



The path toward a human-centric digital transformation.

What the learning capacity of organisations can do for jobs' skills matching

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Digital Transformation and Skills Outcomes

Technological revolutions often raise concerns about:

- Substitution of machines for labour
- Rise of inequalities

However, massive skills and job destruction due to automation, robotics, and AI has not materialized and is unlikely to do so. Instead, each revolution has profoundly transformed work practices, making it essential to assess impacts on:

- Quality of work
- Employment relationships
- Skills development

The Industry 5.0 strategy by the European Commission emphasizes innovation to ensure a sustainable, human-centric, and resilient economy in the context of digital and green transitions. This is the aim of the project **Bridges5.0**

WP2 maps **organizations' learning capacity, how it orients the adoption and uses of industry 4.0 technologies, and consequences regarding task restructuring, emerging occupations, skill needs, shortages and gaps.**

Measurement framework and data strategy

Context factors

Knowledge inputs (and their interactions)

I4.0 technologies
& Big data

Green technologies
& Smart materials

Learning capacity
of the organisation

Environmental preservation
capacity of the organisation



Knowledge outputs

Innovation
(technological,
non-technological,
environmental,
social)



Industry 5.0 Outcomes

Human centricity
(quality of work and
employment relationships,
occupational health and safety,
skills development, skills
mismatches)

Resilience
(Sustainability of the supply
chain in the long term)

Sustainability
(positive environmental impact)

Research focus

Current digital transformation can result in an accrued long-lasting **skills mismatch** and will also require a massive **reorientation of the education system**.

Is this **exogenous adjustment of workforce skills** the only way to go through the current digital transformation? Is there anything that firms can do to smooth out this transition?

Our hypothesis:

- Inserting technology into the production process is not enough to achieve a technological transformation and this process is **neither neutral nor deterministic**.
- Organisations make strategic choices to increase their **productive knowledge** and achieve the digital transformation, and in doing so they can either move towards an Industry 5.0 scenario of human-centricity, resilience and sustainability, or not.

A EU-wide-multilevel combined dataset

Outcome impact is on the employee

But

Inputs effort are on the company

- We need employee-employers level database to look at the role of enterprises' strategies on individual outcomes.
- We need to capture possible compensation mechanisms within industries.
- We need to look at the whole EU picture.

How we do we that?

We combine the 2019 European Company Survey (Eurofound), used to describe the firms' technological transformation, with the 2021 European Skills and Jobs Survey (Cedefop), which provides information about human-centricity outcomes related to skills mismatches. We merge the two sources at meso-level of industries (Nace Rev. 2, 2-digit level) within countries.

Coverage: Enterprises with more than 10 employees in 68 industries (B to N of Nace Rev.2) in EU 27 (ECS) and their employees (ESJS).

Digital technology adoption and use in ECS

Dimensions of digital technology and industry 4.0 adoption	
E-commerce technologies	[ECOMMERCE]
E-business technologies	[ICTAPP] (Δ)
Data analytics	[ITPRODIMP] [ITPERMON] [ITPERFMONUSE] (Δ)
Robots	[ICTROB]

Learning Capacity of the organisation in ECS

Dimensions of the learning capacity of the organisation	
Cognitive dimension of work	[COMPPROBS] [LEARNNONEED] (% employees)
Training opportunities	[CONTR] [PAIDTRAIN] [ONJOB] (% employees)
Autonomy	[SUPCHECK] 2 nominal items [COMORG] (%employees)
Motivation	[MOTICHAL] [MOTILEARN] [MOTIMIS] 4 items scale
Autonomous teamwork	[TEAMEX] [TAUTON] 2 nominal items
Direct help and support	[DISCHELP] 4 items scale
Participation	[SUGGS] [DISCSUGG] 4 items scale [REGMEE] [STAFFMEE] 3 items scale [MMEPINORG] 5 items scale

Innovation in ECS

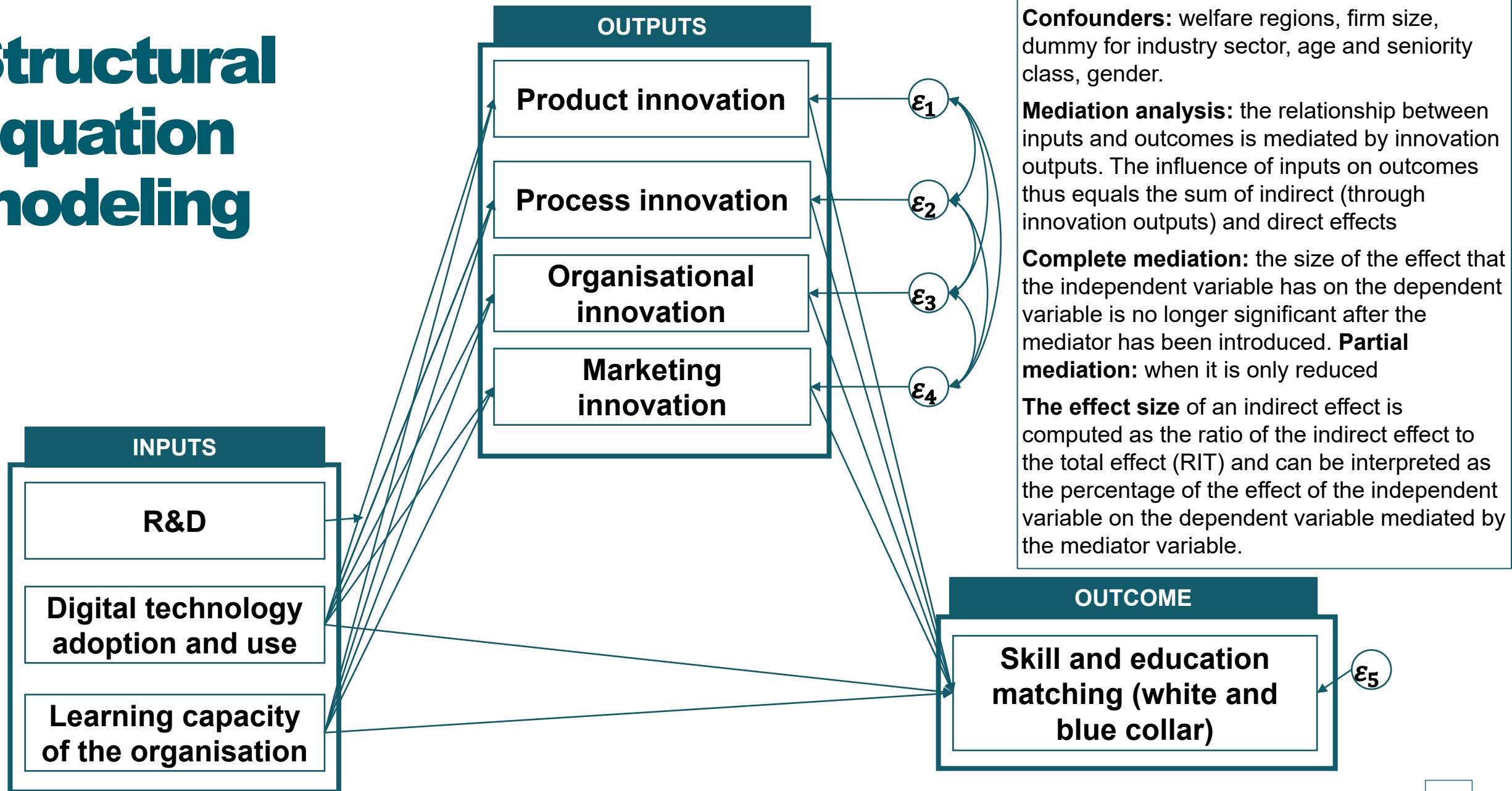
Sub-dimensions	Questions	EU diffusion rates
Product innovation	Since the beginning of 2016, has this establishment introduced any new or significantly changed products or services? Answer yes, whether new to the market or to the establishment	30,9%
Process innovation	Since the beginning of 2016, has this establishment introduced any new or significantly changed processes either for producing goods or supplying services? Answer yes, whether new to the market or to the establishment	32,1%
Marketing innovation	Since the beginning of 2016, has this establishment introduced any new or significantly changed marketing methods? Answer yes, whether new to the market or to the establishment	27,8%
Organisational innovation	Since the beginning of 2016 have employees directly influenced management decisions in the area of organisation and efficiency of work processes? Answer to a great extent	20,0%

Our interests variables – white/blue population

B_ISCOD1_CAT recoded into 2 categories
 White-collar workers: Skilled and semiskilled occupations
 Blue-collar workers: Manual and elementary occupations

Indicator	Questionnaire question(s)	Recodification criteria
Skills underutilisation	E_SKILLU: To what extent can you use your current knowledge and skills in your main job?	skill_underuse= 1 if Small extent/Not at all; 0 otherwise
Match dissatisfaction	F_SATMATCH: On a scale from 0 to 10, where 0 is completely dissatisfied, 5 moderately satisfied and 10 is completely satisfied, how satisfied are you with the following aspects of your job? Job' match with your qualification and skills	Match_dissat= 1 if not satisfied; 0 otherwise
Education Underqualification	E_HIGHED – What Is the highest level of education you have completed? E_REQED – What is the level of education usually needed nowadays to do a job like your main job?	edu_underqual= 1 if e_highedl<e_reqedl; 0 otherwise
Real overqualification	Combination of education overqualification (opposite of education underqualification) and skills underutilisation	real_overqual= 1 if skills_underuse==1 & edu_overqual==1; 0 otherwise

Structural equation modeling

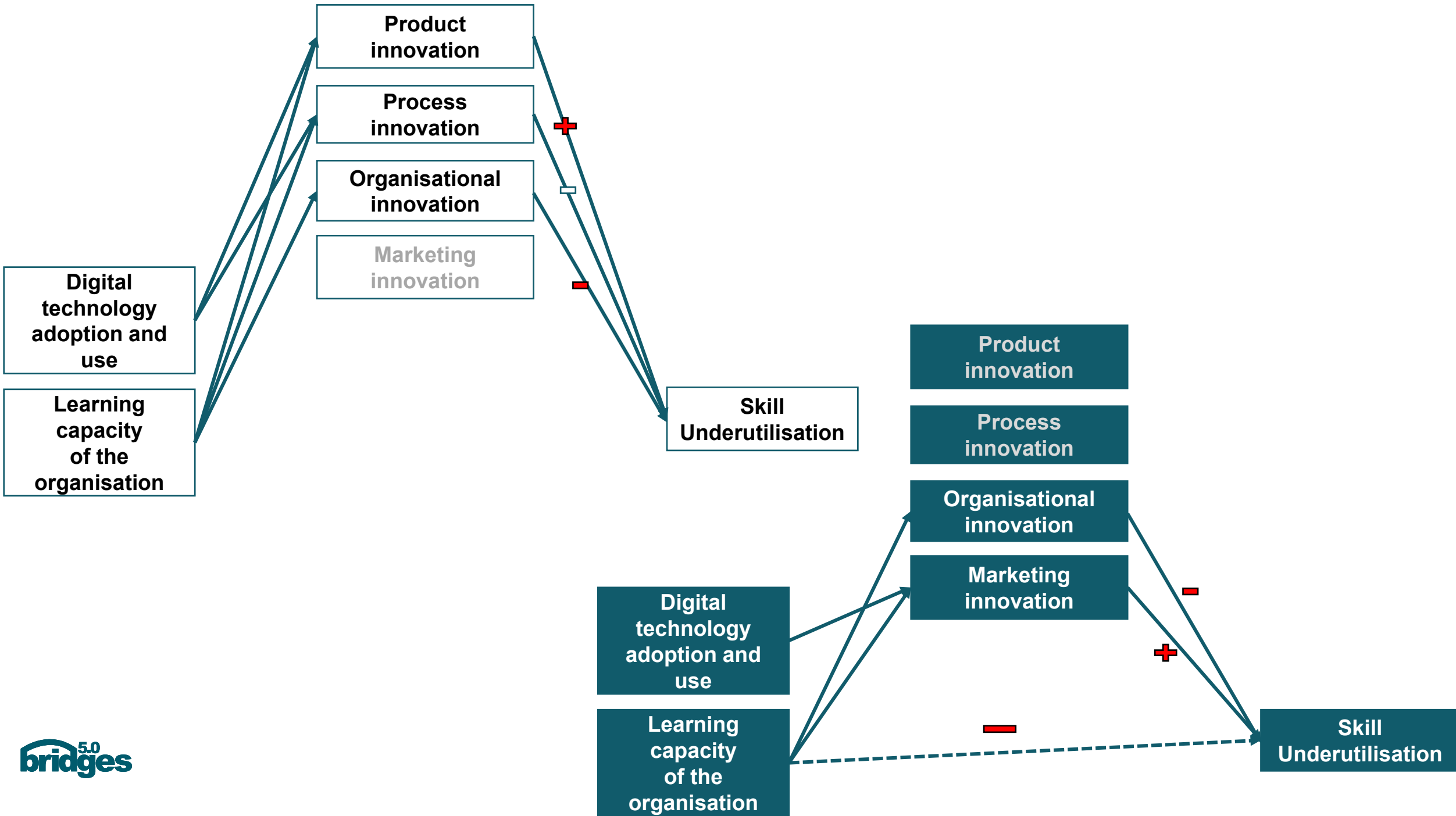


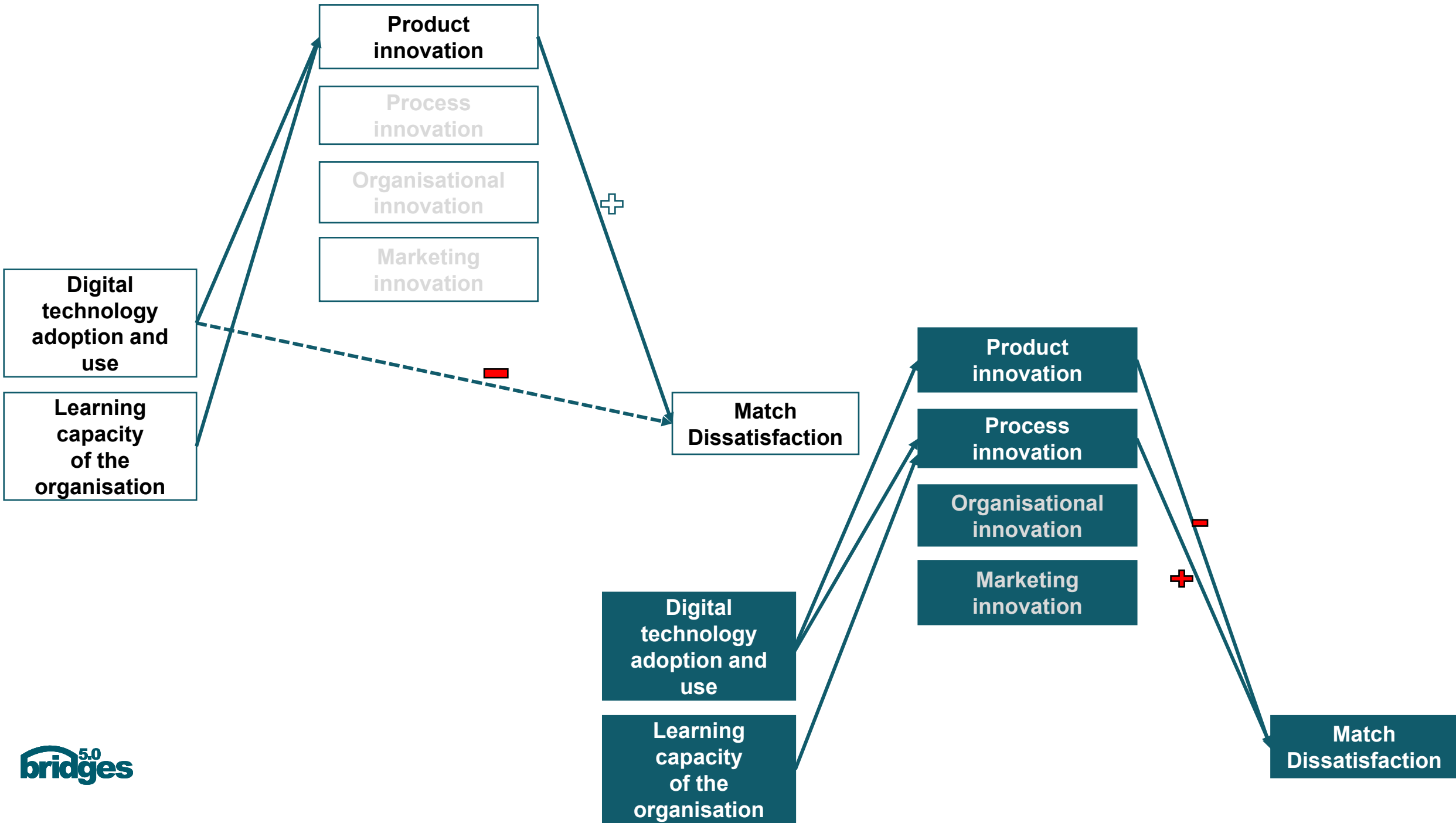
Confounders: welfare regions, firm size, dummy for industry sector, age and seniority class, gender.

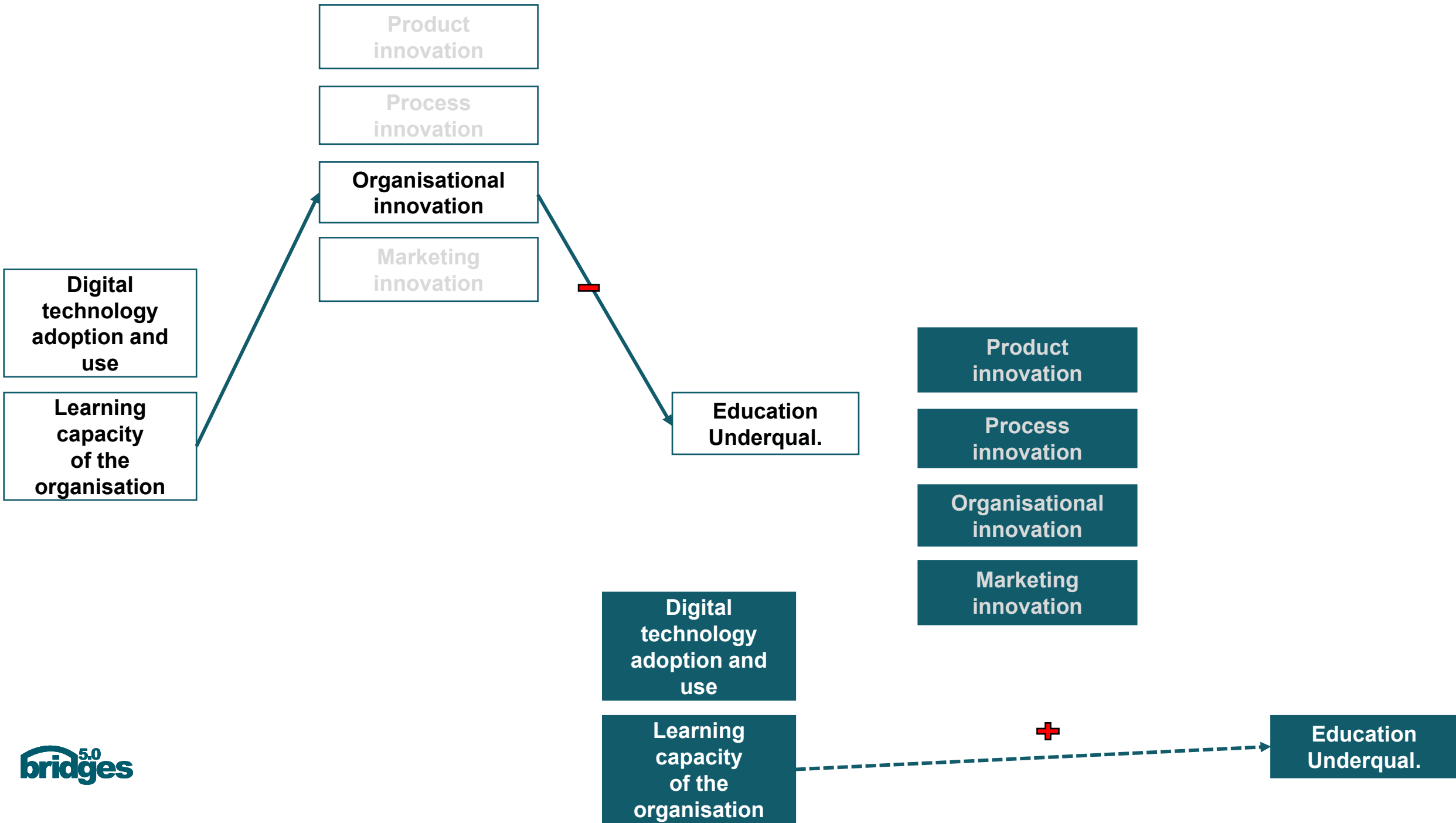
Mediation analysis: the relationship between inputs and outcomes is mediated by innovation outputs. The influence of inputs on outcomes thus equals the sum of indirect (through innovation outputs) and direct effects

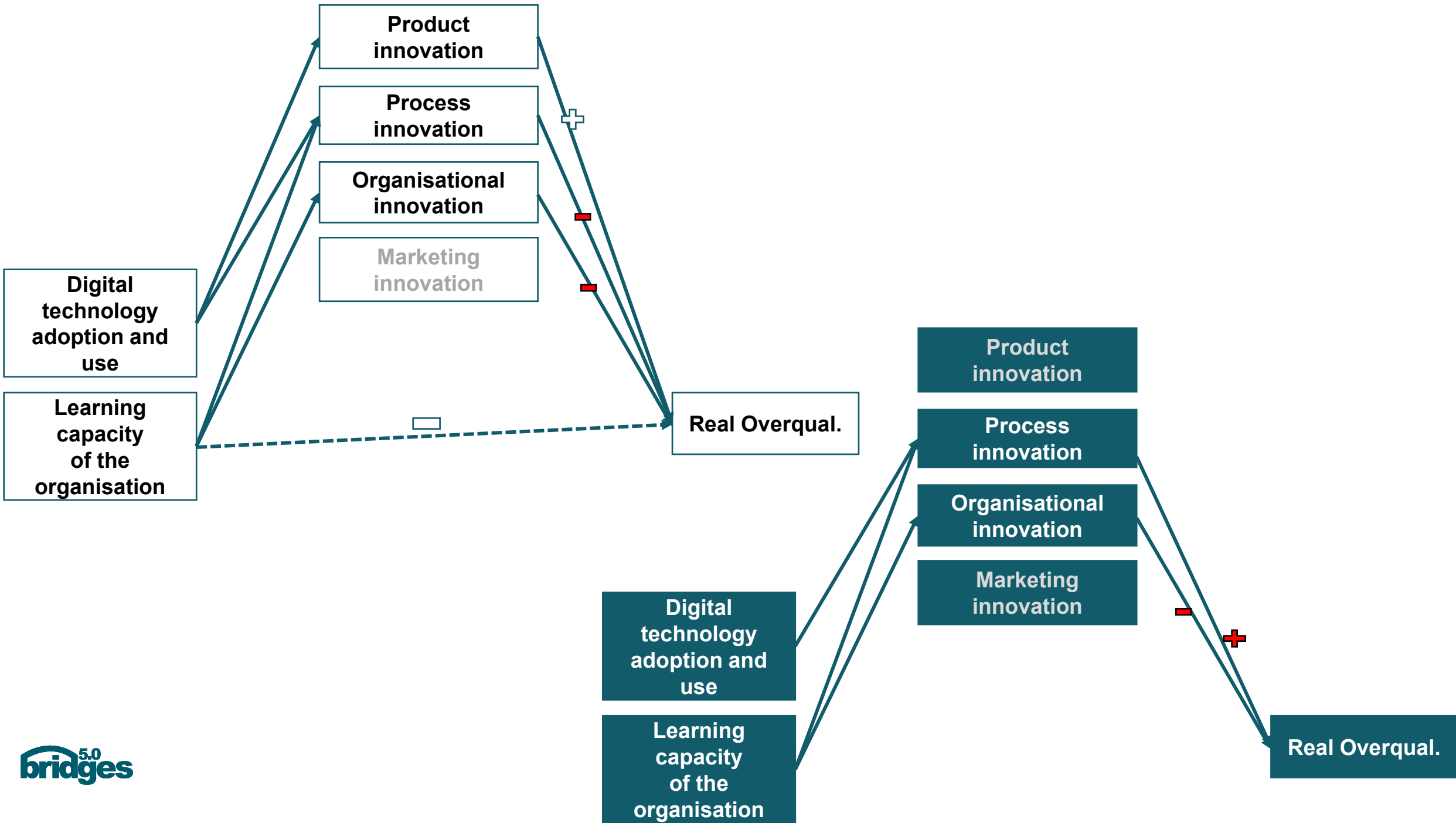
Complete mediation: the size of the effect that the independent variable has on the dependent variable is no longer significant after the mediator has been introduced. **Partial mediation:** when it is only reduced

The effect size of an indirect effect is computed as the ratio of the indirect effect to the total effect (RIT) and can be interpreted as the percentage of the effect of the independent variable on the dependent variable mediated by the mediator variable.









Conclusion – indirect effects

The innovation strategy of the firm also influences the also interfere in the genesis of skills mismatches

Product Innovations:

- Pose challenges for white-collar workers by increasing:
 - Skill underutilization.
 - Real overqualification.
 - Dissatisfaction related to mismatched roles.

Organizational and Process Innovations:

- Have mostly positive effects for white-collar workers by:
 - Reducing skill underutilization.
 - Decreasing overqualification.
- However, their impact on role dissatisfaction is not significant.

Blue-Collar Workers:

- Organizational innovations help reduce skill underutilization and overqualification.
- Marketing innovations, in contrast, tend to have an opposing effect, increasing mismatches.
- Product and process innovations affect dissatisfaction differently:
 - **Product innovations** are linked to higher dissatisfaction.
 - **Process innovations** tend to improve satisfaction.

Conclusion – direct effects

The Learning capacity of the organization helps ease the challenges of digital transformation, and it can play a role in smoothing out the painful aspects of the transition through its direct effects :

- It allows white-collar workers to use their skills effectively as it reduces skill underutilisation.
- It lifts the burden of keeping up with the transformation by enabling less-educated workers to perform more complex tasks.
- It also reduces the overqualification of white-collar workers.

Digital technologies have a direct positive effect by reducing dissatisfaction related to skill mismatches among white-collar workers.

Next steps: Robustness test on CATI sub-sample to validate the only-CAWI questions



**Thank you for your
attention!**



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