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Regional Evolution of the ICT Sector in the European Union: Insights and Trends

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Abstract:
The development of the digital sector is seen as essential for the future of the European Union not only by the European authorities but also by non-governmental organizations (NGOs), national political parties, representatives of the business sector, social activists, or regular citizens. This approach is reflected, among others, in several details of the NextGeneration EU recovery instrument meant to create economic and social stability in the member states after the coronavirus pandemic, which represented one of the grimmest phases in the recent history of the continent. The funds directed towards enhancing the process of digitalization should reduce the development gap that exists at a regional level in the EU. But how profound is this gap, and what are the factors that generate and perpetuate it? The present study shapes answers to these questions by focusing on four regions that include all 27 member countries in the EU: Western Europe, Northern Europe, Eastern Europe, and Southern Europe. The analyzed period is mainly 2018-2022, covering the last two years before the COVID-19 outbreak, the pandemic, and its aftermath. We take into account elements like internet accessibility, the share of Information and Communication Technology (ICT) in the Gross Domestic Product (GDP), other economic particularities, the development of e-commerce, or the level of digital literacy. Our conclusions suggest that the importance of historical factors is at times diluted by strategic decisions implemented by governments. The evolution of the ICT sector is seen in numerous countries as a key element in establishing much-needed political, economic, and social resilience.

Keywords: *ICT sector, digitalization, economic development, e-government, e-commerce, digital literacy.*

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1. Introduction

The 21st century is labeled as the digital century not only in the mass media or in the formal or informal discussions that take place between ICT specialists but also by organizations that are directly connected to the European Union. For instance, *Friends of Europe*, a think tank co-funded by the EU, is focusing on digital and data governance, elements that are seen as pillars of the sustainable development of the member countries. One of its representatives, David Howell, argues that the EU must be dragged into the *digital century* through *„...the injection of rapidly-accumulating information into every aspect of economic and social life..."* (Howell 2015). Moreover, the European Digital SME Alliance, which represents a web of ICT small and medium ventures, describes the *digital century* as follows: *„The future will be dominated by an environment that will be digital in all aspects. Houses, cars, fridges, but also objects of daily use will be equipped with sensors and embed connectivity between themselves, but also interact with human beings. The technical solutions will not be limited to certain areas of the economy but will likely touch all parts of life."* (Linck 2019)

In an environment dominated, rightfully so, by this kind of perspective, it would be expected to have a generalized frenzy in regard to boosting and deepening the digitalization process. However, for some political actors, developing the ICT sector is a main priority, while for others, it is only a secondary issue. Analyzing the European overview, we can notice differences between regions and differences between countries that can be considered parts of the same region. Understanding these contrasts is important because they can weaken the cohesion of the EU, furthering the debates built around the concept of a *multi-speed Europe*. Obviously, proposing a path for reducing the diversity that characterizes the development of the digital sector in EU countries is not possible without identifying the main reasons that enable it.

Before focusing on recognizing the factors that fuel the digital gaps in the EU, we present a brief, but relevant, literature review and also present some key methodological details. The theoretical elements we highlight help us understand the importance of the digital skills and the manner in which acquiring them can transform the functioning of our economies and societies. E-learning, e-government, or e-commerce are terms that define our present and are meant, if humanity will continue its existence, to dominate our future. The methodological section contains not only details regarding our methods and hypotheses but also explanations regarding the division of the 27 EU members into four categories. As we will see below, the geographic element has an undeniable role in shaping our groups, but other aspects must also be taken into consideration. The comparisons made between Western, Northern, Eastern, and Southern Europe are the basis of our conclusions.

The evolution of the digital sector is a challenging topic for an academic article especially because this sector is one of the most dynamic parts of our societies. The brutal experience of the COVID-19 pandemic and the restrictions that were generated by the depth of the sanitary crisis outlined once more the outstanding significance that digitalization has for our age. Nevertheless, just like in many other domains, progress is not irreversible, and the pioneers of today can be the idlers of tomorrow. One of the main pillars of the natural sciences is the idea that adaptability is essential for survival. This idea is a fundamental one for our study as well.

2. Literature review

Nowadays the development of digital skills represents a prerequisite for successfully navigating in a society that has become increasingly oriented on E-learning, as well as on ICTs. Therefore, we could say that we live in a digital society, where things are rapidly changing and being able to keep up can be quite challenging, especially for those that do not incorporate technology in their everyday life or they do so to a small extent, such as having basic cable television or a landline.

First and foremost, we should try to delineate E-learning from digital literacy and ICT, although they have a common ground. E-learning is a learning process that occurs in the virtual world, namely online. A more thorough definition is that E-learning encompasses systems that include a web-based learning and an Internet-based training, offering people the possibility to access information at any time and place in order to maximize the learning experience. Therefore, E-learning couldn`t be possible without digital literacy skills, which are the basic skills to understand and use information in various formats and from a wide range of sources. Hence we can see a reciprocal relationship between E-learning and digital literacy skills. (Hamutoğlu, Sezen-Gultekin, and Savaşçı 2019)

Digital literacy is described as the ability to access, manage, understand, integrate, communicate, evaluate and create information through the use of digital technologies. Consequently, digital literacy is often described as having specific competences that are related to ICT literacy, computer literacy, information literacy and media literacy. (Law et al. 2018)

Nevertheless, these two concepts are often used interchangeably, because they are both comprised of information, media and computer literacy. ICT literacy, just like digital literacy, refers to the ability to access, manage, integrate, evaluate and create information, as well as the ability to use communication tools, networks and digital technologies. (Ainley, Schulz and Fraillon 2016) Digital competence is described as having basic ICT skills, meaning the ability to use the computer for searching, assessing, creating, saving and exchanging information, as well as developing collaboration networks through the Internet. Therefore, ICT is a technology that applies to any type of device that gathers, stores, processes, retrieves, manipulates, receives or transmits data in a digital form. (Aker 2022)

In today`s world lacking ICT skills has a profound impact on individuals` lives, both personally and professionally. Digital literacy has become a life skill, a competence that is indispensable in the workplace, as well as in everyday life, especially after the coronavirus outbreak. Moreover, digital literacy is viewed as being a vital component in the 21st century toolkit for creating more inclusive and secure societies. (Bandura and Leal 2022) However, the knowledge of digital literacy and its impending importance in all sectors of life is not a recent concept, this theory being tackled throughout the years in various works. The educational system has acknowledged ICT`s importance over the years, making considerable strives in this direction. Nonetheless, the focus shouldn`t be only on students perception of ICT, but also on teachers ability to use digital technologies, as well as on schools access to ICT resources. (Fraillon et al. 2013). ICT has produced a shift in the learning process, due to the fact that students have access to online content and don`t rely solely on printed materials. Moreover, the teaching environment has changed into a learner-centred one, where each individual becomes actively involved in the learning process, developing three major traits: autonomy, creativity and capability. (Fu 2013) There have been debates whether ICT skills should

be integrated only in primary and secondary schools (Angeli et al. 2016, Brinda et al. 2014), or should they be taught in kindergarten as well. (Armoni 2012, Drigas and Kokkalia 2014) This is a two-sided viewpoint where the supporting studies argue that children rely on inductive reasoning (Lawson and Fisher 2011), as well as on deductive reasoning from a very early age (Whittaker 2014), therefore it would be to their advantage to learn ICT skills as soon as possible. (Masoumi 2020) On the opposite side of the spectrum, there are concerns regarding the early exposure to technology and how this might affect children`s health in different ways – from eye vision deficiency to bad posture, with all the other health problems that these bring about (Woo, White and Lai 2016) – as well as the possibility to develop digital addiction (Ding and Li 2023) Nevertheless, in today`s digitized society children are being exposed to technology much more than in previous years, which means that, if the necessary precautions are taken, then the emphasis should be on teaching ICT in schools from an early age, because it develops problem-solving skills, it improves communication and computer-based assessment, therefore it has a major impact on both technological and cognitive abilities. (Weber and Greiff 2023)

It is important to acknowledge that digital transformation didn`t have an impact solely on education, it produced fundamental changes in the ethical responsibilities of each individual and in the way social interactions occur at a professional and personal level. This shift determined the emergence of new concepts, such as digital citizenship, e-commerce, digital economy, digital business and digital divide, the latter one having more topicality now than ever before. The focus should be on building critical media literacy skills, which have a positive impact on youth development and civic engagement (Martens and Hobbs 2015, Middaugh, Clark and Ballard 2017), as well as on digital economy, because individuals will be better equipped to understand the challenges and opportunities that arise in the virtual environment. (Lombana-Bermudez et al. 2020) The definition of digital citizenship has evolved throughout the years, as well as its applicability in the formal educational setting around the world. (Kim and Choi 2018, Cortesi et al. 2020) In short, digital citizenship refers to each individual`s right to freely express themselves online in a responsible way and the digital citizen is someone who has the ability to use digital tools, as well to impartially evaluate information from various online sources. (Cubukcu and Bazyan 2016)

Digital economy refers to the process of making money online from various businesses that are carried out in the virtual space. E-commerce (or electronic commerce) is the process of selling and buying goods and services via the Internet, therefore it refers to online businesses and the electronic networking strategies they incorporate through social media or other online platforms in order to succeed. Therefore, it has a direct influence on the development of digital economy (Gazieva et al. 2020), which in turn contributes to the expansion of green economy. (Chen 2021)

Overall, studies suggest that learning ICT improves the quality of life and the economic growth of a country. The use of various statistical methods, such as regression estimators, instrumental variables regression and pooled regression show that e-government and telecommunications have a stronger impact on GDP growth and that ICT development will improve the economic growth in the long run. (Akram et al. 2021) The economic growth of a country is measured through GDP (Gross Domestic Product) and one of its key drivers proved to be the ICT investments. (Goodwin 2022) However, the level of ICT development across the world has never been linear and therefore socio-economic and ICT variables derive, which accentuate the digital divide. For a long time

digital divide has been viewed as a problem that could be solved by simply providing Internet access. The digital divide concept has been debated since the mid-1990s and only in recent years this divide has been regarded as a multidimensional phenomenon that goes beyond the actual access to digital technology. (Mubarak, Suomi and Kantola 2020) This means that the divide is produced because of the way technology is being used for creating or adding economic values and social justice to a society. (Shenglin et al. 2017) Some studies suggest that the digital adoption of a country depends both on "fast moving" policy variables, which include mobile phone ownership, use-cases, coverage and price and "slow moving" policy variables, which include skills, urbanization, labour force participation, inequality and the services` share in the GDP. (Kumar, Amaglobeli and Moszoro 2023)

3. Methodology

Categorizing the EU members in order to shape an overview regarding the evolution of the ICT sector is a difficult task. Several factors can be taken into account in this process: geographical position, historical legacy, economic strategy, cultural and linguistic particularities, the date of accession to the EU, etc. If all these elements were given the same level of importance, we would risk over-fragmenting the analyzed landscape, which would complicate the endeavor of drawing relevant conclusions. Indeed, countries that belong to the same region are differentiated by their economic model, and countries that have similarities in their historical evolutions are separated by their cultural background. Making such a mosaic intelligible requires a flexible approach regarding the importance of the above-mentioned factors. Geography is an unavoidable element, but sometimes its relevance can be diluted; therefore, states like Portugal and Croatia or Ireland and Austria can end up in the same categories. Nevertheless, the four groups we established are named according to the cardinal points. Their componence is as follows: Western Europe – Austria, Belgium, France, Germany, Ireland, Luxembourg, and the Netherlands; Northern Europe – Denmark, Estonia, Finland, Latvia, Lithuania, and Sweden; Eastern Europe: Bulgaria, the Czech Republic, Hungary, Poland, Romania, and Slovakia; Southern Europe: Croatia, Cyprus, Greece, Italy, Malta, Portugal, Slovenia and Spain (Fig. 1).

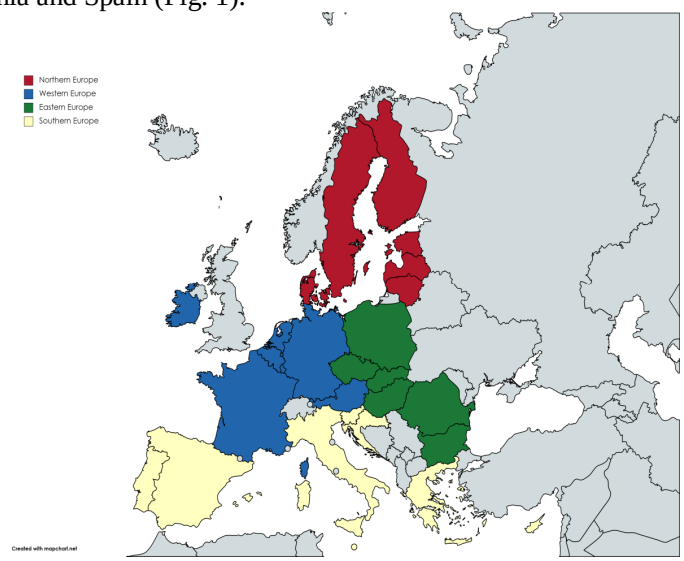

Figure 1 – The four groups delineated by our study. Source: MapChart 2023

The first category is built around five of the six founding members of the European Coal and Steel Community (ECSC), the structure which preceded the creation of the EU. The reasons behind the absence of Italy will be presented below. Germany belongs without any doubt to Western Europe, although some of its eastern regions are still influenced by elements from their Communist past. Ireland and Austria were added to this group because of economic, cultural, and historical reasons. Ireland can be considered a liberal market economy (LMA), while countries like Belgium, the Netherlands, Germany, or Austria are labeled as coordinated market economies (CME) (Hall & Soskice 2001, p. 20). CMEs are also described as the Continental European model (Amable 2003, p. 14). Moreover, an influential study considers Ireland and Austria to be at opposite ends of the economic spectrum, with Ireland having all the characteristics of a LME and Austria having all the characteristics of a CME (Witt & Jackson 2016, p. 793). However, Ireland is closer to the Continental model than to the leftist Scandinavian one or to the more ambiguous system that characterizes some of the Mediterranean countries. In addition, it joined the European Community in 1973, significantly sooner than countries like Greece (1981), Spain (1986), Finland, or Sweden (1995). Therefore, its placement in the Western European group, although debatable, is more appropriate than the alternative options. Regarding Austria, the particularities of its economy and its historical, cultural, and linguistic ties with Germany justify our choice. Although associated with the concept of *Mitteleuropa* (Central Europe), just like countries like the Czech Republic, Slovakia, Hungary, or Poland (Ash 1990: 1-2), Austria is differentiated from them not only by economic and linguistic details but also by the fact that after the end of the Second World War it did not become a part of the Communist bloc.

Northern Europe is composed of two groups that apparently have irreducible differences: the Scandinavian and the Baltic states. Economically, the social democratic model, which relies on boosting innovation and productivity while guaranteeing economic predictability and social protection (Amable 2003, p. 15), is contrasting with the neoliberal model of deregulation, which characterizes Estonia, Latvia, and Lithuania (Bohle & Greskovitz 2012: 2–3). Politically, in Denmark, Sweden, and Finland, liberal democracy has solid roots. These countries have been successful over the decades in avoiding the dangers of right- and left-wing authoritarianism. On the other hand, the Baltic region, as part of the Union of Soviet Socialist Republics (USSR), experienced almost half of a century of Communism. Thus, the three countries joined the EU only in 2004, alongside other former Communist states like Poland, the Czech Republic, Slovakia, Hungary, and Slovenia. Therefore, apparently Estonia, Latvia, and Lithuania should belong to the Eastern group. However, we must take into account that, economically, they have peculiar characteristics even for the easterners, and their cultural and linguistic identity differentiates them from the neighboring Slavic people. For instance, Estonians are closer to Finns than to Poles or Czechs. This observation is valid not only linguistically but also geographically: the distance between Tallinn and Helsinki is 88 kilometers, while the distance between Tallinn and Warsaw is almost 1000 kilometers. Moreover, regarding the digitalization of politics and society, Estonia is clearly closer to the Scandinavian group than to the Eastern one. These elements contributed to our decision to create a category that contains exclusively countries from the shore of the Baltic Sea.

Eastern Europe is homogenous regarding its recent history, all the six countries being former Communist regimes. Economically, the states that created the Visegrád Group (Poland, the Czech Republic, Slovakia, and Hungary) have implemented similar strategies, which can be labeled as *embedded neoliberalism*: deregulating the market is doubled, unlike in the Baltic states, by more or less successful attempts at maintaining social cohesion. On the other hand, Romania and Bulgaria have a more winding path, which leads to a destination that resembles the one reached by Estonia, Latvia, and Lithuania (Bohle & Greskovitz 2012: 2–3). Overall, it is clear that Central and Eastern Europe is not classifiable into one of the categories that exist in the pre-2004 EU (Whitley 1999, p. 209). Culturally and linguistically, the region is also characterized by diversity, with the Slavic identity coexisting with a Latin (Romania) and a Finno-Ugric (Hungary) one. However, all six countries are more or less burdened by a development gap in comparison with the West. Also, they all joined the EU less than 20 years ago (2004: Poland, the Czech Republic, Slovakia, and Hungary; 2007: Romania and Bulgaria). Therefore, especially because over-fragmenting the analyzed domain would be counterproductive for our endeavor, we included them in a single category.

Southern Europe is linked mainly by the Mediterranean Sea. Only Portugal, which is at the northwest of the Gibraltar Strait, does not have direct access to it. Portions of the Mediterranean, like the Alboran Sea (Spain), the Sea of Sicily (Malta), the Levantine Sea (Cyprus), the Ionian Sea (Greece), or the Adriatic Sea (Italy, Croatia, and Slovenia), connect the other countries of the group. Politically, several subgroups can be observed. Portugal, Spain, and Greece experienced right-wing authoritarian regimes during the second half of the 20th century. Moreover, they all joined the EU in the same decade (Greece in 1981, Portugal in 1986, and Spain in 1986). Slovenia and Croatia were part of the Communist Yugoslavia; however, it is essential to note that Yugoslavia exited the bloc led by the USSR in the early phase of the Cold War, being a founder of the Non-Aligned Movement. Therefore, the ties with the West were stronger than in the case of states from the Eastern group. Italy, although a founding member of the ECSC, is not only geographically but also historically and economically closer to the Southern group than to the Western one. It is worth mentioning that seven of the eight countries that compose this category have the highest share of tourism and travel in their Gross Domestic Product (GDP) from the EU in 2022: Croatia (25.8%), Greece (18.5%), Portugal (15.8%), Spain (13.6%), Malta (12.6%), Cyprus (12.2%), and Italy (10.2%). The eighth country, Slovenia, is also in the first half of the ranking (9.2% - 11th position) (Statista 2023). Moreover, the economic model of this region is distinct from the ones encountered in the rest of the EU. Portugal, Spain, Italy, and Greece, alongside France and Turkey, are considered mixed-market economies (MMEs), having both liberal and coordinated characteristics (Hall & Soskice 2001, p. 21; Witt & Jackson 2016, p. 793). Other authors argue that the Mediterranean model is more than a mere hybrid, combining strong rights for the employees, a weak safety net for those who are not integrated into the labor market, and few opportunities for professional reconversion. The education system lacks dynamism, therefore the wages, productivity, and quality of products are at a low level (Amable 2003: 15-16). Slovenia and Croatia have different economic particularities, being still influenced by their Communist path, but their model is not identical to the ones identified in the Visegrád Group or in the Baltic states (Bohle & Greskovitz 2012: 2–3). Culturally and linguistically, we can also observe several subgroups. Portugal, Spain, and Italy are Latin countries, closer to France or Romania from this point of view than to Greece or Croatia. Malta, although a former British

colony, is culturally close to this subgroup, the Maltese language being a Latinized version of Arabic. Greece and Cyprus have a shared heritage, although the issue of the Turkish-controlled area in the northern part of Cyprus is still unresolved. Finally, Slovenia and Croatia are Slavic countries, but, as mentioned above, the proximity of the Adriatic Sea and Josip Broz Tito's foreign policy are separating them from the Slavs of the Eastern group. Perhaps the least homogenous of the four categories, the Southern one is also united by the fact that the development of the ICT sector is still unsatisfactory.

Overall, the four groups we delineated do not lack inconsistencies but are useful for better understanding the evolution of ICT in the EU. Moreover, by shaping them, we avoided the risk of overfragmentation (Table 1). As we will observe below, there are important variations within some of our categories. Nevertheless, the differences between them help us identify several factors that are boosting or sabotaging the process of digitalization.

The Western Group: • Geographic position: Western and Central Europe. • Historical legacy: countries with liberal democratic backgrounds that did not experience left-wing authoritarianism. • Economic model: coordinated market economy (exception: Ireland). • Culture and language: a mix of German, Latin, and Celtic heritage. • Date of accession to the EU or its predecessors: 1952 (France, Belgium, the Netherlands, Luxembourg, Germany), 1973 (Ireland), 1995 (Austria).	The Northern Group: • Geographic position: Northern Europe (countries linked by the Baltic Sea). • Historical legacy: two subgroups with common elements – the Scandinavian and the Baltic states (Finland was, just like the Baltic states, in the influence sphere of the Russians for an important period of time). • Economic model: social-democracy (Scandinavia) and neoliberalism (the Baltic states). • Culture and language: two subgroups with common elements - the Scandinavian and the Baltic states (Finland and Estonia share the Finno-Ugric heritage). • Date of accession to the EU or its predecessors: 1973 (Denmark), 1995 (Sweden and Finland), 2004 (Estonia, Latvia, and Lithuania).
The Southern Group: • Geographic position: Southern Europe (countries linked by the Mediterranean Sea). • Historical legacy: a mix of right-wing authoritarian experiences (Portugal, Spain, Greece, and, earlier, Italy), the Communist heritage of Slovenia and Croatia, and the former status of a British colony shared by Malta and Cyprus. • Economic model: a Mediterranean model that combines coordinated and liberal elements (Portugal, Spain, Italy, Greece), and the post-communist neocorporatism (Slovenia) and embedded neoliberalism (Croatia).	The Eastern group: • Geographic position: Central and Eastern Europe. • Historical legacy: former Communist countries. • Economic model: (embedded) neoliberalism. • Culture and language: a mix of Slavic, Latin, and Finno-Ugric heritage. • Date of accession to the EU: 2004 (Poland, the Czech Republic, Slovakia, and Hungary) and 2007 (Romania and Bulgaria).

• Culture and language: a mix of Latin, Greek, and Slavic heritage. • Date of accession to the EU or its predecessors: 1952 (Italy), 1981 (Greece), 1986 (Spain and Portugal), 2004 (Malta and Cyprus).	

In order to identify the differences between the four groups, we utilize methods such as document and data analysis. We study information presented by the Digital Economy and Society Index (DESI), realized by the European Commission. Moreover, we highlight data from research conducted by Eurostat, the EU's statistical office. The overview is completed with details extracted from studies and reports.

The main goal of the analysis is to establish the validity of three hypotheses. The first hypothesis is as follows: Economic models centered on innovation and productivity have the highest compatibility with the development of the digital sector. The second one states that countries that joined the EU in the last two decades are using digitalization as an instrument to reduce the development gap between them and the core of the organization. Finally, the third one affirms that economies that rely mainly on tourism have the tendency to neglect the digitalization process. As mentioned above, our conclusions are based on the comparisons which arise from verifying the validity of these statements.

4. The ICT sector in the four EU regions

The Scandinavian countries are unarguably the most developed EU members in regard to the digitalization of the economy and society (Fig. 2). In the 2022 DESI index, which focuses on four indicators (human capital, connectivity, integration of digital technology, and digital public services), three out of the first four positions are occupied by Finland, Denmark, and Sweden (Digital Economy and Society Index 2022). In Northern Europe, Estonia and Lithuania are also above the EU average. However, the remarkable achievements of Estonia in the domain of e-governance are clouded by issues regarding connectivity and human capital. Moreover, Lithuania and Latvia are contributing to a significant decrease of the group's average score. As mentioned above, the Scandinavian and Baltic countries have different historical paths and different economic models.

In Western Europe, the Netherlands and Ireland are among the most developed countries, occupying the 3rd and, respectively, the 5th position. Luxembourg, France, Austria, and Germany are also above the EU average. Firstly, this overview underlines that both liberal and coordinated market economies are compatible with high levels of digitalization. Secondly, it suggests that the countries that form the core of the European project are likely to possess competitive advantages in the technological field.

Eastern Europe is clearly underdeveloped, with five of the last six positions in the DESI index being occupied by states from this region (only the Czech Republic is in a slightly better position). Although there are indicators that seem to contradict this conclusion (Romania is close to the EU average regarding connectivity), it is clear that most of the EU members that belonged to the former Communist bloc are yet to catch up with the digital standards of the North and the West.

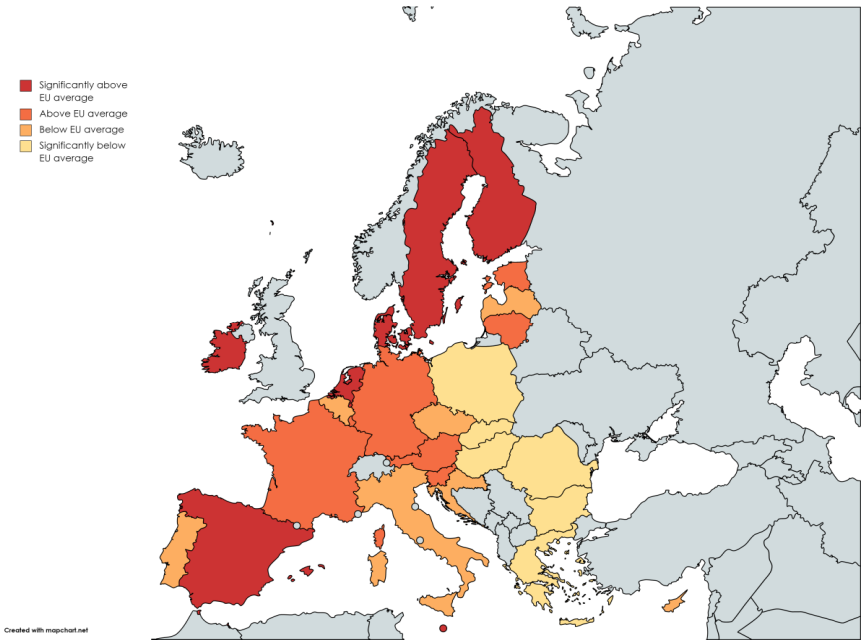

Figure 2 – DESI Ranking 2022. Source: Digital Economy and Society Index 2022; MapChart 2023.

Southern Europe is, even more than the Northern group, heterogeneous: Malta and Spain have excellent scores, Slovenia is slightly above the EU average, Italy, Croatia, and Cyprus are below average, while Greece is in the proximity of the two countries that joined the EU in 2007 (Romania and Bulgaria). These discrepancies cannot be completely explained either by history, the economic model, or cultural particularities. However, as we will see below, other indicators present a more comprehensible image of this group.

Overall, if we focus exclusively on this index, we could argue that it demonstrates the existence of a multi-speed Europe; the North and the West are clearly superior to most of the Eastern and Southern countries (Fig. 3). This image, although quite accurate, is ignoring the latest trends. The strategic approach of several Eastern states prioritizes the process of digitalization.

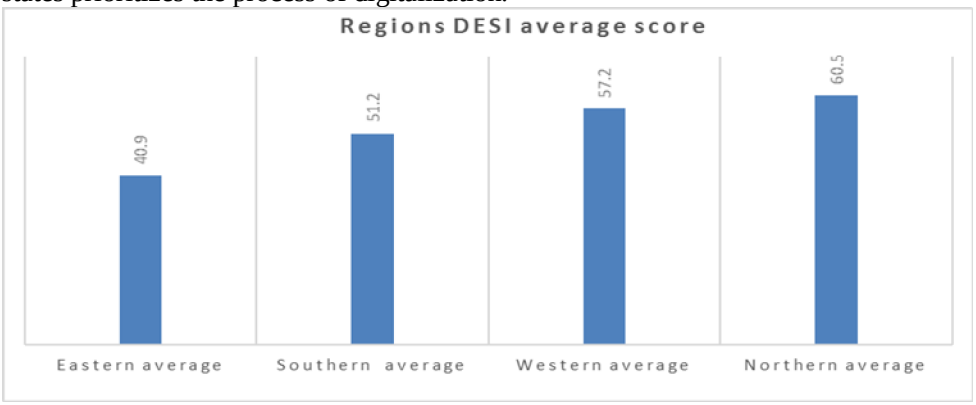

Figure 3 – The average score of the four groups in 2022. Source: Digital Economy and Society Index 2022.

An essential indicator for establishing the importance of the digital field in the economic development of a country is represented by the share of the ICT sector in the GDP. In this regard, the overview presented by DESI is not confirmed. If we analyze the period between 2018 and 2020, we can notice that the Northern group maintains its primacy, but the Western and Southern ones are registering lower figures than the Easterners (Fig. 4). Regarding the West, we must specify that we could not identify complete data regarding the share of the ICT sector in the GDP for two countries (Luxembourg and Ireland). ICT has the lowest impact on the economic evolution in the Southern region (Fig. 4). Here, Portugal, Spain, and Italy have not provided relevant data for all the analyzed years; therefore we filled the gaps by utilizing the averages of the figures that were available.

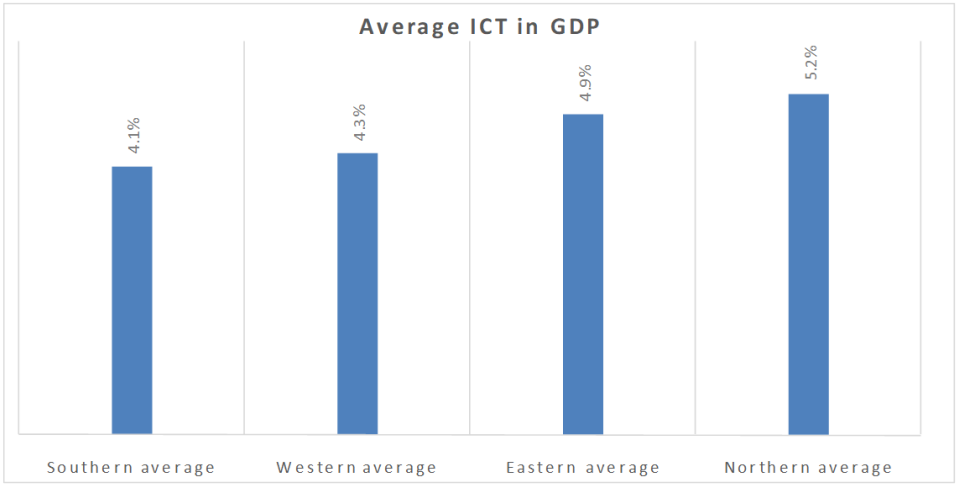

Figure 4 – The average share of the ICT sector in GDP (2018-2020). Source: Eurostat 2023a.

In the North, there are some notable regional differences: Lithuania is the only country that has a percentage below 4%, while Sweden is the only one that exceeds 7% (in 2020). In the East, a quite homogenous landscape is altered by Bulgaria, which has remarkable figures (above 6% in 2019 and 2020). In the West, the only country that is below the 4% mark is Austria. In the South, Malta's share (8% in 2020) is significantly improving the average score (Eurostat 2023a).

The apparent backwardness of the Southern group can be explained by the importance of the tourism and travel sectors in the GDP. Regarding the higher percentage of the Eastern group, there are at least two possible explanations. Firstly, regardless of the dominant economic model, governments seem to consider digitalization as a precondition for social and economic development. Secondly, the involvement of foreign IT companies that benefit from a combination of lower wages and improvements regarding connectivity and human capital is boosting this sector (Anderson 2022).

If we analyze the percentage of the ICT personnel in total employment, we obtain an image that resembles the one offered by the DESI index: the Northern and Western groups have significantly higher figures than the Southern and Eastern ones

(Fig. 5). Notably, the backwardness of the Easterners is significantly less pronounced than in the case of the above-mentioned index. Moreover, it could be argued that employees from Eastern Europe tend to generate a higher added value in the economy, given that the ICT sector's percentage in the GDP is higher in the Eastern region than in the Southern one. Also, it must be specified that the precise number of ICT specialists employed in the West is significantly higher than in the North, given that Scandinavia and the Baltic region have a smaller population density than Western and Central Europe.

The gap between the North and the West on the one hand and the South and the East on the other hand suggests that in the latter, there is still a significant room for improvement regarding e-learning. Thus, we have a confirmation of the overview of digital skills in the EU provided by DESI.

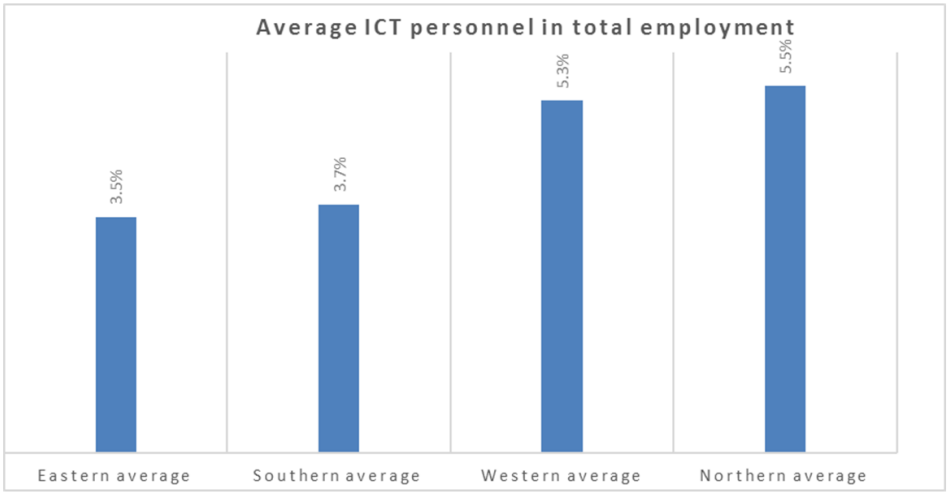

Figure 5 – The average of the percentage of ICT personnel in total employment (2018-2022). Source: Eurostat 2023b

Obviously, acquiring digital skills is heavily influenced by the accessibility of the internet. In this regard, we can also identify a discrepancy between the performers of the DESI index and the rest (Fig. 6). Although the situation is far from grim in the South and the East, it is clear that the possibilities for these regions to boost their digitalization processes can be limited by the lack of significant improvements in this field. In the Eastern region, from 2018 until 2021, internet access increased by 3% every year, and from 2021 to 2022, it improved by 2%. In the Southern region, an increase at a steady pace was registered (2%–3% yearly) (Eurostat 2023 c). The South and the East need to keep up this pace in order to reduce the aforementioned development gap.

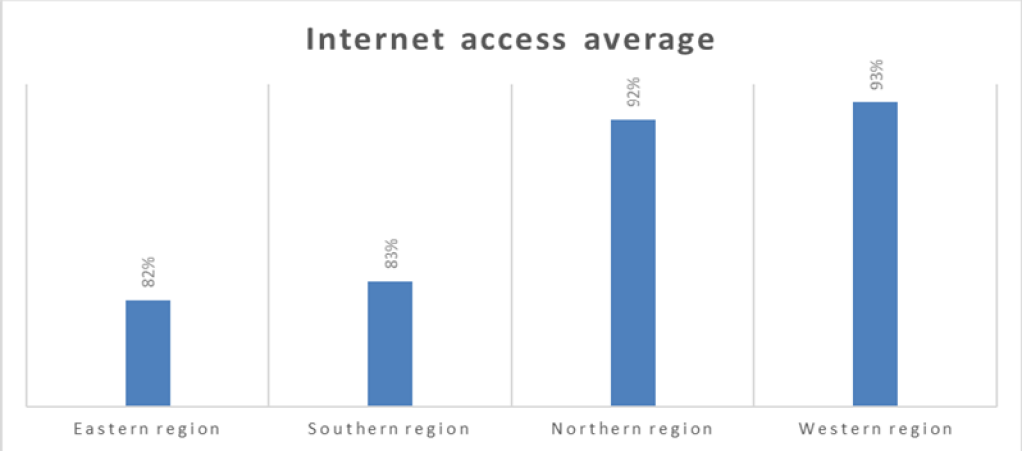

Figure 6 – The average of the internet accessibility in the four groups (2018-2022). Source: Eurostat 2023c

A relevant indicator regarding the importance of the digital sector in the economy and in the everyday lives of individuals is represented by the frequency of internet purchases. Here, the gap between the Northern and Western groups on the one hand and the Southern and Western groups on the other is as visible as ever (Fig. 7). Nevertheless, the latest trends offer us relevant insight into the development of ICT at a regional level. At the beginning of the analyzed period (2018), people from the Western and Northern regions were obviously more familiar with online purchases than citizens from Eastern and Southern Europe. However, the latter managed to adapt and significantly increase their online purchases, especially in the context of the pandemic. Notably, in Eastern Europe, online acquisitions continued to increase in 2022, while in other groups, a recoil was generated by the end of pandemic-related restrictive measures. In the East, the analyzed figure increased from 29% (2018) to 49% (2022). In the South, the progress is from 32% (2018) to 46% (2022) (Eurostat 2023d, Eurostat 2023e). These details highlight the fact that the dynamism of the Eastern digital sector is growing more rapidly than in other regions; therefore, it can be argued that a factor consisting, among others, of governmental strategic approach and foreign investments has the ability to redraw the EU's regional ICT map.

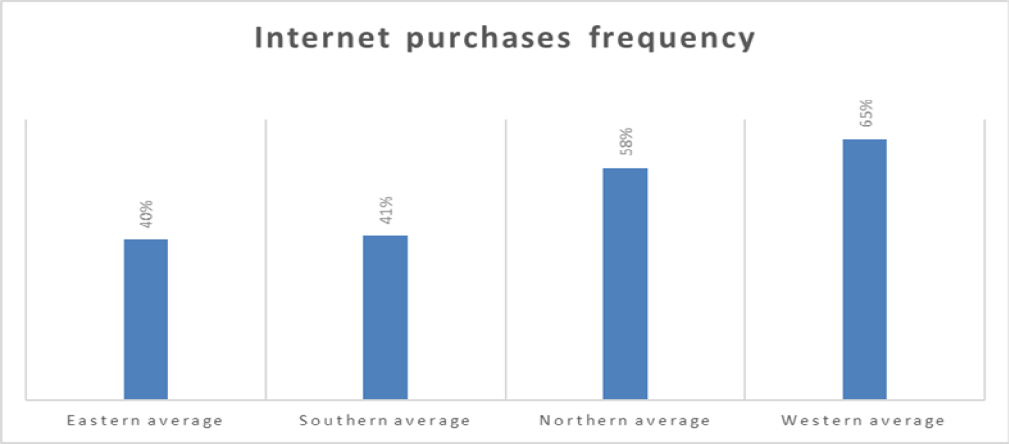

Figure 7 – The average of the annual frequency of internet purchases by individuals in the four groups (2018-2022). Source: Eurostat 2023d, Eurostat 2023e.

5. Conclusions

Our study focuses on an overview that is in continuous transformation. Certainly, in the future, several of our affirmations will be obsolete. Our preliminary attempt to delineate the main trends regarding the development of the digital sector in the EU should be followed by studies that will update its conclusions or rebuild them through the study of analyzed data. The utilization of quantitative methodological tools could represent the proper approach for such endeavors. Nevertheless, our conclusions, although perfectible, can be useful both for academics and policymakers who have the ICT domain in their area of interest.

Firstly, we must underline that the economic model is an essential element for the evolution of the ICT sector. Obviously, these models are a consequence of political decisions, which are unavoidably influenced by historical reasons. The economic landscape is also constantly transforming; the landscapes of 1973, 1998, and 2023 are certainly not identical. Nevertheless, in spaces that were not affected by authoritarian experiments in the last 75 years (Western Europe and Scandinavia), the levels of stability and predictability are significantly higher than in the East and in the South. The social democratic, coordinated, and liberal models are all, in various degrees, compatible with deepening the process of digitalization. On the other hand, the ambiguity and u-turns that sometimes characterize former Communist or right-wing dictatorships can be harmful for innovation and productivity. Therefore, it can be stated that the analyzed information tends to confirm our first hypothesis.

Secondly, the current image reflects the superiority of the Northern and Western groups in comparison with the Eastern and Southern ones with regard to the digital sector. Nevertheless, if we focus on the trends, we can see that former Communist countries are at least partially successful in their endeavor to reduce the digital gap that separates them from the core of the EU. These countries have a significant competitive advantage due to their relatively cheap labor force. Moreover, governments are actively trying to improve this domain. This reality is reflected, among others, in the Bulgarian and Romanian cases. For instance, in Romania, workers in the IT sector had, for a long period of time, important fiscal facilities (Moșoianu 2019). Therefore, it can be argued that the second hypothesis is confirmed as well.

Thirdly, there is a clear correlation between the underdevelopment of the digital sector and having a high share of tourism and travel in the GDP. However, obviously, the presence of correlation does not automatically imply the existence of causation. Moreover, having a low share of tourism in the GDP is not correlated with an excellent situation regarding the ICT sector. For example, in Romania, in 2022, tourism and travel accounted for only 5.5% of the GDP (21st position in the EU) (Statista 2023), while in the same year, Romania occupied the last position in the DESI index (Digital Economy and Society Index 2022). The validity of our third hypothesis is also questioned by the heterogeneity of the Southern group. Nevertheless, some figures indicate that this topic could be further researched. Croatia (25.8% of the GDP in 2022) and Greece (18.5% of the GDP in 2022) have more developed tourism than Spain (13.6% of the GDP in 2022) and Malta (12.6% of the GDP in 2022) (Statista 2023). On the other hand, in the DESI index, the superiority of Malta (6th position in 2022) and Spain (7th position in 2022) in comparison with Croatia (21st position in 2022) and Greece (25th position in 2022) is undeniable (Digital Economy and Society Index 2022).

In conclusion, although the effects of the fourth and fifth waves of the industrial revolution influence all the EU members, the development of the digital domain is not a natural process. Digital literacy and connectivity, among other elements, are influenced by political decisions. Political and economic approaches can boost or delay aspects of digitalization. For now, Scandinavia and Western Europe have the upper hand in this regard. Nevertheless, the peril of stagnation is present in these regions as well. If Eastern Europe continues to prioritize the ICT sector, the following decades could witness a rearrangement of the European status quo.

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