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DIGITAL TECHNOLOGIES AND THE PERFORMANCE OF SMALL AND MEDIUM ENTERPRISES

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Abstract:

The profound negative effects of the current pandemic crisis on firms, especially small and medium-sized ones, have forced them to rethink their business models. In order to survive and compete, many businesses have focused on adopting and using digital technologies. Several studies have shown that digital technologies could facilitate business continuity and increase their resilience to shocks. Starting from the fact that SMEs are an important source of innovation and the predominant form of business organization, the European Commission has repeatedly emphasized the importance of digital business transformation and the need to support the digitalisation of SMEs. Our study aims to analyse the degree of digitalisation of SMEs in EU countries and the obstacles they face in digitizing their business. In addition, we aim to examine the extent to which the use of various forms of digital technology could stimulate the growth of SME performance. The analysis covers the 27 EU member states and is mainly based on data provided by the European Commission and the OECD, as well as information provided by European Investment Bank surveys. Our paper complements the literature focused on the digitization of SMEs, especially by highlighting the gaps between EU countries in terms of digitization of the SME sector, but also by empirically examining the impact of digital technologies on the performance of SMEs in EU countries. Through its content, our study emphasizes the crucial importance of digitizing SMEs so that these companies are drivers of economic growth and development of countries. The results of our research may be of interest to both researchers concerned with business digitalisation and decision-makers at various levels, who should prioritize the identification of appropriate measures to stimulate digital innovation and investment in information and communication technology infrastructure.

Key words: *Digitalisation, SMEs, Performance, Constraints, European Countries*

1. Introduction

One of the current concerns of researchers is to identify ways to increase the performance of Small an Medium Enterprises (SMEs), because these companies are the

engine of the economies, and an improvement in their performance can generate positive effects on the overall economy.

Moreover, especially in the context of recent years, of major challenges on the world's economies, adapting SMEs to all these changes is essential. The digitisation process is a major issue for the European Commission. Digitisation of SMEs is an essential business development to ensure that SMEs can contribute to the transformation of the EU economy into a sustainable economy driven by a new industrial revolution and reap the benefits of such a transformation (European Commission, 2021).

The process of digitalization of enterprises started several years ago has been accentuated in the context of the Covid-19 pandemic. Especially in this context the enterprises, in order to adapt to the situation and to ensure their survival, had to find a way to continue their business without physical contact. Thus, the use of digital technologies has come as a life-saving solution and has provided new opportunities for businesses. Businesses that have managed to adapt and implement basic digital technologies as quickly as possible have continued their business and survived the new challenges. Due to their specificity, SMEs face more difficulties in doing business than large enterprises, so even the digitization process involves more challenges for these companies.

The main objectives of our study are to provide an image of the state of digitalization of SMEs in European countries but also to offer an empirical evidence on the relationship between the digitisation of SMEs and their performance. Therefore, we focus on seeing if using digital technologies in SMEs could determine an increase in the performance of businesses. The empirical analysis part of our study has two major directions. Thus, on the one hand, we analyse the data on digitalisation and we highlight the situation in European countries, also focusing on identifying the barriers that SMEs face in the path of digitalisation. In the second part of the empirical analysis we use econometric models to emphasize the relationship between the use of digital technologies in business and the performance obtained by SME. We consider a sample of 27 European Union (EU) countries, for a period of five years (2017-2021). Our research focuses a set of indicators expressing SMEs performance, and also another set measuring the digitalisation of businesses. We tested several panel data regression models for different types of SMEs.

The value added of our study comes from analysing the link between SMEs digitalisation and their performance, on an extended sample of 27 EU countries, for recent years. Our paper complements the literature in the field by pointing out the need for policy makers to stimulate the use of digital technologies by businesses because this could stimulate their performance and could generate positive effects on the economy as a whole.

The paper is structured as follows. First, we briefly analyse the literature that focus on digitalisation of SMEs. Following, we describe the methodology by presenting the model and the variables. We continue with summarizing the results and discussing them. The study end with conclusions.

2. Linking SMEs digitalisation with performance

OECD (2021) point out the fact that using digital technologies can generate many significant benefits for enterprises. Digitalisation has the effect of reducing the transaction costs offering better and quicker access to information, and communication between staff, suppliers and networks. Also, can help SMEs integrate into global markets, by reductions of the costs associated with transport and border operations. Digitalisation facilitates the access of enterprises to resources, including financial resources, training, and recruitment channels, including government services, which are increasingly being made available on-line. It also supports innovation, and greater access to innovation assets, as well as the potential for enterprises to generate data and analyse their own operations in new ways, to drive improved performance. Even though digitalisation brings the benefits listed above, many SMEs are still lagging behind with the adoption of digital technologies, and the smaller the companies, the greater the differences compared to large companies.

Digital transformation can offer opportunities for growth and competitiveness of the enterprises, regardless of their size (Matt & Rauch, 2020). Ulas (2019) analysis the digital transformation of the manufacturing sector in Turkey, and show that digital transformation determines an increase of the capabilities of enterprises and also an improvement of their processes. But, the authors also affirm that SMEs do not have a constant behaviour in implementing digital technologies and need external support to integrate digital transformations in the overall strategy of the enterprise. Other studies have also shown that the appropriate and strategic adoption of digital technologies can stimulated competitiveness, productivity, and performance of the SMEs (Bruque & Moyano, 2007; Dibrell et al., 2008; Kleis et al., 2012; Chan et al., 2019). The results obtained by Nuseir & Aljumah (2020) showed that digital marketing and that the use of the latest digital technologies help the enterprises to approach customers remotely, and that this influences their business performance.

Other studies (Mazzarol, 2015; Octavia et al., 2020) suggested that the ability to adopt digital technologies and their effective use have a significant influence on the performance of SMEs.

Application of digital transformation is more concentrated in certain sectors of activity, such as: healthcare, telecommunications, automotive, banking and manufacturing sectors (Nadeem et al., 2018). Thus, digital transformation is different depending on the sector of activity of the company. In addition to the business sector, the digital transformation of companies depends on other factors too: the ever-changing needs of consumers, the level of application of high technologies, the position of the enterprise's leadership and the size of the enterprise (Tarutė et al., 2018). Businesses which are frontier firms in digitalisation see higher revenue and productivity compared to less digitally inclined firms in the long run (OECD, 2018).

SMEs can use digital technology for supporting their business functions, for example, for sustaining marketing they can use platforms for e-commerce and also social media applications, for finance and accounting they can use open source software or mobile secure payment solutions, and for human resources they can use videoconferencing, shared calendars and instant messaging. These digital technologies

can either be completely free or may request payment for use as they are based on a service-oriented architecture accessible over the Internet (Cegarra-Navarro & Dewhurst, 2007).

SMEs usually adopt different degrees of digital transformations depending on the firms' contextual factors. These degrees of digital transformation can be represented by three groups. Therefore, first group consists of the SMEs which have a high level of digital maturity and which respond to the challenges by accelerating the transition toward digitalized firms. The second group comprises the SMEs that have liquidity issues but a low level of digital maturity who decide to digitalize the sales function only. The third group is formed from the SMEs that have very limited digital literacy but are supported by a high level of social capital, and they solve the challenges by finding partners who possess excellent digital capabilities (Priyono et al., 2020).

In order to ensure a successful digital transformation, it is needed to invest not only in IT artifacts and infrastructure, such as hardware, software, networks (Bradley et al., 2011; Besson & Rowe, 2012) but also in strategic, intellectual, structural, formal and informal, social and cultural dimensions (Chan & Reich, 2007; Pelletier & Cloutier, 2019). Imran and Kantola (2018) showed that for optimal performance outcomes of the enterprises, the significant operational changes in the external environment have to be correlated with compatible inter-organizational changes. However, these internal changes often face many challenges. Overcoming these challenges in digital transformation can be overcome by adapting business models, technology, and knowledge. Bouwman et al. (2019) also point out that for increase the benefits of adopting digital technologies for SMEs they have to spend more time and effort on innovating their business models.

The use of digital technologies can help the financial inclusion for SMEs, by helping them to obtain more easy the financial resources they need. The study of Rasheed et al. (2019) has analysed the role of digital micro financial services in enhancing SMEs' access to finance, and shows that digital financial services have greatly helped owner managers of SMEs in smooth management of their transactions and finances. Their study also points out that there is a need to further reduce the cost of using digital financial services and increase the financial product portfolio on digital platforms. Focusing on the same direction Nemoto & Koreen (2019) point out that the inclusion of the financial technology and innovations in traditional business models can expand SMEs' access to credit. Many studies have considered that funding diversification has a positive impact on enterprise performance (Guo et al., 2011), therefore increasing the access of SMEs to other sources of financing than the traditional ones (such as bank lending) could result in stimulating their performance. Similarly, the study of Mushtaq et al. (2022) is analyzing the data of 171,000 SMEs from 149 countries between 2006 and 2020, and emphasizes that SMEs with greater access to and use of new technologies are more likely to acquire financial resources from banks.

Besides all the positive effects of digitalisation for SMEs and their performance, there are other studies that have obtained contradictory results. So, the findings of Usai et al. (2021) showed that digital technologies have very low impact on innovation performance of firms, however Research and development expenditures are the most

reliable predictor of innovation. Their results sustain that there is a false belief that digital technologies improve innovation performance of firms.

Starting from all the findings stated above in this section we aimed at realizing an empirical investigation to see which of the findings will be confirmed.

3. Research methodology

Empirical data analysis was developed in two major directions. One of the directions is emphasizing the state of digitalisation of European SMEs by analysing the data from European Commission, the OECD, and European Investment Bank surveys. The analysis of the data provided by these institutions allows us to draw a clear situation on the stage of digitalisation of SMEs today, with comparisons between countries and even between companies depending on their size. The second direction aims at conducting a panel data analysis for testing the effects of digitization of SMEs on their performance. In this part we mainly focus on testing the relationship between the Digital Economy and Society Index (DESI) on a couple of indicators expressing SMEs performance.

The analysed sample consists of the 27 member countries of the European Union. The number of countries included in the sample was limited due to the availability of data, especially for the indicators measuring the performance of SMEs. The period selected for the analysis covers a period of five years between 2017 and 2021.

The variables considered for the empirical investigation are summarized in Table 1.

Table 1. The description of the variables

Variable (Abbreviation)	Definition (Measurement)
	Dependent variables
Value added of SMEs	is calculated as the difference between production and intermediate consumption. Total intermediate consumption is valued at purchasers' prices. The production is valued at basic prices or factor costs.
Number of persons employed in SMEs	The number of persons employed in Small and medium enterprises, from the non-financial business economy.
	Independent variables
Digital intensity index	Small and medium enterprises with at least a basic level of digital intensity.
Digital technologies for businesses	measures the use of different digital technologies at enterprise level. The DII score of an enterprise is based on counting how many out of 12 selected technologies are used.
E-commerce	the percentage of companies selling online.
	Control variables
GDP Growth	measured as percentage change (constant prices).
Total investment	measured as percentage of GDP.

Source: processed by the authors

The data for the variables measuring SMEs performance were obtained from SME Performance Review, SME Fact Sheets (European Commission, 2022a) which offer data regarding key performance indicators and also of national policy developments related to SME policy. The data for the components of the DESI index were obtained from the European Commission (2022c), The Digital Economy and Society Index page.

Starting from the main purpose of our paper, and from the fact that we collected data for 27 countries, over a period of 5 years for 7 indicators, we used as a method to determine the effects of digitization of SMEs on their performance panel data estimation techniques. Thus, the general equation of the implemented model is of the form:

$$Perf_{it} = \beta_1 DESI_{it} + \beta_2 Z_{it} + \mu_{it} \quad (1)$$

where: *i* represents the country and *t* is time (2017…2021); *Perfit* represents the dependent variable and is measuring the SMEs performance; *DESIit* represents the Digital Economy and Societal index; Z_{it}: represents the control variables; β_1 and β_2: are the coefficients and μ_{it} is the error term.

Given that to measure the performance of SMEs we use the two indicators considered by the European Commission (European Commission, 2022b) to express the performance of these enterprises: value added and number of persons employed in SMEs, the specific models applied are:

$$VA_SMES_{it} = \beta_1 DESI_{it} + \beta_2 GDP_{it} + \beta_3 Invest_{it} + \mu_{it} \quad (2)$$
$$EMPL_SMES_{it} = \beta_1 DESI_{it} + \beta_2 GDP_{it} + \beta_3 Invest_{it} + \mu_{it} \quad (3)$$

The main hypothesis of our empirical study is:

Hypothesis 1: Increased digitalisation of SMEs is positively related with their performance.

The empirical investigation of data implies several stages. The first stage implies testing the variables to identify the presence of a unit root. Only the variables measuring digital technologies for business and e-commerce have a unit root, thus we calculated the first difference of these variables. The second stage implies, transforming the variables measuring value added and the number of persons employed by applying the natural logarithm. These variables are expressed in absolute size, resulting in the need to transform them. Following, we analysed the descriptive statistics and applied the panel data regression models for testing the relations between digitalisation and SMEs performance.

4. Results and discussions

The first part of this section focuses on analysing and discussing data provided by various international organizations on the digitization of SMEs.

Thus, as shown in Table 2, in 2020, 34% of the European SMEs adopted or were planning to adopt basic digital technologies. The proportion of micro enterprises which adopted or were planning to adopt basic digital technologies was higher compared to small and medium enterprises (36% compared with 29% and with 26%). At the same time, only

about 23% of all SMEs started to adapt advanced digital technologies. The proportion of enterprises that started to adapt advanced digital technologies was higher for medium enterprises and decreased with the reduction of the size of the enterprise (37% compared to 30% and 20%). It is also noted that 20.3% of micro enterprises considered that there was no need to introduce any kind of digital technologies. This proportion has decreased with the growth of the company, so 15% of small and only 9% of medium-sized enterprises did not consider it necessary to introduce digital technologies.

The data in Table 2 show that 8% of SMEs said that they are limited by the lack of knowledge or skills or financing in adopting advanced digital technologies. The percentage of micro enterprises that claim this is higher and decreases with the increase of the size of the enterprises, but still the differences are not very big (8.1%, compared with 7.9% and 7.3%).

Table 2. The state of digitalisation of SMEs (February – April 2020)

Digital tool	All SMEs	Micro	Small	Medium
The SME has adopted or is planning to adopt basic digital technologies such as email or a website but not advanced digital technologies	34.5%	**36.5%**	29.2%	26.9%
There is a need to introduce advanced digital technologies but the SME does not have the knowledge or skills or financing to adopt them	8.0%	**8.1%**	7.9%	7.3%
There is a need to introduce advanced digital technologies and the SME is currently considering which of them to adopt	9.4%	8.5%	11.7%	**13.7%**
There is a need to introduce advanced digital technologies and the SME has already started to adopt them	22.9%	19.9%	29.9%	**37.5%**
The SME does not need to adopt any digital technologies	18.9%	**20.3%**	15.8%	9.8%
Other, none of the above, don't know, no answer	6.3%	6.7%	5.5%	4.8%
Total	100%	100%	100%	100%

Source: European Commission, 2021

These results show the clear need for digitalisation of SMEs in the first part of 2020. Given that after this period the restrictions imposed due to the covid-19 pandemic continued, and even intensified in some countries, we expect that this need to have expanded and the use of digital tools to increase significantly.

Regarding the adoption of basic digital technologies on the main categories, there are also differences between enterprises depending on their size (see Table 3). Thus, while only 97.7% of small enterprises use computers, almost 100% of large ones are in this situation. Similar differences are observed in terms of internet access.

More important differences arise when considering businesses for which employees use computers with access to the World Wide Web. Nearly half of small businesses have employees who have access to World Wide Web, and this percentage increases with the size of the enterprises, so 57% of large businesses are in this situation.

Table 3. Proportion of SMEs and large enterprises using selected basic ICT tools in the EU-27 (2019)

Basic Technologies	Small	Medium	Large
Enterprises using computers	97.7%	99.3%	**99.9%**
Enterprises with internet access	97.1%	99.0%	**99.8%**
Persons employed using computers with access to the World Wide Web	49.8%	52.6%	**57.6%**

Note: No data on micro SMEs are available. The data exclude the financial sector.
Source: European Commission, 2021

The advanced digital tool most used by European SMEs in 2020 was *Cloud computing* which implies storing and processing files or data on remote servers hosted on the internet. The second most used advanced tool was *High speed internet infrastructure*. The use of these tools was lower in the case of micro enterprises and increases with the increase of the size of the enterprises (see Table 4). However, almost 50% of micro enterprises that use cloud computing show that many of the digital services used by these enterprises involve cloud computing.

The next advanced digital tool used by SMEs is *Smart devices*, which consider the use of smart sensors, smart thermostats, and others like this. Other digital tools have been used in relatively small proportions at the SME level, such as: *Big data analytics*, *Robotic*s, *Artificial intelligence* and *Blockchain*. For all these instruments, the higher share was registered in the case of medium enterprises and decreased with the decrease in the size of the enterprises.

Table 4. Use of advanced digital tools by EU-27 SMEs (February – April 2020)

Digital tool	All SMEs	Micro	Small	Medium
Cloud computing, i.e. storing and processing files or data on remote servers hosted on the internet	52.8%	49.9%	60.3%	**64.6%**
High speed internet infrastructure	36.2%	32.9%	44.4%	**50.7%**
Smart devices, e.g. smart sensors, smart thermostats etc	28.9%	25.7%	35.2%	**51.6%**
Big data analytics, e.g. data mining and predictive analysis	14.0%	11.5%	19.6%	**29.2%**
Robotics, i.e. robots used to automate processes for example in construction or design etc.	8.7%	6.4%	13.4%	**23.2%**
Artificial intelligence, e.g. machine learning or technologies identifying objects or persons etc.	7.3%	6.1%	10.4%	**11.7%**
Blockchain	3.4%	2.5%	5.3%	**7.6%**
None of these	38.2%	**42.1%**	29.5%	16.6%
DK/NA	1.6%	**1.8%**	1.2%	1.5%

Source: European Commission, 2021

We also consider the analysis of the barriers faced by SMEs in the digitalisation process to be of significant importance. Thus, Table 5 centralizes these barriers identified in the study conducted by the European Commission (2021). The lack of required skills together with a lack of internal financial funds, are the most important barrier to the digitalisation of SMEs which had not yet digitalised any of their business activities or had done it only to a very limited extent (see Table 5). These two barriers were also relatively important for the SMEs with more extensive digitalisation experience. The lack of access to finance and a lack of public financial support were important for the SMEs with no digitalisation experience and with very limited experience and SMEs which had somewhat more extensive digitalisation experience. However, the factors related to the financial and skills aspect do not affect SMEs which are very experienced in digitalising their business.

Table 5. Barriers faced by SMEs in their digitalisation process

Barrier	No digitalisation	Very limited digitalisation	More extensive digitalisation	Very extensive digitalisation
Lack of required skills (e.g. internal ICT and/or managerial knowledge)	92%	88%	42%	26%
Lack of internal financial funds	88%	79%	50%	33%
Lack of access to finance	58%	67%	58%	35%
Lack of public financial support (e.g. grant funding, subsidies etc.)	46%	46%	42%	22%
ICT infrastructure issues in rural areas	33%	38%	33%	26%
ICT infrastructure issues in urban and semi-urban areas	13%	22%	21%	17%

Source: European Commission, 2021

Around a third of SMEs mentioned problems with ICT infrastructure in rural areas as barriers to digitalisation. When we talk about urban and semi-urban areas, the percentages are reduced.

The second part of this section presents and discusses the results obtained after running the econometric analysis. Thus, the results obtained for descriptive statistics are centralized in Table 6. These results show that the variables with the highest variations are those expressing SMEs digitalisation. Therefore, digital intensity index varies between a minimum of 0.4 in Bulgaria (in 2017) and a maximum of 12.6 in Denmark (in 2021). Digital technologies for business index varies between 10.5 in Poland (in 2017) and 41 in Finland (in 2021). The percentage of enterprises selling online vary between a minimum of 1.3 in Bulgaria (2017) and a maximum of 11.5 in Ireland (2020). These results complement those showing major differences between Western European countries, especially the

Nordic countries, and Central and Eastern European countries. They also show that the degree of digitization is in line with the degree of economic development of countries. But also the fact that the digitalisation of SMEs was accentuated in the years 2020-2021 as a result of the restrictions imposed by the Covid-19 pandemic.

Table 6. Descriptive statistics of the variables

Variable	Mean	Max.	Min.	Std. Dev.	Obs.
LVA SMEs	10.894	13.757	8.517	1.350	135
LVA micro	9.851	12.538	7.679	1.360	134
LVA small	9.711	12.735	7.155	1.357	135
LVA medium	9.794	12.786	7.049	1.352	135
LEMPL SMEs	14.258	16.747	11.660	1.219	135
LEMPL micro	13.407	15.682	10.726	1.299	135
LEMPL small	13.048	15.775	10.487	1.200	135
LEMPL medium	12.904	15.609	10.448	1.148	135
Digital intensity index	6.122	12.684	0.405	2.785	135
Digital technologies for businesses	21.893	41.098	10.550	6.127	135
E-commerce	5.080	11.513	1.330	2.035	135
GDP Growth	2.190	13.036	-1.082	4.102	135
Total investment	22.480	54.698	12.107	5.045	135

Source: the authors' own calculations

In the Table 6 we presented the descriptive statistical results for the variables that measure the added value and the number of employees transformed by using the logarithm, so as to facilitate the application of the models. But in absolute terms the highest value added of SMEs was recorded in Germany (2017) and the lowest in Malta (2017). In terms of the number of people employed in SMEs, most were also in Germany (2017) and the fewest in Malta (2020).

For estimating the results of the panel data regression we run different models by types of enterprises according to their size. Thus, we run a general model for all SMEs, and then a model for micro, small and medium enterprises. The definition of these types of enterprises is presented in Table 7 below.

Table 7. Definition of SMEs by size

Size of SME	Number of employees	Turnover or	Balance sheet total
Micro	< 10	≤ 2 million euros	≤ 2 million euros
Small	< 50	≤ 10 million euros	≤ 10 million euros
Medium	< 250	≤ 50 million euros	≤ 43 million euros

Source: European Commission, 2022d

The results of the panel data regressions are summarized in Table 8 and describe the coefficients and standard errors (in parenthesis). The main findings point out that

regardless of the indicator used for measuring SMEs performance and the size of the SMEs, the degree of SMEs digitalisation influences significantly their performance. Therefore, the digital intensity has a statistically significant and positive effect on the value added of SMEs and also on the value added of micro, small and medium enterprises, considered separately. This is showing that, if the SMEs have at least a basic level of digital technologies implemented will determine an increase of their value added. Also, implementing at least basic digital technologies will determine an increase of the persons employed in SMEs only for the case of small and medium enterprises.

Table 8. The relationship between SMEs digitalisation and their performance, by total and size class

	VA SMEs	VA MICRO	VA SMALL	VA MEDIUM	EMPL SMEs	EMPL MICRO	EMPL SMALL	EMPL MEDIUM
Digital Intensity	**0.200*** (0.021)**	**0.192*** (0.015)**	**0.202*** (0.022)**	**0.200*** (0.023)**	0.036 (0.022)	0.022 (0.026)	**0.039** (0.019)**	**0.042** (0.019)**
Digital Technologies for Businesses	**-0.070*** (0.008)**	**-0.062*** (0.006)**	**-0.071*** (0.009)**	**-0.069*** (0.008)**	**-0.067*** (0.013)**	**-0.074*** (0.015)**	**-0.059*** (0.012)**	**-0.063*** (0.010)**
E-Commerce	**0.130*** (0.034)**	**0.126*** (0.035)**	**0.115*** (0.035)**	**0.134*** (0.033)**	**0.120*** (0.037)**	**0.135*** (0.044)**	**0.107*** (0.033)**	**0.115*** (0.0128)**
GDP Growth	0.042 (0.031)	**0.050* (0.027)**	0.044 (0.032)	0.045 (0.034)	**0.049* (0.029)**	**0.053* (0.031)**	**0.049* (0.029)**	0.044 (0.027)
Total investment	0.018 (0.011)	0.007 (0.011)	**0.020* (0.010)**	**0.024** (0.011)**	**0.029*** (0.008)**	**0.037*** (0.009)**	**0.023*** (0.007)**	**0.019** (0.007)**
Constant	**11.026*** (0.213)**	**9.662*** (0.210)**	**9.976*** (0.212)**	**10.050*** (0.219)**	**15.672*** (0.204)**	**15.154*** (0.230)**	**14.181*** (0.194)**	**13.946*** (0.177)**
Obs.	135	134	135	135	135	135	135	135
R-squared	0.128	0.142	0.120	0.129	0.078	0.092	0.065	0.069
R-squared adjusted	0.094	0.108	0.086	0.095	0.042	0.057	0.028	0.032
F-statistic	3.795***	4.241***	3.526***	3.832***	22.199***	2.632***	11.793***	11.193***

Source: the authors' own calculations

We also got similar results for E-commerce variable. Regardless of the size of the SMEs analysed, if they sell online it will lead to an increase in their value added but also in the number of people employed in SMEs. Other studies in the literature also have obtained a positive relationship between e-commerce and the improvement of business performance (Mazzarol, 2015; Octavia et al., 2020).

Only for the indicator that measures the use of different digital technologies at enterprise level the obtained coefficients are negative, and show that the adoption of one or more of the twelve digital technologies for business leads to a decrease of the added value of SMEs but also of the number of employed persons in SMEs. This can be explained by the fact that, in order to apply these technologies, they have to make a series of expenses, which can be quite high, and therefore will generate in the short term a reduction of added value, but will also limit the expansion by increasing the number of employees.

The coefficients obtained for the control variables show that GDP growth has a positive and statistically significant effect on the value added of micro enterprises and on the employment in SMEs, but also in micro and small enterprises. Total investment has a positive effect on the value added of small and medium enterprises, and on the employment in SMEs regardless of their size.

The R-squared adjusted show that only between 8% and 10% of the value added of SMEs and between 2% and 4% of the employment in SMEs can be explained by the influence of the variables considered in the analysis.

5. Conclusion

The aims of our research was to determine the level of digitalisation of SMEs from European countries and also to test if exists a relationship between digitalisation of SMEs and their performance. The analysis is conducted on sample of 27 European Union countries for the period from 2017 to 2021.

For the first part of the analysis we focus on the results obtained by the study of European Commission. The results of this part show that the level of digitalisation of SMEs has increased, especially in recent years due to Covid-19 pandemic restrictions. However, only a third of SMEs use or have started to implement digital technologies in their business. Most of them use basic digital technologies such as using email and / or owning a website. About 10% of SMEs, regardless of size, use advanced digital technologies. The main barriers identified in the way of digitalisation of SMEs are mainly the lack of knowledge or skills or financing to adopt these technologies.

The results of the second part, of panel data analysis show that the use of at least basic digital technologies and selling only it can be a way to stimulate the growth of added value and the employment of SMEs. Therefore, digitization of SMEs can increase their performance. On the other hand, adopting these technologies that involve increased additional costs can lead to a reduction in SMEs performance in the short term.

We have to keep in mind that the period considered for the analysis also included the period of manifestation of the covid-19 pandemic which brought restrictions in the way of the traditional development of the business, and impelled and accelerated the process of digitalisation of the enterprises.

The added value of our study comes from considering an extended sample of 27 EU countries, and the effective analysis of the effects of digitalisation on the performance of SMEs. We consider that our findings could be of interest to both researchers and policy makers, because they emphasize the significant role of digitalisation in increasing SME performance but also by pointing out barriers in the way of digitisation. By conducting courses that prepare people to have digital knowledge and skills, but also by providing funding tools that support digitisation, decision makers can drive the process of digitising SMEs with positive effects on their performance.

The limitations of our study come from the availability of the data for the indicators that measure the performance of SMEs. In order to extend the results of this study, we intend to extend the analysis to the world countries, to introduce more variables for

measuring digitalisation of SMEs, and also to realise comparison between groups of countries according to their stage of economic development.

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6. References

Besson, P., & Rowe. F. (2012). Strategizing Information Systems-Enabled Organizational Transformation: A Transdisciplinary Review and New Directions. *The Journal of Strategic Information Systems*, 21(2), 103-124. https://doi.org/10.1016/j.jsis.2012.05.001.

Bouwman, H., Nikou, S., & de Reuver, M. (2019). Digitalization, business models, and SMEs: How do business model innovation practices improve performance of digitalizing SMEs?. *Telecommunications Policy*, 43(9), 101828. https://doi.org/10.1016/j.telpol.2019.101828.

Bradley, R. V., Pratt, R. M., Byrd, T. A., & Simmons, L. L. (2011). The role of enterprise architecture in the quest for IT value. *MIS Quarterly Executive*, 10(2), 73-80.

Bruque, S., & Moyano, J. (2007). Organisational determinants of information technology adoption and implementation in SMEs: The case of family and cooperative firms. *Technovation*, 27(5), 241-253.

Cegarra-Navarro, J. G., & Dewhurst, F. (2007). Linking Organizational Learning and Customer Capital through an Ambidexterity Context: An Empirical Investigation in SMEs. *The International Journal of Human Resource Management*, 18(10), 1720-1735. https://doi.org/10.1080/09585190701570882.

Chan, C. M., Teoh, S. Y., Yeow, A., & Pan, G. (2019). Agility in responding to disruptive digital innovation: Case study of an SME. *Information Systems Journal*, 29(2), 436-455. https://doi.org/10.1111/isj.12215.

Chan, Y. E., & Reich, B. H. (2007). IT alignment: what have we learned?. *Journal of Information technology*, 22(4), 297-315. https://doi.org/10.1057/palgrave.jit.2000109.

Dibrell, C., Davis, P. S., & Craig, J. (2008). Fueling innovation through information technology in SMEs. *Journal of small business management*, 46(2), 203-218. https://doi.org/10.1111/j.1540-627X.2008.00240.x.

European Commission. (2021). *Annual report on European SMEs 2020/2021: digitalization of SMEs*: background document. https://ec.europa.eu/docsroom/documents/46062.

European Commission. (2022a). *SME Performance Review*. https://ec.europa.eu/growth/smes/sme-strategy/sme-performance-review_ro.

European Commission. (2022b). *SME Performance Review. SME Fact Sheets*. https://ec.europa.eu/growth/smes/sme-strategy/sme-performance-review_ro.

European Commission. (2022c). *The Digital Economy and Society Index (DESI).* https://digital-strategy.ec.europa.eu/en/policies/desi.

European Commission. (2022d). *SME Definition*. https://ec.europa.eu/growth/smes/sme-definition_en.

Guo, S., Hotchkiss, E. S., & Song, W. (2011). Do buyouts (still) create value?. *The Journal of Finance*, 66(2), 479-517. https://doi.org/10.1111/j.1540-6261.2010.01640.x.

Imran, F., & Kantola, J. (2018, July). Review of industry 4.0 in the light of sociotechnical system theory and competence-based view: A future research agenda for the evolute approach. In *International Conference on Applied Human Factors and Ergonomics* (pp. 118-128). Springer, Cham. https://doi.org/10.1007/978-3-319-94709-9_12.

Kleis, L., Chwelos, P., Ramirez, R. V., & Cockburn, I. (2012). Information technology and intangible output: The impact of IT investment on innovation productivity. *Information Systems Research*, 23(1), 42-59. https://doi.org/10.1287/isre.1100.0338.

Matt, D. T., & Rauch, E. (2020). SME 4.0: The role of small-and medium-sized enterprises in the digital transformation. In Matt, D., Modrák, V., & Zsifkovits, H. (eds), *Industry 4.0 for SMEs* (pp. 3-36). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-25425-4_1.

Mazzarol, T. (2015). SMEs engagement with e-commerce, e-business and e-marketing. *Small Enterprise Research*, 22(1), 79-90. https://doi.org/10.1080/13215906.2015.1018400.

Mushtaq, R., Gull, A. A., & Usman, M. (2022). ICT adoption, innovation, and SMEs' access to finance. *Telecommunications Policy*, 46(3), 102275. https://doi.org/10.1016/j.telpol.2021.102275.

Nadeem, A., Abedin, B., Cerpa, N., & Chew, E. (2018). Digital transformation & digital business strategy in electronic commerce-the role of organizational capabilities. *Journal of theoretical and applied electronic commerce research*, 13(2), 1-8. http://dx.doi.org/10.4067/S0718-18762018000200101.

Nemoto, N., & Koreen, M. (2019). Digital innovation can improve financial access for SMEs. *SME Policy Faced With Development of Financial Technology G20 Japan*, 1, 1-11.

Nuseir, M. T., & Aljumah, A. (2020). The role of digital marketing in business performance with the moderating effect of environment factors among SMEs of UAE. *International Journal of Innovation, Creativity and Change*, 11(3), 310-324. https://www.ijicc.net/images/vol11iss3/11325_Nuseir_2020_E_R.pdf.

Octavia, A., Indrawijaya, S., Sriayudha, Y., & Hasbullah, H. (2020). Impact on E-commerce adoption on entrepreneurial orientation and market orientation in business performance of SMEs. *Asian Economic and Financial Review*, 10(5), 516-525. https://doi.org/10.18488/journal.aefr.2020.105.516.525.

OECD. (2018). T*owards the Implementation of the G20 Roadmap for Digitalisation: Skills, Business Dynamics and Competition*, Report prepared at the request of the 2017 G20 German Presidency. https://www.oecd.org/g20/OECDreport_Implementation_G20_Roadmap.pdf.

OECD. (2021). *The Digital Transformation of SMEs.* OECD Studies on SMEs and Entrepreneurship, OECD Publishing, Paris. https://doi.org/10.1787/bdb9256a-en.

Pelletier, C., & Cloutier, L. M. (2019, January). Challenges of digital transformation in SMEs: Exploration of IT-related perceptions in a service ecosystem. In *Proceedings of the 52nd Hawaii international conference on system sciences*, 4967-4976. http://hdl.handle.net/10125/59934.

Priyono, A., Moin, A., & Putri, V. N. A. O. (2020). Identifying digital transformation paths in the business model of SMEs during the COVID-19 pandemic. *Journal of Open Innovation: Technology, Market, and Complexity*, 6(4), 104. https://doi.org/10.3390/joitmc6040104.

Rasheed, R., Siddiqui, S. H., Mahmood, I., & Khan, S. N. (2019). Financial inclusion for SMEs: Role of digital micro-financial services. *Review of Economics and Development Studies*, 5(3), 571-580. https://doi.org/10.26710/reads.v5i3.686.

Tarutė, A., Duobienė, J., Klovienė, L., Vitkauskaitė, E., & Varaniūtė, V. (2018). Identifying factors affecting digital transformation of SMEs. In *Proceedings of the 18th International Conference on Electronic Business* (ICEB) (pp. 373–381). https://aisel.aisnet.org/iceb2018/64.

Ulas, D. (2019). Digital transformation process and SMEs*. Procedia Computer Science*, 158, 662-671. https://doi.org/10.1016/j.procs.2019.09.101.

Usai, A., Fiano, F., Petruzzelli, A. M., Paoloni, P., Briamonte, M. F., & Orlando, B. (2021). Unveiling the impact of the adoption of digital technologies on firms' innovation performance. *Journal of Business Research*, 133, 327-336. https://doi.org/10.1016/j.jbusres.2021.04.035.