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The Evolution of ICT Indicators on the Portuguese Business Environment in the 21st Century

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Abstract. The digital economy is a reality that shapes the world business environment and impacts the performance of firms independently of their dimension or economic activity. The use of ICT tools in firms is not straightforward for all the firms, namely the ones with a smaller dimension or in certain economic activities that do not understand or are not able to implement the common use of computers, internet connections or do not see as fundamental the presence in the internet, with a website for instance. Portugal is a small economy with a small local market in which the government recognizes the importance of the digital economy. However, a big way had to be run in the Portuguese business environment to achieve the standards of the European Union regarding the digital economy. For understanding the evolution of Portuguese firms on the digital economy and the adoption of ICT tools, several indicators collected by the survey on "Information and Communication Technologies Usage in Enterprises (IUTICE)" carried out by Statistics Portugal from 2003 to 2017, are used in this research work to illustrate the evolution of ICT tools on the Portuguese business environment in the 21st century. It is concluded that Portuguese firms have understood the crucial importance of the use of computers, internet connection and presence on the internet. However, for the majority of Portuguese firms, the presence on the internet continues not to be a reality and a major public and private investment is requested to implement effective measures that change the actual scenario.

Keywords: Digital Economy, Information and Communication Technologies, Business Environment, Firm's dimension, Portugal

1 Introduction

The economic activity of a country relies not only on existing businesses and companies, but also on new businesses that allow the introduction of new knowledge, new products or services, and the introduction of new techniques, methods and processes of doing traditional businesses. Although many new businesses do not innovate or introduce anything new, there are many other businesses – both new and incumbents – that

are created and developed with the intent of adding value which is the consequence of investigation in research centres and universities.

For many researchers, even if the definition of entrepreneurship is vast and controversial, entrepreneurship is about creating a new business or introducing new ideas into existing businesses. This idea comes from the seminal works of Schumpeter (1934) and Drucker (2014) and remains in the scientific literature on the subject as a starting point for other definitions of entrepreneurship and approaches to the topic (Ferreira, Reis and Miranda, 2015). Entrepreneurship is often linked to individual creativity, discovery, surprise, and learning (Mahoney and Michael 2005). Acs and Szerb (2010) suggest that entrepreneurship can be seen as a dynamic interaction of entrepreneurial attitudes, entrepreneurial activity, and entrepreneurial aspiration. However, the authors refer that the previous relationships vary across stages of economic development. In this sense, the development of entrepreneurship is often related to the capacities and the individual perception of the entrepreneur and his abilities to prospect the creation of a business.

Entrepreneurship can then lead to the creation of new businesses, the start-ups, which can have an impact on the economic development of the country. There is also evidence that start-up businesses with high potential growth tend to increase knowledge and economic growth. The impact of entrepreneurship on the economy are presented in Wennekers and Thurik (1999). Here it is explained that entrepreneurship is related to the economic growth, which is associated with the increase in productivity, with the introduction of new practices that improve current businesses and the development of new businesses, as well as with international competitiveness.

In the last decades, there has been a change in the paradigm of business creation, which has been increasingly based on innovation through the development of research and development activity and through the new information and communication technologies (ICT) that allows reducing the transaction costs and the importance of economies of scale. Also, the globalization of business and deregulation have been important factors in the decisions of the entrepreneurs. In this sense, all these issues have been evolving towards the creation of an environment that facilitates the development of opportunities for new businesses.

The digital economy has become increasingly important in the global economy. The work of the United Nations Conference on Trade and Development (UNCTAD, 2017) explains the importance of the digital economy, associated with the use of Internet-based digital technology for the production and trade of goods and products, in today's economy. This “new” procedure of economy has many strengths and opportunities, but challenges and drawbacks can also be found that should be considered. Regarding the benefits of the digital economy, UNCTAD (2017) refers about the improvement of competitiveness of all industries, new business and entrepreneurial opportunities, as well as the possibility to access external markets and the possibility of accessing new tools to answer social problems. Here, technology can facilitate for example healthcare, education and financial services. With the scanning, new business models can also emerge. Digitization allows governments to be more effective in dealing with citizens and transparent and enables the construction of anti-corruption tools. The main drawbacks are the potential for social and developmental problems, as well as regulatory problems such as security and privacy.

With the increasingly easy access to the internet, the digital economy has been affecting more and more people's lives and is becoming more and more a part of their lives. The digital economy has become increasingly a business platform and development of economic transactions. Business-to-consumer transactions tripled from 0.5% global GDP in 2010 to 1.5% in 2017 and industry accounts for about 4% of GDP in the largest economies. Government use of the internet has also increased to interact with citizens and to provide services. "In general, digitalization can expand choices and lower transaction costs in social and economic interactions; improve livelihoods by allowing users to create, access, utilize and share information; and boost individual empowerment and collective engagement through the use of social media" (UNCTAD, 2017, p. 157). Also, Chaaben and Mansouri (2017) refers that digital technologies benefit countries' economic development, business productivity in all industries and increase the quality of life of citizens. With technological advances and their applications have been created new needs to be solved and new problems that have to be solved in all markets. Thus, investment in the ICT sector has resulted in the competitiveness of the company in all industries.

European Commission (2014) adds that the internet has allowed and facilitated people to create and share ideas, which gives rise to new content, entrepreneurs and markets. It should be noted that the number of workers in the ICT sector has been increasing 3% per year and that there are already about 4 million ICT workers in Europe. The European Commission believes that digital economy enhances mobility in commercial and tax terms, among others, that data on markets, activities and people are a key source of value and that network effects are universal in the digital economy.

For the European Commission (2014) the digitization has had a great transformative effect and a great impact on all the industries. In this sense, digital technologies increase competitiveness in the economy, as well as improve productivity and innovation, contributing to GDP growth. There are some studies that analyse the impact of technology on the economy. Pohjola (2002) verify that with the new information and communication technologies there is economic growth and performance seems to improve. For example, Sharma (2005) finds evidence that e-commerce technologies help companies and countries for economic growth and supports business growth. Kollmann (2006) also explains how the creation of companies in the new economy may be central to the economy of a country, which is based on the development of technology, especially in e-business and the internet. Van Welsum, Overmeer and van Ark (2013) find that ICT investment had an impact on growth and that 74% of the growth in labour productivity in the US between 1995 and 2007 was related to ICT investments. Choi (2010) found a significant and positive relationship between the number of internet users and total services trade. Choi, Rhee and Oh (2014) evidence that, in the USA, the internet reduces information asymmetry and thus increases cross-border portfolio flows. Najarzadeh, Rahimzadeh and Reed (2014) using data for a panel of 108 countries between 1995 and 2010 find a positive relationship between Internet use and labour productivity. Czernich (2014) find a negative relationship between Internet and unemployment. Lechman and Marszk (2015) found a positive, strong and significant relationship between ICT penetration and exchange-traded funds. However, Ishida (2015) in a study for Japan from 1980 to 2010 find that ICT investment did not contribute to an increase in GDP. Jin and

Cho (2015, p.260) find that ICT is positively related with economic development and conclude that "ICT development planning as a catalyst for economic development requires not only consideration of ICT factors but also socio-economic factors". Salahuddin and Gow (2016) find evidence of a positive and long-term relationship between Internet use and economic growth in South Africa, which will be associated with greater ease of communication and ease of development and adoption of innovation processes. With the internet, it is easier to spread knowledge, develop products and processes as well as business models.

This paper is divided into four sections. After this first section were several theoretical concepts related with the business environment, the digital economy and the adoption of ICT tools are defined and analysed, follows a section were the database, indicators and method of analysis are explained. In section three the results are presented and discussed. Section four, concludes.

2 Database, Indicators and Method of Analysis

A statistical survey on "Information and Communication Technologies Usage in Enterprises (IUTICE)" is being carried out by Statistics Portugal following a sample of 3,275 Portuguese firms selected among the population of firms with 10 or more persons employed. IUTICE is an annual survey based on a representative sample of enterprises in Portugal carrying out their main economic activity in manufacturing, energy, construction, trade and repair, hotels and restaurants, transport and communication, and other services (excluding education and health activities and, as from 2015 onwards, financial activities). It is carried out from 2001 and, since 2006, the data is collected in accordance with specific Community regulations and pursuant to Regulation (EC) No 808/2004 of the European Parliament and of the Council of 21 April 2004, for international comparison purposes (INE, 2017). The data is used by Eurostat to produce the same indicators for the European Union and several other countries in Europe (Zečević and Radović-Stojanović, 2017).

Using this survey, a selection of indicators that can consider as proxies to indicators for the Portuguese digital economy are collected and can be used in the scientific analysis to understand how the Portuguese business environment is changing over the influence of such indicators. Among the indicators collected can be found: numbers of firms that use computers (by dimension and by economic activity), the number of firms with an internet connection (by dimension and by economic activity) and the number of firms with a presence on the internet (with a website, for example). Such indicators are available since 2003 which allow drawing the evolution of such indicators over the 21st century regarding the dimension and type of economic activity of Portuguese firms.

The above mention illustration of the evolution of some available ICT indicators for the Portuguese firms is the main objective of this research work. So, having in mind the defined objective will be presented and described the available statistical data for the period of time in analysis – 2003 to 2017, calculating the annual growth rates and also the average annual growth rate for the entire period. This last indicator allows to summarize the full set of data.

Note that, the digital economy has been evolving over time, since the introduction of computers. Katz (2017) explains the existence of three waves of digital technology. The first began in the 1960s with the introduction of computers and mobile communications. The second wave occurs in the 1990s with the use of the internet, social networks and use of the cloud and the third emerged recently from 2010 with the big data, robotics and machine learning. However, in this work, the indicators analysed belong to the first and second waves of the digital economy evolution– this paper refers just to indicators related to the use of computers, internet and social communication, namely throughout firms' websites. It is too soon to assess the impact of the third wave of digital technology introduction in Portuguese firms and the survey abovementioned does not contemplate such advanced technological issues.

3 Results: Digital evolution in the Portuguese Business Environment

Nowadays, for many businesses having internet access is vital for performing their daily activities. Due to this vital importance, just 3 % of businesses in the European Union (EU) did not have an internet connection at the beginning of 2016, with the highest shares found in Romania (16 %) and Greece (12 %). In 2016, Portugal was located near the average of the European Union (Eurostat, 2017). Not being in the front platoon of the countries with more firms with an internet connection, Portugal is a country that is being observed a digital inclusion in their business environment.

In Portugal, according to the definition of the National Statistical Institute (INE, 2018), a business may have a presence on the internet in several different ways: (i) having a website in an outside domain name (for example, belonging to an economic group or a virtual shopping centre); and, (ii) having a first or second level domain name (for example in an internet service provider - ISP).

In the following table (Table 1), is possible to observe how the companies have been integrating internet in their activities over the past fifteen years, by the dimension of companies measured regarding the number of employees. In the table is considered the percentage of total firms with a presence on the internet, as a percentage of the total number of Portuguese firms, as well the percentage of micro firms (firms with less than 10 employees), small firms (firms with 10 to 49 employees), medium firms (firms with 50 to 249 employees) and large firms (firms with 25o or more employees) with a presence on internet in percentage of the Portuguese firms in the same group dimension. In the table is also possible to observe the annual growth rate of firms with a presence on the internet and the percentual average growth rate for the period for each firms' dimension.

Table 1. Firms with a presence on the internet as a % of the total of firms, in total and by number of personnel employed (Sources: INE, 2017 and Pordata, 2018).

Years	Firm's dimension: number of personnel employed									
	Total		Micro Firms (< 10)		Small Firms (10-49)		Medium Firms (50-249)		Large Firms (250+)	
	Annual (%)									
	Value	Growth	Value	Growth	Value	Growth	Value	Growth	Value	Growth
2003	11.3	---	7.3	---	22.2	---	43.2	---	69.0	---
2004	10.8	-4.4	5.9	-19.2	24.9	12.2	50.5	16.9	76.4	10.7
2005	15.1	39.8	9.1	54.2	33.4	34.1	55.9	10.7	76.4	0.0
2006	15.1	0.0	10.6	16.5	31.0	-7.2	57.3	2.5	85.2	11.5
2007	19.1	26.5	13.8	30.2	37.9	22.3	66.0	15.2	87.0	2.1
2008	21.5	12.6	16.2	17.4	42.4	11.9	68.8	4.2	92.2	6.0
2009	21.4	-0.5	16.2	0.0	42.9	1.2	71.0	3.2	94.0	2.0
2010	23.0	7.5	17.2	6.2	47.9	11.7	75.3	6.1	93.9	-0.1
2011	23.9	3.9	18.4	7.0	49.3	2.9	78.1	3.7	96.5	2.8
2012	28.5	19.2	21.1	14.7	47.2	-4.3	76.2	-2.4	96.1	-0.4
2013	32.0	12.3	24.0	13.7	54.6	15.7	85.0	11.5	97.1	1.0
2014	31.6	-1.3	24.4	1.7	49.3	-9.7	80.3	-5.5	95.8	-1.3
2015	37.8	19.6	30.1	23.4	56.4	14.4	86.4	7.6	96.6	0.8
2016	39.4	4.2	31.4	4.3	60.8	7.8	80.1	-7.3	95.2	-1.4
2017	40.9	3.8	32.7	4.1	60.9	0.2	83.3	4.0	95.7	0.5
Average growth rate (%)	9.6		11.3		7.5		4.8		2.4	

As can be observed is perceptible that micro firms are the ones with the lower presence on the internet. At the beginning of the XXI century, only 7.3% of Portuguese micro firms had a presence on the internet. Fifteen years after, almost 33% have a digital presence. These companies were the ones with the biggest average digital growth rate – 11.3%, on average per year. The presence in the internet growths with the dimension of the companies. That evidence was true at the beginning of the XXI century and continues manifest in the present. Moreover, since were the larger companies having a bigger presence on the internet since the beginning of the century they are the ones that do not need to make the biggest efforts to adhere the digital economy – the average growth rate of presence in the internet decreases from 7.5% (small firms) to 4,8% (medium firms) and 2.4% (large firms). Nowadays almost all the Portuguese large firms have a presence on the internet (only near 4% do not have this presence), more than 83% of medium firms have an internet presence with such a presence decreasing to 61% when the dimension decreases and the companies are small.

In total, is important to refer that half of the Portuguese firms do not have a presence on the internet – only approximately 61% of all the Portuguese firms have a digital existence. Even if, the number of firms with an internet presence has increased almost 10% in average per year. This evidence may be essentially due to the high number of micro firms that compose the Portuguese business environment. According to Sarmento and Nunes (2012), more than 80% of the Portuguese business employer firms, operating in Portugal over the last three decades, have less than 10 employees and this feature in being enhanced in the last decades due to the creation of firms that are being born tendentially smaller. Another stylized fact that should be considered, and is mentioned by the previous authors, is the tertiarization of the Portuguese economy over the past years. So, it is also important to observe how the Portuguese companies, by sectors, present a digital activity.

The discussion of the presence of firms on the internet is fundamental at the present time. As mentioned by Mazzarol (2015), the spread of digital technologies may be both an important opportunity and a possible threat for small and medium-sized firms (SMEs). "The opportunity comes from the ability of SMEs to access digital technologies that were previously only available to large companies and to use these to compete in international markets Yet the threat emerges from SMEs losing business by not embracing the opportunities and becoming uncompetitive in increasingly digital and online markets" (Mazzarol, 2015, p. 79).

It was already observed that are the Portuguese firms with more than 10 employees that have the biggest presence on the internet and due to this evidence are the ones for each is possible to obtain robust statistics regarding the presence on the internet by sector of activity. Therefore, Table 2 presents for 2003 and for fifteen years later, 2017, the percentage of firms with 10 or more employees with an internet connection.

Table 2. Firms with 10 or more employees with an internet connection as a % of total enterprises, by sector of economic activity (Sources: INE, 2017 and Pordata, 2018)

Period of time	Enterprises with 10 or more employees by sector of economic activity								
	Total	Manufacturing	Construction	Wholesale and retail trade	Accommodation and food service	Transportation and storage	Financial and insurance activities	Real estate activities	Other service activities
	Annual (%)								
2003	70.0	64.2	64.6	72.9	87.6	76.0	99.4	84.6	89.0
2017	98.0	97.8	95.3	100.0	93.5	100.0	100.0	100.0	100.0
Average growth rate (%)	2.4	3.1	2.8	2.3	0.5	2.0	0.0	1.2	0.8

The first evidence from Table 2 is that in some economic activities the digital economy is a reality and all the companies (100%) have an internet connection. This very positive evolution has been done over time as is proven by the positive values of the average growth rate/year presented in the table. Economic activities that had in 2003 good levels of internet connection grew steadily by year, however, the economic activities with lower degrees of internet connection present annual average growth rates that reach the 3.1%, in the case of manufacturing, or 2.8% in the case of construction.

The last "Survey on Information and Communication Technologies Usage in Enterprises (IUTICE)" carried out by Statistics Portugal (INE, 20017) following a sample of 3,275 Portuguese firms selected among the population of firms with 10 or more persons employed, concluded that by economic activity is verified, for the Portuguese economy a generalization of the use of Information and Communication Technologies (ICT). Economic activities with higher levels of adherence to the digital economy are wholesale and retail trade, transportation and storage, financial and insurance, real estate and other services activities (in 2017, in these economic activities 100% of the firms had an internet connection). Firms in the sectors of manufacturing and construction are the ones "less digital" – just 97.8% and 95.3% firms, respectively, in these activities have a connection to the internet. The same survey, carried out from 2001, as explained in the previous section, (and since 2006 in accordance with specific Community regulations and pursuant to Regulation (EC) No 808/2004 of the European Parliament and of the Council of 21 April 2004 for international comparison purposes), also

observes that, in 2017, 46% of enterprises use Internet-based applications or communication platforms designed to connect, create and exchange content online with customers, suppliers or business partners. The percentage of enterprises using these social media increases with the size of the enterprise, varying from 44% in enterprises with 10 to 49 persons employed, 57% in medium-sized enterprises and 73% in large enterprises. The highest increase was registered by medium-sized enterprises (INE, 2017).

Table 3, presents the evolution of the proportion (in %) of firms with 10 or more employees that use computers, that have an internet connection and with a presence on the internet. The table also presents the annual growth rates for each one of the items and the annual average growth rate for the 15 years period in the analysis. Figure 1 allows visualizing the evolution of the proportion of firms (and their respective annual growth rates), with more than 10 employees, using a computer with internet connection and with a presence on the internet, over the last 15 years.

Table 3. Proportion of firms with 10 or more personnel employed that use computers, with an internet connection and with a presence on the internet (Sources: INE, 2017 and Pordata, 2018)

Years	Firms that use computer		Firms with internet connection		Firms with presence on the internet	
	Annual (%)					
	Value	Growth	Value	Growth	Value	Growth
2003	81.6	---	70.0	---	25.8	---
2004	91.9	12.6	77.5	10.7	30.0	16.3
2005	91.0	-1.0	81.5	5.2	37.1	23.7
2006	94.6	4.0	83.1	2.0	35.5	-4.3
2007	95.1	0.5	89.8	8.1	42.4	19.4
2008	96.0	0.9	91.8	2.2	46.6	9.9
2009	95.3	-0.7	92.7	1.0	47.3	1.5
2010	97.2	2.0	94.1	1.5	52.1	10.1
2011	97.5	0.3	95.0	1.0	53.7	3.1
2012	98.1	0.6	95.4	0.4	51.8	-3.5
2013	98.2	0.1	96.2	0.8	59.5	14.9
2014	98.8	0.6	96.5	0.3	54.3	-8.7
2015	98.9	0.1	98.1	1.7	61.5	13.3
2016	99.0	0.1	98.1	0.0	64.2	4.4
2017	98.7	-0.3	98.0	-0.1	64.8	0.9
Average growth rate (%)	1.4		2.4		6.8	

By the observation of Table 3 and, particularly, by the observation of Figures 1 and 2 is possible to see that was not the use of computers and the internet that was a problem for the Portuguese firms in the 21st century. The presence on the internet through a website, for example, was the real challenge for Portuguese firms in terms of the digital economy. In this last case, the proportion of firms grew up from one quarter of the firms in the business environment to near 65% of the universe of companies with 10 or more employees operating in the economy – the number of companies with 10 or more employees with presence on the internet grew up to almost 7%, in average, per year, to

reach the nowadays reality. In 2017, almost all the universe of Portuguese firms uses a computer and have an internet connection.

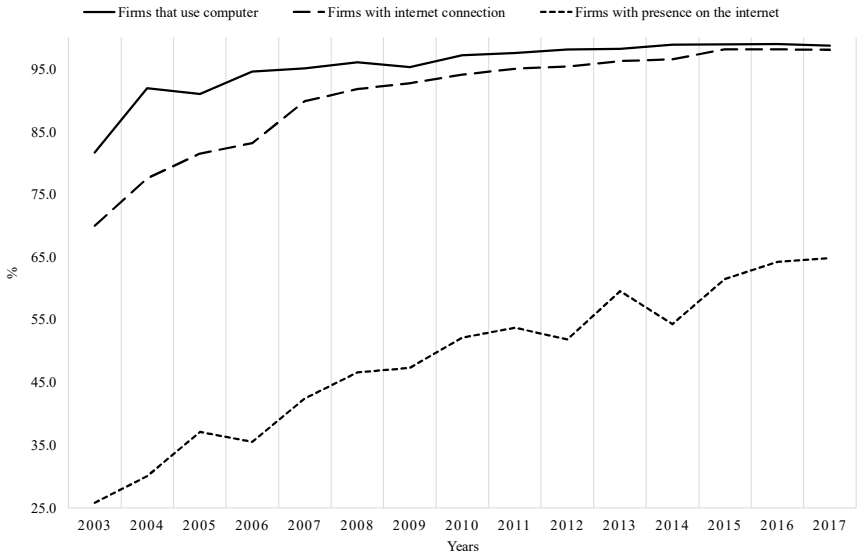

Figure 1. Evolution of the proportion of firms with 10 or more employees that use computers, with an internet connection and with a presence on the internet

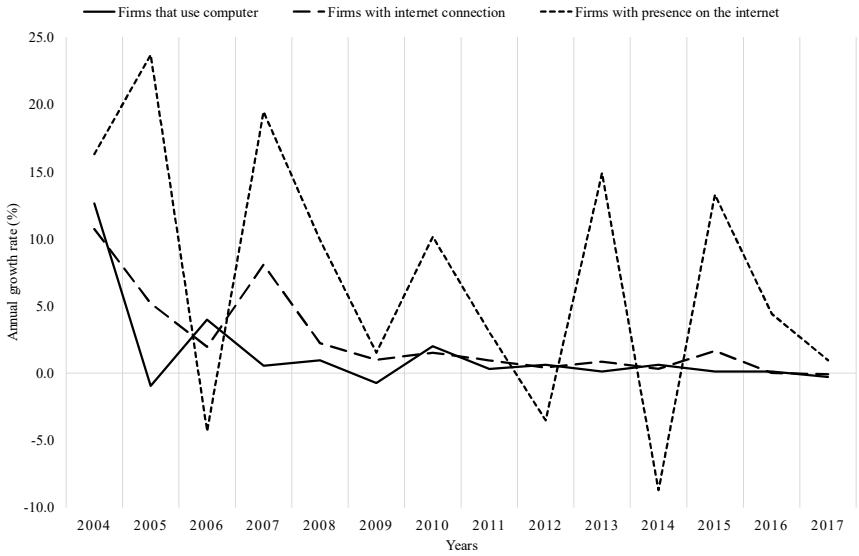

Figure 2. Evolution of the annual growth rates of the proportion of firms with 10 or more employees that use computers, with an internet connection and with a presence on the internet

Due to the high levels of firms using computers and internet the annual growth rates for each one of these indicators were bigger at the beginning of the analyzing period and stabilized in the last decade to values near zero, as would be expected. This is not the case for the indicator that measures the proportion of Portuguese firms with a presence on the internet. The annual growth rate, even if it was very high on average over 15th years, was very inconstant from year to year, demonstrating that the use of practical applications of the computing science to classify, preserve and disseminate information among partners (clients, suppliers, government, among other firm's stakeholders) is not yet an easy issue is the management of Portuguese firms, even if they are not just micro firms.

The presence of a firm on the internet is important due to the amount of turnover that could generate in a globalized world. According to last the survey carried out by the Portuguese statistical office, 29% of firms had reported carrying out e-commerce 2.2% more in 2016 than in 2015. By type of transaction, 18% referred having received 2% more orders for goods or services that were placed via a website or Electronic Data Interchange, than in the previous year (INE, 2017). There is no doubt that the world is going digital and the companies have to follow the same path. Unfortunately, the results also show E-commerce usage increases with the size of the firm: 26% in enterprises with 10 to 49 employees, 41% in firms with 50 to 249 employees and 58% in large enterprises. No indicators are collected for Portugal on the reasons for these results but the costs associated with the maintenance of a website, hiring a specialized ICT worker (or with ICT proper training) and the time need to allocate to it may be limitations to the adoption of the E-commerce by smaller firms. For example, in 2017 in the Portuguese economy, just 20% of firms indicated employing ICT specialists, a percentage that increases with business employment size: 13% for firms with 10 to 49 employees, 50% for medium-sized firms, and 77% in large firms (INE, 2017).

Indeed, technological progress in ICT, logistics and distribution enable almost every firm to buy, sell and cooperate on a global scale and even the tiny (micro) and locally oriented firms will be forced to trade and compete in a global context to survive. So, although common sense is that the globalization exposes SMEs to many challenges the recent literature argues that these firms can benefit from the challenging new digital business environment via ICT tools (Savrul, Incekara and Sener, 2014) and be so competitive as their larger competitor firms.

4 Conclusion

Nowadays is not discussed the digital economy is fundamental in the development of a business environment and, as a consequence, in an economy's growth and development. Regarding the indicators presented and the analysis of its evolution for the Portuguese firms in the 21st century it is possible to conclude the firms have understood the crucial importance of the use of computers, internet connection and presence on the internet. However, for the majority of Portuguese firms, the presence on the internet continues not to be a reality. Mainly due to the dimension of firms (the big majority of firms – more than 80% - are micro firms) they do not have a presence on the internet

even if the majority uses computers and have access to the internet. It was concluded that almost all the Portuguese firms with 10 or more employees use computers, have a connection to the internet even if their presence on it decreases for less than three-quarters of the total number of companies with 10 or more companies. Portugal is on the average of the European Union but more measures should be implemented an effective presence of Portuguese firms on the internet.

The inexistence of statistical data on micro companies is a problem on the analysis of the Portuguese digital economy. It is clear that this firms, are "not connected" even if they are going "digital" (the average annual growth rate verified for these firms was approximately 11%). Such results indicate the need to develop policies target-oriented for these firms to enable them to compete in a globalized digital market. There also economic activities that seem not notice so much the need to move on the digital direction (manufacturing and construction) when 100% of firms on other economic activities adopted ICT and are working fully in the digital economy. Specific policies and measures for more "resistant" economic activities should also be developed and implemented.

Finally, it is important to stress that the scarcity of indicators and microeconomic statistic data that allow relating the evolution of the indicators describe and discuss in this research work is a limitation for the elaboration of further research on the relationship between the digital economy, business creation and dynamics, entrepreneurship and macroeconomic development. Eurostat and national statistics offices are developing surveys on the subject but more research is demanded on the subject to improve the understanding of the topic.

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