CEDEFOP
European Centre for the Development of Vocational Training

cambridge econometrics
connecting you to the future

Expansion demand and changes in occupational structure

I. Livanos and R.A. Wilson

3rd Technical Workshop
May 7-8 2007, Maastricht, Netherlands

ROA
Researchcentrum voor Onderwijs en Arbeidsmarkt
Research Centre for Education and the Labour Market

WARWICK INSTITUTE *for* EMPLOYMENT RESEARCH
1981- 2006
IER
Celebrating 25 years

Purpose

- Explain what accounts for changes in the occupational structure
- Forecast occupational shares within sectors

WARWICK INSTITUTE *for* EMPLOYMENT RESEARCH
1981- 2006
IER
Celebrating 25 years

Changing demand for skills

- Various studies (e.g. *Machin and van Reeven, Autor, D. et al. 2003, Acemoglu 2002, Machin 2001*) suggest that there is a shift away from low-skilled occupations towards high skilled ones.
- Main factors : international trade and skill-biased technological change.
- Not many studies have examined the causes of changing occupational structures in detail.

Previous works

Gregory et al. (2001)

They examined the changing demand for skills in the UK, and how it is influenced by technology, trade, and domestic demand, using a Leontief input-output model.

S = f(Technology, Consumption patterns, Trade)

WARWICK INSTITUTE *for* EMPLOYMENT RESEARCH
1981- 2006 IER Celebrating 25 years

Previous works

Bishop and Carter (1992), Bishop (1992)

They analysed the trends of occupational employment in the USA using a logistic growth path.

S = f(Technology (time trend), Economic cycle, Trade)

Previous works

Briscoe and Wilson (2003)

They used annual data from the UK LFS to model occupational trends over the period 1981 to 1999. They developed time series models for some nine occupational groups across 17 industrial sectors.

S= f(Technology (time trend), Economic activity levels, Relative Wages, Cyclical variables, Trade)

WARWICK INSTITUTE *for* EMPLOYMENT RESEARCH
1981- 2006 IER
Celebrating 25 years

Previous works

Cörvers and Dupuy (2006)

They developed a model in order to explain the occupational structure of sectors of industry in the Netherlands. They estimated the structural parameters of a model for the period between 1988 and 2003 using system dynamics OLS techniques.

S = f(Economic activity levels, Capital intensity Cyclical indicators, Technology (R&D))

Methods used by other occupational forecasters

- Fixed shares coefficients
- Extrapolations of past trends
- Extrapolations + judgments of future structure

The ideal specification

$$S_{ijt} = f(\text{Technology}_{ijt}, \text{Trade}_{ijt}, \text{Wage}_{ijt}, \text{Cyclical indicator}_{jt}, \text{Output}_{ijt}, X)$$

S denotes the share by industry (i) and occupation (j), and X denotes a vector of other individual characteristics such as sector of employment, country of residence, gender, etc

Data to be used

- Aggregate EU-LFS data.
- Micro-data from the EU-LFS
- E3ME data

WARWICK INSTITUTE *for* EMPLOYMENT RESEARCH
1981- 2006 IER
Celebrating 25 years

Aggregate LFS data (as published by Eurostat)

- 1993-2006
- Country
- Gender
- Industry
- Occupation

WARWICK INSTITUTE *for* EMPLOYMENT RESEARCH
1981- 2006
IER
Celebrating 25 years

LFS micro-data

- General characteristics
- Labour market activity
- Information on first job
- Information on flexible working patterns
- Information on second job
- Information on previous employment
- Methods of looking for a job
- Education
- Wages

E3ME data: indicators by industry, etc

- GVA
- Hours Worked
- Earnings
- Gross Output
- Imports
- Exports
- Unemployment rate
- R&D
- Investment in ICT

WARWICK INSTITUTE *for* EMPLOYMENT RESEARCH
1981- 2006
IER
Celebrating 25 years

Proposed model: mlogit

$$\Pr\left(OCC = j \mid T = t\right) = \frac{\exp\left(\Omega^{(j)} X\right)}{1 + \sum_{i=1}^{N} \exp\left(\Omega^{(i)} X\right)}$$

The equations state that the probability of the representative individual working in occupation *j* at time *t* can be expressed as a function of explanatory variables, normalised by the sum of probabilities for all categories

Alternative methods

- Technical problems with the full model
- Alternatively: logit models using the same set of explanatory variables

Proposed Regressors

- **Relative wage of occupation j**
- **Unemployment rate**
- **Sectoral value added**
- **Export volume share**
- **Import volume share**
- **Sector of employment**
- **Sector of employment x time**
- **Country of residence**
- **Country of residence x time**
- **Time period of observation**
- **Individual characteristics: gender, age**

Preliminary results: Greece

Multinomial logit econometrics output

	Managers		Professionals		Associate prof.		Office clerks Service workers		Machine operators		Other workers	
	Coefficient	Z ratio	Coefficient	Z ratio	Coefficient	Z ratio	Coefficient	Z ratio	Coefficient	Z ratio	Coefficient	Z ratio
t*Industry1	-0.41	-32.32	-0.82	-27.75	-0.58	-25.66	-0.65	-41.36	-0.28	-26.66	-0.21	-23.72
t*Industry2	-0.17	-14.28	-0.33	-24.26	-0.12	-10.67	-0.22	-24.28	0.11	15.15	-0.12	-9.76
t*Industry3	0.45	52.29	-0.15	-9.43	0.06	4.72	0.34	41.52	0.08	6.18	0.19	16.38
t*Industry4	0.23	10.93	0.11	5.08	0.42	22.3	0.36	21	0.6	33.85	0.21	8.59
t*Industry6	0.16	5.06	0.47	21.18	0.59	26.28	0.47	21.54	0.33	12.23	0.63	27.73

Log likelihood = -94441.334, Pseudo R2 = 0.1305, Prob > chi2 = 0, Omitted category = Specialized agr. workers and technicians, No of obs: 60,662

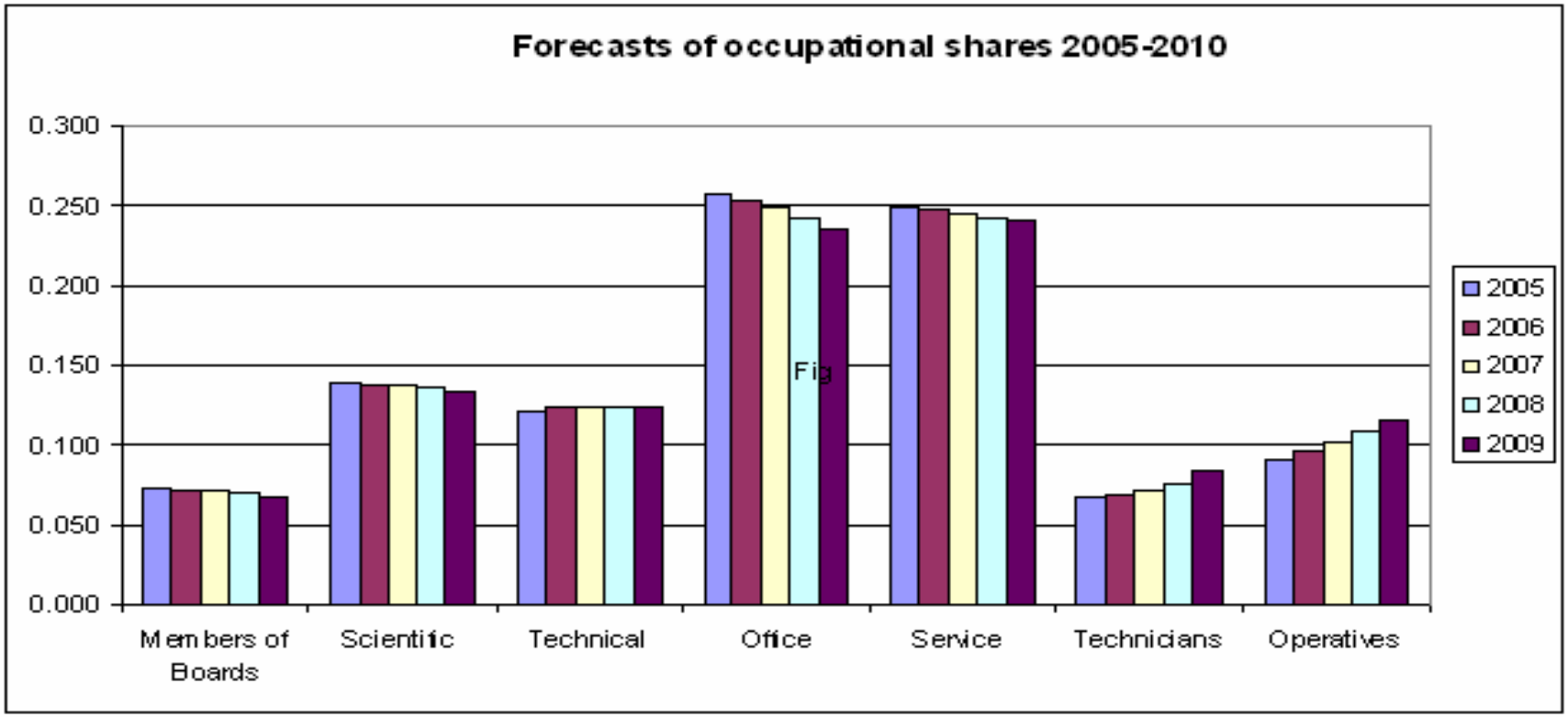
All coefficients are statistically significant at the 1% level.

WARWICK INSTITUTE *for* EMPLOYMENT RESEARCH

1981- 2006 IER

Celebrating 25 years

Preliminary results: Greece



Fig

WARWICK INSTITUTE *for* EMPLOYMENT RESEARCH

1981- 2006 IER

Celebrating 25 years

Preliminary results: Greece

	Forecasts of occupational employment 2005-2009						
	Members of Boards	Scientific	Technical	Office	Service	Technicians	Operatives
2005	296	565	489	1042	1005	271	368
2006	291	560	496	1023	997	277	390
2007	286	555	502	1004	992	289	414
2008	280	549	506	983	986	309	440
2009	275	542	506	958	979	338	467

WARWICK INSTITUTE *for* EMPLOYMENT RESEARCH

1981- 2006 IER Celebrating 25 years

Roundtable discussion

- Literature: are there any other works that we should be aware of?
- Methods: comments on proposed approach- any alternative suggestions?
- Model: other variables to be included model?
- Econometric technique: comments, alternatives?
- Data used: any comments, suggestions?
- Preliminary results: comments?