

The Double Divide: The Intensity of Intangible and Investment into New Technologies in Small Firms and Their Contribution to Firm Performance

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Background. Historically, technological progress has been the biggest contributor to productivity growth. According to Chadha (2019), even 2/3 of the productivity growth in the UK resulted from technological progress. The new technologies of Industry 4.0 are expected to boost productivity growth amidst the declining trends in overall productivity growth in the ageing European economies. However, while the large companies are very successfully implementing different technological solutions, from simplest cloud work and use of smart mobile devices to smart factories, robots, big data and even augmented and virtual reality, in the majority of technologies, with the exception of smart mobile devices small(er) companies significantly lag behind. In Slovenia, for example, around 40-50% of medium enterprises used IoT, CPM, CRM, big data, and only 10-20% of micro companies (Čater et al., 2019b). Small and medium sized companies represent around 99% of all companies, with micro companies representing alone around 95% of companies in Slovenia. Technology is expected to increase productivity growth for a number of reasons, from short-run cost and efficiency effect to long-run strategic benefits (Čater et al., 2019a; Prašnikar et al., 2017). Nonetheless, companies, especially smaller, are slow in the implementation. When studying the obstacles in Slovenia, the biggest obstacle is not financial, but human: from the lack of skilled workers, technical knowledge, resistance to change both behind white and blue collar workers (Čater et al., 2019b). Following the literature on intangible capital, the intangible capital components, which are largely related to human capital as well, are crucial in firm performance (Corrado et al., 2009, 2017; Mason et al., 2018; O'Mahony, 2012; Piekkola, 2018; Roth, 2020). Small(er) companies typically are generally less focused on investing in intangible capital (EIB Investment Survey, 2020), which could be an additional factor, holding back the implementation of new technologies and productivity growth.

Purpose. This analysis focuses on investigating the contribution of new technologies (number of technologies used, as well as specific technologies, in particular robots, CPM, CRM and big data) to firm productivity. We are in particular interested in the role of complementary investments in both technologies and intangible capital at the same time as an additional boost to productivity growth.

Data. The analysis relies on a combination of four different firm-level databases, three of them population-wide. The proprietary »Agency of the Republic of Slovenia for Public Legal Records and Related Services/ AJPES« data provide the demographic characteristics and detailed financial statements data on the entire population of Slovenian firms. Information about the structure of employees in each firm was obtained from the population-wide »Registry of active population«. Based on the structure of employees by education and occupation, we were able to construct the variables on the investments in intangible capital in each firm. These datasets were merged with the micro-data from the official EU-harmonised survey on »The use of ICT in companies« conducted by the Slovenian Statistical Office among around 1500 companies per year. In total, 18 212 observations were investigated over the period between 2008 and 2017.

Results. The analysed sample comprised 25.6% micro companies, 11.3% small companies, 14.9% small companies and 48.1% large companies. The results show that there are significant differences between companies by size. While more than a third of large companies used big data, only a tenth of small companies did. The differences in the intensity of investment in intangible capital follows a similar pattern – smaller companies lag significantly, with many small companies not having any intangible capital at all. Productivity analysis shows that while the contribution of using either new technologies or having intangible capital is positive, it is interestingly U-shaped – the impact is stronger in small than medium companies, while it is again stronger (strongest) in large companies. However, if companies have both new technologies and invest also in intangible capital, the impact is significantly stronger.

Implications. Results stress that (1) small and medium companies lag in the implementation of new technologies, (2) new technologies have a positive impact on productivity growth, (3) firms must acknowledge the importance of investing both in technology and human resources to maximize the benefits.

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