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Digital gender divide in the European Union

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Digital gender divide in the European Union

Abstract

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The results show a lower dispersion among European countries in the ICT-USE indicator than in the ICT-PURCHASE indicator. In general, the digital gender gap is usually lower when ICT-USE is examined, compared to ICT-PURCHASE. Regardless of the indicator used, the highest values of the digital gender gap are found in Croatia and Italy, reflecting an unfavourable position for women, along with Ireland which, in turn, shows an unfavourable position for men. On the contrary, Denmark and Cyprus do not register gender differences in either of the two indicators analysed. Finally, the convergence between European countries is corroborated, both in the indicators analysed and in the different digital gender gaps built.

Keywords: Digital economy, ICT indicators, Digital gender divide, Convergence, European Union.

JEL code: J16, O33, O52.

1. Introduction

The digital economy, linked to the fourth industrial revolution or Industry 4.0, is made up of the sectors producing digital goods and services related to Information and Communication Technologies (ICT), including electronic commerce (Veciana et al., 2001). Guerrero (2018) highlights that the usual model of labour relations has changed and new forms of commerce and work have emerged in such a way that consumers can easily and immediately access products they demand on digital platforms. In fact, Degryse (2019) shows how some companies do not need a specific physical space anymore because the production system has been altered, and a service that connects workers and customers can be provided by computer applications.

As indicated by Cohen, DeLong and Zysman (2000), ICTs are tools that allow manipulating, organising, transmitting and storing information in digital form. They consider that ICTs amplify the intellectual capacity in a way comparable to the extension of the muscular power achieved by the technologies of the Industrial Revolution. In addition, they acknowledge that the digital economy has promoted significant increases in productivity[1], thus boosting economic growth. However, according to Doménech et al. (2018a: 136), "it is possible that the same changes that, in some countries, increase productivity, wages and employment at the aggregate level, have diametrically opposed effects in others". Likewise, it is crucial to address certain changes and measures of economic policy in the technical and legal fields, in order to carry out a new formulation of the rules that allow markets and society to be organised in a balanced way.

In this sense, the most analysed issue might be the impact of the digital economy on work, in general, and the labour market, in particular (ILO, 2017; CES, 2018; World Bank, 2019). In a pioneering study, Autor, Levy and Murnane (2003), who developed an estimated model for the United States, point out that ICTs can replace the everyday work tasks and complement workers in other types of tasks that require communication, flexibility and creativity. Similar models that have been applied to countries over different periods of time confirm the increase of the most qualified and least routine employment. However, this does not imply that all low-skilled employment will drop (Gortazar, 2018). In Spain, Doménech et al. (2018b) consider that the risk posed by digitization to workers is reduced due to their increased educational level, their commitment to updating their training and their ability to adopt new forms of employment, such as remote work.

The digitization of work entails both positive and negative effects globally. Nevertheless, positive or negative effects may predominate at a national level or among specific groups, so it would be necessary to implement appropriate educational, labour and social policies. Therefore, the development of mathematical and social skills must be promoted, both in the spheres of education and employment. In relation to social skills, Barro (2017) highlights persuasion, empathy or ability to work in a team. Taking into account that significant changes are going to take place in the labour market, Barro suggests that the educational system and, above all, universities, have to propose a different education (not just different contents) that allows graduates to adapt to the new changing and automated work environment. It will be necessary to rethink how to approach technology and innovation from a transversal perspective, and how to incorporate their contents in specific subjects. Thus, in this new scenario of continuous changes, flexible and permanent learning is necessary. As Alós (2019) indicates, there may be occupations and

[1] There is no consensus about the impact of new technologies on productivity and economic growth. An interesting analysis on this issue can be found in a report by the Economic and Social Council of Spain (CES, 2017).

tasks with different levels of qualification and salary in the same sector, which reinforces permanent and dynamic training.

Faced with these profound productive, labour and educational changes, the European Union has been preparing its digital transformation since the beginning of the 21st century, through different objectives embodied in the successive economic growth strategies, formulated by Lisbon and Europe 2020, in 2000 and 2010, respectively. The flagship initiative, the *Digital Agenda for Europe*, within the Europe 2020 Strategy, has oriented community action towards the construction of a digital single market, that is, a common regulatory framework at European level to promote public administration and electronic commerce (European Commission, 2015).

At present, the digital and ecological transition, together with the promotion of social cohesion and European values, initiated in the European Pillar of Social Rights (European Commission, 2018), are the core around which the six political priorities of the EU for the period 2019-2024 are articulated. Such priorities are the European Green Deal, an Economy that Works for People, a Europe Fit for the Digital Age, Promoting our European Way of Life, a Stronger Europe in the World, and a New Push for European Democracy (European Commission, 2020a).

Following the publication of the *Shaping Europe's Digital Future* initiative in February 2020 (European Commission, 2020b), the unexpected global disruption caused by the COVID-19 pandemic has put the planned development on hold. A year later, and although uncertainty about the future of events remains high, the EU has presented its roadmap for the so-called *Europe's Digital Decade* with the horizon in 2030 (European Commission, 2021). Twelve goals have been established. They evolve around four basic areas of action, or cardinal points, which make up the EU's Digital Compass to guide the course of its digitization process.

Nevertheless, the difficult economic and social situation caused by the current health emergency raises serious doubts about the success of the European Digital Compass, especially when looking back and taking into account previous experience. Despite the progress made in the digitization of the EU's economy, the 2008 crisis, with a huge long-lasting social impact, has truncated much of the European aspirations to lead the knowledge economy and innovation. In fact, the competitive position of the EU has worsened and its technological dependence has increased in recent years.

As it has already been pointed out, the growing use of ICTs in production and consumption processes can have positive and negative effects on society and the different agents involved. As it affects workers, sectors and countries in different ways and degrees, this phenomenon causes both beneficiaries and victims. This is the approach taken by the concept of digital divide, which seeks to identify the inequality in the access and use of ICTs between different territories or population groups, such as men and women.

The aim of this work is to analyse the digital gender divide in the EU countries. The gap has been constructed in absolute and relative terms by means of two common indicators of Internet usage, and accounts for territorial convergence during the 2007-2019 period. The paper is organised as follows. First, the concept of the digital gender divide is examined. Second, the methodological aspects related to the analysis carried out are detailed, and the results obtained are presented later. Finally, the main conclusions are drawn.

2. The digital divide from the gender perspective

As noted above, the digital economy involves the application of technology in different areas, such as work, education and home. However, the digitization process is not geographically homogeneous, since not all regions access the Internet as easily as others. Given the differences in technical means and in the opportunities to acquire certain skills, socioeconomic imbalances are also detected.

In this way, the digital divide is defined as the disparity in the access and use of ICTs, whether between people or countries, and can be measured in terms of available digital infrastructures or skills and knowledge related to the use of computer technology or the Internet (Park, Choi and Hong, 2015; Vicente and López, 2006). The digital divide is determined by factors such as educational level, income, geographical area, age, and gender (De Andrés, Collado and García, 2020).

The Economic Commission for Latin America and the Caribbean acknowledges that the digital divide can increase pre-existing socioeconomic inequalities, and concludes that the differences between men and women in the technological field is a reflection of the social gender gap itself (ECLAC, 2013). Additionally, Caridad and Ayuso (2011) consider that the digital divide can reinforce other social, cultural, economic, generational, and geographical disparities, as well as aggravate gender inequalities. According to Bhandari (2019), digital inequality is a field of study that is developing in all disciplines, and she examines the factors determining the unequal access to mobile phones between men and women in 51 countries.

Consequently, the term *digital gender gap* or *divide* is used when comparing the situation of men and women in this area. The growing digitization can cause or increase the risk of exclusion of vulnerable groups: those with scarce resources, advanced age, poor social and family relationships, etc. Furthermore, the risk of exclusion can be aggravated in the case of women. Among other reasons, that can be due to the fact that their presence in the workplace, where the use of ICTs is common, is lower despite their high level of training. However, women's participation is low in studies and jobs related to the science and technology (STEM[2]).

Equality between men and women is not only a fundamental right but also an essential requirement to achieve inclusive and sustainable growth, as dictated by the United Nations[3] (2015) or the Organisation for Economic Cooperation and Development (OECD, 2018). For this reason, increasing the female presence in the digital world is one of the measures to promote equality. In 2005, UN Women highlighted the role that ICTs could play in the socioeconomic progress, generating new types of activities, employment opportunities and improvements in the provision of educational and health services (United Nations, 2005).

Antonio and Tuffley (2014) consider that digital technologies can provide women with job opportunities, increased income levels and better access to health and educational services. Ramos and Rodríguez (2009) qualify such findings, since the use of ICTs generates economic and social benefits only if there are adequate technical and training infrastructures, together with an appropriate legal framework. Therefore, equal

[2] STEM stands for Science, Technology, Engineering and Mathematics.

[3] In 2015, the 193 member countries of the United Nations signed the ambitious commitment known as the 2030 Agenda, which encompasses 17 sustainable development goals. Goal 5 is "Achieve gender equality and empower all women and girls".

opportunities in the access and use of ICTs need to be promoted in order to avoid the possible digital gender divide.

The study of the digital gender gap can take different perspectives. For instance, Castaño (2008) considers the inequality between men and women in the access to ICTs as the first digital gender gap, whereas the one related to the skills necessary to obtain all the benefits of access is considered as the second gender digital divide. Martín and Martínez (2009) introduce a third gender digital divide regarding the use of the most advanced ICTs. On the other hand, Sáinz, Arroyo and Castaño (2020) refer to three gender digital gaps: the differences between men and women in the access to ICTs; the disparities in the level of competencies in ICT management; and the benefits acquired through the use of ICTs. These three aspects of the digital gender divide are contemplated in OECD (2018), where digital financial inclusion is incorporated. On the other hand, for Van Dijk and Hacker (2003) and Martínez (2013), access to digital resources is a multifaceted phenomenon affected by four factors: the ones mentioned above (material, skills and usage) with a psychological one, which refers to the user's own interest or motivation and their attitude towards ICT.

The importance of the psychological factor has also been analysed by Larsson and Viitaoja (2020), who consider it crucial to introduce changes in attitudes, behaviours and habits by launching informative campaigns that show female role models in STEM. Such measures would inspire and encourage girls and women to start academic and professional careers in these areas, and would also help eradicate gender stereotypes or prejudices.

Another important issue, pointed out by Fernández-Morante, Cebreiro and Casal (2020), is that the digital gender gap is persistent and present from a very early age, so only the actions taken on the initial educational stages will correct it. Thus, Gil-Juárez et al. (2011) recommend strategies focused on early recruitment, such as workshops aimed at informing girl teenagers about technological studies. As suggested by Larsson and Viitaoja (2020), it is common for women linked to ICTs to collaborate in such campaigns, so the girls are provided with female role models with whom to identify.

3. Methodological aspects

As mentioned above, the main objective of this work is to analyse the digital gender gap in the EU, by addressing its calculation in absolute and relative terms. The definition of digital gender gap given by the Spanish National Institute of Statistics (INE) has been used: "the difference between the percentage of men and the percentage of women in the use of ICT indicators (Internet usage in the last three months, frequent use of the Internet, and online purchases) expressed in percentage points" (INE, 2020: 356). This calculation, expressed as (M-W), quantifies the gap in absolute terms. Secondly, the ratio between men and women has also been determined in a way similar to the procedure used by Martín and Martínez (2009). Therefore, the gender gap in relative terms is obtained by calculating (M-W)/W, expressed as a percentage. In both cases, the sign of the gap consistently shows the group in disadvantage: the female population when the sign is positive, and the male population when the sign is negative.

The indicators used to calculate the digital gender gap refer to two areas of ICT usage included in the Digital Economy & Society Database elaborated by Eurostat. These are the percentage of the population aged 16 to 74 that has used the Internet in the last three months, which we call the ICT-USE indicator, and the percentage of the population aged 16 to 74 that has made an online purchase in the last three months. which we call the ICT-

PURCHASE indicator. The results of the digital gender gap in absolute and relative terms, as well as the values of the ICT indicators for the years 2007 and 2019, are shown in the Annex.

Finally, we examine the evolution of the digital indicators and the absolute and relative gender digital gap in order to identify the approximation or distance of these variables across the EU-28 countries. As González, López and Martínez (2019) point out, the analysis of economic convergence across countries has incorporated other social magnitudes in recent years, such as gender equality. This paper addresses the study of beta and sigma convergence, verifying whether the countries that start with lower ICT indicators achieve higher growth over time (there is β-convergence), and whether the dispersion across countries is reduced (there is σ convergence). The β-convergence is necessary, but not solely responsible, for σ-convergence to occur.

Such techniques are also applied to the digital gender divide, and the convergence is examined between European countries. It should be specified that, in this case, the gap is considered by taking into account only its numerical value, that is, omitting its sign; otherwise, the analysis would not be possible[4]. This means that it is not distinguished whether the indicator is higher in men or in women, as the treatment of the gender disparity is the same regardless of the sex in disadvantage. Obviously, this distinction is important, so it will be determined when comparing the levels of the digital gender gap for the year 2019.

We not only examine the dynamics of the digital gender gap, but also whether the male and female ICT indicators themselves have approached each other or not, since digital gender equality can occur in countries where men and women make high or low use of the Internet (for instance, 90% and 30%, respectively). Therefore, although no indicator of the digital gap is calculated, the fact that there is convergence between the ICT indicators, for each sex, provides an approximation of the reduction of the digital gap between them.

4. Analysis of the digital gender gap in the European Union

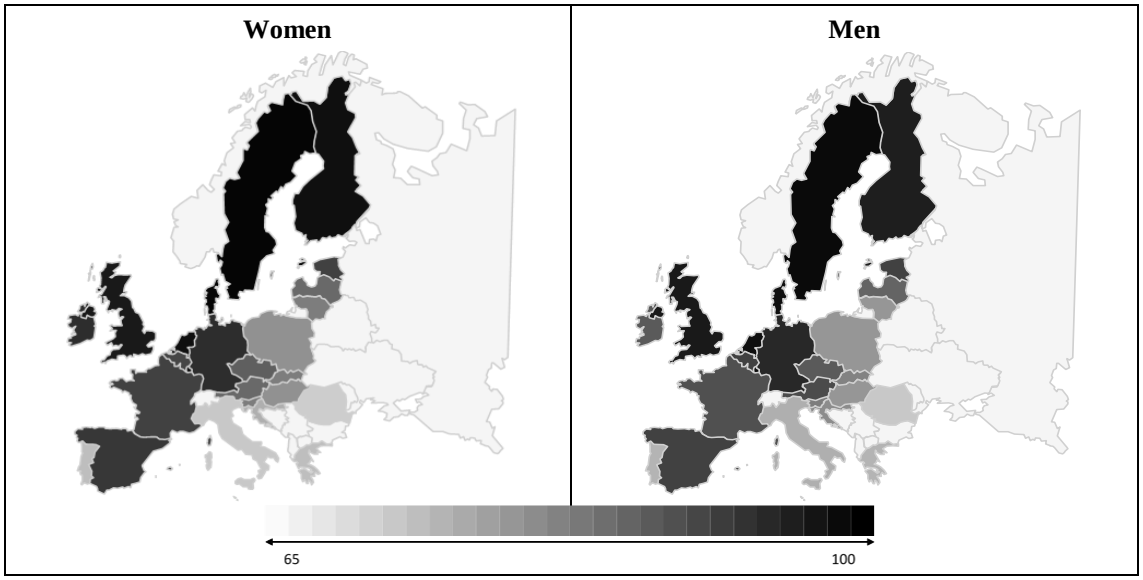
The convergence study is carried out starting from a comparative analysis of the ICT indicators and the digital gender gap referred to the year 2019. For β-convergence, the situation in 2007 and the variation experienced between 2007-2019 are taken as a reference point. When examining the σ-convergence, the evolution of the standard deviation of each year during the period considered is observed. Finally, it should be noted that, although Cyprus is not represented in the maps, it has been included in all the analyses carried out.

4.1. ICT indicators in the EU-28: disparities and convergence

In 2019, the EU-28 countries had a very high percentage of the population, both women and men, who used the Internet in the last three months. As can be seen in map 1 (data in Annex, table 1), except for Bulgaria, Romania, Greece, Italy and Portugal, the rest of the EU-28 countries reach ICT-USE values above 80%; near 100% in Denmark, Sweden, Luxembourg, the Netherlands, Finland and the United Kingdom. In Spain, 91% of the population, both women and men, used the Internet in the last three months, so its ICT-USE indicator is above the EU-28 average: 86% in women and 88% in men (table 1).

[4] That is, |M-W| and |M-W|/W are considered in the analysis of beta and sigma convergence.

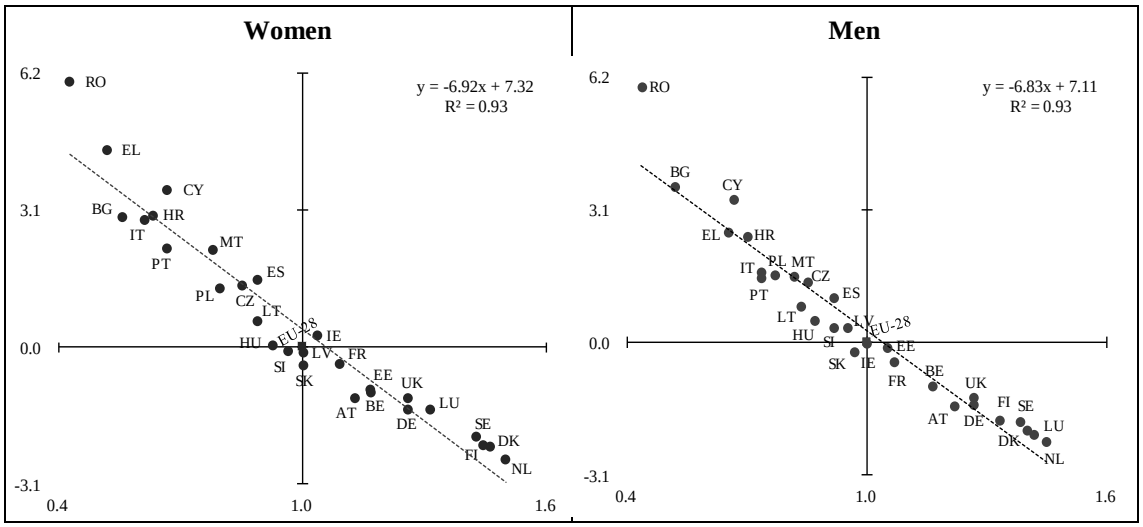
Map 1. ICT-USE indicator in the EU-28, 2019 (%)



Source: Own elaboration based on the Digital Economy & Society Database (Eurostat) and using Clearly and Simply (https://www.clearlyandsimply.com/clearly_and_simply/2009/06/choropleth-maps-with-excel.html).

The differences between the EU-28 countries have narrowed since 2007. As shown in graph 1, there is a clear process of β-convergence between countries for the two sexes. Thus, those countries that started in 2007 from levels higher than the European average are those that have grown less than the EU average between 2007-2019 (located in the lower right quadrant). On the other hand, those that started from lower levels have grown more intensely (upper left quadrant). That is why the equation shows a negative regression coefficient, the coefficient of determination R^2 being very close to unity.

Graph 1. β-convergence in Internet use in the EU-28, 2007-2019

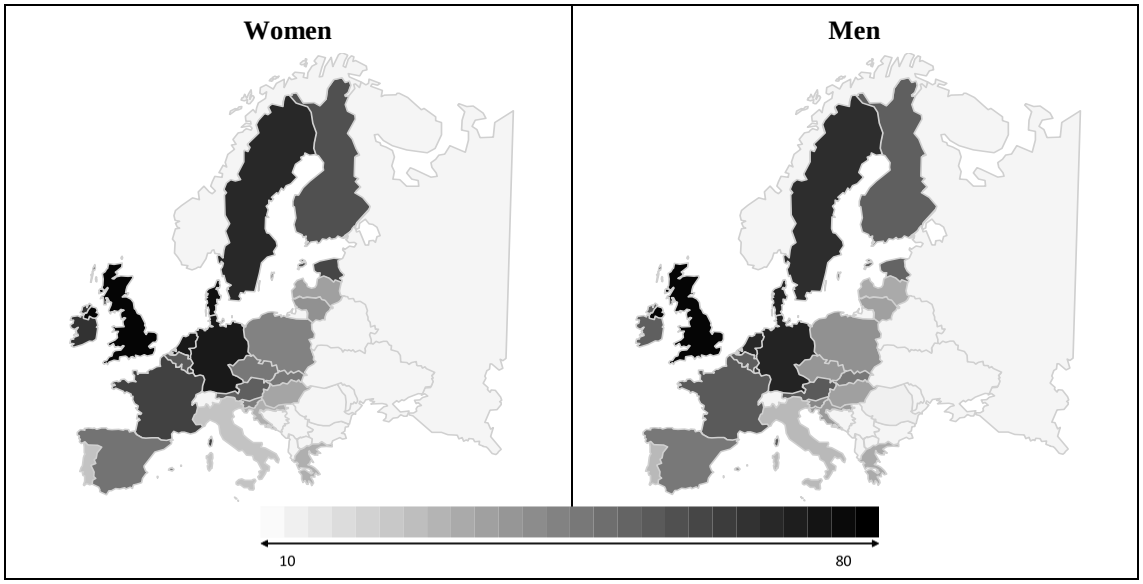


Note: The abscissa represents the relative situation of women and men with respect to the EU-28 (which represents the unit) in the 2007 ICT-USE indicator. The average annual growth differential with the EU between 2007 and 2019 is represented on the ordinate.
Source: Own elaboration from Digital Economy & Society Database (Eurostat).

The values decrease notably in the percentage of the population who have made an online purchase in the last three months (ICT-PURCHASE), and the differentials between countries widen. At the lower end are Bulgaria and Romania, with figures below 15% for both sexes (Annex, table 1). On the contrary, in the United Kingdom, Denmark, Germany

and the Netherlands, the percentages exceed 70% (Map 2). Spain is below the EU-28 average, with a percentage of 50%.

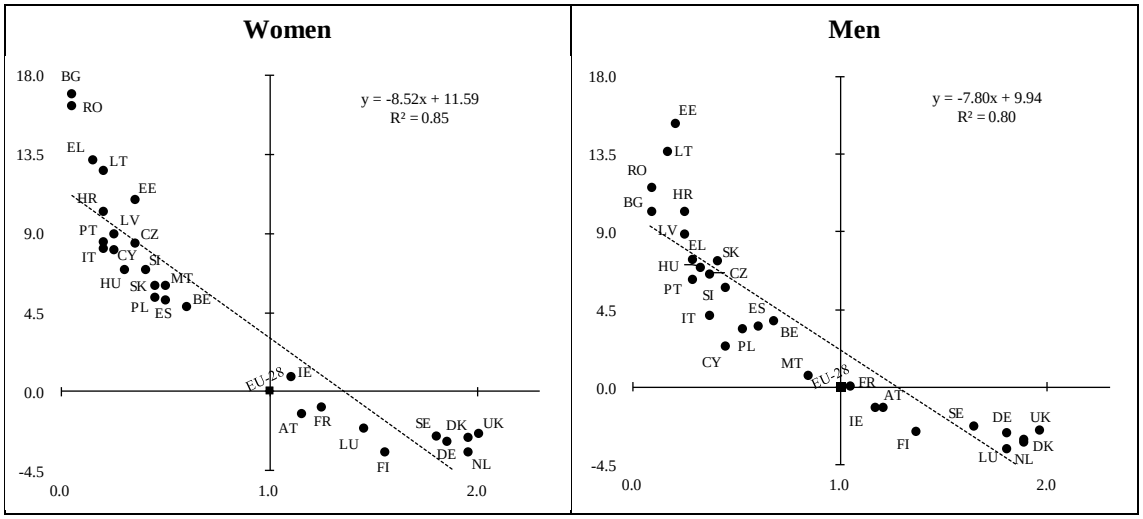
Map 2. ICT-PURCHASE indicator in the EU-28, 2019 (%)



Source: Own elaboration based on the Digital Economy & Society Database (Eurostat) and using Clearly and Simply (https://www.clearlyandsimply.com/clearly_and_simply/2009/06/choropleth-maps-with-excel.html).

However, graph 2 shows that such differences have decreased since 2007, as the worst-situated countries at the beginning of the period have increased their percentage much more (upper left quadrant) than the better situated ones (lower right quadrant). Therefore, the existence of β-convergence in the evolution of the ICT -PURCHASE indicator for both sexes is verified. Again, the equation shows a negative regression coefficient, with R^2 reaching a fairly high value.

Graph 2. β-convergence in online shopping in the EU-28, 2007-2019

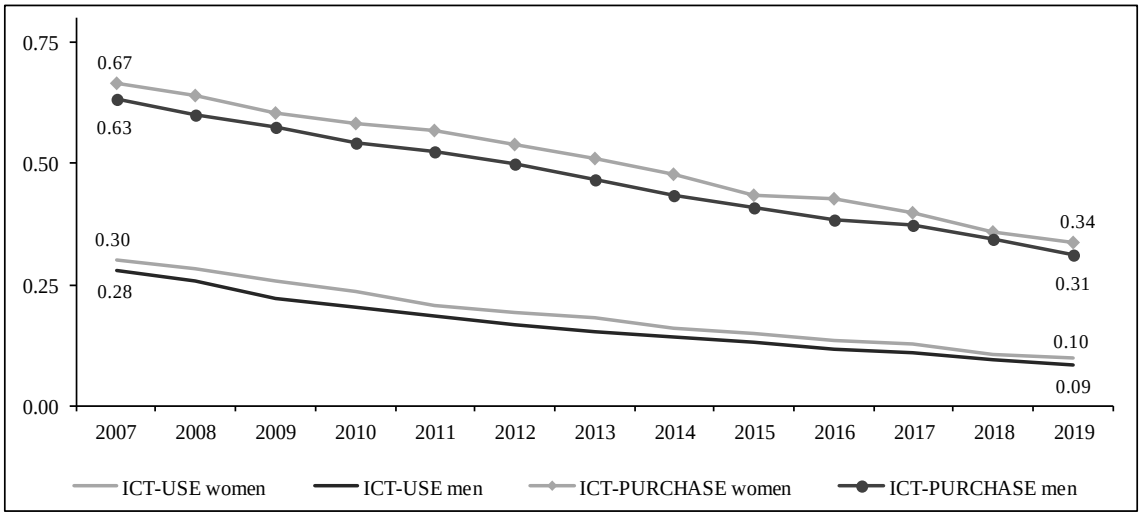


Note: The abscissa represents the relative situation of women and men with respect to the EU-28 (which represents the unit) in the 2007 ICT-PURCHASE indicator. The average annual growth differential with the EU between 2007 and 2019 is represented on the ordinate.
Source: Own elaboration from Digital Economy & Society Database (Eurostat).

Furthermore, as graph 3 shows, the dispersion between countries is greater in online purchases than in Internet use, both in men and women. Between 2007 and 2019 there has been a continuous process of convergence, with the standard deviation falling by more

than 67% in the indicators of Internet use (men and women), and around 50% in those of Internet shopping.

Graph 3. σ-convergence of ICT indicators in the EU-28, 2007-2019



Note: Evolution of the standard deviation.
Source: Own elaboration from Digital Economy & Society Database (Eurostat).

Therefore, there is a clear approximation across European countries in the use of ICTs, not only between extreme years (β-convergence), but throughout the entire period (σ-convergence).

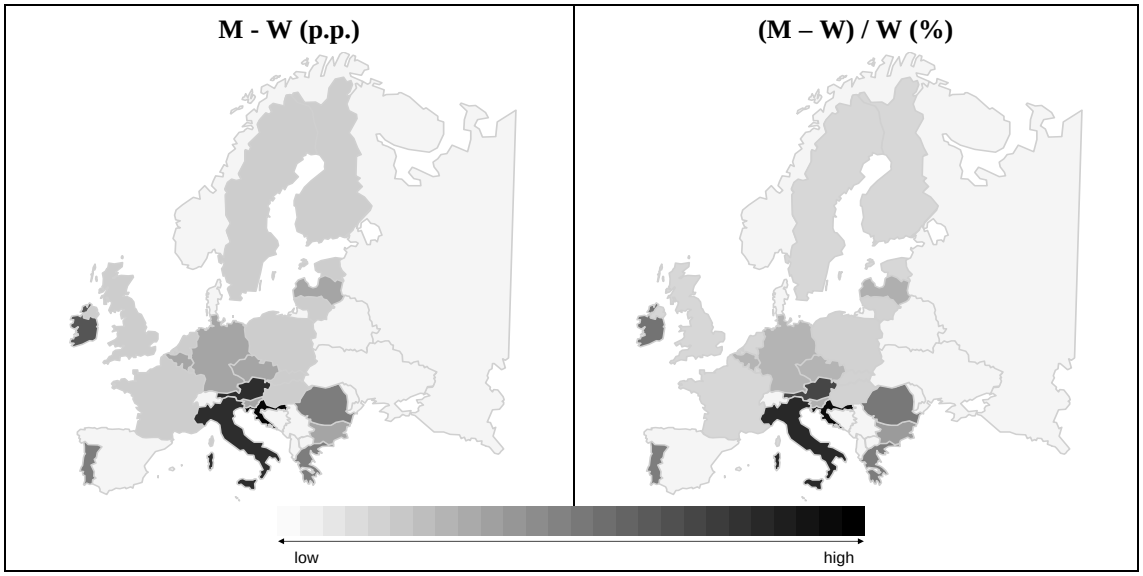
4.2. Gender digital divide in the EU-28: narrow and convergent

As indicated above, the digital gender gap has been calculated in absolute terms, difference in percentage points between the indicators for men and women (M – W), and in relative terms, (M–W)/W, expressing the difference as the percentage of the indicator corresponding to women.

Regarding Internet usage, there are hardly any differences between the proportion of men and women in the EU-28 in 2019 (map 3). The greatest digital gender gap, with women in disadvantage, corresponds to Croatia, with 6 percentage points, which is 7.9% in relative terms. It is followed by Italy and Austria, with the same digital gender gap in percentage points (5), and percentage values of 6.8% and 7.9%, respectively (table 1). It is important to note that, for the most part, the ICT-USE indicator is higher for men and, therefore, the positive sign of the gender gap indicates less female integration in the digital world. Only four countries register negative figures for the gender gap, three of them (Slovakia, Lithuania and France) with identical low values (-1 point), whereas Ireland (-4 points) is the fourth country in the EU-28 with the largest gender gap, with men in disadvantage[5].

[5] Obviously, although the sign of this difference is provided, it is considered a gap both in one sense and the other.

Map 3. Digital gender gap in the ICT-USE indicator in the EU-28, 2019



Source: Own elaboration based on the Digital Economy & Society Database (Eurostat) and using Clearly and Simply (https://www.clearlyandsimply.com/clearly_and_simply/2009/06/choropleth-maps-with-excel.html).

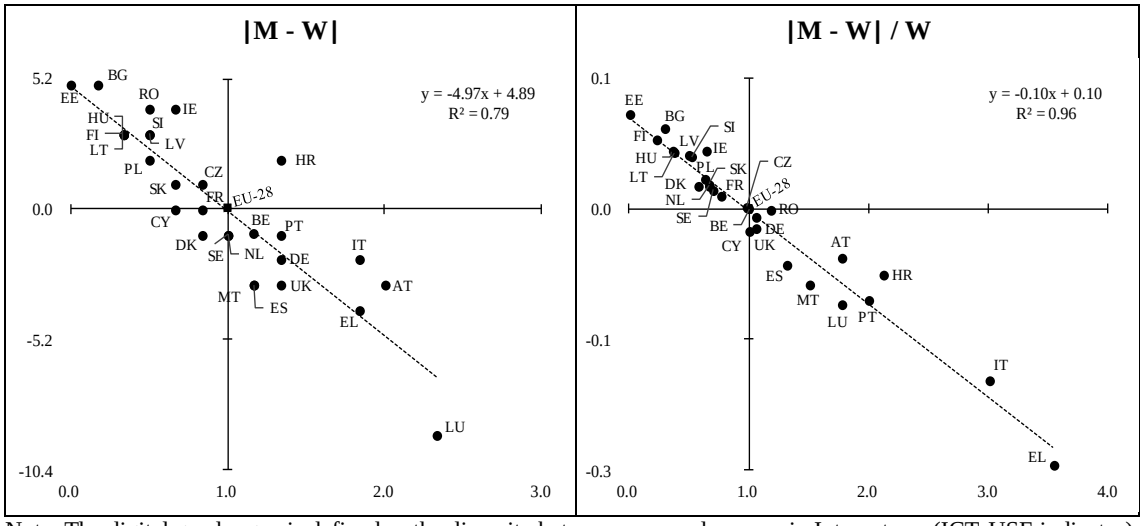
No differences between the two sexes are found in the ICT-USE indicator for Denmark, Cyprus, Spain and Malta. However, it should be noted that the most significant differences take place between countries. The proportion of women who use the Internet in Denmark and Sweden reaches 97%, 30 points more than in Bulgaria, with a similar distance occurring also for men. Taking such disparity into account, the gap has been calculated in both absolute and relative terms, since the same difference in percentage points can result in a different percentage.

Our results agree with those obtained by Martínez and Castaño (2017), referring to a previous period, confirming that the Spanish gender digital gap is lower than that of the EU. However, they differ from those offered by Martínez (2013), who obtains a more intense digital gender gap in countries with high digitization, such as the Nordic countries. Such disparities may be due to the fact that that study was carried out some years before our period of analysis (2007 and 2011), and it also included non-EU countries, such as Norway and Iceland. Furthermore, an indicator of more complex and specialized digital skills was used to define the gender gap.

In any case, the results obtained for 2019 (table 1) show a clear advance in the digital integration of women compared to 2007 (table 2), when, except for Estonia, which registered gender equality in Internet use, the rest of the EU-28 countries presented unfavourable gaps for women in the digital sphere.

On the other hand, graph 4 shows the results of the β-convergence analysis. As can be seen, the digital gender gap converges in the EU-28 countries between 2007-2019, regardless of how it is expressed, in percentage points or as a percentage. Two negative regression coefficients are obtained and a lower R^2 is obtained in the digital gender gap calculated as the difference in the percentages of Internet use by men and women.

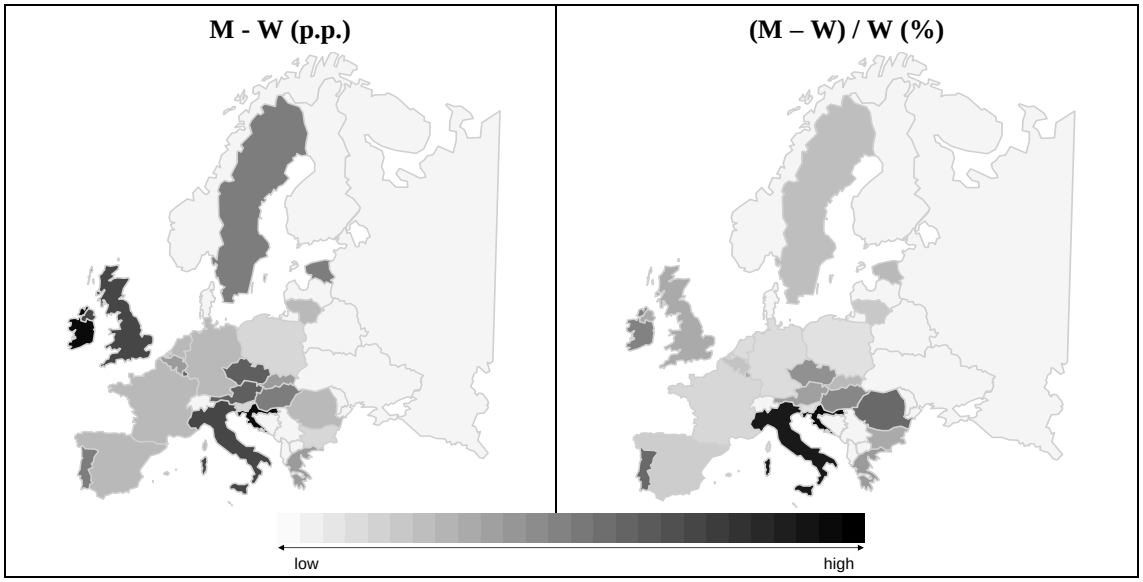
Graph 4. β-convergence of the digital gender gap (ICT-USE) in the EU-28, 2007-2019



Note: The digital gender gap is defined as the disparity between men and women in Internet use (ICT-USE indicator), expressed in absolute terms, as a M-W difference, and in relative terms, as a ratio (M-W)/W, taking the numerical value and omitting the sign. In each case, the abscissa represents the relative situation of the digital gender gap (without taking into account the sign) compared to the EU-28 (which represents the unit) in the 2007 gap. The variation differential of the digital gender gap with the EU is represented on the ordinate.
Source: Own elaboration from the Digital Economy & Society Database (Eurostat).

Map 4 contains information on the digital gender gap in online shopping, through the ICT-PURCHASE indicator. An increase in the number of countries, up to seven, with a negative gender digital divide, unfavourable to men, is identified (Annex, table 1) in Ireland (-8 points), Czechia (-5), Estonia (-4), France (-2), Lithuania (-2), Malta (-1) and Poland (-1).

Map 4. Digital gender gap in the ICT-PURCHASE indicator in the EU-28, 2019



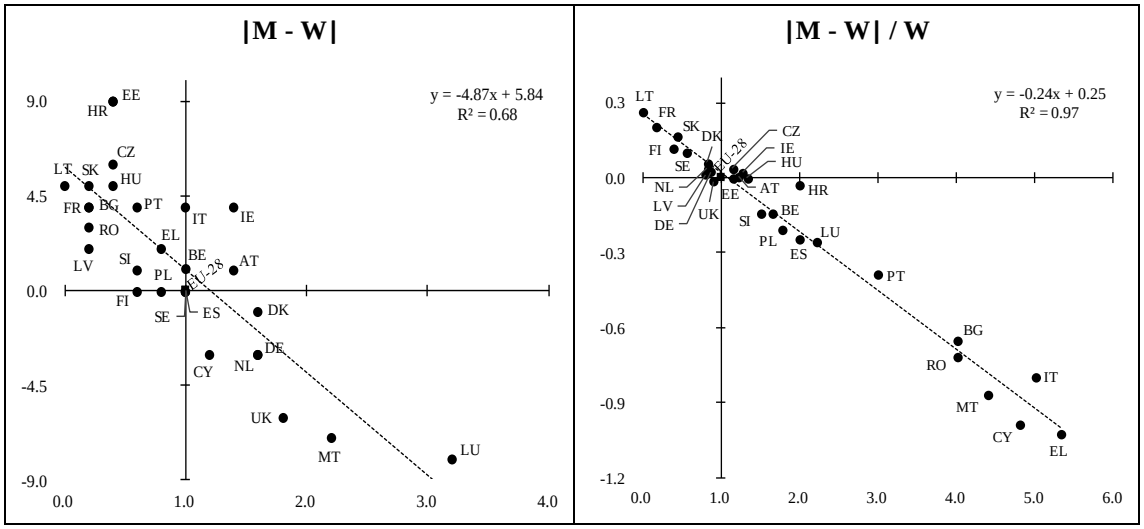
Source: Own elaboration based on the Digital Economy & Society Database (Eurostat) and using Clearly and Simply (https://www.clearlyandsimply.com/clearly_and_simply/2009/06/choropleth-maps-with-excel.html).

Once again, Croatia has the highest positive gender digital divide, 8 percentage points, followed by Italy and the United Kingdom. As indicated, the same difference between men and women in the ICT-PURCHASE indicator, which happens for the two countries mentioned (6 points), has a very different relative importance, since this difference in points represents 24% of the female indicator in Italy and only 8.1% in the UK. Likewise, Portugal and Romania have one of the highest gender digital divides, both in percentage points and as a percentage. In contrast, there is no gender disparity in Internet purchases in Denmark,

Cyprus, Finland and Latvia. With respect to the situation in 2007, an improvement in the gap is also observed, since all the countries analysed, except Estonia, presented disadvantages for women in relation to online purchases (table 2).

On the other hand, graph 5 shows the results of the study of β-convergence for the digital gender gap, constructed from the ICT-PURCHASE indicator. As in all the previous cases, a clear convergence is observed in the digital gender gap. The R^2 is much higher if the difference between both sexes is used to define the gender gap than if it is done in percentage terms.

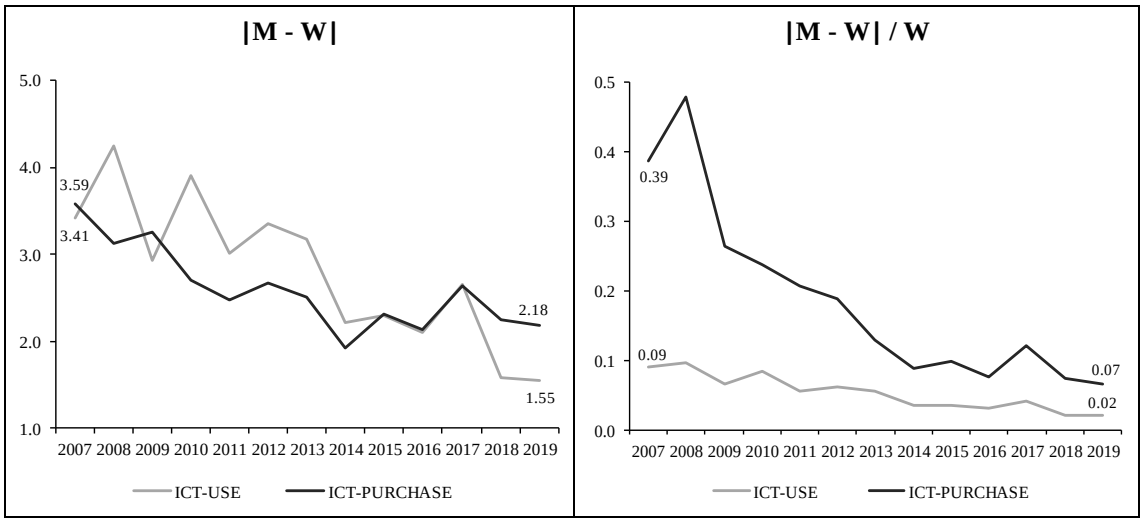
Graph 5. β-convergence of the digital gender gap (ICT-PURCHASE) in the EU-28, 2007-2019



Note: The digital gender gap is defined as the disparity between men and women in Internet purchases (ICT-PURCHASE indicator), expressed in absolute terms, as a M-W difference, and in relative terms, as a ratio (M-W)/W, taking the numerical value and omitting the sign. In each case, the abscissa represents the relative situation of the digital gender gap (without taking into account the sign) with respect to the EU-28 (which represents the unit) in the 2007 gap. The variation differential of the digital gender gap with the EU is represented on the ordinate.
Source: Own elaboration from the Digital Economy & Society Database (Eurostat).

Finally, when studying the evolution of the dispersion of the digital gender gap, a gradual process of convergence is also observed, as shown in graph 6. As can be seen, this dispersion between countries is much higher when using the relative gap, than if it is calculated as a difference.

Graph 6. σ-convergence of the digital gender gap in the EU-28, 2007-2019



Note: Evolution of the standard deviation.
Source: Own elaboration from the Digital Economy & Society Database (Eurostat).

In general, there is a greater disparity in the digital gender gap between countries when it is calculated from the ICT-USE using the absolute gap, although the dispersion in the gap built with ICT-PURCHASE is more intense at some points. On the other hand, if the relative gap is considered, then the dispersion is greater when analysing the digital gender gap for online shopping, although the amount of the standard deviation of each indicator has been approached.

5. Conclusions

The process of propagation and use of ICTs has been heterogeneous from a geographical viewpoint and also affects people and groups differently. Thus, the digital divide refers to the disparity in the access and use of ICTs between different territories or population groups. When the situation between men and women in this area is compared, the term digital gender gap is used, the analysis of which has been carried out in the EU-28 countries during the period 2007-2019.

In this work, two ICT use indicators offered by Eurostat have been used, in both cases referring to the percentage of the adult population (women and men, aged 16 to 74 years) who, in the last three months, have used the Internet (ICT-USE) and have made an online purchase (TIC-PURCHASE). The gender gap has been calculated in absolute and relative terms and, in addition to analysing the current situation of men and women, the existence of territorial convergence has also been studied, both in the indicators themselves and in the digital gender gap.

The countries that lead the exploitation of digital resources, both in the ICT-USE indicator and in the ICT-PURCHASE indicator are Denmark, the Netherlands, Sweden and the United Kingdom, while Bulgaria, Portugal, Romania, Greece and Italy are at the opposite end. Although there are important differences between one group of countries and another in 2019, the convergence analysis carried out shows that the dispersion has decreased since 2007. It seems that the geographical and economic distribution North-West (higher income per inhabitant) compared to South-East (lower income per inhabitant), with some exceptions, accounts for a good part of the differences. Spain's position is relatively positive, especially in the ICT-USE indicator, ranking above the average, among the top 10, although it is below average in the ICT-PURCHASE indicator, in a central position.

In relation to the digital gender gap, it has been found that it is relatively low when the ICT-USE indicator is used, while it reaches somewhat higher values in the case of the ICT-PURCHASE indicator. The highest gaps in ICT-USE are found in Croatia, Italy, Austria and Ireland, although in the latter it is favourable to women. No digital gender gap can be seen in Denmark, Cyprus, Spain and Malta. Regarding ICT-PURCHASE, the largest gender gaps are also found in Croatia, Ireland and Italy, along with the United Kingdom. No gap is identified in Denmark, Cyprus, Finland or Latvia. Spain stands out in the ICT-USE indicator because, as has been pointed out, it coincides in men and women. On the other hand, in ICT-PURCHASE, Spain is located in a central position, with a digital gender gap that is unfavourable to women.

Our analysis of the digital divide in 2019 reveals a clear advance for women in their digital integration compared to 2007. However, as mentioned, there are still countries with a clearly unfavourable situation for women, especially in the indicator relating to Internet purchases. In addition, the convergence analysis allows us to affirm that the differences between countries have narrowed since 2007. Specifically, from the perspective of the gender gap, the countries with the greatest digital gap have generally managed to reduce it more intensely than those that started with a smaller gap, hence

existing β-convergence. In addition, this dynamic has occurred gradually throughout the period, hence existing σ-convergence.

In short, and, although the empirical analysis may be conditioned by the indicators used, it has been found that there has been a continuous convergence between the EU countries in the digital sphere, for men and women, which has made it possible to reduce gender inequality, both in the use of the Internet and in electronic commerce. Likewise, the digital gender disparity has been gradually reduced.

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Annex

Table 1. TIC indicators and the digital gender, 2019

Countries		ICT-USE Indicator				ICT-PURCHASE Indicator			
		Women (%)	Men (%)	Digital gender divide		Women (%)	Men (%)	Digital gender divide	
				M - W (p.p.)	(M – W) / W (%)			M - W (p.p.)	(M – W) / W (%)
European Union - 28	EU-28	86	88	2	2.3	52	54	2	3.8
Belgium	BE	89	91	2	2.2	53	56	3	5.7
Bulgaria	BG	67	69	2	3.0	12	13	1	8.3
Czechia	CZ	86	88	2	2.3	45	40	-5	-11.1
Denmark	DK	97	97	0	0.0	72	72	0	0.0
Germany	DE	92	94	2	2.2	70	72	2	2.9
Estonia	EE	90	91	1	1.1	58	54	-4	-6.9
Ireland	IE	92	88	-4	-4.3	63	55	-8	-12.7
Greece	EL	74	77	3	4.1	31	34	3	9.7
Spain	ES	91	91	0	0.0	46	48	2	4.3
France	FR	90	89	-1	-1.1	59	57	-2	-3.4
Croatia	HR	76	82	6	7.9	31	39	8	25.8
Italy	IT	73	78	5	6.8	25	31	6	24.0
Cyprus	CY	86	86	0	0.0	31	31	0	0.0
Latvia	LV	85	87	2	2.4	34	34	0	0.0
Lithuania	LT	82	81	-1	-1.2	39	37	-2	-5.1
Luxembourg	LU	96	97	1	1.0	60	65	5	8.3
Hungary	HU	80	81	1	1.3	33	37	4	12.1
Malta	MT	86	86	0	0.0	50	49	-1	-2.0
Netherlands	NL	96	97	1	1.0	69	71	2	2.9
Austria	AT	85	90	5	5.9	52	57	5	9.6
Poland	PL	80	81	1	1.3	42	41	-1	-2.4
Portugal	PT	74	77	3	4.1	26	30	4	15.4
Romania	RO	72	75	3	4.2	13	15	2	15.4
Slovenia	SI	82	84	2	2.4	44	45	1	2.3
Slovakia	SK	82	83	1	1.2	45	48	3	6.7
Finland	FI	96	95	-1	-1.0	55	55	0	0.0
Sweden	SE	97	98	1	1.0	65	69	4	6.2
United Kingdom	UK	95	96	1	1.1	74	80	6	8.1

Source: Own elaboration based on the Digital Economy & Society Database (Eurostat).

Annex

Table 2. TIC indicators and the digital gender, 2007

Countries		ICT-USE Indicator				ICT-PURCHASE Indicator			
		Women (%)	Men (%)	Digital gender divide		Women (%)	Men (%)	Digital gender divide	
				M - W (p.p.)	(M – W) / W (%)			M - W (p.p.)	(M – W) / W (%)
European Union - 28	EU-28	54	60	6	11.1	20	25	5	25.0
Belgium	BE	63	70	7	11.1	12	17	5	41.7
Bulgaria	BG	30	31	1	3.3	1	2	1	100.0
Czechia	CZ	46	51	5	10.9	7	9	2	28.6
Denmark	DK	79	84	5	6.3	39	47	8	20.5
Germany	DE	68	76	8	11.8	37	45	8	21.6
Estonia	EE	63	63	0	0.0	7	5	-2	-28.6
Ireland	IE	56	60	4	7.1	22	29	7	31.8
Greece	EL	28	39	11	39.3	3	7	4	133.3
Spain	ES	48	55	7	14.6	10	15	5	50.0
France	FR	59	64	5	8.5	25	26	1	4.0
Croatia	HR	34	42	8	23.5	4	6	2	50.0
Italy	IT	33	44	11	33.3	4	9	5	125.0
Cyprus	CY	36	40	4	11.1	5	11	6	120.0
Latvia	LV	54	57	3	5.6	5	6	1	20.0
Lithuania	LT	48	50	2	4.2	4	4	0	0.0
Luxembourg	LU	71	85	14	19.7	29	45	16	55.2
Hungary	HU	50	52	2	4.0	6	8	2	33.3
Malta	MT	42	49	7	16.7	10	21	11	110.0
Netherlands	NL	81	87	6	7.4	39	47	8	20.5
Austria	AT	61	73	12	19.7	23	30	7	30.4
Poland	PL	43	46	3	7.0	9	13	4	44.4
Portugal	PT	36	44	8	22.2	4	7	3	75.0
Romania	RO	23	26	3	13.0	1	2	1	100.0
Slovenia	SI	52	55	3	5.8	8	11	3	37.5
Slovakia	SK	54	58	4	7.4	9	10	1	11.1
Finland	FI	78	80	2	2.6	31	34	3	9.7
Sweden	SE	77	83	6	7.8	36	41	5	13.9
United Kingdom	UK	68	76	8	11.8	40	49	9	22.5

Source: Own elaboration based on the Digital Economy & Society Database (Eurostat).