

Diverging patterns of digital transformation and innovation activities in European firms

Martin Falk (University of South-Eastern Norway, USN)

Eva Hagsten (Swedish Agency for Economic and Regional Growth)

Abstract (500 words)

This study examines the determinants of innovative activities and aspects of digital transformation at the firm level. Technological innovations are measured as product or process innovations, differentiated into incremental (new to the company) or radical innovations (new to the market). Digital transformation is captured by the use of e-commerce applications, robots or data analytics. A special feature of the empirical model is that the different types of innovations and ICT activities within the digital transformation are allowed to be correlated with each other. Another important aspect is that a context variable is employed: the country level R&D capabilities. Few studies examine the presumptive complementarity of innovation activities to a set of different kinds of information and communication technologies. Data for the analysis originate from the "European Business Survey 2019", which contains information on approximately 22,000 firms across 27 EU countries and the United Kingdom.

The simultaneous model consists of two ordered Probit equations (for product and process innovations) and three binary Probit equations (e-commerce, use of robots, use of data analytics). Independent variables include size of firm, age, industry affiliation, exporting or foreign customers, share of managers, past performance, competitive intensity and general R&D intensity and speed of internet at the country level as alternative to country level dummy variables. The system of equations is estimated by the simulated maximum likelihood estimator. As a robustness check a multi-level simultaneous model is estimated where the error term is allowed to vary across countries.

Descriptive statistics show that robot use is highest in manufacturing (29 per cent) followed by financial firms (18 per cent). In transport, accommodation and food services firms the proportion is lower than 3 per cent. Across countries, the use of robots is highest in Finland

(21 per cent), followed by Denmark (17 per cent). Data analytics to improve production or service processes is highest among ICT service companies (66 per cent) and in the financial sector (65 per cent) as well as in the country of Spain. E-commerce activities are most common in Finland and in the ICT sector. Product or process innovations that are new to the market are frequent in ICT service firms.

The results of the simultaneous model show that the degree of product and process innovations are also highly related. Different types of ICT show a low degree of correlation with technological innovations and also within each other. Significant differences can be found across countries, size, age and exporting, while competition intensity plays a minor role. This study builds on Koster (2021) but uses a more sophisticated econometric model as well adds different types of ICT to the model.

References

Koster, F. (2021). Organisational antecedents of innovation performance: An analysis across 32 European countries. *International Journal of Innovation Management*, 25(04), 2150037.

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