footnote 12) about 41 % of all company-provided training was considered to be related to information technology.

In addition, innovation is frequently used as a performance measurement for companies. Innovation itself is related to various financial returns but there is no definite association between innovation performance and the financial performance of firms. However, there is broad empirical evidence that innovation is associated with the growth of firms and that, in specific industries, more innovative firms yield higher financial returns. The results of the Cranet survey also indicate a connection between innovation and a number of personnel related variables. The top (10 %) performing firms in their sector had more training, trained more of their employees, had greater supporting HRM policies for employee development, and employed more graduates than low performing firms.

5.6. Specifics of SMEs

Small and medium sized enterprises (SMEs) are usually defined as firms with less than 250 employees. They represent more than 95 % of all firms and employ around 65 % of all employees in the EU. Given their importance to the economy, there are surprisingly few empirical studies dealing explicitly with the impact of training on SME performance. Despite great heterogeneity across Europe and the diversity of industries, most surveys in different European countries show that SMEs make fewer investments in vocational training and do not use formalised forms of training. While SMEs generate many jobs and attract young people, most do not provide them with skills and improve their long-term employability. Apprenticeship is an important form of SME initial vocational training of the workforce. In general, most SMEs have difficulty in appropriating codified forms of training (Trouvé, 2001), which, in turn, leads to additional methodological problems in measuring informal training within SMEs. The organisational structure of SMEs is an important reason for the lack of vocational training by them.

The survey on continuing vocational training in enterprises, carried out by the EU in 12 Member States, shows that larger firms offer continuing vocational training more often (European Commission, 1999). Small firms, especially those with 10-49 employees, seldom offer continuing vocational training; only half the firms of this size provide it, compared with more than 90 % of firms with more than 250 employees. Correspondingly, expenditure on vocational training in SMEs is lower than in larger firms, though this is highly dependent on country, size and sector. Similarly, SMEs rarely have a clear human resource strategy, training plan, or advanced HRM practices.

The importance of human capital investment is also of interest in relation to other forms of intangible and tangible investments in explaining competitiveness and performance. Flexibility, entrepreneurship, close relations with partners and customers, motivation of the workforce, and the realisation of niche strategies are important SME strengths in comparison with larger firms (for more details see Descy and Tessaring, 2001). In addition, there is empirical evidence that smaller firms use their R&D investments more efficiently. Nevertheless, there are no theoretical or empirical facts stating that this holds for training investments. Yet, it is probable that additional training investment could yield higher returns in SMEs than in larger firms given the low level of training of the workforce.

It is difficult to deal with return on training investments in more detail, leaving us with the question why SMEs do not invest more in training. We conclude by stating that there is nothing in the current review suggesting that skills or training in SMEs have any less impact on company performance. The study by Leitner (2001) indicates that training is one of the few variables associated with company earnings. The findings of Bosma et al. (2002) suggest that certain skills, such as experience in business ownership and industry experience, contribute to the success of start-up companies. The study by Romijn and Albaladejo (2000) indicates that both skills and training are associated with the innovation capability of SMEs.

5.7. The influence of labour markets and social partners

Research that connects education, training, or skills/competence with different labour market conditions and the impact that they may have on training strategies and company performance is not very common. We have not seen any paper examining the effect of different labour market conditions on, for instance, the ability of firms to profit from training investments. However, some general remarks can be made on existing training literature and the influence of labour markets. It has been argued that differences between the US labour market and labour market in Germany and other European countries in regard to mobility and wage structure would indicate that training investment is more likely in Europe (e.g. Acemoglu and Pischke, 1998; 1999a). These arguments have been supported by different empirical reasoning based mainly upon observations that firms invest in general training, such as in the German apprenticeship system⁽¹⁷⁾. Nevertheless, there are no clear empirical results indicating that less efficient labour markets make training investments more profitable for firms, though mobility has the ability to reduce this potential. Similarly, it is likely that more equality in wages (compressed wage structure) has a positive influence on the ability to extract profits from training investments (and prior education). Still, we have not been able to locate research verifying differences in return on company training between different labour market systems.

There are some indications that differences in productivity between countries can be explained by differences in national education and training systems. For instance, Mason et al. (1992) found substantially higher proportions of vocationally qualified personnel on all job levels in the Netherlands compared with Britain. They also argue that the higher average level of skills and knowledge in the Dutch workforce contributes to higher productivity through better maintenance of machinery, greater consistency of product quality, greater workforce flexibility, and less learning time on new jobs. Similarly, Carr (1992) found that

⁽¹⁷⁾ Other features of the German apprenticeship system are that firms screen potential employees and that the apprentice system provides a better matching of employee and employer. According to Euwals and Winkelmann (2001) apprentices staying within their firm after graduation have higher wages and longer first job duration than apprentices leaving the training firm.

Britain had substantially lower productivity (measured by sales per employee) than, for instance, Germany. Carr maintains that the highly educated and trained German workforce, the high qualification of the foremen, and extensive vocational training by firms, explains the productivity advantage of German firms. Carr also ascribed improved productivity growth in Britain during the 1980s to increased labour flexibility during this period. However, it is important to note that neither study is based on any (significant) statistical test but more on reasoning based upon gathered information.

A somewhat contradictory argument on the effect of increased labour flexibility is put forward in Michie and Sheehan (1999). Their findings suggest that strategies to increase employment flexibility by short-term contracts, weakening trade unions, etc., do not enhance innovation performance. This study leads us to the effects that social partners may have on training outcomes. Again we have not come across any study that connects the influence of social partners on the decision to train employees and what effect this may have on company performance. The role of the social partners is not explicitly treated in any of the analysed studies.

Nevertheless, there are some general observations that can be made. The role of social partners is strongly connected with the different national funding systems for education and training. As argued by Mason et al. (1992) and Carr (1992), education and vocational training may, in turn, have an effect on productivity. Other observations that can be made are, for instance, that higher wages and lower mobility in unionised establishments typically promote training (Booth et al., 1999).

The Cranet survey results also cast some light on the question of whether different labour market systems or the social partners have any effect on the decision to train. The training regression is based on about 1 400 company responses mainly from European countries. The

results indicated that unions might have a negative impact on the amount of training provided but a positive (not significant) impact on the number of employees being trained in a year. As mentioned earlier, the negative association between unionisation and the amount invested in training is probably caused by our inability to control for industry differences in the training regression. The indication that unions might affect the training decision by providing more employees with company training is more interesting. However, this is not statistically verified in the analysis of the Cranet survey. The correlation analysis also indicated a lower personnel turnover in more unionised establishments, which is in line with the findings of Booth et al. (1999).

Our measurement of the degree of internal labour market appears to confirm that these types of structures do not promote training and learning. In spite of the indication of lower personnel turnover in firms with more internal promotion, training is less provided in these types of establishments. The result of the training regression also revealed that personnel turnover itself does not determine training. This finding might be interpreted as an indication that turnover does not reduce the incentive to train employees or that personnel turnover induces training by forcing firms to train newly hired employees. We also see large differences in turnover among different European countries but this seems to affect the amount of training provided to a minor degree.

It is important to note that these findings only concern the provision of training and not the potential effect that different labour markets systems may have on training outcomes. This is clearly an area that needs much additional work. We conclude this section by merely stating that there are indications that labour market conditions and the role of, for instance, unions may have an effect on company training outcomes by their effect on mobility, wages, and the incentives to train and be trained.

6. Summary and discussion

A growing number of papers focus on the effects of human capital and human capital investments on company performance. Previously, this subject was largely disconnected from company based impact research as human capital (investments) are not owned or controlled by firms. However, more studies are needed to understand how education, training and skills/competence affect firms, in an effort to comprehend fully what generates profits and growth. The main findings of this review of literature on the impact of education, training, and skills/competence may be summarised as follows.

- (a) The type of training firms provide to their employees is not so much a question of whether the training is general or specific but possibly more a question of what is needed to stay ahead of competitors. A growing body of literature suggests that firms are financing all types of training (general as well as specific).
- (b) More recent research findings also suggest that investments in training generate substantial gains for firms irrespective of whether the training is useful to other firms. The evidence that employers profit from training investment comes from different countries including Ireland, Britain, the Netherlands, Sweden, France, as well as the US. In most of these studies we can, with reasonable confidence, maintain that training generates performance effects and not the other way around.
- (c) The effects of education and skills/competence on productivity and innovation are generally positive and significant. That we also start to see studies that connect education and skills with profitability might be somewhat more unexpected. That firms extract profit from prior education is also related to the ability of firms to capture returns from general training investments.
- (d) Employee development practices, such as training policies and methods for analysing training needs, appear to be important elements in explaining the provision of training and training outcomes. Similarly, innovative or advanced HRM practices are generally associated with firm performance.

- (e) Innovation and IT not only cause firms to invest more in training but are also highly dependent on education, skills and training in generating profit from these investments. Other findings suggest that training, together with comprehensive HRM practices, is closely related to firms' innovative capacity.

- (f) The lack of studies connecting SMEs, labour market characteristics, and social partners with training strategies and company performance measurements such as productivity or profitability makes it difficult to draw any conclusions. This research gap provides an important incentive to investigate these types of question more thoroughly in the future.

In conclusion, research concerning the effects of education and training on firm performance is gathering momentum. Much more research on this subject will appear in the near future. However, the findings thus far raise questions and issues that we will discuss in more detail in the next section.

6.1. Implication of firm financed general human capital investments

That firms invest in general training implies that there might be a market failure in vocational training. Several authors, (Acemoglu and Pischke, 1999a; Bassi and Ludwig, 2000; Booth et al., 1999), see in rejection of Becker's theory on company training evidence of under-investment in vocational training. In a perfect labour market, individuals pay for their general training by accepting a lower wage than their productivity during the training. The individual then captures all benefits from the training by an increased wage after the training. In this case it is likely that the provision of training is close to the social optimal level as the investment decision is made by the individual. Acemoglu and Pischke (1999a) noted that in a perfectly competitive labour market, insufficient investments in skills could only arise because workers are severely credit constrained. But in this case, the solution may be better loan markets rather than direct subsidies to training.

When the firm makes the training decision it is most likely that too little training is provided. Or, as Booth et al. (1999) put it, when training is general to an industry, firms will choose a suboptimal level of such training, since they realise that workers would take these skills with them when they leave for other firms in the same industry. However, human capital is not lost to society so a market failure arises. The findings that firms are active in, and profit from, general human capital investments might thus warrant government regulations and subsidies for training, as these findings suggest under-investment in vocational training. However, such a definite statement is not warranted by the present state of research on company training. More research is required to be certain that company-based decision-making concerning the provision of general training leads to fewer investments in training.

That firms profit from all types of training investments indicates that we have underestimated the benefits from company training. Because most (formal) training is general in nature, research on the impact of training has been largely focused on the effects for the individual (wages); the benefits for employers have been considered to a lesser extent. As noted by Dearden et al. (2000) by only examining the effect of education and training on wages, economists may have underestimated the importance of training for modern economies. The authors' conclude that it is time to start casting the net wider than wages in seeking the impact of training on corporate and national economic performance.

It appears that it is not only researchers who have underestimated the effects of training investments but, perhaps more severely, also the owners of the companies and investors. The findings of Bassi et al. (2001) indicate that firms investing more in training have a better stock market performance. This result suggests that investors are not aware of the investments in training and that this type of information has relevance for investors. The lack of information about training investment and the consequent benefits leads to a suboptimal allocation of resources to training in the capital market. It is conceivable that the lack of information about company training leads

to under-investment in profitable training projects (training projects with a positive net present value). So another implication of the evidence that training predicts stock market returns is that investors possibly need more information about these investments in order to make better decisions about where to allocate their financial resources. The issue about information to the capital markets will be discussed in more detail in the next section.

The problem of allocating enough resources is, however, complex as information asymmetries is one of the more prominent reasons given for the existence of firm financed general human capital investments. According to Katz and Ziderman (1990) information asymmetries between the firm carrying out the training and other firms make firms more willing to invest in general training. This is because the lack of information about the training investment reduces the potential benefits that a worker with general training can obtain by moving to another firm. If Katz and Ziderman are right, providing more information about training investments to capital markets might have a negative effect on the provision of training.

However, another information-based argument implies the opposite effect. Acemoglu and Pischke (1999b) argue that firms train their employees because they have sufficient monopsony power over their employees due to information asymmetries. While asymmetric information encourages firms to invest in training, it reduces the workers' incentive to invest in their skills, as most of the returns on training will be appropriated by the firm. This means, in contrast to Katz and Zidermann's argument, that asymmetric information in labour markets might undermine the existence of training by not giving enough incentives to workers. More information about the training investment in this case leads to more investment in training⁽¹⁸⁾.

6.2. Information on training and intangibles to capital markets

We proposed earlier that investors possibly need more information about training investments.

⁽¹⁸⁾ The divergent views of the outcome of more information about training investments between Katz and Ziderman (1990) and Acemoglu and Pischke (1999b) appear largely a consequence of different opinions about how inefficient the labour market really is.

Johanson (2003) proposes that capital market actors are hesitant regarding recent knowledge gathered from research on the importance of human capital investments because of the following five reasons.

First, capital market actors might be ambivalent because they fail to understand the importance of a certain human capital investment. They probably are not aware of recent research on the profitability of human capital investments. They lack the necessary understanding of the potential of human capital investments in a specific firm. They have little or no appreciation of how human capital contributes to the value creation process. This inability to comprehend the meaning of human capital could be conceptualised as a 'knowledge' problem.

Second, even if capital market actors do understand the connection between indicators and the vision of the firm, they are probably hesitant about human capital investments because they do not know if they can rely on the indicators. Do indicators of human capital transform adequate information? Are they valid? And are the methods of measurement reliable? These issues of validity and reliability could be referred to as the 'uncertainty' problem.

Third, this reluctance might be connected to the lack of ownership of intangibles related to people. For example, because an organisation cannot own individual competence, the risk of losing this competence might be overly exaggerated. This condition could be known as the problem of 'ownership'.

A fourth problem could be that capital market actors are ultimately hesitant and indecisive because they do not know if the measurements matter in the management control processes of the firm. Is information taken care of? Does management take the necessary action on data, i.e. a 'management' problem?

The final problem suggested by Johanson (2003) concerns the 'mentality' of different capital market actors, who are neither used to considering human capital investments as important factors that drive firm performance nor encouraged to do so.

These five barriers are probably relevant not only for capital market actors but also for company management and policy makers.

There is a need to develop a new way of

measuring and reporting internally as well as externally on training investments with the potential to increase understanding of the financial impact of education and training. Our proposal at this point relates to the debate about human resource costing and accounting, intellectual capital (IC), balanced scorecard, etc. (here referred to as the IC-movement).

During the last decade numerous initiatives have been taken to encourage the development of a new global framework for the measurement, management and reporting on intangibles. Major initiatives have been taken by the OECD and the European Commission. In 1998 the Commission decided to support a six-nation (Denmark, Finland, France, Norway, Spain and Sweden) research project named *Measuring and reporting intangibles to understand and improve innovation management* (Meritum, 2002). The Meritum work, which was performed between the years 1998 and 2001 was organised in four different activities:

- (a) definition and classification of concepts, e.g. intangibles and intellectual capital;
- (b) investigation of how management control of intangibles was performed at company level;
- (c) capital market implications of the poor information from firms on intangibles;
- (d) development of guidelines for the reporting and management of intangibles.

The guideline was subject to a Delphi test at the end of the project.

The Meritum work is presently subject to a follow-up project E*KNOW-NET which is also financed by the European Commission. The aim of the follow-up project is to spread the findings from the Meritum work, to improve guidelines and to propose a research and education agenda regarding intellectual capital.

The Meritum and E*KNOW-NET works are based upon the belief that firms are facing a major transformation in the value creation process. Intangibles, including, more specifically, knowledge, are increasingly becoming the major driver of firms. These changes pose a great challenge to firms because intangible resources are not easily identified, not measured, and not reported internally or externally. Another basic assumption is that there is a need to develop a common framework, which involves definitions and classifications of intangibles and a guideline for measuring, managing, and reporting intangibles.

The mismeasurement of knowledge may lead to inefficient allocation of financial and human resources. As the European Commission states in its report *Towards a European research area*, 'the European financial market has not yet sufficiently discovered the economic value to investment in knowledge' (European Commission, 2000, p. 7). This is partly due to the fact that the information provided by companies to the financial markets is primarily based on traditional tangible investments, whereas value increasingly relies on investment in intangibles.

Efforts are needed both to provide information on how knowledge is produced and accumulated, and on the way knowledge can be transformed into profits. The generalisation of good practice in the management of intangibles also needs to be encouraged. New common procedures, documents, rules, etc., should be provided in order to improve the informative capacity of the firm's financial statements. This is precisely the main purpose of the *Guidelines for managing and reporting on intangibles* (Meritum, 2002), hereafter referred to as *Guideline*.

The *Guideline* document attempts to support firms in the process of developing their ability to identify, manage and value their intangible assets. To start with, a set of definitions on intangible resources and intangible activities is provided; it is integrated with a classification used for the proposed intangible management system (human capital, structural capital and relational capital). Based on the experience of best practice firms, a model for the measurement and management of intangibles is suggested, which covers three different phases: identification, measurement and monitoring of intangibles.

The *Guideline* also contains information on the structure and contents of an external document called the *Intellectual capital statements*. Three different parts are considered for inclusion in that document:

- (a) vision of the firm,
- (b) a summary of intangible resources and activities, and
- (c) a system of indicators.

To overcome the barriers proposed by Johanson (2003) it is important, as well as challenging, to develop understandable indicators on issues related to training investments. The indicators have to be measurable and valid. Because

the very idea behind the development of training indicators is to increase the understanding of the importance of knowledge, the indicators have to be clearly related to the vision of the firm or the value creation process. It is probable that this new kind of standardised indicator also needs to be subject to independent audit.

6.3. Strength and weakness of data and methods

The lack of information on training investments also poses a problem for researchers, as the data has to be gathered from different sources. Depending on how one defines training, the estimate of working time spent on training varies considerably. The IPF at the Uppsala University regularly carries out surveys of companies listed on the Stockholm stock exchange. The human capital survey of 2002 included questions on what firms defined as company training. Some companies report only training conducted outside the firm (12 %), some report internal and external training sessions with a defined curriculum (39 %), and others report anything from formal training sessions to such informal training as learning by doing and self studies (45 %).

The lack of a coherent definition of training that is used and reported consistently by companies is one of the more important issues for research on company training. The problem of varying measurements of training is not likely to be solved by defining what is regarded as training in different surveys. Firms are unlikely to change their data collecting methods regarding training for each new survey. It seems likely that what companies report as training is what they have data for, no matter what is defined as training in each specific survey. At best one can expect the provider of the information to make some professional judgement or correction of their data for different surveys. Some straightforward guidelines or general agreement among researchers and companies on what to define as training seems be warranted.

Apart from a common definition and standard of training, another problem with the data concerns agreement on what type of costs should be included in training measures. The variety of measurements of training costs in different studies

and in different databases hinders the opportunity to make comparisons across countries and across different studies. A comprehensive measurement of training investments in companies will not only work as a foundation for comparison and across countries and studies but also facilitate comparison with other types of tangible investments. If investments in human capital can be compared with, and have the same credibility as, tangible investments we would advance understanding of what drives firms and, ultimately, what generates wealth for firms and society.

However, varying views of what is to be considered as company training do not mean that inferences drawn from, for example, current cross-sectional data are not valid. If there is a true relationship between training and company performance, vague definitions of training typically make estimates less precise and less significant. In other words, as long as it cannot be shown that profitable firms are constantly using a broader definition of training, and also account for more training investment, than less profitable firms, the consequence of vaguely defined training measures is a downward bias in the impact of training. Increased variance due to measurement problems (errors) leads normally to less significant results or, in the case of severe measurement problems, insignificant results. Definition problems might partly explain the low or insignificant impact of training in some of the studies reviewed in the present paper.

In the case of studies based on panel data the definition problem is less important since we are largely concerned with changes in variables over time in this type of investigation. If we follow the same company at different time intervals this means that we cancel out all time-invariant effects that can bias the results. As long as the unit of analysis (e.g. the company) does not change its definition over time the differences between how companies measure training is of less importance. The fact that we can draw stronger conclusions from panel data studies also mitigates problems with vague definitions.

In general, the weakness of data and the weakness of methods used in the reviewed studies do not exaggerate the results but, on the contrary, work against finding positive responses to human capital investments and thus tend to underestimate their impact on company performance.

6.4. Policy implications and future research

This review of research has highlighted a number of questions that possibly need more attention in an effort to establish a common understanding of how human capital and human capital investments influence growth and performance on firms. The general impression of the research that has been reviewed in this study is encouraging in that the economic effects of education, skills and training can be observed in company data. That firms appear to benefit from all types of training (no matter how general) is an important finding that also generates a number of other training related questions and implications. We will highlight some of the implications and research questions we feel should be pursued in the future.

(a) What are different aggregated measures of training actually measuring?

We have seen in the Cranet survey that two common ways of measuring training (the proportion of employees being trained and percentage of wage bills spent on training) are determined by quite different factors. Whether this is the case in other samples and whether it has any meaningful interpretation in regard to company performance would be useful to determine in future research.

(b) What influence has firm performance on the provision of training?

We have also discussed the timing of training. We have seen a number of studies indicating that training is more likely to be carried out in times of weak productivity; we have also seen in the Cranet survey that how much firms invest in training is not conditioned by past performance. Clarification of any mutual dependence between training and economic conditions is important as the answer would facilitate interpretation of cross-sectional results.

(c) When do the effects of training materialise?

Some of the studies reviewed suggest that it takes some time before the effects of training are seen in company performance measurements. Whether this is the case is an important research question as it influences interpretations made in cross-sectional estimates (are we measuring the effects of past training or the effects of current training efforts?) and

it also influences the time horizon within which we can expect benefits from training.

- (d) Are certain types of training or certain ways of conducting training more efficient?

The current state of research typically uses very coarse and aggregated measurements. A more precise division of human capital and human capital investments might give us a better understanding of the type of education and training that generates profit and growth for firms.

- (e) Do firms benefit from employing more educated and skilled workers?

More research is warranted that connects skills, competence and education with company measurements such as profitability and stock market return.

- (f) How important are supportive HRM practices for generating training and performance effects?

There is a need to understand how and in what way HRM practices influence training decisions and to what extent are they increase efficiency in training and training outcomes.

- (g) More research is needed on the impact of training for SMEs, and on the influence of social partners and the labour market.

While smaller firms undertake less training, more research is needed to explain the reasons for this. Research is also warranted on the influence that social partners and different labour market systems might have

on the ability of firms to benefit from training investment. We see quite large differences between different countries in company training and an explanation for these differences might be found in the effect that these two factors have on the provision of training and training outcomes.

- (h) Another important issue is a common standard for defining and measuring training and training costs.

There is a significant difference between asking individuals about training and asking firms about their training. Gathering information on training in large organisations consumes considerable resources and training data is not easily changed in accordance with different surveys. A common definition of what to regard as training and a common definition of costs in training investments would be beneficial not only for researchers but to compare companies, industries, and countries on company training.

- (i) More information for capital markets about training investments appears to be warranted. A way of providing information on how much firms invest in training appears to be an important issue in establishing a more efficient allocation of resources to firms with good investment opportunities. More company-based information on training might also lead to a better allocation in the human capital (labour) market.

List of selected abbreviations

GMM	General method of moments
HPWS	High performance work systems
HRM	Human resource management
IC	Intellectual capital
IT	Information technology
LFS	Labour force survey
OLS	Ordinary least square
R&D	Research and development
SME	Small and medium enterprise
STW	School-to-work
TQM	Total quality management

Annex — Selected Cranet questions

Training related questions

- 3:1 a) Approximately what proportion of the annual salaries and wages bill is currently spent on training?
 ----- % 1 ☐ don't know
- b) Approximately what proportion of employees have been on internal or external training activities within the last year?
 ----- % 1 ☐ don't know
- 3:3 Do you systematically analyse employee training needs?
 1 ☐ Yes 2 ☐ No 3 ☐ Don't know
- 3:5 Do you monitor the effectiveness of your training?
 1 ☐ Yes 2 ☐ No 3 ☐ Don't know
- 3:6 Does your organisation have a policy for the following personnel/human resource management areas:
- | | Yes,
written | Yes,
unwritten | No | Don't
know |
|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| C. Training and development | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 |

Performance related questions

7. If you are a private organisation would you say the gross revenue over the past 3 years has been:
- | | |
|--------------------------------------|----------------------------|
| A. Well in excess of costs | <input type="checkbox"/> 1 |
| B. Sufficient to make a small profit | <input type="checkbox"/> 2 |
| C. Enough to break even | <input type="checkbox"/> 3 |
| D. Insufficient to cover costs | <input type="checkbox"/> 4 |
| E. So low as to produce large losses | <input type="checkbox"/> 5 |
9. Compared to other organisations in your sector, where would you rate the performance of your organisation in relation to the following?
- | | Top 10 % | Upper half | Lower half | Not applicable |
|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| A. Service quality | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 |
| B. Level of productivity | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 |
| C. Profitability | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 |
| E. Rate of innovation | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 |
| F. Stock market performance | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 |

Questions related to internal job market and unionisation

2:5 How are managerial vacancies generally filled? (Please tick as many as applicable for each management level).

	Senior Management	Middle Management	Junior Management
A. Internally	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
B. Recruitment by head hunters/consultancies	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
C. Advertise in newspapers	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
D. Word of mouth	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1

5:1 What proportion of the total number of employees in your organisation are members of a trade union?

- 1 ☐ 0 % 2 ☐ 1-10 % 3 ☐ 11-25 % 4 ☐ 26-50 %
 5 ☐ 51-75 % 6 ☐ 76-100 % 7 ☐ Don't know

Employee related questions

6:3 Please provide the following information about your workforce:

- A. Annual staff turnover _____ % turnover per year ☐ 1 don't know
 B. Age structure _____ % of employees over 45 years ☐ 1 don't know
 C. Absenteeism _____ average days per year ☐ 1 don't know
 D. Education structure _____ % of graduates ☐ 1 don't know

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The benefits of education, training and skills from an individual life-course perspective with a particular focus on life-course and biographical research

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Abstract

This paper has been prepared within the framework of the third Cedefop report on vocational education and training (VET) research in Europe which is dedicated to evaluation and impact research. The objective is to provide an overview of national and cross-national research into the benefits of education and training from a life-course perspective. The existing literature and approaches in this field are reviewed and their results discussed from a European perspective. The report tries to develop an integrated perspective on the material and non-material benefits of education and training throughout the life course and introduces the theoretical approach of life-course and biographical research and its methodological implications. The added value of life-course studies and biographical research for conventional research on education and training benefits is highlighted through lines of thematic investigation. After a review of current empirical work carried out at national and European level, a summary of key findings is presented which highlights those results that allow European (or at least cross-national) comparisons to be taken into consideration. Finally, addressed are the implications of research evidence for policy and practice and recommendations for further research and on how to improve data comparability, particularly at European level.

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1. Introduction

This paper has been prepared within the framework of the third Cedefop report on vocational education and training (VET) research in Europe, which is dedicated to evaluation and impact research. The paper aims to present an overview of national and cross-national research into the benefits of education and training from a life-course perspective and will discuss relevant approaches and methodologies in the field. Since other contributions focus on VET impacts on a macro or meso level, our study is concerned with the individual, or microsocial benefits of education. In particular, we look at the impact of education, training and skills from a life-course perspective. Life-course and biographical research complements other studies by investigating the long-term educational benefit for individuals and the impact over time of social and structural change. The aim of our study is to provide an overview of existing literature and work in this field and to discuss its findings on the benefits of education and training for the individual in different European countries. In contrast to other approaches, life-course and biographical research is not limited to investigating material issues such as employment and income differentiation, but also focuses on the non-material outcomes of education and training. Our paper will, therefore, consider the material as well as non-material benefits of education and training.

As with many other contributions in this report, the basis of this paper is a secondary analysis of recent empirical studies. Besides reviewing published literature for this investigation, we use sources from internet-based material, national experts and grey literature. A complete list of sources is attached in the annex. Nevertheless, the search for relevant material turned out to be quite complicated, especially when trying to provide a European overview. As little work has been found in southern European Member States, any generalisation of results remains limited. Furthermore, it has become obvious that national

research is diverse in both its quantity and quality, which is clearly reflected in the data sources used. Comparisons between different countries are therefore difficult to reach. These and further problems of investigation will be discussed in the following chapters of the paper.

Following the scientific debate on what benefits of education, training and skills precisely are, the second chapter sets out different concepts and tries to develop an integrated perspective of material and non-material benefits. Furthermore, a classification of education and training benefits is attempted in order to provide an analytical tool for the later arrangement of empirical research in the field. The third chapter introduces the approach of life-course and biographical research and illustrates the methodical implications for empirical research work. The focus of the investigation into the benefits of education and training is explained from the perspective of life-course analysis, and the added value of life-course studies for conventional research into education and training is highlighted. Chapter 4 provides an overview of existing empirical work on the benefits of education and training from a life-course and biographical perspective. Also in this chapter the main methods used to investigate the impact of education and training through life-course and biographical research are clarified and supported by studies from national and cross-national empirical work. As most of the studies are based on different national longitudinal data sets, a comparative and critical approach is adopted. Chapter 5 sums up the key research results. The evidence for the material and non-material benefits of education and training throughout the individual's life course is reviewed and scrutinised critically for its relevance for European VET research. The final chapter tries to derive some implications for policy and practice through focusing on recommendations for further research and on how to improve data comparability at European level in particular.

2. Individual benefits of education, training and skills

The simple assumption that education and training have short-term and long-term effects on life-course patterns, at least on the individual's career and (life) wages, is generally accepted and its correctness seems to be fairly obvious. But when it comes to actual education and training benefits, questions arise: what do we understand by the term 'benefits' and – equally contentious – how can these be measured? Furthermore, education and training can take quite different forms as regards its type, content, degree of formality and resources invested. This chapter therefore deals with current perceptions of the benefits of education and training and their consequences for empirical investigation. As concepts of education, as well as training and skills, differ strongly not only between European countries but also because of different 'schools of tradition', it is necessary to clarify the definitions of education and training as used in this paper. A research review of empirical work needs, as an introduction, a relatively simple technical understanding of its central terms (education, training and skills), in order to clarify the various definitions of education, training and skills/qualifications in existing empirical surveys:

(a) education:

the term education is used to mean programmes of learning with general objectives relating to the personal development of the learner and his/her acquisition of knowledge. Formal education takes place in a structured and taught manner normally in schools or other educational institutions. Education is also a property that a person possesses after going through this process, usually confirmed by a formal and generally accepted qualification. Therefore, education as a concept is tangible and is – in comparison to intangible terms like learning – relatively easy to measure (Tessaring et al., 2003; Desjardin, 2001);

(b) training:

in comparison to education, training is more directly related to the preparation of individuals for employment in current or emerging occupations. Training can take place on-the-job as well

as off-the-job, the latter usually being organised as programmes offering a sequence of courses. Training can include applied learning, problem-solving skills, work attitudes, general employability skills, and the occupational-specific skills necessary for economic independence as a productive and contributing member of society. The training a person has obtained is usually measured in quantitative terms (duration, frequency) discriminating between types (initial, continuing), degrees of formality and place (Pfeiffer, 2001);

(c) skills:

The term skill is defined as the relevant knowledge and experience needed to perform a specific task or job. Skills also constitute the product of education, training and job experience together with relevant technical know-how. Specific skills can only be measured through elaborate testing procedures which are normally too costly to perform. As an alternative to the lack of objective measurements, surveys rely on subjective statements from respondents regarding the skills they believe they possess. This is unlikely to be reliable, because the subjective perception of skills can differ strongly between individuals (Bjørnåvold and Tissot, 2000; Mertens, 1999; ETF, 1998).

Most empirical studies seem to be based on rather implicit definitions of education and training and reveal a somewhat unstructured picture. As there are many different notions of complex concepts like education, training or skills, there are also many different perceptions of the benefits of education and training. In econometric studies, for example, individual benefits are often reduced to educational returns in terms of income or wage development, avoidance costs and other measurable economic benefits. Predominantly based on human capital theory (Section 4.1.1.), these studies have a clear concept of educational benefits which is as consistent as it is simplistic.

In contrast, psychological and educational research concentrates on non-monetary or 'wider' benefits like health, reduction of criminal

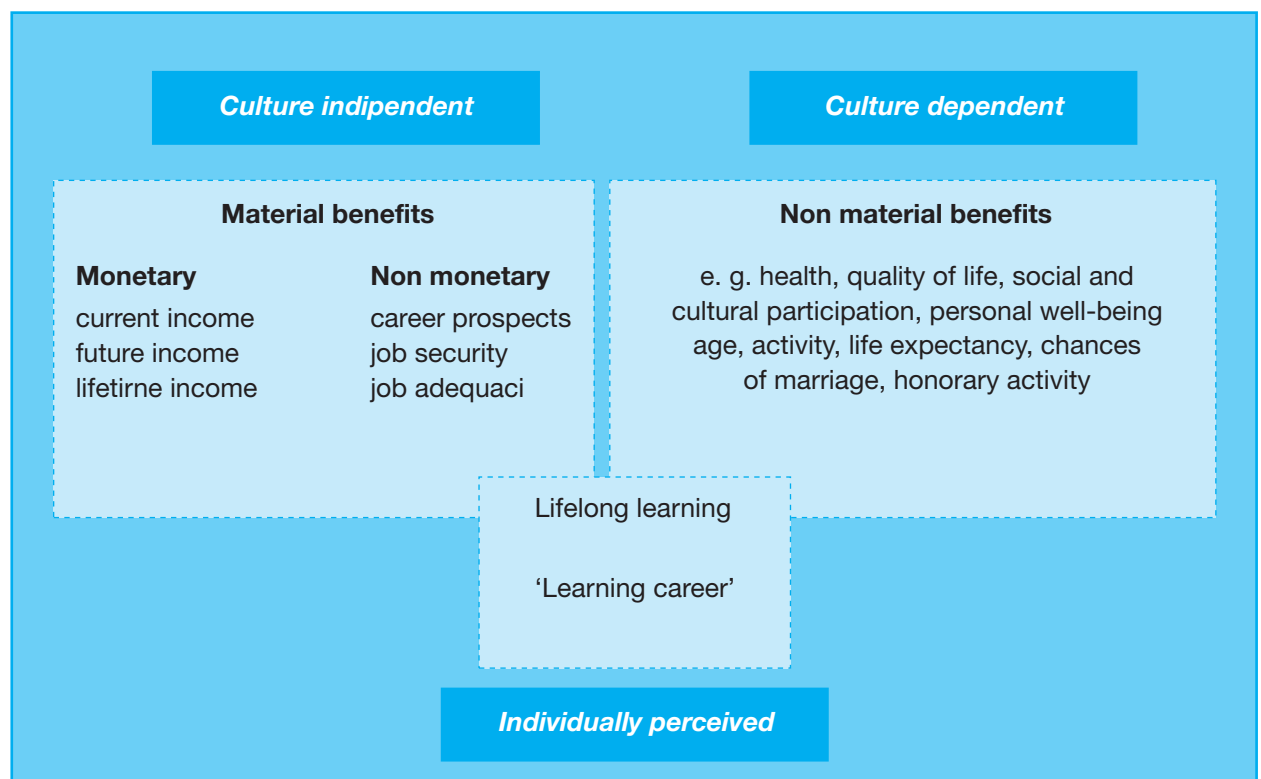
behaviour or social exclusion, usually without providing any corporate concept of the benefits of education and training. Theoretical educational discussion does not really contribute any greater clarity. Lacking more or less any descriptive concept, most of this research dissipates into some kind of philosophical discourse about the meaning and importance of educational benefits.

From a sociological perspective, benefits are perceived as bringing all manner of advantages – material or non-material – concerning the individual's place within society. Social institutions (e.g. educational system, labour market) and individual behaviour (e.g. educational decisions) determine the chances and risks of attaining, or not attaining, the social position to which an individual aspires. Such a definition allows at least for the integration of economic and non-economic benefits (e.g. power, prestige, satisfaction) and – as sociological research shows – points to their strong interrelationship. The all-embracing sociological concept is social status, i.e. the position of a person in the social structure of a certain group or society. Status

can be assigned (e.g. through nationality, age) but also attained actively through individual performance. It is assumed that education and training play a major role in status attainment. Within this concept 'hard' education and training outcomes, that might be termed material benefits (employment, occupational position, etc.), are more or less directly linked to monetary aspects while other 'soft' or non-material outcomes are rather indirectly influenced by education and training and often conveyed through these material benefits. For example, health or participation in social and cultural life are, at least in part, influenced by individual earnings or the economic status of a person. We recommend the following differentiation between material and non-material benefits as a first analytical tool in this review of studies dealing with the benefits of education and training.

Nevertheless, this applied perspective also brings with it some difficulties. Although it seems to be common sense that material benefits are mainly represented by patterns of employment, income and career prospects, concepts of

Figure 1: **Individual benefits of education and training**



non-material benefits are more controversial ⁽¹⁾. Moreover, non-material benefits are not primarily objective constructs but are merely the result of subjective judgements or cultural dispositions. Marriage, for example, has largely been seen as a social benefit and higher education has increased the likelihood of marriage. Today – as a result of individualisation – marriage is losing its attractiveness, especially for those with experience of higher education. Nevertheless, some non-material beneficial aspects can be considered substantially agreed upon, such as health and social participation, even if the perception of their benefits remains again rather subjective. For analytical correctness we recommend three additional dimensions of education and training benefits: individually perceived benefits; culture dependent benefits; and culture-independent benefits.

Most empirical research into the benefits of education and training claims to apply an objective perspective as a benchmark for beneficial outcomes. But this objectivity is rather questionable even with regard to material benefits, because every benefit remains subjective at micro level. As a kind of compensation for this problem of attribution (how can we know then what is an individual benefit and what is not?) an implicit transfer of a macrosocial to the individual perspective is carried out. Whatever is labelled a benefit from a mass perspective is also a

benefit from the individual perspective and *vice versa*. Understanding individual (micro) benefits is, therefore, largely congruent with social (macro) benefits (for a discussion of the macrosocial benefits of education see the contribution of Green et al. to this report). There is also a tendency to stress the intended outcomes of education and training rather than the unintentional benefits or harm.

Research from a life-course perspective tends to concentrate on those education and training benefits which have a longer-term relevance in an individual's development and which undergo a form of accumulation over the life course. Among possible material benefits are primarily (lifetime) income, employment opportunities, career prospects and the avoidance of unemployment. Non-material outcomes of education and training in which life-course research has an interest relate mainly to health, marriage and family formation as well as social participation and status attainment. Furthermore, the inequalities, or neutrally expressed differences, in accessing education and training and the benefits of education and training between social groups, are of special interest in life-course research. The following chapter provides explanations for this special interest by giving a short introduction to the theoretical approach and focus of empirical investigation of the life-course perspective.

⁽¹⁾ The separation of material and non-material benefits is, of course, artificial. While, for example, monetary outcomes can be comparatively easily labelled as a material benefit, the occupational position a person achieves is not only a material and sometimes (e.g. compared to a position occupied before) not even a material benefit, but can also be a non-material one – expressed, for example, in achieving higher social prestige.

3. Approach and focus of investigation

The individual life course can be observed from very different viewpoints and with a great variety of social theories in mind. For the purpose of this research review, the following short definitions of life course and biography (according to Meulemann, 1990a) should be used:

- (a) the life course is defined as – and mostly determined by – a series of individual decisions between institutionally offered alternatives which an individual is forced to make at several specific points in history. Each decision influences the path through the institution and the future decision situation. The opportunities presented by social institutions open different pathways of one's individual life through society and its social structure. These generalised pathways are divided into typical patterns and several well-defined sequences. Changes between these pathways (in form of status passages or social mobility) are only possible at special historical transition points, leading from the exit of one sequence to the entrances of a limited number of new sequences. Although the historically observable individual life course is generally structured, and in main parts determined by social institutions, individual decisions between the opportunities offered at these transition points are equally important for its development;
- (b) Biography is the subjective interpretation and digestion of all life-events, from which decisions during the life course (and their results) are only one (though important) part. Moreover, biography is the self-perception of one's life history and is recognised by the individual as a single entity (in contrast to the clear-cut sequences of the pathways determined by social institutions). While individual biographies are structured by more or less the same patterns (due to the institutional design of life course), homogenous forms of self-perception and identification with social positions seem to be obvious. As a result, typical sociocultural milieus with common interests, experiences, feelings, knowledge, etc., will be

formed and have a major impact on social stratification, which itself influences the institutionalisation of life courses by offering opportunities at the transition points. The sociocultural milieus and their way of thinking of society are merely reflected in biographic reports on individual lifestyles or personal autobiographies, these being the most important sources for biographic research. As Roberts (2002, p. 1) mentioned, 'biographical research is an exciting, stimulating and fast-moving field which seeks to understand the changing experiences and outlooks of individuals in their daily lives, what they see as important, and how to provide interpretations of the accounts they give of their past, present and future.'

By using this differentiation, life-course research concentrates on the decision situation offered by institutions and its well-defined alternatives (which are mostly also guaranteed by law), while biography focuses on the individual (psychological) process of perceiving, assimilating, understanding and reconstructing reality. It has to be mentioned that other definitions and separations between life course and biography (if any at all) are available in literature and the authors of the studies presented here may not necessarily agree with this characterisation.

3.1. Life-course and biographical research

While talking about life-course and/or biographical research, one has to consider that most disciplines within the social sciences have some links to this kind of research. A number of examples concerning specific research questions on the relationship of education and individual life course will be presented in Chapter 4. In this chapter the focus lies on the historical development and its methodological implications of life-course and biographical research. Only a brief overview is possible and no systematic investigation of all theoretical perspectives should be considered (for further information:

Heinz, 1997; Ecarius, 1996; Mayer, 1990; Voges, 1987; Sørensen, 1986; Clausen, 1986; Elder, 1985; Kohli, 1978). However, the strong input of both economic and sociological thinking on the development of life-course and biographical research should be mentioned here.

As a result of World War II, social scientific research in Europe almost disappeared in the 1940s. Many economists and social scientists escaped to America, finding not only peace but also a continuously improving infrastructure for their research within an open-minded society. Stimulated by this 'brain-drain' from Europe (and other nations), the newer research areas of economics and sociology developed very quickly. One strong input for life-course research, the study of social change, came out of some of the early studies on city growth, industrial change, and migration in the US, which itself formed one of the most important sociological fields of research interest (for a brief overview and introduction see Sanderson, 1995). In general, this research tradition is mainly committed to a macrosociological perspective and strongly related to the macroeconomic view on long-term developments. Depending on the political position of the researchers as well as on membership of competing scientific schools different mixtures of scientific disciplines (e.g. political economy, socioeconomic research) and terms to describe and explain the phenomena under observation (e.g. modernisation, imperialism) have been developed. In the 1960s and the early 1970s, many research studies were conducted on the socioeconomic development of countries. Most had a comparative perspective and they were mainly based on (Neo-) Marxist or structural-functional theories.

Confronted with Karl Marx and his postulation of historical materialism (the first explicitly formulated theory of social change with class conflicts as its driving force, dominating theoretical thinking, at least in Europe, up to the midst of the 20th century) functionalism, the North American mainstream of sociological theory-building of this time, was criticised for its static and therefore conservative implications. As a reaction to this criticism, Parson (1966) linked his structural-functional theory to biological evolution theory. While the British social theorist Herbert Spencer failed to earn broad respect for his trial to connect sociological thinking on biological evolution theory only a short time after its revolutionary influence

at the end of the 19th century, Parsons reformulation had been recognised as a stimulating innovation. This paved the way for several theoretical and empirical works which were summarised under the label of 'modernisation theory' (although they never built one homogenous theoretical school; as an overview see Zapf, 1975).

What is common to these studies of social change (as well as for dependency theory or transformation theory) is the attempt to explain social development primarily with macrosociological variables (for an overview on these theories see Box 1). This is also true for macroeconomic modelling, especially those studies concerned with labour market development (including neoclassical theory, as well as Keynesianism; for an overview on labour market economy see Franz, 1991; Ashenfelter and Layard, 1986; Holler, 1986). Although micro theories of social action are not generally rejected, there are only weak ties to them within these studies. While most modernisation theorists (economists as well as sociologists) in functionalistic tradition argue in terms of social systems (sometimes using individuals only as puppets on the strings of norms and sanctions, which perfectly determine their behaviour), the majority of macroeconomists refer to the *homo oeconomicus* concept, describing human decisions as perfectly rational in terms of economic considerations. In further theoretical development, both kinds of oversimplification proved to be too weak as a satisfying explanation of social change.

Contrary to this, the second major line of research associated with life-course and biographical research focuses on individual development and has its roots in microsociological, ethnographical, psychological, and pedagogical theories (for an overview see Elder, 1991). Early works on family patterns and migration in Europe and the US considered the importance of personal history to explain individual decisions. To analyse this, a longitudinal approach to life history (Volkart, 1951, p. 593), including for example continuous qualitative life records, had been first developed by W. I. Thomas early after World War II. Although some research (especially on child welfare in the US) used these new methods, the popularity of such (qualitative) longitudinal studies stayed very poor until the mid-1960s. Other examples of the origins of life-course and biographical research at microanalytical level can be found in the theoretical

Box 1: **Modernisation theories**

The modernisation approach had been primarily evolved to explain underdevelopment by using the historical observable development patterns (and its causes) of advanced (western) societies as an analytical model. By using the label 'modernisation theory', several, sometimes competing, theories on sociocultural evolution have been summarised. Basically these theories are united by two assumptions (Sanderson, 1995; p. 212 et seq.).

First, development is postulated as a standardised, general transition from underdevelopment to modern society by several steps. Rostow (1960), for example, distinguished five stages of economic development: traditional society, the preconditions for take-off, take-off, the drive to maturity and mass consumption. As important influences for transition from one stage to another he assumed social patterns, political structures and value systems as preconditions for economic development. These variables had been measured on a national level (not mentioning regional or individual differences) and used for international comparisons.

Second, modernisation theories recognise development as an endogenous process of national societies, only determined by internal deficiencies or capacities. International networks and dependences had not been mentioned by this approach in its early formulations. Therefore it had been criticised by dependency theorists in the early 1970s, which put (economic) interconnections between developed and underdeveloped countries as the focus of its argument (Caporaso, 1980; Palma, 1981; Valenzuela and Valenzuela, 1978). Common to modernisation theories, dependency theory argues purely with macrosociological (e.g. migration balances of elites) or macroeconomic (e.g. terms-of-trade) variables.

More recent versions of modernisation (e.g. the concept of reflexive modernisation of Beck, 1994) try to avoid the disadvantages of those early approaches by integrating other concepts of social change (like dependency theory) and by using micro theoretical explanations to support their macrosociological (or macroeconomic) considerations. For actual development of modernisation theory and critical comments on the historical background see for example Berger (2000), Engerman et al. (2003), Tiryakian (1991).

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reflections on generations (especially the work of Mannheim, 1952) and in the development of the cohort concept in demographic research (e.g. Ryder, 1965). The analysis of family-cycles (Glick, 1947) and of passage between different age groups (Gennep, 1960), and those parts of sociology which had been interested in different life-periods (e.g. the sociology of ageing, the sociology of youth) are further examples.

To connect the research lines on social change and on individual development, a third theoretical perspective was of great importance. Starting with the discussion on the 'open society' (Popper, 1966) and its opportunities for intergenerational mobility in the 1950s, inequality research reached another stage of investigation by asking how people get into their social positions (e.g. classes). Important steps were made through the analyses of status attainment processes within

societies (Blau and Duncan, 1967), the discussion on objective placement in classes and the meaning of collective judgements like prestige (Svalastoga, 1959), the differentiated analyses of occupational mobility (Rogoff, 1953) and the empirical definition of position structures as units for mobility research (Goldthorpe, 1980).

Starting with an understanding of intergenerational mobility through the use of mobility tables in cross-sectional surveys, the focus moved more and more to a consideration of intragenerational mobility and the influence of social institutions like school, family, the economic system and so to structuring the individual life course (see Mayer and Müller, 1986; Mayer et al., 1991). As a result, status passages, transitions and critical life-events during the occupational career came into the spotlight of analyses. Within this research tradition, individual qualification and the development of the educa-

tional system has been considered as one of the most important determinants of these processes. Hence, the individual development perspective has been strongly linked with the macroprocesses of social change as well as with the quickly developing microeconomic research on labour market development, which has increased following the ongoing labour-market crisis in Europe since the 1970s.

The first steps towards the institutionalisation of life-course and biographical research as a research field in its own right (in the US as well as in some European countries like Germany, the United Kingdom, the Netherlands and the Scandinavian states) can be found in the mid 1970s. For the first time, conferences were held and handbook articles and readers on this topic were published (Elder, 1975; Kohli, 1978). However, life-course and biographical research still remained strongly related to the sociology of age and family – studies on the transition within the educational and/or the occupational system continued to be exceptions to the norm. An increasing interest in topics like status passages during life course (for an overview see Levy, 1991) and the institutionalisation of standard biographies (Kohli, 1988) began to appear only at the beginning of the 1980s.

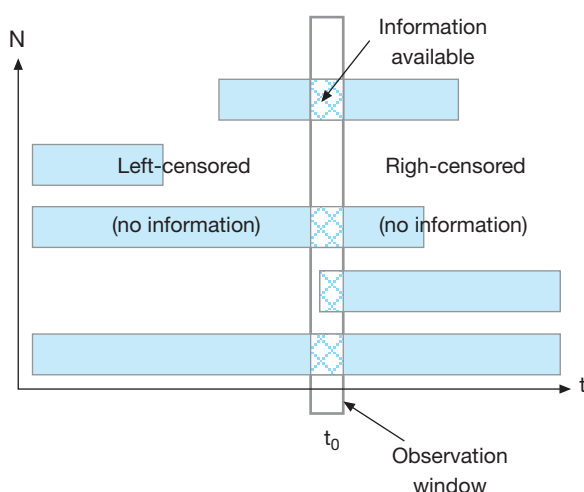
One important aspect of the growing popularity of life-course analysis within the context of educational and labour-market research in the early 1980s was the improvement in data quality and analysis techniques. As presented later, the major data sources for longitudinal research in Europe had been implemented no earlier than the beginning of the 1980s. In Germany, for instance, the interdis-

iplinary Special Research Unit 3, set up in 1980 at the Universities of Frankfurt/Main and Mannheim, initiated and developed over the next 12 years some of the most important data sources for life-course research to date. Examples of this work are the welfare surveys, the German socioeconomic panel (GSOEP), and the German life history study (GLHS) (Hauser et al., 1994). Today in Germany, not only scientific surveys but also process-produced data are available for life-course research on labour-market development. The Federal Institute for Employment Research (IAB) offers a data warehouse, which includes longitudinal data from the labour offices, the social statistics and several regular surveys (some of them in panel design) and tries to match this data to increase the informational basis on every case (Schwarzfärber, 2002). Similar developments can be found in other European countries (especially in the Netherlands, Scandinavia and the UK). Even in the US only a few comparable data sets can be found earlier than 1980 (e.g. the Michigan Panel Study of Income Dynamics started at the end of the 1960s).

Compared to a single representative cross-sectional survey (Figure 2), the claims put forward for the quality of the data of life-course research are obviously very high. A perfect data set should contain a complete sequence of information from the beginning to the end (which in many cases means from birth to death of a person). Cross-sectional surveys (as for example used in opinion polls) are only able to represent exactly the information valid at the time of data collection. It might tell us whether one person is employed or not and whether he (or she) has a university degree. In general, this kind of survey will not tell us anything about the individual historical development (past and future) and the circumstances under which this development has taken place. The data set is incomplete due to right and left censoring.

A data set is called left censored if information needed from the past of a single person's life course is missing. One simple solution to this problem is to ask for this kind of historical information during the interview, e.g. using questions like: 'when did you leave school?' or 'how long have you been employed?' (Figure 3). Although some elaborate techniques have been developed, the collection of retrospective information is strongly restricted by the respondent's ability to recall the facts required (Papastefanou, 1980). Due to the results of methodological studies, the use of retrospective data

Figure 2: **Cross-sectional design**



collection methods concerning central events in one's life (e.g. marriage, birth of child) seems to be possible (Blossfeld, 1985b). Questions regarding educational and employment history proved to be of reasonable validity too (Brückner, 1994; Dex, 1991; Mayer and Brückner, 1989). Nevertheless, the use of retrospective data collection is limited: subjective judgements and opinions especially seem to be strongly biased by an individual's attempt to 'streamline' their own behaviour and decisions (Schwarz et al., 1994; Schwarz and Sudman, 1994).

By using a single cross-sectional design another serious problem occurs related to the historical time of data collection. The information available at the time of observation is always right-censored (lack of future information) and may become obsolete at a future date due to social change (e.g. political decisions, new laws, and economic development). To measure these effects one needs comparative representative surveys at regular time intervals, which also try to capture the individual life history by additional retrospective questions (Figure 4). However, such analyses only allow population comparisons and are not able to follow individual development over time. Retrospective questions are necessary, but give no information on opinions or options facing the individual in the past. Therefore, in order also to investigate the reasons for individual decisions, panels should also include prospective questions, e.g. concerning future plans, problems, alterna-

tives, preferences, etc., which afterwards form the basis for explaining decisions taken.

To analyse the individual life course over time, a panel design is needed, for which the same persons are interviewed again at regular time intervals (Figure 5). Obviously, the technical requirements (and therefore the expenses) increase. In addition to the regular costs of representative surveys one has to control addresses and invest some extra time to find people who moved between the two dates of investigation. Additionally, some special problems associated with this kind of research design occur (for a brief overview see Blossfeld and Rohwer, 1995; p. 11 et seq.; detailed information can be found in Hsiao, 1986). From the viewpoint of life-course and biographical research, pure panel designs without any retrospective questions are limited because they only offer information for a series of discrete points on the time scale.

Only a panel-design with retrospective information included (Figure 6) will give the opportunity to investigate individual life courses and their continuous development. Even then, there is still one problem remaining: the attrition of the sample. While those previously sampled in panel design will be repeatedly interviewed, the number of participants declines as time goes by (panel mortality). Moreover, the data set stays representative for the original sampling process, ignoring the population change (due to migration and fertility) in the society under observation. There-

Figure 3: **Retrospective design**

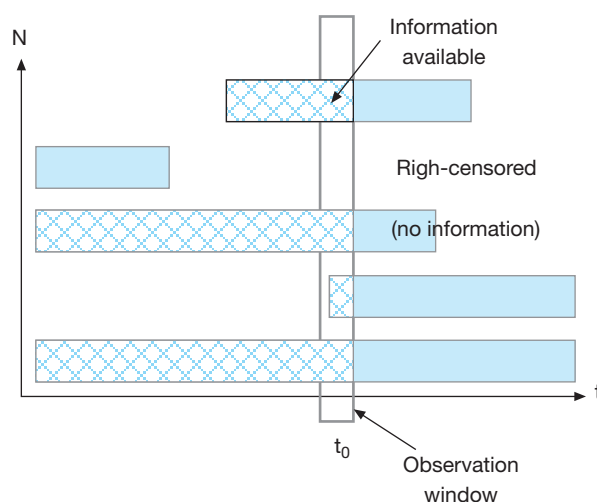


Figure 4: **Comparative cross-sectional design with retrospective questions**

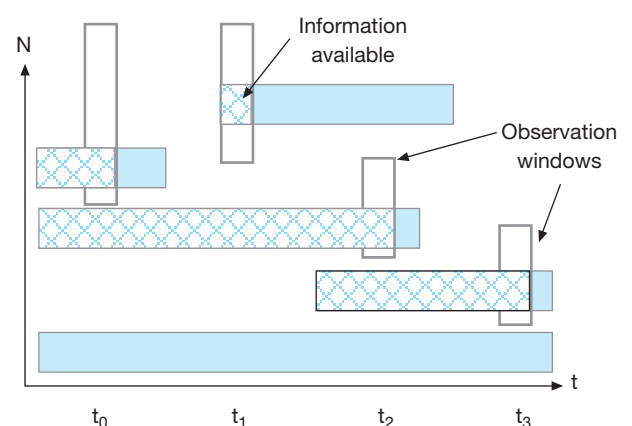
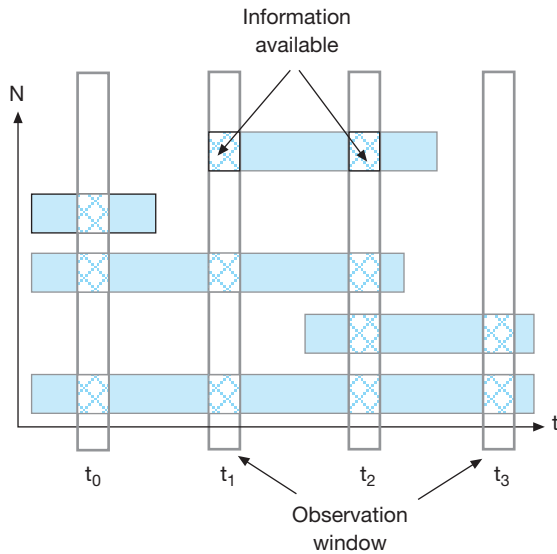


Figure 5: **Panel-design**



fore, additional sampling at each point of observation (or at least at some reasonable time intervals) is necessary to keep the information of the panel data representative (Figure 7).

Although some of the problems mentioned here are almost the same for life-course and biographical research, there is at least one important difference that makes it more difficult to collect adequate data for analyses in life-course than in biographical research. According to its interpretative approach, which tries to understand the individuals' percep-

tions of their own biographies and to analyse them in detail, biographical research uses qualitative, hermeneutic methods of analysis. The oral or written biographical material is generally interpreted by the researcher applying interpretation techniques of the so-called life-history method: 'A biographical study is the study of an individual and her or his experiences as told to the researcher or found in documents and archival material' (Creswell, 1998). In contrast to this, life-course research is interested in explanations of population development by using representative data sampling and quantitative analysis methods to draw conclusions. Obviously, most data collection problems listed above are closely related to the need for representative data sampling, which is seldom used in biographical research for its purpose of understanding instead of explaining.

Moreover, compared to common quantitative approaches, life-course research introduced time as the most important new variable. Time can be observed from three different points of view, which are strongly interrelated. From an individual perception, time means the process of ageing, while from a collective point of view time is primarily historical development. Both aspects are connected in the context of cohorts, which are defined by means of a common historical starting point for individuals (e.g. those people born in the same year form birth cohorts, staying at the same time in specific social institutions such as school). This interrelationship

Figure 6: **Panel-design with retrospective questions (source population only)**

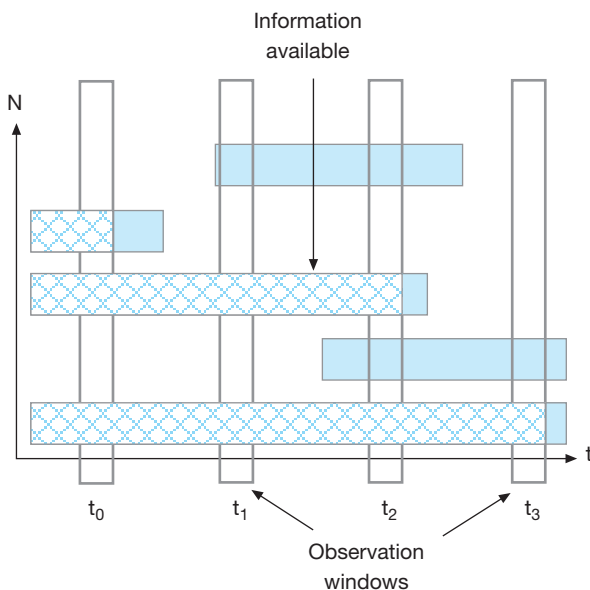
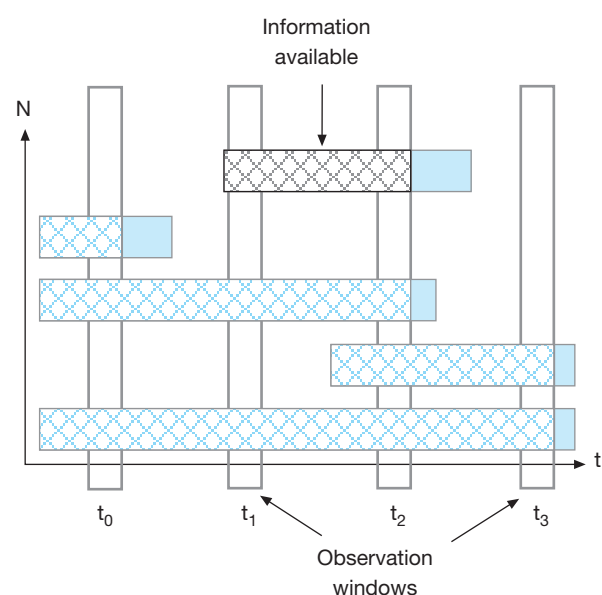


Figure 7: **Panel-design with retrospective questions (additional sampling)**



was discussed and presented in diagram form (Figure 8) by the demographer Lexis (1875) at the end of the 19th century. Nevertheless, most social scientific research concentrates only on one of these aspects. Life-course research offers the possibility of separating age, cohort and period effects by using specific statistical measures once these had been developed (Hagenaars and Cobben, 1978; Rogers, 1982; Mayer and Huinink, 1990, 1994) ⁽²⁾. Moreover, the computer equipment required for handling longitudinal data sets of adequate size did not become available before the beginning of the 1980s (for an early introduction see Tuma and Hannan, 1984).

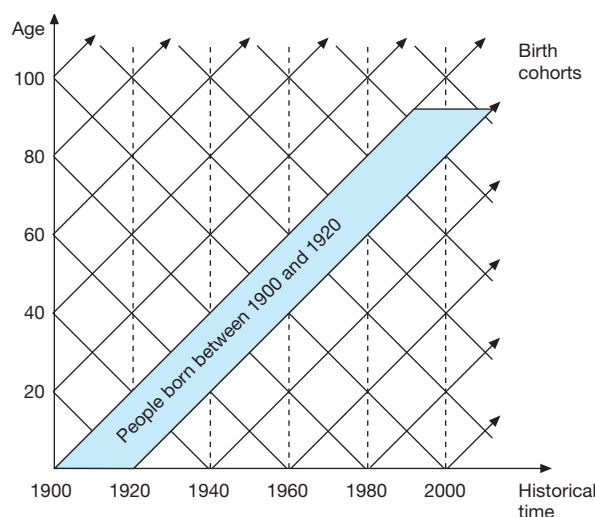
The central and commonly applied statistical method of life-course research is 'event history analyses' (for introduction see Yamaguchi, 1991; Blossfeld and Rohwer, 1995; Giele and Elder, 1998). Using these techniques requires a special data structure. First, as dependent variable (the event), a transition between discrete states has to be defined. In general, two clearly divided states (one initial and one destination state) are used. Secondly, the time axis is assumed to be continuous and – as analytical unit – the time span an individual spends on this axis until a change of states occurs (the episode or spell) will be used for analyses. Hence, a precise and clearly distinguishing definition of the two states and a permanent observation of dura-

tion time are needed. Thirdly, the transition must happen at an explicitly measurable point on the time axis and not as a gradual change from origin to destination state.

Right censoring can be handled adequately by using (non-parametric) survival analyses or a group of related parametric transition rate models, which additionally need the definition of a specific shape of time dependence for the transition rate. In contrast, left censoring is a serious problem in that transition rates depend on the duration in the original state (which commonly has to be assumed). Moreover, some other theoretical and methodological problems are experienced using such advanced statistical analyses (e.g. Bretagnolle and Huber-Carol, 1985; Hamerle and Tutz, 1989; Galler and Pötter, 1992).

With respect to these restrictions, event-history analysis can be done by using standard statistical software packages like SAS or SPSS. However, such procedures were not available in these programmes before the end of the 1980s and the capacity of personal computers for this kind of calculation was not sufficient before the mid-1990s. Hence, the improvement of life-course research was highly dependent on the technical development in statistical hard- and software. We have to consider life-course and biographical research as still a very young and fast developing new discipline, influencing (and being influenced by) a great variety of social sciences. Amongst these, economics and sociology seem to be the most important.

Figure 8: Lexis diagram



3.2. Relevance of life-course and biographical research for the investigation of education and training benefits

The objective of the last section was to describe briefly the development of life-course and biographical research and to give a short overview of the methodological implications directly related to this specific perspective. As outlined above, life-course and biographical research was not primarily developed to investigate the benefits of education or labour-market

⁽²⁾ A simultaneous consideration of all three effects within a single model is not even possible with advanced theoretical or statistical methods because of the tautological relationship between the three effects (see for more detail Descy and Tessaring, 2001; p. 322)

processes. Nevertheless, these research topics have made at least strong contributions to the development of life-course and biographical research as a specific scientific research field. In the following sections, the input of life-course and biographical research on the development of educational and labour market research is discussed. The main question is to examine the central contribution of life-course and biographical perspective for these research areas. Again, no complete overview or systematic introduction into these studies should be expected.

In the second half of the 20th century, education was one of the most important and sometimes most controversially discussed topics within European societies and a main source of new social movements. The most recent developments have emerged from the results of the PISA study, ranking the efficiency and competitiveness of national educational systems within OECD countries by measuring the performances of schoolchildren on comparable levels and within different subjects (OECD, 2001a, 2002a and b, 2003). While some European countries (especially Finland) did very well, others such as Germany and Luxembourg achieved only poor results, which initiated a political debate in these countries ⁽³⁾ (for the German results and reactions see Deutsches PISA-Konsortium, 2001, 2002; Adam, 2002; Terhart, 2002). Previous historical events (especially the 'Sputnik-Shock' 1957 and the Student-Movements at the end of the 1960s) also stimulated political discussion inside as well as outside of the parliaments in several countries all over Europe and finally led, to a greater or lesser degree, to deeply influential reforms and a restructuring of national educational systems.

Unsurprisingly, political controversies also encourage and support scientific research and therefore many different research institutions across the whole of Europe have produced studies and publications on educational topics. Among the most important issues investigated by this research are:

(a) the world wide expansion of education since

the 1950s. Not only in Europe but all over the world, an increasing number of young people are enrolled in education, with the greatest movement towards higher and higher levels of education. Research enquiries try to understand the reasons, as well as the results of this process for the world community, international relationships, nation states, and regional development (e.g. Boudon, 1974; Dore, 1976; Müller, 1998);

(b) equal access to education. One important point associated with the expansion of education is the question of whether there are equal opportunities for entering different levels of education and what are the criteria (e.g. ability, money, social status) used for selection. In Europe, the ideal of equal opportunities and selection focused strongly on ability is widespread, although the reality in most countries varies (e.g. Shavit and Blossfeld, 1993);

(c) right to follow individual aspirations. Particularly in contrast to the communist states of eastern Europe, which postulated the state's preferences on the use of individual education, the western world followed the principle of free decision-making within the educational system (excluding from this right the duty to attend schools). Therefore, not only personal abilities and performances but also individual aspirations and wishes were put into the focus of analyses (e.g. Duncan et al., 1971).

Undoubtedly, studies from the life-course and biographical perspective made some very important contributions to these (and of course some other) debates. By putting cohorts into the centre of analyses, the expansion of education proved to be one important source of inequality amongst generations and the increasing importance of education for status-attainment can be demonstrated (Mayer and Blossfeld, 1990). The question of equal opportunities cannot be addressed at any one particular point of the educational career, because the circumstances at its beginning and

⁽³⁾ Besides the great differences of the PISA results between the Member States, one has to consider important differences in the public and in the scientific reactions. By using the OECD database on press reaction (OECD, 2002a) and the number of published press reports in each country as an indicator, the range within the EU ranges from one article (Greece and Luxembourg) to about 600 in Germany. More than half of all articles collected for EU countries are from Germany. Belgium and Austria, with around 100 articles, are next. Therefore, the German reaction on PISA is not representative by far for the EU. Compatible data for the scientific debates on PISA are not yet available in Europe.

the process itself are important influences which have to be considered (Meulemann, 1990a). And finally, individual aspirations, as well as abilities and performance, are not stable parameters across time – they change because of personal and societal development.

As dependent variables, some very important transitions into, within and out of the educational system were analysed. The transition from school to university and from the educational to the occupational system was particularly examined. For independent variables – besides the operational definition of education (which in practice offers many difficulties, as discussed later) – some personal characteristics (e.g. gender, age, social status, occupation of parents) and structural aspects (e.g. school structure or system, region, class performances) were used. In general, a very broad spectrum of analyses – very similar to the one presented here – was used for life-course and biographical design in respect of education since the beginning of the 1980s and this changed at all events the scientific discussion on educational topics.

Compared with the tremendous amount of research on education, literature on vocational training and occupational careers seems to be rather small. While work is one of the central themes in sociology and economics, and labour-market processes attracted a great scientific attention following the labour-market crisis in Western Europe shortly after the first oil crisis in the 1970s, the benefits of education and training for the occupational life course are more or less marginal topics inside this field. Other contributors will accentuate this kind of research from a macro perspective in the third Cedefop report on VET-research. Therefore, only some short remarks on the development of social and economic research on work, employment, occupation, and the labour market with respect to the impact of life-course and biographical research are necessary here.

Again, three specific topics should be highlighted:

- (a) entrance to the labour market. The increasing extent of youth unemployment has focused attention on the circumstances under which the transition from the educational to the employment system happens (e.g. Farvaque and Salais, 2002; Jahnukainen, 2001; Kortteinen

and Tuomikoski, 1998; Blossfeld, 1985a). The adaptability of the VET-system to economic needs, which underwent a great deal of investigation from an international comparative perspective, became an important research topic;

- (b) unemployment and the chances of re-entering the labour market. The increasing number of unemployed people in Europe also led to the question of how to get them into work again (for the evaluation of active labour-market policy from a macroeconomic point of view see the contribution of Hujer et al. to this report). Moreover, to avoid long-term unemployment with its socio-psychological consequences (as demonstrated earlier by Jahoda et al., 1933; and re-confirmed by other analyses e.g. Jahoda, 1982; Kelvin and Jarrett, 1985) this topic became an important political issue. To develop adequate measures, scientists (especially economists) became involved in the political process (e.g. for the EU, the European Employment Strategy and the National Action Plans (NAP) for Employment: European Commission, 2000, 2003; for Germany also: Senatverwaltung, 1997);
- (c) career-mobility and lifelong learning. One of the most important resources for the economy in developed countries is the skill level of the employed. Due to increasing worldwide competition, the pressure to increase individual competences and to adapt them to accelerating innovation cycles is growing both for individuals and companies. From an individual perspective, lifelong learning is increasingly becoming a premise for job security. However, the flexibility needed to acquire new skills also requires the individual to change jobs more often than before and to accept periodic phases of unemployment. According to the individualisation thesis of Beck (1994), 'patch-work' career patterns like this will take the place of family-like types of company memberships (for empirical research on the risks of this kind of job career see for example Andreß, 1989; Büchel, 1992; Felstead et al., 1997; Tuominen, 2000; van de Werfhorst, 2002).

The contribution of life-course and biographical research to these three topics (as for some others) is again very straightforward. As entrance, or re-entrance, to the labour market is a time-dependent transition (according to the dura-

tion in the educational system or whether or not employed), the use of longitudinal data and event history analyses proved to be the only adequate way of analysing these processes. Moreover, life-course and biographical research assumes time outside the employment system not only dependent on specific historical situations (e.g. labour-market imbalances due to business cycles) but also on individual experiences and skills assembled through the life course. Both effects can be separated and controlled for the analysis of cohort differentiation, which seems to be the right way to test the 'patch-work' career assumption of individualisation theory as an effect of structural social change.

In conclusion, both educational and labour-market research was productively influenced by the life-course and biographical perspective and its techniques of analysis. However, life-course and biographical research never became the leading force within this research field. Additionally, the mainstream of life-course and biographical research followed broader research interests other than the benefits of VET for work life. Nevertheless, a small but slowly growing group of European social scientists uses the increasing amount of appropriate data for this kind of analysis. An overview of the different theoretical assumptions, scientific perspectives and results of this work is presented in the following chapter.

4. Empirical evidence

4.1. Life-course and biographical research in Europe

Originating from national social research movements in the US and northern and central European countries (amongst them France, Germany, Norway, and the UK) empirical life-course research is increasingly starting to locate its insights in international contexts. Besides the progress made in several European countries to develop an internal professional framework of longitudinal empirical research, cross-national and international cooperation enables researchers to study country comparative issues. Current issues under investigation are societal trends, comparisons of different political systems and national differences in access to public goods, such as education. In contrast, the exploration of educational benefits in the life course has received less attention in European social research, not only in comparative but also in national contexts. Moreover, earlier research in countries with a comparatively long tradition of life-course analysis and of investigation into educational issues like Germany, the Netherlands and the UK, seems to be undergoing a shift in emphasis away from research into educational impact to a broader investigation of individual life chances under certain social conditions and developments – where education plays only a minor role. The reasons for this development may lie in difficulties regarding the definition and measurement of education (or, no less demanding, training, skills, abilities, qualifications, etc.) which make hypotheses on educational outcomes less attractive than the mere description of social situations and developments, using education as one explanatory factor among others. And indeed, specific educational benefits are hardly determinable by quantitative measurements, because cause(s) and effects are interrelated, leaving almost no possibility to arrange the effects in a testable causal order. Keeping the above in mind, this paper will attempt to provide an overview of the limited existing knowledge on the benefits of education, training and skills in an

individual life course. To be able to do so it is necessary to include several empirical works which give information on the benefits of education and training in the life course but which stem not primarily from life-course research as a scientific discipline. However, even these studies do at least take up a lifetime perspective and use longitudinal data for analysis. This section will initially give an introduction to the thematic interests, approaches, variables and methods utilised predominantly in the investigation of education and training benefits from a life-course perspective. Subsequently, the data employed for empirical analysis will be presented. Finally, various studies are listed and described along with the criteria developed in Chapter 2, Sections 4.1.1. to 4.1.6. and Section 4.2.

Before proceeding, one important factor needs to be addressed in order to understand the meaning of the term life-course perspective within the framework of research into the impact of education and training. As shown in Chapter 3, life-course research itself is not historically without precedence but has developed from the evolution and convergence of different theoretical approaches, faculties and empirical research areas. The range of theoretical approaches involved are, for example, human capital, segmentation and status allocation theories, gender and ageing theories, and theories of generational change. Faculties linked are economics, sociology, social psychology, developmental psychology and social demography. Empirical impacts come from mobility research, family cycle observations, qualification and career research, etc. Despite all their inherent differences this mix has one main thing in common: the investigation of dynamic processes. Life-course research is to be understood as an instrument to catch these dynamics, rather more as a perspective than an independent and united theory. Therefore, it is more an enlargement (mainly in an empirical sense) of other theoretical approaches than an alternative. In general, life-course and biographical research have recourse to one or other of these theoretical

approaches. In the following illustration of the main lines of investigation of life-course research into the benefits of education and training, the life-course perspective should be understood as lying transverse to theories of educational impact and outcome.

4.1.1.1. Monetary returns on education and training and life-time income

One of the most investigated benefits of education and training in social research is 'earnings as dependent variable' of education and training ⁽⁴⁾. As in all outcome oriented research into education and training, a good deal of the investigation of education and training benefits from a life-course perspective is dedicated to the measurement of individual monetary returns of education, training or skills. The term 'individual returns' refers to the private rate of return in terms of higher income resulting from prior individual investment in education and training ⁽⁵⁾. Empirical research, therefore, investigates the impact that education, training and skills have on income as one of the most important material benefits. In doing so, most of the outcome oriented education and training research, including life-course research, refers to human capital assumptions. In brief, human capital theory assumes a direct relation between the accumulation of education in terms of years or levels of education and the rise of current or life-time income (Mincer, 1997, 1964; Sweetland, 1996; Becker G., 1993, 1964). According to this theory, employees are paid solely for their productivity which on its part depends entirely on their qualifications achieved through education and training. Therefore, the basic hypothesis is that the more a person invests in his or her education the higher his or her productivity and the higher the individual rates of return in terms of higher income (Becker and Schömann, 1996).

The OECD defines human capital as follows: human capital refers to 'the knowledge, skills, competences and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being.' (OECD, 2001b, p. 18).

The main critical point of the human capital approach is that it implies a labour market without any restrictions or discrimination and a rational individual who is perfectly informed about his or her options (Alewell, 1993; Franz, 1991; Katz and Zideman, 1990; Sengenberger, 1987). On the other hand human capital research has proved to be (at least partly) successful in estimating income effects of education and training and in explaining variations in individual rates of return, e.g. regarding country-specific conditions (Asplund and Pereira, 1999). Moreover, recent developments show that vigorous efforts are being made to improve the original approach by considering several interceding factors that might have an impact on the relationship between education and training and income.

As early as the 1980s, Tuma (1985) developed an advanced human capital model, which had been modified from the life-course perspective. In her analysis of occupational careers she considered career courses based on ill-informed decisions and unbalanced labour-market conditions. She estimated a resulting risk of misallocation that could be corrected or compensated for by job-specific training received by the individual, which would again offer returns from investment in education, training or skills.

Analogue enhancements of the human capital approach can be viewed in the so-called filter and signal theories which assume individuals act under uncertainty and impaired transparency in the labour market. According to job-market filter and signal theories, educational credentials act as mere signals or filters in the job-match process (Spence, 1973; Arrow, 1973), separating individuals with higher ability (= higher educational level) from the rest. However, these signals can turn out to be wrong, because a higher educational level does not mean necessarily lead to higher productivity.

In summary, despite several attempts to advance human capital research in order to bring in the life-course perspective, only a small number of empirical investigations from this economic scientific school utilised longitudinal life-course

⁽⁴⁾ We speak of earnings instead of income, because earnings describes the payments someone receives from his or her employment (and which is influenced also by education and training), whereas income refers to the total money at the disposal of an individual, that is earnings plus money gained otherwise, e.g. rents, dividends, interest, etc.

⁽⁵⁾ Generally, the rate of return to education is defined as the extra income earned as a result of attaining one additional year or level of education (Harmon et al., 2001) and discounted to the time of entrance into the labour market.

data for the estimation of long-term educational returns. In contrast – maybe surprisingly – empirical studies which argue from a life-course perspective (see theoretical assumptions in Chapter 3) examining education and training benefits are based to a respectable degree on human capital assumptions of educational returns.

4.1.2. Education, training and labour-market participation

Apart from these income-oriented estimations of individual monetary returns from education and training, life-course research looks at a range of different facets of an individual's participation in the labour market which are viewed as beneficial outcomes of education and training. Among these are transitions from education and training to work and mobility between and within jobs, employment prospects, avoiding unemployment and reacquiring employment, obtaining qualification-adequate jobs, as well as participation in continuing education and training programmes. To sum up, any kind of labour-market events can be used (and have been used to a certain extent) as dependent variables in life-course and biographical research.

From a life-course perspective success or failure at different times in an individual's working history have an impact on present and later success or failure, not only regarding the further working career but also far beyond it. An individual's position in the labour market, for example, has an impact on that person's social status, not only in the present but also – and maybe more importantly – at the time of later status passages. Life-course research therefore deals with direct possible outcomes or benefits from education and training such as successful job entry after finishing education and training as well as with indirect, or later outcomes, which are mediated through these direct benefits. Access to continuing education and training for example is viewed as an indirect, later benefit of initial education and training, because it is assumed that education and training have a major impact on labour-market entry. This in itself determines the later occupational career and therefore the access to continuing education and training. The same could be said for other aspects of an individual's career. Of course the relationships are not as deterministic as purported here, many different factors of a person's educational and occupational career interfere with each

other. But the central principle of coherences should have become clear.

As the concrete subjects of investigation related to labour-market participation are manifold so are the applied approaches. Therefore, life-course research utilises a number of different labour-market related theories which range from status attainment approaches through segmentation theories and human capital to mere descriptive research. Applying the life-course perspective to educational outcomes or benefits related to the labour market only means that different time points in an individual's working history must be associated with important differences in the quantity and quality of these benefits. Therefore, despite all the differences in the theoretical approaches, life-course research points to the fact that neither individual behaviour nor social systems are static by nature. From this it follows that statements on a society or its subsystems can be made only with reference to certain points in historical time.

4.1.3. Education and transitions

From the life-course perspective, transitions have a special relevance for the individual working life history and are therefore highlighted here as a special case for bringing possible benefits to education and training. Successful transitions *per se* do not yield benefits to education and training, but the other way around: successful transitions follow (as a benefit) from education and training. The determination of life histories by institutional structures in modern societies produces a cycle of certain phases and transitions, which are of a very different character. These institutional structures are mainly defined by the educational and occupational system of a country which, through their organisation, account for the existence of sensitive and less sensitive phases in an individual's educational and occupational career (Blossfeld, 1989). Transitions (from school to work, to further education, etc.) in this sense are particularly sensitive or fixed phases, because they are more susceptible to internal and external influences (recessions, educational expansion, etc.). Periods between transitions, for example after the decision to pursue a certain job or training, are correspondingly less susceptible to change. As different life phases constitute an interrelated course where early phases can be seen as relatively formative

for later periods it is assumed that early transitions are of high importance for later states and transitions and are open only to limited correction, for example by further/continuing training.

Particularly in countries with a strong emphasis on formal qualifications, highly differentiated professions and a low permeability of occupational and educational systems, successful or unsuccessful transitions from education to training and/or the first job are believed to be essential for the whole further educational and occupational career of an individual (Mayer, 1996). An effective first placement on the labour market can therefore determine an accumulation of educational benefits such as high wages, a qualification-adequate job, good career prospects, etc. An ineffective job placement is likely to lead to an accumulation of disadvantages in the further life course. Blossfeld (1989) first formulated the thesis that once a disadvantage is experienced in the transition from education to training and/or to work it cannot be compensated for over the whole occupational career. Therefore, from the perspective of life-course research, transitions – especially those that occur in the early phases of the life course and the individual working career – are crucial for the analysis of educational benefits. The associated material and non-material returns are not only believed to constitute benefits in themselves but also to account for a good proportion of chances and benefits in the subsequent life course. Besides the outcomes of early transitions from education to training and/or work, the consequences of later transitions, upward mobility and generally all forms of mobility leading to the avoidance of unemployment are seen as important possible benefits of education and training in the life course. On the one hand, mobility in later career is likely to be determined by early transitions and therefore in terms of upward mobility it is as a rule an indirect beneficial outcome of education and training. On the other hand, different forms of training or continuing education on or off the job can lead to upward mobility as a direct benefit.

4.1.4. Generational differences in education and training benefits

Besides the impact of education and training on so-called ‘intra-generational’ mobility, as described in the previous section, life-course research has a special interest in inter-genera-

tional mobility. The social (upward) mobility between generations can be determined by comparing the occupational status of children with that of their parents (Hradil, 1997; Goldthorpe, 1980; Featherman and Hauser, 1978). It is assumed that there are large differences between generations regarding the allocation of life chances and risks and in gaining benefits from education and training. Through the comparison of successive generations or birth cohorts it becomes possible to follow social change, specifically the change of educational and occupational trajectories and how they are determined by institutional changes over historical time. A birth cohort consists of a group of people who are of homogenous age and therefore share the same significant life event(s) at almost the same historical date.

Therefore, the life-course perspective argues that different generations are confronted with different social and historical conditions and even birth cohorts which are only a few years apart from each other face these conditions in different (sensitive or less sensitive) phases of their life. According to this, people belonging to different generations or birth cohorts are exposed to very disparate chances and risks regarding their education, training and working career and therefore receive a very different quantity and quality of education and training benefits. Analytically, these differences can be assigned to three effects: the age of a person within a cohort, the cohort to which a person belongs and the framework conditions a person faces in a certain period of time (war, high unemployment, etc.) as a consequence of his or her belonging to a certain birth cohort (for a detailed description of age, cohort and period effects see Descy and Tessaring, 2001; Part 5, Sections 1.3.2.1. and 2.3.1.). Taking up again the thesis that a disadvantage once experienced during a particular life phase can hardly be compensated for over a whole (working) life, it becomes obvious that not only the individual’s fate is influenced – to whatever extent – by this, but also the fortune of whole generations or birth cohorts. Early life-course research confirmed the ‘entry-job’ thesis by demonstrating how the different education and training benefits for older and younger cohorts were determined by having been faced with quite different historical conditions such as

the post-war period, the economic boom in the 1950s and the beginning of educational expansion in the 1970s (Blossfeld, 1989). In the present day, studies into the effects of cohort and generational differences on the benefits of education and training constitute an important research line of life-course analysis. The increased attempts at cross-national comparisons of education and training benefits make it particularly essential to consider generational change. A separation of cross-national from historical comparison would, in any case, lead to misinterpretations of coherences in the analysis of educational and occupational pathways.

4.1.5. Social differences in education and training benefits

Besides cohort and generation specific differences regarding the gaining and utilisation of education and training benefits, social determinants of education and training benefits in respect of ascriptive attributes like family background, gender, ethnicity, etc., are important interest fields for life-course research – as for every empirical social science discipline. Gender and ethnicity have been recognised as outstanding factors in the access to and outcomes of education and training. Although there has been a certain equalisation of life-chances for men and women in many respects over the last 30 years, gender still matters in the utilisation of human resources like education and training. From a life-course perspective, gender differences in education and training benefits not only remain but increase and accumulate over the life courses of men and women. Family background is a further important factor in the analysis of differences in the attainment of education and training benefits. Generally, it is acknowledged that family background determines the chances of educational participation and attainment in a variety of different ways. From a static position, we see that children from families with a comparatively high income and social status usually have better chances to achieve higher levels of qualification and are over-represented in tertiary education and under-represented in the group of early school leavers or in lower vocational education. From a life-course perspective, it is assumed that these inequalities are carried further not only through the whole individual life course but also

by the reproduction of inequality via successive generations. Therefore, studies of family background and gender differences are often combined with studies of generational and cohort developments.

4.1.6. Subjective perception of educational benefits in the biography

Research into life-course perspective investigating education and training benefits as described show only the objective aspects of the impact of education, training or skills on several outcome variables. This view has been criticised because the individual perspective, and therefore the subjective meaning of learning and occupational biographies, is more or less ignored. As judgements on and subjective interpretations of the individual educational biography are likely to have important impacts on the working and life careers of individuals, they cannot be ignored from a life-course perspective. Compared to the demographic life-course perspective which focuses on the life course as a unit, the biographical perspective is subject oriented and concentrates on the differences in and specialities of individual learning and occupational pathways. Therefore, studies of subjectively perceived benefits in individual biographies are becoming increasingly interesting and help supplement rather objective life-course notions. Furthermore, in consequence of this subject oriented perspective, biographical research which is concerned with individual education and training benefits often includes resultant 'soft' or non-material beneficial aspects and thereby complements life-course research on 'hard' material education and training benefits.

The research topics presented here are viewed as the main lines of investigation of education and training benefit measurement from a life-course perspective in Europe. The next section outlines the empirical research conducted from one or more of these lines. Since studies follow their own logic according to their subject(s) of investigation, the classification chosen to subdivide this research is rather artificial. In order to give an overview of results from life-course research it seemed nevertheless appropriate to use such means. The description of studies as classified in Section 4.3. is therefore not to be understood as a scientifically derived categorisation but rather as a review tool.

4.2. Research design and data

The perspective of life-course and biographical research has some important implications for empirical methodology and data requirements (Chapter 3). As the focus of investigation is on the whole life course of individuals rather than on a single point in time, cross-sectional measurements do not serve the required purpose so a longitudinal design is needed. The term ‘longitudinal’ can be narrowed down to research, which allows a diachronic analysis of the incidence of conditions and events by collecting data for each item from at least two distinct time periods. Longitudinal research involves analysis of the same individuals, or more generally cases, over different time periods; and involves some comparison of data between and among periods (Menard, 1991; Ruspini, 1999; Mayer, 1987). In contrast to comparative-static cross-sections, longitudinal analysis can therefore control for cohort-, period- and age-effects that might have a substantial impact on the relationship between education and training and assumed outcomes. Furthermore, longitudinal data normally contains a broader spectrum of individual characteristics than cross-sections and therefore allows for a more reliable analysis of interactions.

There are a number of different designs in longitudinal analysis from which, for the purpose of life-course research, only three are of interest: prospective designs; retrospective designs and follow up designs.

While in surveys with a prospective design the same individuals are interviewed repeatedly in defined periods from one common starting point, retrospective studies collect data via life-history studies that cover the past life course of the respondents. Retrospective studies have the advantage that they provide very detailed and precise information (Blossfeld and Rohwer, 1995),

but are less reliable in comparison to prospective studies data on punctual events and do not offer the same strength for research on causal processes. Furthermore, they cannot include opinions or plans for the future. Therefore, retrospective surveys are often addressed as ‘quasi-longitudinal’ (Hakim, 1987; Ruspini, 1999). Follow-up studies can be considered as a specific form of prospective surveys concentrating on the pursuit of selected offset groups, in our case mainly school, training or programme graduates. A further central point for life-course research is to divide between panel data and cohort data.

Panel surveys trace individuals of different age at fixed points in time and thereby offer the possibility of exploring individual change, for example in educational attainment, job mobility, etc. Surveys with a cohort design can be considered as a specific version of panels that aim to give information on generational differences or the process of generational change. A cohort is defined as a group of people within a population who share the same significant life event(s) in a given period of time. Thus a cohort typically consists of people of the same age group, meaning that they share the same date of birth, year or period of years (e.g. 1920-25). Nevertheless, physical age is not the only criterion for constructing cohorts. School or job entry and other shared events can be used to form coherent cohorts as well. Whereas panel surveys trace individuals over time, the observation unit of cohort surveys is a group of people sharing the same life event(s). It should be emphasised that the distinction of panel and cohort surveys lies transverse to the other three categories which leads to four different longitudinal designs: prospective panel (PP) surveys, retrospective surveys based on individual data (R), prospective cohort (PC) surveys, retrospective cohort (RC) surveys. The design of follow-up studies does not essentially differ from other prospective data collections (Figure 9).

Figure 9: Prospective data designs

Longitudinal design	Observation unit/reference group	
	Individual	Cohort
Prospective	PP	PC
Retrospective	P	RC

Well-known PP are household panel surveys which are well established in most European countries. Among them the most reliable are presumably the British household panel survey (BHPS), the Dutch and the German socio-economic panel (SEP; GSOEP). However, the comparability of these data sets is limited because of variations of variable construction. A major step towards overcoming these problems was the invention of the European Community household panel (ECHP) in 1994. It has already become a unique basis for cross-sectional and periodical comparison of education and training benefits in 12 European countries.

An important example of retrospective surveys based on individual data (R) is the GLHS that also serves to exemplify retrospective cohort studies, because data has been collected for individuals belonging to subsequent birth cohorts. In the survey, about 8 000 persons belonging to cohorts of around 10 years apart (1919-21, 1929-31, 1939-41 up to 1971) were interviewed in great detail about their life courses. A further example of RCs is the Norway Survey (NORS) in which a cohort of people born between 1956 and 1958 was interviewed retrospectively. PC designs are best represented by the British National Child Development Study (NCDS) and the 1970 British Cohort Study (BCS70). In their detailed format and sample size the cohort studies in the UK provide a unique database for single cohort research in Europe. However, the great disadvantage of these surveys is that each of them covers only one cohort of individuals. Apart from the comparison of these two different data sets, no comparisons can be made regarding other cohorts.

In contrast to cross-sectional analysis of education and training benefits, which can

already draw on a substantial selection of harmonised databases, longitudinal research has no similar means of comparing education and training benefits in Europe. Apart from the ECHP, which contains only limited information on education, training and skill-related issues, no longitudinal survey on a European level exists. As already pointed out, the comparability of country specific data remains quite limited and results need to be treated very carefully. Table 1 contains the most important individual data sets utilised for life-course research in European countries.

Beyond this roughly presented differentiation of longitudinal data, a further more sophisticated classification is generally needed when dealing with empirical social research. When comparing results from studies of varying concept and research design we should if possible consider the following dimensions of alternative empirical methodologies:

- (a) data sources: survey/questionnaire – observation – written material – mix – register;
- (b) data analysis: quantitative – qualitative;
- (c) data collection: self-collected – secondary analyses;
- (d) sample: representative sample/non representative sample;
- (e) level of aggregate: regional – national – cross-national.

In the next section studies are presented which apply a life-course perspective in the analysis of education and training benefits. Due to the limited scope of this study, it is not possible to give a complete overview of empirical investigations. Nevertheless, a good number of national as well as cross-national and European studies are listed according to the dimensions proposed. In addition, selected studies are explained in more detail.

Box 2: Eurostat's ECHP and EPAG data set

The creation of the ECHP was a major step towards cross-European data comparability. 1994: launch by Eurostat (Statistical office of the European Union): parallel surveys were taken in 12 Member States
 Follow up: every year
 Restricted time frame: so far only three waves available
 As compensation the EPAG (European Panel Analysis Group) has produced a longer data set from three household panel surveys (Germany, the Netherlands, the UK)
 EPAG data set has been available since 1991, accessible through ISER (Institute of Social and Economic Research, UK)

Table 1: Longitudinal data sets for research into the impact of education and training in Europe

Survey	Country	Type	Aims	Sample	Time of measurement
British household panel survey (BHPS)	UK	PP	C	Representative sample of British households	annually, since 1991
National child development study (NCDS)	UK	PC	B	Cohort of people born from 3 to 9 March 1958	1965, 1969, 1974, 1981, 1985, 1999
Youth cohort study (YCS)	UK	PC	B	Representative sample of 10 cohorts aged 16+	regularly, since 1985
1970 British cohort study (BCS70)	UK	PC	B	Cohort of people born from 5 to 11 April 1970	1975, 1980, 1986, 1996, 1999/2000
Irish panel	IRL	PP	B	Representative sample of Irish households	annually, 1987-1995
Dutch socio-economic panel (SEP)	NL	PP	C	Representative sample of Dutch households	annually/ biannually since 1984
Brabant cohort study	NL	PC	A	Representative sample of a cohort of pupils who in 1952 were in the sixth grade	1952, 1983, 1993
OSA (Organisation for Strategic Labour Market Research) panel	NL	PP	B	Representative sample of individuals aged 16 to 64	regularly, 1985-1996
Explanation of socio-economic inequalities in health (GLOBE)	NL	PC	B	Cohort study, N= 18 973	regularly
German life history study (GLHS)	D	RC	B	Representative sample of cohorts born in 1929-1931, 1949-1951, 1954-1956, 1959-1961, 1971	retrospective
German socio-economic panel (GSOEP)	D	PP	B	Representative sample of the German population	annually, since 1984
Life chances, careers and delinquency of low level school leavers	D	PC	A	Representative sample of 1989 school leavers from German <i>Haupt- and Sonderschule</i>	1989-2001
Malmo study (MS)	S	PC	B	Original sample size 1 542 children at the age of 10	regularly, 1937-1988
Malmo longitudinal study of social assistance (MLS)	S	PP	C	Sample of all households receiving social assistance in Malmo	1995-1999
Evaluation through follow-up	S	PP	A	Original sample size 10 000 children at the age of 10 and 13	regularly, since 1961
Swedish level of living survey (LNU)	S	PP	B	Sample of about 6 000 individuals between ages 16 and 75	4 waves, 1968-1991
Norway survey (NORS)	NO	RC	B	Cohort of people born from 1956-1958	retrospective
Norway level of living survey (NLLS)	NO	PP	B	Sample of Norwegian adult population	5 waves, 1980-1995
Danish longitudinal database (DLDB)	DK	PP	B	Representative sample of the population in the age group 16-75 drawn from admin. registers	annually, 1976-1990
Zuercher longitudinal study: from school to middle adulthood (ZLSE)	CH	PC	A	394 school leavers in Switzerland	regularly, since 1978
Transitions from education to employment	CH	PC	A	National PISA 2000 sample leaving	2001-2003 annually 2004-2010 biannually

Panel study of Belgian households (PSBH)	B	PP	B	Representative sample of Belgian households	annually, since 1992
Luxembourg panel	L	PP	B	Representative sample of Luxembourgish households	annually, 1985-1995
Survey on class structure, consciousness and biography (ECBC)	E	R	C	Sample of 6 629 individuals, not fully representative regarding region and educational level	retrospective, 1991
Greek household panel	EL	PP	B	2 952 Greek households	every two years, 1988-
Hungarian household panel (HHP)	HU	PP	B	2 000 Hungarian households	annually, 1988-1997
European Community household panel (ECHP)	EU	PP	B	Representative sample of households in 12 Member States	annually, since 1994
<p>Types: PP = Prospective panel data; PC = Prospective cohort data; R = Retrospective individual data; RC = Retrospective cohort data.</p> <p>Aims: A = Main objectives are the impact of education and/or training; B = Main focus is on other issues, but these are related to the impact of education and training; C = Focus is on other issues, but some education and training variables are included.</p>					

4.3. Empirical Studies

Most of the existing studies referring to education and training benefits from a life-course perspective are naturally based on national data sets which have been carried out by statistical offices or large research institutes. The reason for this concentration on secondary analysis lies in the amount of capacity and financial resources needed for representative longitudinal investigation. Indeed, only a few European countries are even able to provide data material, which serves the demands of life-course analysis, amongst them primarily Germany, the Netherlands and the UK. About two thirds of relevant life-course studies on education and training benefits, therefore, draw on data from these countries ⁽⁶⁾.

Among the data sets used most for secondary analysis of education and training benefits are the British, Dutch and German representative Panels (BHPS, SEP, SOEP), the British cohort studies (NCDS, BCS70, YSC) and the GLHS. The Dutch cohort studies (Brabant, GLOBE) and Swedish

and Norwegian panel and cohort data (MS, MLS, NORS) are also often used for country specific analyses. In total, there are around 60 different usable studies dealing in the broadest sense with education and training benefits from a life-course perspective. Compared to cross-section analysis of individual data this might be a small number but even given this limitation the sheer amount of varying conceptual approaches, specific investigation interests, definitions of explanatory and depending variables, sample sizes and above all results makes it very hard to provide a comprehensive overview.

Given the heterogeneity of study concepts, selected national and cross-national works are classified according to the dimensions proposed in the previous parts of this report. Generally, education and training research from a life-course perspective is prevalent in the northern and western Member States while there is only little evidence from southern or eastern European countries. On this basis, any generalisation or attempt to compare results at European level must be handled with care ⁽⁷⁾. Furthermore, there

⁽⁶⁾ Even the oldest longitudinal panels (British household panel, German socioeconomic panel, and Dutch socioeconomic panel) all had their starting point in the mid-1980s. Therefore, the period of measurement is limited to at least 20 years and covers only a part of an individual's life course. Although the panels sometimes enclose records on educational and occupational histories, the amount of information collected in this retrospective section is limited and therefore concentrates on main life events.

⁽⁷⁾ The limited study material detected in the southern European countries might be also in part due to the fact that most of them still lack a working publication and communication system of research groups, communities, journals, databases and other dispersive media.

is a clear concentration on material benefits (primarily income and employment patterns) and there are few studies on non-material benefits.

4.3.1. Studies at national level

Life-course studies, which are concerned with individual education and training benefits on a national level, are of a very diverse character and cannot really be compared. The reason for this lies not only in the difficulty of comparing results from studies with different definitions of explanatory and dependent variables but in the entirely diverse research designs of these studies. Depending on the particular research lines and traditions existing in different Member States the focus of investigation varies to an extent that actually allows for no serious comparison of results at all. Table 2 shows selected national studies and areas of current research related to education and training benefits.

Studies related to human capital approaches measuring longer term rates of return from years in education, level of education or type of training can be found in most European countries (Steiner and Lauer, 2000; Brunello and Miniaci, 1999; Uusitalo, 1999; Chevalier, 1999; Hægeland, et al., 1999; Denny and Harmon, 1998; Curti, 1998; Hartog et al., 1993; Goux and Maurin, 1994; Pedersen et al., 1990). In contrast, other studies are not as widespread. Current research on individual work histories or labour-market participation over the life course is concentrated in Germany, Scandinavia and the UK. The explanatory factors related to education and training in this research are normally limited to the level and/or the number of years spent in educa-

tion and/or training (Müller and Shavit, 2000; Wolbers, 2000; Hujer and Wellner, 2000; Bryson and Lissenburgh, 1996; Hammarström, 1996; Becker and Schömann, 1996; Kettunen, 1994).

Few studies analyse dynamic factors such as income development or changes regarding educational returns over the life course. An example is the study of Steiner and Lauer (2000) who examined returns on education in Germany from 1984 to 1997 on the basis of the GSOEP and showed that rates of return are not constant over the life cycle, especially for women who experienced a substantially increased rate of return until 1994 and subsequently a continuing decline. An analysis of longitudinal data from France and Spain confirms this result, but also displays national differences. While in France educational returns already start to decline after five years of job tenure, in Spain returns do not decrease until 20 years of tenure. Unfortunately the authors of the article do not give any information on the data sets used for their analysis (in progress) (Barceinas-Paredes et al., 2001). Becker and Schömann (1999, 1996) estimate the long-term educational returns of further vocational education on the basis of the GLHS and the GSOEP and detect a tendency to lowering rates of further education returns in Germany but also continuing income growth resulting from participation in further education, especially for men. A very detailed analysis of the impact of further on-the-job and off-the-job training on the working career is provided by Pannenberg (1995). Besides the measurement of income development, he looks at individual job mobility as a possible benefit of education and training and finds that short (two to

Table 2: National studies on education and training benefits from a life-course perspective

Study	Data Source	Data analyses	Sample size*	Longitudinal design aggregate	Outcome variables**	Explanatory variables***	Benefit (result)****
Pannenberg (1995)	GSOEP (D)	secondary/quantitative	1965	PP national	OC, ID	FVET	material
Hillmert (2002)	GLHS (D)	secondary/quantitative	> 1 000/C	RC national	OC	LE, TQ	material (+/0)
Diewald and Sørensen (1996)	GLHS (D)	secondary/quantitative	2 323 SQ 45 % P2	RC regional PC	OC	LE	material (+)
Blossfeld and Timm (1997)	GSOEP (D)	secondary/quantitative	n.n. P11	PP national	M	LE, YE, FB	non-material
Born (2000)	SFB 186 (D)	self-collected/quantitative	2 130	RC national	OC	TQ	material

Becker (1998)	SOEP/GLHS (D)	secondary/quantitative	> 14 000/1 781	PP/R national	LEx	YE	non-material (+)
Becker and Schömann (1999)	SOEP/GLHS (D)	secondary/quantitative	3 075/2 171	PP/R	national ID	FVET	material (+)
Becker and Schömann (1996)	GLHS (D)	secondary/quantitative	> 1 000	RC national	ID	FVET	material (+/-)
Bender and Dietrich (2001)	Social insurance data	secondary and self-collected/quantitative	2 674	RC national	OC, UR	LE	material (+)
Bynner and Parsons (2001)	NCDS/BCS70 (UK)	secondary/quantitative	11 400/9 000 (10 % last) P37/P21	PC/PC national	UR	YE/S	material/ non-material
Bynner et al. (2001)	NCDS/BCS70 (UK)	secondary/quantitative	11 400/9 000 (10 % last) P37/P21	PC/PC national	ID, OC, H	S	material/ non-material
Dale and Egerton (1997)	NCDS (UK)	secondary/quantitative	11 193 P33	PC national	OC, FF, ID	LE/TQ/FB	material (+/-)
Payne (1995)	YCS (UK)	secondary/quantitative	n.n.	PC national	EC	LE, TQ	material
Schallberger and Spiess Huld (2001)	ZLSE (CH)	self-collected/quantitative	1 706 SQ 23 % P21	PP (follow-up) national	OC, PD	LE/VET/TQ	material/ non-material
Unwin and Wellington (2001)	MA (UK)	self-collected/quantitative and qualitative	120	PP (follow-up) national	non	VET/TQ/S	material/ non-material (subjective)
Meyer (not concluded)	TREE/PISA (CH)	secondary and self collected	6 500	PP (follow-up) national	EC, OC	LE	material
Wolbers (2000)	OSA (NL)	secondary/quantitative	10 514 P14	PP national	UR	LE	material (+)
Skov (1998)	(DK)	self-collected/quantitative	5 100	PP (follow-up) national	EC	LE/VET	material
Koivuluhta (1999)	(FIN)	self-collected/quantitative	1 cohort of training leavers P16	PP (follow-up) regional	EC, OC	LE/VET/TQ	material/ non-material
Nummenmaa (1996)	OSLM (FIN)	secondary	1 732 P10	PP (follow-up) national	EC, OC, PD	LE/VET	material/ non-material (+/0)
Gash and O'Connell (2000)	(IRL)	self-collected/quantitative	n.n.	PP (follow-up) national	EC, OC, ID	LE	material (+)
Keogh and Downes (1998)	individual autobiographical summaries (IR)	self-collected/qualitative	114	R national	non	FVET	material/ non-material
* Sample size	SQ: P:	survival quota of respondents (where available); period of measurement in years.					
** Outcome variables:	EC: FF: H: ID: LEx:	educational career; family formation; health; income development; life expectancy;			M: OC: PD: R: UR:	marriage; occupational career; personal development; rate of educational return; unemployment risk.	
*** Explanatory variables:	E: FB: FE: FVET: LE:	general education; family background; further education; further vocational education/training; level of education or qualification;			S: TQ: VET: YE:	skills; type of qualification (subject); vocational education or training; years of education or training.	
**** if possible							

seven days) as well as longer (one week to one month) training on-the-job increases the possibility of upward mobility significantly. Shorter training periods tend to have a more positive impact on in-company mobility whereas longer training programmes rather increase inter-company mobility. The medium-term income development of 'job-stayers' (1986-91) is positively affected by on-the-job training but this is not true for 'job-changers'. This might be due to the fact that on-the-job training is normally closely related to the requirements of the specific job. Off-the-job training after having become unemployed significantly reduces the risk of staying unemployed but only if programmes are medium-term (6 to 12 months). Long-term programmes (over 12 months) in contrast increase the risk of staying unemployed. A study by Fitzenberger and Prey (1999) shows that training-on-the-job also increases job stability (GSOEP 1984-97). Wolbers (2000) analyses the effects of educational level on unemployment risk and the chances of reemployment on the basis of the OSA Panel and finds a continuous decreasing unemployment risk with higher levels of education for the Netherlands (1980-94). Also the years of job experience have a decreasing impact on the probability of becoming unemployed. Furthermore, he concludes that higher qualified individuals have better chances of regaining employment than those unemployed without higher qualifications.

However, examined in detail, studies on educational returns and individual working careers reveal no sign of convergence of educational benefits across the European countries. For example, while Scandinavian countries especially have rather low rates of educational returns Ireland and the UK show high rates over time (Harmon et al., 2001; Asplund and Pereira, 1999). Central European countries are located somewhere in-between these two extremes. Some of them show a downward trend in rates of return (like Germany and Austria) whilst other remain stable or even show slight upward trends (Italy, Portugal) (Chevalier, 1999; Brunello and Miniaci, 1999; Goux and Maurin, 1994). Other education and training benefits however need not be distributed in the same way. The correlation between education and training and employment

for example is very strong in Belgium, Germany, the Netherlands and Scandinavian countries while it is moderate in Spain and the UK and much lower in Portugal (Hannan and Werquin, 2001). However, apart from these national differences there remain some European-wide general education and training benefits. These are:

- (a) the nearly universal material benefits of more education in terms of higher entry wages, higher wages throughout the working life, increased job opportunities and a reduced risk of becoming unemployed;
- (b) an indication of potentially high returns of more education for socially disadvantaged individuals who reached only a low level of education ⁽⁸⁾.

Beyond the investigation of educational return rates and other working career related education and training benefits, there is a continuing boom of particular transition and mobility research in many European countries. This can presumably be related to the worsening condition of the labour market for young education and training graduates and the unemployed in particular. National longitudinal data sets have been utilised widely to study the processes of transitions of young people from education and training to working life. See the first (Tessaring, 1998) and second (Descy and Tessaring, 2001) research reports of Cedefop for details. In the absence of a longitudinal survey at European level, national research nevertheless indicates some differences concerning the job-entry of education and training leavers (Liefbroer, 2002; Gash and O'Connell, 2000; Fabrizio, 2000; Koivuluhta, 1999; Bratberg and Nielsen, 1998; Breen, 1995; Arum and Shavit, 1995; Bynner, 1995). Transitions seem to be easier in Denmark, Germany, the Netherlands, and Austria than in southern European countries like Greece, Spain or Italy. In Belgium, France, Ireland and the UK young people also face serious difficulties in their transitions but take up an average position in the EU regarding youth unemployment rates. There is some evidence that countries with very well coordinated educational and occupational systems (well-defined occupational labour markets and a high standardisation of education and training systems) have the best transition rates. Nevertheless, only a small part

⁽⁸⁾ One should remember at this point the limitation of comparative research based on national surveys. The comparability is greatly impaired by use of different data sets, definition of variables and differences in estimated model specifications.

of transition research has been carried out from a life-course perspective. Most of the studies look at transition points separately, especially those from education and training to work or to further education and training, ignoring the fact that transitions are embedded in the framework of an individual's life history and can only be interpreted properly when considered independently. Furthermore, from a life-course perspective transitions, as sensitive phases (Blossfeld, 1989) in the life course, are of special relevance for the entire working career of an individual (Section 4.1.3). As most studies cover only the single transition points (cross-sections) or at most the first years of job tenure (follow-up), there is little to extract from them for further life-course analysis. One exception is the study of Schaeper et al. (2000) who have examined career development for up to eight years after the transition from VET to work in Germany. They find that successful career development depends directly on the occupation in which an individual is first trained and indirectly on the educational background of the individual. Bender and Dietrich (2001) confirm the long-term incidence of successful or less successful transitions from education and training to work. Furthermore, cohort differences have an important impact on the stratification of education and training benefits.

Studies that have examined the effect of cohort and generational differences on education and training benefits constitute an important research line in life-course analysis. One might say that life-course research has almost rediscovered the relevance of individual affiliation to a generation or age cohort as a social factor in determining one's opportunities in life (Mayer, 1987). Studies comparing the different benefits accrued through education and training resulting from different generational or cohort patterns focus mostly on age group differences of material (educational returns, labour-market participation, working life) and non-material (family formation, health) benefits. Generational differences have been intensively investigated in Germany, the Netherlands, Norway, Sweden, and the UK thanks to existing cohort data sources. Scandinavian cohort studies have emphasised health related benefits and often stem from medical research (Gridley et al., 1999; Veierød

et al., 1997; Hall et al., 1993). Life-course research in Germany, the Netherlands and the UK has concentrated more on material and other non-material benefits (Konietzka, 2002, 1999; Hillmert, 2002; Schrijvers et al., 2001; Sackmann, 2001; Born, 2000; Boockmann and Steiner, 2000; Becker, 1998).

Becker (1998), on the basis of GSOEP and GLHS data, looks at the education and life expectancy of successive birth cohorts while controlling for other social determinants, for example stratum. As well as confirming existing research that tends to show a causal link between higher educational attainment in Germany and an increase in average life span, Becker finds that the persistence of educational inequality throughout generations has contributed to the continuing variance in life expectancy regarding social stratum and class. Hillmert (2002), in an analysis of GLHS, found that over four birth cohorts from 1974 to 1992 the educational level of an individual became slightly less important as a factor in getting a first job. He also found that vocational qualifications continued to be more advantageous than general education in getting work in Germany. Based on the same data set, Mayer and Brückner (1995) and Mayer (1996), in a comparison of 1930 and 1960 birth cohorts, found that education and training levels were an increasingly important factor in getting a first job. They found an even closer link between the education and training level and job status in the later years (5, 10, 15) of the working career. Konietzka (2002) analysed differences in the transition from initial training to work of successive graduate cohorts and concluded that patterns of job entry have changed in mainly qualitative terms over time. Born (2000) used self-collected data ⁽⁹⁾ to examine how the choice of initial vocational training affected the life course of three subsequent female cohorts. She found that these choices determined women's working career and family life in all three cohorts. Different types of vocational qualifications of equal level are not equivalent in terms of educational benefits. According to Born, women tend to have VET qualifications that typically yield lower education and training benefits. Although she noted a slight

⁽⁹⁾ Data is collected in the framework of research projects (1988-1996) of the German special research unit Sfb 186 (*Sonderforschungsbereich*).

enhancement of former job concentration across the cohorts, the most frequently occupied jobs stayed the same. Bynner and Parsons (2001) compared the relevance of qualifications and basic skills of two birth cohorts (1958 and 1970) as protection against unemployment. They concluded that qualifications and skills are becoming increasingly important factors in determining the levels of unemployment in the UK. Unemployment rates at different ages were consistently higher amongst the more lowly qualified in the younger cohort than in the older cohort. Boockmann and Steiner (2000) showed declining educational returns from the 1925 to 1974 cohorts in Germany, especially for women.

There are also a considerable number of studies exploring how gender and family background affect the benefits gained from education and training (Lauer, 2002; Antoninis and Tsakloglou, 2001; Ermisch and Francesconi, 2000; Ganzach, 2000; Dale and Egerton, 1997). These studies are often combined with a cohort approach, searching for differences in the influence of background or gender on the connection between education and training and its material and non-material benefits and the development of this connection over time or over generations. A study by Antoninis and Tsakloglou (2001) in Greece indicates that 'the most well-off segments of the population' (p. 216) have the highest educational opportunities and benefits. As longitudinal data was not available to them Antoninis and Tsakloglou (2001) – based on two cross-sections from the Greek household survey (HBS 1993-94) – can only speculate on what effects this might have for the whole life course. However, they estimate that these could be even greater than their static results indicate (taking into account the different circumstances experienced by the offspring of well-to-do families and the less well-off throughout their working life).

Lauer (2002) examined the educational impact of family background, gender and cohort in France for the cohorts born between 1929 and 1968. Besides a general improvement in educational standards throughout the cohorts, she found that the parents' own educational performance had a significant effect on the school outcome and performance of their children. Also the impact of the father's occu-

pation was significant: children of senior managers had the best educational prospects whereas workers' offspring experienced the worst educational outcomes. The educational impact of family background, however, does not differ across gender. In France, women achieve better than men in secondary education. In post-secondary education, however, women have higher thresholds than men, which means that they are at a disadvantage. Payne (1997), using the YCS (UK) as her basis, investigated the consequences of the choice of different post 16 routes in the UK. She found that young women who leave full-time education at 16 are more likely than young men with similar characteristics to be without a full-time job or training. On the other hand, young women with above average GCSE⁽¹⁰⁾ results for this group have a better chance of securing a job than similarly qualified males. The study of Dale and Egerton (1997) is concerned with the benefits of education and training for highly educated women, based on the NCDS (UK). Women in this cohort (born in 1958) are less likely to have a degree level qualification and are more likely than men to be under-achieving in occupational terms. It is evident that both men and women show a considerable return on qualifications gained. However, women earn less than men at the same level of qualification.

With very few exceptions (e.g. Born, 2000; Dale and Egerton, 1997), quantitative studies treat education and training in the same way as they treat any other explanatory variable (e.g. work experience, family background, gender) in order to explain differences in the economic, social and private wellbeing of individuals. Therefore, measurements of education and training tend mainly to be limited to the level of graduation and the number of years in schooling or training. This creates a considerable gap in the field of life-course research, because too few cross-European comparisons can be made about differences in the type and quality of education and training and of qualifications and skills.

The analysis of individual learning biographies complements, therefore, the studies of the benefits of education and training described so far. The biographical perspective, which is concerned with the individual's perception of education and training benefits, is in general less often used

⁽¹⁰⁾ General Certificate of Secondary Education

than studies from a solely objective life-course perspective. However, there have been some very illuminating attempts to include the subjective perceptions of the benefits to be gained from education and training (Sauer-Schiffer, 2000; Rabe-Kleberg, 1994). Possibly the most outstanding are those carried out in Ireland and the UK (Unwin and Wellington, 2001; Bloomer and Hodgkinson, 2000; Stone et al., 2000; Keogh and Downes, 1998). In contrast to the information collected quantitatively on material and non-material benefits, it is not possible to quantify or to make generalisations about how an individual might perceive the advantages to be gained through education. Therefore, results from biographical research are difficult to summarise from any general perspective. Moreover, this would be contrary to the entire intention behind the analysis of individual biographies, because it is precisely their individual differences that makes them worthwhile. Keogh and Downes (1998), for example, asked 114 participants of the Irish vocational training opportunities scheme (VTOS) to write down their learning biography and experiences during and after having taken part in the VTOS. Besides giving a record of their educational achievements, their stories document the transition between social exclusion and inclusion and 114 different ways of coping with this situation. While the document overall gives a very positive impression of the benefits gained from the VTOS programme in Ireland, quantitative research that measures the impact of compensation oriented vocational training schemes does, however, present a rather critical picture. This reveals the occasionally important difference between the subjectively perceived and objectively measured benefits of education and training. For this reason Schaeper et al. (2000) complement their quantitative analysis of working careers after VET (continuous and discontinuous) through biographical interpretations of the individuals concerned. They conclude that different subjective interpretations of discontinuous careers correlate with the profession and occupation a person has attained through VET. Amongst those with a lower level VET and profession, negative interpretations (discontinuity as threat) prevail, whilst positive interpretations (discontinuity as chance) figure more often amongst higher level occupations.

In this section various national life-course and

biographical studies on education and training benefits have been presented to give an impression of the numerical and thematic scope of possible lines of investigation. It should have become clear that any comparison of results on this level is nearly impossible and moreover inappropriate, not only because of differences in the quantity and quality of data material but also – and more importantly – due to the variety of different research questions and theoretical assumptions subsumed under the term ‘life-course research’. In order to compare the life course benefits gained from education, training and skills where different country specific conditions apply, a study would be needed which displays a corporate set of research questions or hypothesis based on a particular theory or set of theories. This would also need to be based on a prospective or retrospective survey conducted at a European level.

Such a study, however, does not exist at present. The few, limited studies that deal with cross-national and European comparisons are presented in the next section.

4.3.2. Cross-national studies

The lack of sufficient European longitudinal data limits cross-national life-course research into the benefits of education and training to a small number of studies, which are either based on:

- (a) European panel data;
- (b) corrected or harmonised national data;
- (c) data collected or reproduced within the framework of single cross-national projects.

A selection of relevant studies is shown in Table 3.

Studies which draw on data from the only available European longitudinal data set, the ECHP, cover a comparatively short period of time since the survey was first conducted in 1994 (Deding and Dall Schmidt, 2002; Pedersen and Dall Schmidt, 2002; Brunello, 2001). The limited period of coverage is also a reason for the fact that research has been limited only to measurements of short-term educational returns. It follows that the potential of the ECHP for comparative research into the benefits of education and training has not been fully exploited. As with most national panels it contains only limited information, focusing mainly on the time spent in education and training and on levels achieved. Employment prospects and the potential for

Table 3: **Selected cross-national studies on education and training benefits from a life-course perspective**

Study	Data Source	Countries covered	Data analyses	Sample size* aggregate	Longitudinal design	Outcome variables**	Explanatory variables***	Benefit (result)****
Brunello (2001)	ECHP	A, DK, FIN, F, D, I, P, UK, NL, B, IRL, EL, E	secondary/ quantitative	≈130 000	PP cross-national	VET, R	YE	material (+)
Brunello and Comi (2000)	11 national data sets (G-SOEP, OSA, LFS, etc.)	A, CH, DK, FIN, F, D, I, N, P, UK, NL	secondary/ quantitative	n.n.	PP*****	Ex, R	YE	material (+)
Kieselbach et al. (2000)	Qualitative interviews; official statistics	I, F, E, FIN, UK, I, D, S	secondary and self-collected/ quantitative and qualitative	qual.: 300	R	non	E, VET, FVET	material, non-material
Hillmert (2001)	BHPS, GLHS	UK, D	secondary/ quantitative	≈ 7 000 (BHPS) Ø 800/C (GLHS)	PP/RC	OC	E, VET	material
Schömann (1994)	GLHS, PSSM	D, PL	secondary/ quantitative	465/n.n.	RC/RC	R	E, VET	material (+)
<p>* Sample size</p> <p>SQ: survival quote of respondents (where available); P: period of measurement in years.</p> <p>** Outcome variable:</p> <p>Ex: experience; OC: occupational career; R: rate of return; VET: vocational education or training.</p> <p>*** Explanatory variable:</p> <p>E: general education; FE: further education; FVET: further vocational education/training; LE: level of education or qualification;</p> <p>S: skills; TQ: type of qualification (subject); VET: vocational education or training; YE: years of education or training.</p> <p>**** if possible</p> <p>***** different panel designs</p>								

further education and training, mobility patterns and income growth are all possible areas of benefit that could be explored. Brunello (2001), for example, used the ECHP to investigate the relationship between educational attainment and training incidence ⁽¹¹⁾ and finds that across Europe training incidence is higher among individuals with more experience of education. He also discovered that this relationship varied significantly across countries and birth cohorts. Individuals had a higher training incidence in countries with a more educated labour force and a less stratified schooling system. The most significant finding from a life-course perspective was the strong disparity observed between the effect of previous and of current training on the growth of individual earnings. While current training has medium to strong positive effects on educational returns, previous training has very low positive and often negative effects. This result points to the possibility that much of the private returns to training is rather temporary. Furthermore – as might be expected – there is evidence that individuals with more education and limited labour-market experience enjoy higher private returns from recent training than those with the same experience and less education.

Most of the studies which use harmonised or adjusted national data look at the impact of the occupational and educational systems of two or more central European Member States in order to compare education and training (life-course) benefits (Hillmert, 2001; Sackmann, 2001; Brunello et al., 2001a; Kaiser and Siedler, 2000; Brunello and Comi, 2000; Müller and Shavit, 1998; Brauns et al., 1997). Brunello and Comi (2000) and Brunello et al. (2001a) investigated the relationship between education and earnings growth in 11 countries. They found evidence in all countries that education not only gave an initial advantage for entry into the job market but that this advantage was permanent and increased over time. Analysing this relationship in more detail, they showed that earnings growth generated through education was lower in countries with a higher level of corporatism (e.g. Denmark, Germany and Norway) and higher in countries which experienced both relatively fast labour productivity growth and relatively low educational attainment

(e.g. Italy and Portugal). When comparing educational systems, they found that countries with a more stratified system of secondary education (as in Germany and the Netherlands) had smaller differences in earnings growth through education than other countries. However, whether causal relationships exist is not explained.

Hillmert (2001) provides a more specific analysis of the effects of different educational and training systems. Using the BHPS and the GLHS, he investigated differences of education and training benefits in the life course through comparison of two completely different VET systems: the British 'training-on-the-job' version and the German dual system. He compared the life courses and working careers of different generations (both 1930-1970) by looking at the transition from education to employment position in the labour market at the time of job entry and the occupational career in the years after first employment. Contrary to general belief, he found that the two systems had many similar education and training outcomes. With regard to the transition into work the differentiation of successive education and training levels had increased. This meant that it became more and more difficult for people with low levels of education to enter the labour market successfully. Nevertheless, in both countries intermediate vocational – non-academic – qualifications were the most relevant for gaining direct entry into stable employment. In addition, the stability of the first employment showed a constant decline in both countries over subsequent cohorts. However, there were also expected differences: the correlation between the level of education and training and successful entry into the job market was generally higher in Germany than in the UK and this did not change over the cohorts. This seems to confirm the assumption that despite attempts to improve the traditional 'training-on-the-job-learning' in the UK through national VET programmes (NVQ and modern apprenticeship) there is still a lack of appropriate vocational qualifications for young people. On the other hand, there seems to be greater flexibility in the British system to get a job without having the exact qualifications needed for it.

Results from other studies also confirm the relevance of the education and training and occupational systems for the distribution of education and training benefits over the life cycle. Schömann

(11) Training incidence refers to the probability of taking part in training schemes and its frequency.

(1994), for example, compared the development of labour earnings over the life course in Germany and Poland and concluded that, despite very different political, occupational and educational systems, the impact of education and training on wage attainment throughout the life course was quite similar. Higher levels of education and training had a significant, positive impact both on initial wage levels and after subsequent changes of employer. Nevertheless, a deeper analysis showed some important differences between the two systems. In contrast to Germany, the level of education and training in Poland did not account for wage growth within the same job and after job changes within the same company. Also, the differences in starting wages based on qualifications are only half as high in Poland as in Germany. However, the study suffers from some comparability problems in respect of the design and collection of data material. To sum up, it is clear that comparative studies from a life-course perspective are still rare in Europe and that those which do exist are limited in their explanatory power and comparability due to the differences in the national surveys they depend on – even if corrected or harmonised.

This gap was partly closed by increased efforts to develop cross-national and international research projects. Within these projects additional data sets were produced or existing national data related to education and training and other social issues were integrated (Kieselbach, 2000; Sofer, 2000; Hannan, 2000; Blossfeld, 1999; McIntosh and Steedman, 1999; Furlong and Hammer, 2000). Although few European social research projects adopt a life-course perspective in particular, some recent projects do relate education and training to different aspects of current and future life success. The analysis of such projects does give more of a qualitative insight into the mechanisms of education and training and its benefits than by simply measuring the impact of education and training on the basis of qualifications achieved and the number of years spent in education and on quantitative outcomes such as higher income or job stability. The TSER project Yuseder (Youth unemployment and social exclusion: dimensions, subjective experience and institutional responses in six European countries), for example, looks at the risk of and experience of unemployment and its relationship to the process of social exclusion. Besides the collection of empirical evidence on youth unemployment and

its determinants in each country, a qualitative analysis of 300 (50 per country) long-term unemployed people was conducted. As one important factor in the reduction of unemployment risk they identify the education and training undertaken by the individual. Research shows that youth unemployment is likely to have severe consequences for personal well being and health and that suicidal behaviour is more prevalent amongst the long-term unemployed. Therefore, investment in education and training indirectly safeguards young people from these non-material risks of social exclusion. Yuseder confirms that, depending on the labour-market situation and trends as well as on the educational system and its connection to the labour market, the possibility of young people reducing the risk of becoming unemployed through their participation in general or vocational education varies from country to country. Other projects which examine life course education and training opportunities and benefits are the European Commission project FAME (Vocational identity, flexibility and mobility in the European labour market), the TSER project Newskills (New job skill needs and the low skilled), the Leonardo da Vinci project 'Dual Qualifications and Vocational Mobility', VTLMT (Education, Vocational Training and Labour-Market Transitions), PURE (Public funding and private returns to education), SEdHA (Socioeconomic determinants of healthy ageing) and the Globalife project funded by the German Volkswagen Foundation. As some of these projects have already been dealt with in the second Cedefop research report (Descy and Tessaring, 2001), only three comparatively unknown projects – in the context of research into the impact of education and training – are briefly discussed here. These are PURE, Globalife and SEdHA.

PURE, a recent European Commission project examined the national educational returns of 15 Member States not only with regard to wages but also to higher job opportunities. Its findings showed that the status and the trends of return rates were totally different for each Member State. Though the research was not entirely from a life-course perspective, results from (in part) longitudinal measurement point to several life-course relevant aspects (Section 5.1). The description and main conclusions of the project can be viewed in Box 3.

The Globalife project analyses the influence of globalisation on different life-course dimensions

in OECD-type societies. Central to the focus of this investigation is the increasing tension between the growing uncertainty of future life-course situations and peoples' natural need to make self-binding decisions and how they cope with this. Therefore, the analysis concentrates on the transition from youth to adulthood, on changes in career mobility, on forms of employment and unemployment over the life course and on the transition from employment to retirement. Due to its broad research approach it draws mainly on the secondary analysis of existing longitudinal data sets rather than on collecting new data. As there are numerous, different investigations of education and training benefits in the life course within the framework of Globalife, it is not possible to give a summary here. Nevertheless, important results are discussed in the next

chapter along with findings from the other studies and projects presented.

A project presently running on a European level which is concerned with the non-material benefits of education and training in the life course is SEdHA. The project aims to provide an analysis of socioeconomic differences in health expectancy among the elderly in different European countries, and to contribute to the explanation of these differences by looking at risk factors and the accumulation of health problems over the life course (Mackenbach et al., 1999). Since the explanatory variable 'socioeconomic status' is operationalised as educational level, it is mainly the impact of education on health that is measured. Besides several national surveys and longitudinal studies, the ECHP is used to improve the comparability of information. At present, no results have been published, but a first report is due soon.

Box 3: **PURE – Public funding and private returns to education**

Objective:

Study the impact of different systems of public funding and school differentiation on observable outcomes in the labour market.

Outcome:

Main outcome variables are level and dispersion of private educational returns and education-related inequality in earnings.

Method:

- (a) examine broad national data sets which contain individual-level information on wages and education;
- (b) link the observed patterns and trends to national educational systems and policies. Besides repeated cross-sections, a few longitudinal studies are also utilised.

Countries:

Austria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the UK.

www.etla.fi/PURE; www.cordis.lu

5. Discussion of results

So far, studies which deal with the benefits of education, training and skills or which at least contain some information on education and training benefits in the life course, have been presented at national, cross-national and European level. Some results have already been indicated, but in a rather fragmentary way. This chapter, therefore, arranges and discusses the most significant results according to the research lines outlined in Section 4.1. However, the central result of this study already limits this intention since, up to this point, there is not a single study (or even survey) which would allow for a serious comparison of education and training benefits in the life course of individuals or cohorts on a European level. The establishment of the ECHP has been a major step in this direction but as yet it covers too limited a period of time and only provides information on the number of years spent in education, training and skills acquisition, on levels achieved and on formal degrees acquired.

5.1. Individual monetary returns on education and training

As already indicated at several points in this report, the studies reviewed are of very different character in terms of concepts, specific research interests, definitions of explanatory and dependent variables, sample sizes, etc. Many of the studies, especially those concerned with educational return rates, do not display a genuine life-course concept as it was described in Chapter 3. Instead, they take up other approaches first (e.g. human capital) and then add a longitudinal lifetime perspective (e.g. through the investigation of lifetime earnings) as an enhancement of this approach. For the purpose of gathering information on impact research into education and training, it was nevertheless unavoidable that all these 'borderland' studies be included in our review, because otherwise there would have been almost nothing to revise. The life-course approach is itself – as explained earlier – a perspective that enhances

other theories on the impact of education and training. Studies of this kind (even if they do not display the life-course approach in detail) therefore contribute a great deal to the understanding of the impact and benefits of education and training in the individual life course.

As pointed out in Section 4.1.1, educational benefits are often defined and measured in terms of individual monetary returns in the life course. In the tradition of the human capital approach, studies assume a direct relationship between the accumulation of education, training and skills and the rise of current and lifetime income (Steiner and Lauer, 2000; Brunello and Miniaci, 1999; Goux and Maurin, 1994). The general relevance of skills and qualifications acquired through education and training for individual income development is confirmed by several studies on income development and lifetime income. Most of the national and cross-national studies also show a direct correlation between education and training, continuing education and training and the gaining of higher rates of monetary returns throughout the life course (Becker and Schömann, 1999; Asplund and Pereira, 1996; Pannenberg, 1995; Schömann, 1994).

As regards the level of private returns on education and training, there seem to be differences among European countries. Scandinavian countries, for example, display rather low average rates of educational returns, whereas Ireland and the UK are the opposite and central European countries are located somewhere in-between. Some of them, such as Austria, Germany and Switzerland, show a downward trend in rates of return; others remain stable or even show slight upward trends, such as Italy or Portugal (Harmon et al., 2001; Asplund and Pereira, 1999). The conclusion of Asplund and Pereira (1999) from a European comparison of educational returns is that there are few general trends and that these are rather confusing to interpret given the difficulty of identifying any general tendencies. Moreover, due to the lack of sufficient cross-national surveys, the results from national studies need to be interpreted very carefully. Data, measurement

and estimation differ to the extent that comparability can be seriously questioned. The general problem of comparability is shown very clearly if we consider that estimations based on the same kind of data differ significantly between studies due to their different model specifications, the addition of control variables, etc.

There is evidence that education and training regarding earnings complement each other. The incidence of training is higher amongst individuals with more education (Brunello, 2001). Both education and training affect the earnings of individuals in the short term and the long term (Pischke, 2000; Fougère et al., 2001; Arulampalam et al., 1995). However, the direct effect of training on earnings growth seems to weaken after a few years and can even show negative growth without an investment in further training. This suggests that training has primarily a temporary impact on monetary returns and that qualifications and skills become outdated within a few years (Brunello, 2001). However, the monetary impact of participation in continuing training programmes seems to be hard to determine. Depending on the definition of training, measurements and data material, national return rates differ strongly between the studies and results are difficult to interpret. There is some evidence that in countries with a high standardisation of initial training systems, the monetary benefits of continuing VET seem to be lower than in countries with no such system (Hujer and Wellner, 2000). However, further research utilising a unique database is needed to throw light on this rather tentative conclusion.

Rates of educational returns do not seem to be constant over the life cycle, especially for women. Though returns clearly rise in the early years of an individual's working career, the increase slackens in mid career and then stagnate and decline completely in the years leading to retirement. Assuming that productivity decreases with age, the results are compatible with the human capital approach which claims a direct link between individual productivity and rates of return (Steiner and Lauer, 2000).

There is a correlation between higher levels of education and training and higher incomes, but also a higher variance in income. At this level, job experience is a further factor influencing the rates of individual returns, because it acts as an additional

selectivity mechanism and therefore reduces variance (Asplund and Pereira, 1999; Lauer and Steiner, 1999).

Studies that investigate differences of educational returns with regard to types of education, qualification and skills are still rare and exist only at a national level. The impression is that returns on different types of qualification depend heavily on the inherent structure of the educational and occupational system of a country. The return rates for VET qualifications, which particularly depend on traditional structures and values, differ from those for general educational qualifications. In countries with a traditionally high degree of institutional standardisation of their training system and a clear differentiation of general and vocational education, individual return rates to VET seem to be much higher than in countries which show a rather low degree of standardisation and differentiation in education and training. For the UK, as an example of the latter, there is evidence that individuals who participate in Youth Training Schemes (YTS) after compulsory school age receive significantly lower wages than those who leave school at the age of 16 with no further training. These differences cannot be explained by a simple delay in returns as a result of the extra years training and the opportunity costs incurred. Rather, they seem to be stable over time (Green et al., 1994). Therefore, from an individual (life-course) perspective it can be more beneficial not to invest in further formal qualifications even if the opposite is true from a macrosocial perspective. This leads us back to the weaknesses of human capital theory as described in Section 4.1.1, because this approach only explains differences in structural circumstances in rational terms and completely ignores traditional and cultural explanations for these differences. Furthermore, this approach sees the benefits of education and training simply in terms of monetary returns. It disregards other beneficial aspects that are not as easily quantifiable, such as the different patterns of individual career prospects or non-material benefits, e.g. the gaining of higher social prestige.

In summary, it has to be pointed out that to explain life course benefits just in terms of human capital rates of monetary return is ultimately very limited. Despite several refinements of estimation techniques, too many dynamic and unpredictable

factors cannot be anticipated or estimated. Human capital rates of return ignore structural differences resulting from traditional factors that produce inequalities in the access to and outcomes of education and training, both within and between European countries. Last but not least, it can be questioned whether these studies have a value apart from pure scientific interest. As they assume a balanced situation, which cannot be found in reality, any recommendations for policy and practice must, by their very nature, be limited.

5.2. Education, training and labour market participation

Another group of studies deals with the different dimensions of an individual's occupational career. These, generally speaking, look at his or her participation in the labour market and are either largely descriptive or based on one or more labour-market theories (Section 4.1.2.). The diversity of topics covered and of theoretical approaches and methods makes it very hard to compare results from these studies, especially from a European perspective. Nevertheless, some key generalities are summarised here.

There is strong evidence that higher qualifications and skills significantly reduce the danger of spending a considerable part of one's working life in unemployment. Evidence also shows that the value of education and training and continuing education and training affects not only one's current career but also that it has accumulative effect over the whole working life (Bukodi and Robert, 2002; Noguera et al., 2002; Becker and Schömann, 1999). As basic education and training determine access to higher and continuing education and training to a considerable extent, individuals with higher educational and vocational degrees have much better working career opportunities.

However, research also indicates national differences regarding the link between education and training and career prospects over the life course. In countries with a high standardisation of training systems and an emphasis on well-defined vocational qualifications, adequate employment and successful working careers are strongly dependent on specific vocational qualifications. This link is not as strong in countries with less

well-integrated education and employment systems and less vocational specialisation (Liefbroer, 2002; Klijzing, 2000; Blossfeld and Mayer, 1998). In systems fostering high standards of vocational qualification, the differentiation between the unqualified and vocationally qualified constantly increases over the working life, with there being hardly any opportunity to compensate for this (Antoninis and Tsakoglou, 2001). On the other hand, the material benefits of education and training in terms of employability, the avoidance of unemployment and career development are generally higher in countries with specific vocational education (Shavit and Müller, 2000).

Upward mobility and individual career development seem to be increasingly bound to the participation in continuing VET and lifelong learning opportunities (Becker and Schömann, 1999), as do increased job stability and labour market flexibility. In both cases this leads to higher income and improved career prospects (Fitzenberger and Prey, 1999). For Germany in particular, completed and certificated participation in further VET supports upward mobility and income growth but this might not be equally true for other countries with less formalised and structured education and training systems (Becker R., 1993). As access to further VET is strongly determined by educational levels, the selective mechanisms which operate to qualify for further training tend to lead to a cumulative increase of educational inequality over the life course (Schömann and Becker, 1995; Becker R., 1993).

Earlier studies (Meulemann, 1990b) sometimes found that additional qualifications had a negative overall effect on subsequent job status because employers possibly considered the acquisition of additional qualifications in other fields of study to be inconsistent or because they were uncertain about the value of additional skills and flexibility. However, more recent research has rejected this finding. This might indicate a constantly growing need for individuals to adapt to new skill requirements of the labour market and to the necessity for lifelong learning. Double qualifications, in the sense of acquiring two entirely different vocational or university degrees, do not result in easier access to jobs or the achievement of a higher job status at a later date.

The importance of initial and continuing education and training for participation in the labour

market is also clearly shown by looking at the other side of the coin: the continuing and cumulative disadvantages of unskilled people or those with no formal education and training in the life course (Solga, 2002; Stone et al., 2000; Bynner, 1995; Dietz and Matt, 1994). Nevertheless, research shows that a direct linear relationship between disadvantages experienced in education, training and labour-market participation on the one hand and problems of individual development (e.g. delinquent behaviour) on the other hand, contrary to popular belief, does not exist (Schumann and Mariak, 1995; Böttger, 1998; Matt et al., 1998).

5.3. Education, training and transitions

As pointed out in Section 4.1.3 transition periods (between education and training, education/training and employment, etc.) are of special interest for life-course research, because the life course – in contrast to an individual biography – is in principle merely made up of successive transitions. In particular, the degree of success achieved in the transition to the first job is considered to be a formative element for the whole later career and life path.

In general, research shows the beneficial impact of education and training on the success of the transition from education and training to work. The very low skilled in particular have major disadvantages compared to other young people who at least have some kind of formal education or training (Bynner, 1994; Heinz, 1999; Starrin et al., 2000).

However, clear national differences are also apparent (Starrin et al., 2000). Transitions seem to be comparatively easy in Denmark, Germany, the Netherlands and Austria but in southern European countries like Greece, Italy or Spain, direct entry in a stable position after completing education or training seems to be extremely difficult. In Belgium and Sweden, where the systems of education and training are decoupled and where there is an emphasis on the general education system, one can see a trend towards the polarisation of extremely highly and very poorly qualified people. In addition, young people experience the trap of companies demanding a high level of qualification but at the same time reducing their

offers of on-the-job training. Due to the lack of work experience and job related skills, it has become more and more difficult to gain a first job (Rantakeisu et al., 2000). In contrast, Germany has always been known as a country that eases the transition from education to work by the dual system, which combines theory (in schools) and practice (workplace) in a differentiated VET system. However, due to a worsening labour-market situation and job cutbacks the dual system has experienced a serious crisis. Companies have reduced their offers of training or do not take on apprentices (Kieselbach, 2000).

‘The Swedish education system is almost diametrically opposed to its German counterpart: in Sweden, education is not so tailored towards the requirements of the labour market, whereas in Germany the system is too adjusted to short-term demands by the industry and thus compels young people to decide on a particular vocational training too early.’ (Kieselbach, 2000, p. 37).

In southern European countries such as Greece and Spain the lack of coordination between the educational system and the labour market accounts for many of the problems of youth unemployment. In both countries the youth unemployment rate is three times higher than the overall rate of unemployment. Despite their limited job prospects, university degrees in Greece are overvalued, because they are traditionally connected with high social esteem for the family. In contrast, vocational training is regarded as being of minor value, which leads to a mass of unskilled university graduates in a labour market demanding specific vocational qualifications. Spain currently tries to challenge its high youth unemployment by a system reform that aims to improve the adjustment of demand and supply. The decision either to go to university or to choose a vocational strand is still mainly determined by financial opportunities and social class. However, people with a university degree are more likely to become unemployed than those with intermediate level qualifications because of an early and continuing decrease in jobs requiring high qualifications. A high level of qualification alone, therefore, does not improve the individual’s opportunities on the labour market (Lemkow et al., 2000; Sokou et al., 2000).

From a life-course perspective, these results are of relevance in several different ways. As

already pointed out, it is assumed that individual life trajectories are entirely determined by the educational and occupational system. As has been shown, the education and training system and its relationship to the labour market has a major impact on the success or failure of young people's transition to their first (stable) job. But as far as is known from studies of working careers, the impact of education and training, and consequently of its system, goes far beyond this. Through the link between occupational factors, unemployment and employment and social in-/exclusion, the educational system contributes to the quality and quantity of educational benefits throughout the entire life course (Müller et al., 2002). This is also supported by the findings of the Yuseder project (Starrin et al., 2000), which show that countries with a poorly coordinated education and training system not only display low transition rates but also often provide few possibilities for further education or training. In addition, people with lower qualifications and low-income jobs typically have fewer chances of getting access to further education. This is likely to result in an accumulation of disadvantages and benefits in equal measure throughout the life course not only in, but also between, European countries.

5.4. Generational and cohort differences in education and training benefits

From a life-course perspective differences between successive generations and birth cohorts in the benefits they gain from education and training are of special interest, because social change over historical time becomes tangible when using a life-course approach (Section 4.1.4).

Throughout Europe there are clear generation and cohort effects in the attainment of education and training benefits. Subsequent birth cohorts display different education and qualification structures and are each faced with different opportunities in entering the job market due to economic, social and political developments (Brunello et al., 2001b; Bynner and Parsons, 2001; Bender and Dietrich, 2001; Bynner, 1998; Hægeland et al., 1999).

Generally older cohorts possess lower average levels of qualification and also had less difficulty in entering the labour market (Bynner, 1998). Due to the international economic turn-down from the early 1980s onwards, the labour-market situation has changed and increasing job competition has become prevalent. The pressure of general educational expansion has made it more and more difficult for young people to position themselves successfully on the labour market. A heightened significance of qualifications and skills as protection against unemployment is found in most of the studies reviewed. The younger the cohorts the more important higher levels of education and training become (Bynner and Parsons, 2001; Mayer, 1996).

The results of research into the monetary returns on education and training are not uniform. Whilst in Germany a significant decline in return rates can be observed across generations and cohorts, especially for women (Steiner and Lauer, 2000; Boockmann and Steiner, 2000), research from Norway indicates a trend towards higher return rates of education and training (Hægeland et al., 1999). An important question is how these differences can be explained. The usual explanation that the increased participation of women in the labour force and in their educational attainment is responsible for these differences seems questionable given that these were European-wide developments, which obviously had not led to a decline in educational returns across successive cohorts in all countries.

5.5. Social differences in education and training benefits

Besides generational aspects, there are two further central factors which help explain differences in education and training benefits in the life course: family background and gender. Children from low-income households or with less well-educated parents tend to be disadvantaged in their access to education, training and further education and training (Lauer, 2002). In most countries their disadvantages accumulate rather than decline over the life course (Bynner, 1995).

Despite numerous training and reintegration programmes for the low skilled and unemployed,

current educational systems still seem to foster educational inequality. However, there are also differences between countries as regards the depth and extent of this discrimination. Educational inequality related to family background seems to be stronger in those countries where traditional class structures survive, and where hierarchical education and training systems prevail and counterbalancing programmes are rare (Schnabel, R. and Schnabel, I.; 2002; Antoninis and Tsakloglou, 2001; Tsakloglou, 1993, 1997). On the other hand, financial transfers in public education, the promotion of reemployment programmes and other forms of intervention have high distributional effects for educational equality in these countries (Magoula and Psacharopoulos, 1997).

In a review of studies concerned with the conditions and consequences of being 'not in education, employment or training' (NEET) at age 16-18, Coles et al. (2002) find that NEET is strongly related to poor family background. Not being in education, employment or training, together with other related factors, is very likely to lead to material as well as non-material problems throughout the later life course: experience of unemployment, involvement in drug or alcohol misuse, poor health, parenting at an early age and involvement in crime. There is also evidence of lower earnings throughout the life course even when the person is in work. Many of those unemployed at the age of 18 have few or no qualifications and this significantly impacts on any later earnings if employment is obtained. Persistent offending amongst 18-30 year olds correlates very strongly with having been excluded from school, having no or low qualifications and regular drug and alcohol misuse. Evidence on persistent offenders confirms that an accumulation of risk factors leads to social exclusion.

In comparison to other socially disadvantaged groups, women have been able to catch up with men in education and training both in respect of levels as well as of types of qualification in the last 20 years. However, they have not been able to convert their education and training achievements into higher and better-paid jobs as successfully as men. Highly qualified women are still more likely than men to be under-achieving in terms of their occupation. Also women earn less than men at the same level of qualification (Dale and Egerton, 1997).

Research shows that there is not only a male-female segregation according to the allocation of occupational levels (vertical) but also for different types of vocations located on the same formal level (horizontal). Men typically hold occupations with higher educational benefits than women (income and job status). Moreover, as these vocations are typically attributed to male characteristics women have fewer opportunities to access these jobs. Occupational fields related to male characteristics (accountancy, law, computing, etc.) lead to higher material educational benefits than fields associated with female characteristics (humanities, education, social sciences, etc.) (Born, 2000; Dale and Egerton, 1997)

Women also do not often have the same chances of participating in continuing education and training programmes due to family commitments or because they are employed in parts of the (segmented) labour market where there are fewer possibilities to access continuing education and training and higher career options.

5.6. Non-material benefits of education and training and subjective biographical perception

Findings regarding non-material benefits of education and individual learning biographies complete the rather 'objective' social research presented so far. The biographical research summarised in Section 5.6.2 is often concerned with the non-material benefits of education as discussed in Section 5.6.1.

5.6.1. Non-material benefits of education and training

As explained earlier, non-material benefits are comparatively hard to define and even harder to measure. Therefore, life-course research mostly concentrates on the 'hard facts', the material benefits of education. Nevertheless, there are also some beneficial non-material aspects that are more or less agreed upon, such as health and the quality of life. However, with the exception of a few health studies, empirical measurements have to rely mostly on subjective judgements about personal wellbeing, quality of life and other rather 'soft' issues.

A number of life-course research studies display a positive correlation (not necessarily causality) between education, training and skills on the one hand and, for example, health, quality of life, family formation, reduction of criminal behaviour and avoidance of social exclusion on the other (Blackwell and Bynner, 2002; Schuller et al., 2002; Hammond, 2002; Preston and Hammond, 2002; Bynner et al., 2001; Lasheras et al., 2001; Hullen, 1998, 2000; Becker, 1998; Dale and Egerton, 1997; Frenzel, 1995; Blossfeld and Huinink, 1990). Education is in general one of the most important determinants of health inequalities. Becker (1998), for example, confirms the enduring impact of education on life expectancy on the basis of GSOEP and GLHS data. As education structures the life course, it is responsible for the distribution of socioeconomic opportunities. On the one hand the trend to higher qualifications has led to an increase in the average life span of European populations, on the other hand the persistence of educational inequalities in society contribute to the persistence of variance in life expectancy between the social classes. The educational level of the individual and of the family determines to a large extent their standard of living and quality of life.

There is also an indirect connection between education and behaviour for health and mortality risks (Lasheras et al., 2001; Marmot and Wilkinson, 1999; Nehru and Dhareshwar, 1993). As the increase of (lifetime) earnings, the enhancement of social status, etc., are direct effects of education and training, these may also lead to the reduction of indirect effects such as health risks and criminal behaviour. Education is also seen as an important condition for the formation of cultural capital like personal development, social participation and dealing with institutional demands (Becker, 1998). This in turn is central for the anticipation and processing of critical life events and coping with stressors which can affect the quality of life, self-consciousness and health.

There is evidence that men and women with higher qualifications are the most distinctive in terms of their marital arrangements. In comparison to lower vocationally qualified groups they are the least likely to have formed partnerships and to have had children by the age of 33. Also there is a strong relationship between the level of educational qualification and age at birth of the

first child for both men and women, with the most highly qualified delaying parenthood the longest. There is some indication that the most highly qualified women may be more likely to choose not to have a child (Huinink, 2000; Dale and Egerton, 1997). However, for Germany there is some evidence that the increasing educational attainment of women has led them to delay getting married but has not caused a general decrease in marriage overall. Contrary to general belief, the likelihood of women getting married seems not to have been affected by the increasing participation of women in the educational system (Blossfeld and Huinink, 1990). Life-course research needs to be considered alongside an individual's own subjective biographical interpretation before these results can be interpreted as advantages or disadvantages of education and training. Nevertheless, the well-discussed processes of macro- demographic change (birth decline, ageing societies) (will) also have a reveritive impact on the individual level.

5.6.2. Subjective biographical perception of educational benefits

Biographical research studies complement the objective, rather quantitative life-course perspective through subjective, qualitative insights of individual biographical interpretation (Section 4.1.6). The individual perception of education and training benefits is entirely related to the persons' educational and occupational biography and is therefore more dependent on individual interpretations and self-construction than on objective circumstances. However, biographical range is influenced by the structural limitations of the life course. The acquisition of non-material benefits is often placed within biographical contexts, because it is more difficult to find rational objective explanations for their definition as 'benefits'. Non-material benefits are not primarily objective constructs but are merely the result of subjective judgements.

Compared to life-course research, there are few studies concerned with the benefits of education and training from a biographical perspective. In addition, since the analysis of individual biographies aims to identify the special, unique characteristics of each single person, it is – strictly speaking – not possible to give any summary of results. The aim of this kind of research is rather to come to a reasonable under-

standing or interpretation of life courses and their differences. In comparison to the mere quantitative, objective life-course perspective, the central question is 'why' not 'if'. Therefore, individual interpretations are hard to generalise. However, the most outstanding outcome of biographical

research is presumably the discrepancy between objective events and their subjective interpretation. The same kind of experience, for example a interruption in the working career, is perceived in quite different ways depending on the individual biographical background (Schaeper et al., 2000).

6. Conclusions and recommendations

The purpose of this report was to provide an overview of life-course research as regards education and training benefits in Europe. After outlining the main problems involved in defining and measuring the benefits of education and training, the theoretical background of the life-course perspective was comprehensively explained. The synthesis of the two fields covered, namely research into the benefits of education and training and the life-course perspective, was done by explaining the special interest life-course research has in the analysis of education and training benefits for the individual and by showing how the life-course perspective enriches research into the impact of conventional education and training. After having set out the main lines of investigation, selected national and cross-national life-course studies, which provide empirical evidence on individual education and training benefits, were presented and their different approaches, use of data and conclusions were reviewed. Finally, the main results of the studies were summarised and an attempt was made to compare them from a European or at least a cross-national perspective. However, the different studies offer different definitions of education and training, a wide range of education and training benefits, heterogeneity in data quantity and quality and above all an enormous diversity of research questions. A serious comparison of results, which would allow for conclusions and recommendations to be made about the impact of country specific conditions, is therefore simply not possible. Our conclusion will offer a cautious attempt to address some general trends, but its focus will be on recommendations for further research rather than on implications for policy and practice.

As regards the individual's monetary returns on education and training throughout the life course, the studies reviewed indicate differences between countries in average return rates as well as in upward and downward trends. The consequences of these differences are hard to estimate. Some studies claim that there is higher mobility across national borders, particularly of highly educated

people. They suggest that countries with a continuing downward trend in educational return rates ought to increase their investment in education and training. Hence, these studies indicate substantial individual and social benefits to be gained from policies aimed at lowering the number of early school leavers and from providing socially deprived groups with the opportunities and incentives to continue education and training (Asplund, 2003). In comparison with cross-sections, longitudinal investigations highlight different context dependencies of human capital configuration. Human capital allocation is not a static characteristic of a society but is a process of acquisition and allocation in the individual life course and through historical change. However, as estimations of individual rates of returns are based on simple human capital assumptions of 'input' and 'output', results must be treated carefully. In addition, return estimations stem from national data sets in which the quantity and quality of data material is very different. A comparison on a European level would actually need a unique database. Results from studies dealing with a broader concept of education and training benefits, including different aspects of an individual's changes of status over the life course, are even harder to review for their general trends and recommendations, because they display very different approaches, focal points, empirical methods and measurements.

Moreover, since the majority of these studies do not aim to evaluate the education and training system of one or more countries but rather generally try to reveal how the individual life course is determined by education and training, or education and training systems, policy and practice implications are hard to derive. Nevertheless, these studies should not be underestimated within the framework of research into the impact of education and training, because they demonstrate the relevance that education and training has for the whole individual life course by showing that participation in education and training have an increasing and cumulative effect on occupational career and personal develop-

ment (Bukodi and Robert, 2002; Noguera et al., 2002; Becker and Schömann, 1999). These studies confirm what has been identified already in early life-course research (e.g. Featherman and Shavit, 1990): educational policy and practice have a major impact on the individual life course. The connection between the education and training system and the labour market, for instance, is a main factor in determining the entry into the job market and, as a consequence, later career development. Empirical life-course research also shows how the still existing selectivity of continuing education and training, as regards educational level, gender and family background and other social factors, and how this contributes to the persistence and accumulation of social discrimination throughout the life course. This means that simply increasing the opportunities for continuing education would not necessarily improve an individual's opportunities for participating in the labour market. On the contrary, this might lead to quite undesirable side effects such as the further polarisation of educational and occupational opportunities. Our recommendations would be to increase target group orientation and to provide permanent evaluation and quality controls. Furthermore, subsidised continuing education and training must be more than a mere social sop or a simple cure-all for problem groups, but must, as a matter of course, be integrated into a system of economic and labour-market policy (Allmendinger, 1994). Life-course research also shows the 'wider' or non-material benefits of education and training, especially for health, life expectancy, personal development and family formation, all of which also accumulate throughout the life course. As regards this – already repeatedly mentioned – accumulation effect of education and training and further education and training throughout the life course, the central policy recommendation from life course and biographical research would be to improve the participation in education and training of socially deprived groups. This would ease transitions between education and training, initial education and training and higher education, education and training and work. It would also facilitate vertical and horizontal mobility and actively foster the participation of the lower qualified in continuing education programmes. The life-course perspective also points to the necessity of devising specific, national solutions to policy

development in education and training, because different education and training systems do not simply exist as a matter of fact, but have developed over time due to particular historical and structural realities. However, life-course research as a rule does not provide evidence on the impact of particular education and training programs but restricts its education and training variables to levels achieved and to the number of years spent in education (or, at most, to types of qualifications). Therefore, suggestions as to how improvements could be achieved cannot be offered but this needs to be demanded of evaluative research.

However, the suggestions made above should be treated carefully. From studies, which draw on long-term prospective panels or retrospective analyses, we have learned that it becomes increasingly difficult over time to ascribe a specific effect to initial education and training or to a particular education and training programme. A variety of other factors, such as life experience, personal attitudes, family and social background, can all interfere with education and represent either conditions or impacts. Furthermore, most studies are based on national surveys that are difficult to compare because their definitions and the quality and quantity of their empirical work vary so much. In Europe longitudinal research has been concentrated in Germany, the Netherlands, the UK and a few Nordic Member States, whilst there is only a weak database for life-course investigations in southern and eastern European countries. The rapid economic advancement of these countries over the last few years would, however, make these the most interesting ones to assess for the impact of education and training over time. Increased efforts are therefore needed to produce comparable longitudinal data sets in Europe and to include southern and eastern European countries in particular. The ECHP will presumably be the most appropriate and most used data source for research into education and training benefits from a life-course perspective over the coming years. However, as the panel contains only limited information on education, training and skills a European cohort study, which focuses on aspects related to education and training, would be an essential addition long-term European research into the impact of education and training.

List of abbreviations

BCS70	1970 British cohort study
BHPS	British household panel survey
ECHP	European Community household panel
EPAG	European panel analysis group
GLHS	German life history study
GSOEP	German socio-economic Panel
IAB	Federal Institute for Employment Research
LNU	Swedish level of living survey
MLS	Malmo longitudinal study of social assistance
MS	Malmo study
NCDS	National child development study
NORS	Norway survey
PC	Prospective cohort
PP	Prospective panel
PURE	Public funding and private returns to education
R	Retrospective
RC	Retrospective cohort
SEdHA	Socioeconomic determinants of healthy ageing
SEP	Dutch socio-economic panel
SOEP	Socio-economic panel
VET	Vocational education and training
VTLMT	Education, vocational training and labour-market transitions

Annex — List of data and information sources

National and cross-national electronic catalogues

Acronym	Resource	Available from Internet [cited 15.07.2003]
BIBSYS	Online Library System of Norwegian University Libraries	www.bibsys.no/english
BVB	<i>Bibliotheksverbund Bayern</i>	www-opac.bib-bvb.de
COPAC	Union Catalogue of UK and Ireland	www.copac.ac.uk/copac
FoDokAB	<i>Forschungsdokumentation zur Arbeitsmarkt- und Berufsforschung</i>	— — —
FORIS	<i>Forschungsinformationssystem Sozialwissenschaften</i>	Access limited
GBV	<i>Gemeinsamer Bibliotheksverbund</i>	www.gbv.de
IBSS	International Bibliography of the Social Sciences	— — —
IBZ	<i>Internationale Bibliographie der Zeitschriftenliteratur</i>	www.asu.edu/lib/resources/db/ibz.htm
KOBV	<i>Kooperativer Bibliotheksverbund Berlin- Brandenburg</i>	www.kobv.de
KVK	Karlsruhe Virtual Catalog	www.ubka.uni-karlsruhe.de/kvk
LIBRIS	The union catalogue of Swedish libraries	http://www.libris.kb.se
LitDokAB	<i>Literaturdokumentation zur Arbeitsmarkt- und Berufsforschung</i>	— — —
OLC	Online Contents	www.gbv.de
SOLIS	<i>Sozialwissenschaftliches Literaturinformations-system</i>	Access limited
WISO	<i>Literaturnachweise für Wirtschafts- und Sozialwissenschaften</i>	http://www.wiso-net.de

Cross-national and national databases

Acronym	Resource	Available from Internet [cited 15.07.2003]
ACROSS	Educational issues across Europe	www.b.shuttle.de/wifo/across/=start.htm
CESSDA	European social science data archives	www.nsd.uib.no/Cessda
CORDIS	Community research development information service	www.cordis.lu
EHRD	Human resource development in Europe	www.b.shuttle.de/wifo/ehrd/=portal.htm
IDEAS		http://ideas.repec.org
LLL Base	Lifelong learning base	www.b.shuttle.de/wifo/III/=base.htm
OECD Ed	OECD education database	www.oecd.org/scripts/cde/fbase
SSRN	Social Science Research Network	http://www.ssrn.com/
VET Bib	Cedefop VET bibliographical database	http://libserver.cedefop.eu.int:4505/ALEPH

Online-bibliographies of professional organisations/institutes

Acronym	Resource	Available from Internet [cited 15.07.2003]
CSL	Centre for Longitudinal Studies, UK	http://www.cls.ioe.ac.uk
ISER	Institute for Social and Economic Research, UK	http://www.iser.essex.ac.uk
ECASS	European centre for the analysis in social science	http://www.iser.essex.ac.uk/ecass/
EPAG	European panel analysis group	http://www.iser.essex.ac.uk/epag
Eurydice	Information network of education in Europe	http://www.eurydice.org
FORUM	Forum for research in education and training	http://www.theknownet.com
MZES	Mannheim centre for social research in Europe	http://www.mzes.uni-mannheim.de
MPIB	Max-Planck-Institute for human development	www.mpib-berlin.mpg.de
DIPF	German institute for international educational research	www.dipf.de
FiBS	Institute of education and socio-economic research and consulting	www.fibs-koeln.de
ZEW	Centre for European economical research	www.zew.de
CRWBL	Centre for research on the wider benefits of learning	www.learningbenefits.net
ECSR	European consortium for sociological research	— — —
CREST	Center for research in economics and statistics	www.crest.fr/presentation/Apresentation.html
CLS	Centre for labour market and social research, Denmark	http://www.cls.dk
CIM	Centre for research in social integration and marginalisation, Denmark	http://www.hha.dk/eok/CIM/
IAB	Federal institute for employment research	www.iab.de
IZA	Institute for the study of labour	www.iza.org
ROA	Research centre for education and the labour market	www.fdewb.unimaas.nl/roa
WZB	Social science research center berlin	www.wz-berlin.de/
Cedefop	European centre for the development of vocational training	www.cedefop.eu.int
DFES	Department for education and skills	www.dfes.gov.uk

National and cross-national electronic data archives and statistical offices

Acronym	Resource	Available from Internet [cited 15.07.2003]
ADPSS	<i>archivio dati e programmi per le scienze sociali, Milano, Italia</i>	www.ifdo.org/org_archives/arc_bfr.htm
BASS	Belgium archive for social science	http://logi.rspo.ucl.ac.be
BDSP	<i>Banque de données socio politiques</i>	http://195.221.54.130/bdsp/
CIS	<i>Centro de investigaciones sociológicas</i>	www.cis.es
DDA	Danish data archive	www.dda.dk
ESRC	UK data archive	www.data-archive.ac.uk/
ESSDA	Estonian social science data archive	http://sys130.psych.ut.ee/esta
Eurostat	Statistical office of the European Communities	http://europa.eu.int/comm/eurostat

FSD	Finish social science data archive	www.fsd.uta.fi/english/index.html
IFDO	International federation of data archives	www.ifdo.org
NSD	Norwegian social science data services	http://www.nsd.uib.no
SDB	Social data bank, Greece	http://www.ekke.gr/databank/
SIDO	Swiss information and data archive service for the social sciences	http://www.sidos.ch
SSD	Swedish social science data service	http://www.ssd.gu.se
ZA	<i>Zentralarchiv für Europäische Sozialforschung</i>	http://www.gesis.org/ZA

Programme- and project bibliographies

Acronym	Resource	Available from Internet [cited 15.07.2003]
CATEWE	Comparative analysis of transitions from education to work in Europe	www.mzes.uni-mannheim.de/projekte
FAME	Vocational identity, flexibility and mobility in the European labour market	www.itb.uni-bremen.de/projekte/fame
Globalife	Life course in the globalisation process	http://alia.soziologie.uni-bielefeld.de/~globalife
ISSP	International social survey programme	http://www.issp.org/public.htm
Newskills	New job skill needs and the low skilled	http://158.143.98.51/homepage/tser
SEdHA	Socioeconomic determinants of healthy ageing	http://www.eur.nl/fgg/mgz/
STT	Schooling, training and transitions: an economic perspective	www.b.shuttle.de/wifo/across/p-st.htm
TSER	Targeted socio-economic research programme	http://www.cordis.lu/tser/home
Youth Marginalisation	Youth unemployment and processes of marginalisation on the Northern European periphery	www.b.shuttle.de/wifo/across/p-yo.htm
Yuseder	Youth unemployment and social exclusion	www.ipg.uni-bremen.de/YUSEDER

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Cedefop (European Centre for the Development of Vocational Training)

Impact of education and training

Third report on vocational training research in Europe: background report

Pascaline Descy, Manfred Tessaring (eds)

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Pascaline Descy, Manfred Tessaring

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