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# HUMAN CAPITAL IN THE DIGITAL SOCIETY. SOME EMPIRICAL EVIDENCE FOR THE EU COUNTRIES

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**Abstract**

*Development and innovation in the digital technologies impact the whole society, communications, finances, trade, education and health services, business patterns and the entire value-added channel.*
*The increase in the speed of digitization and its expansion within businesses leads to significant changes, both regarding the human capital and the way work and place of work are organized, with high impacts on skills, labor standards, human welfare and sustainable development of countries. Digitization involves changes not only in the human capital, but in the organizational one as well, so that for each euro invested in physical capital (hardware) some additional 10 euros have to be invested in intangible activities, especially in the human and organizational capital (Brynjolfsson and McAfee, 2014).*
*The paper aims to analyse the impacts of digitization on human capital in the EU economies, also considering the impact of the COVID-19 pandemic that has speeded up the digitization process in the EU countries. Both the useful aspects and the challenges determined by the new requirements regarding the skills necessary to human capital are emphasized, as well as the efforts included in the EU programs dedicated to such issues, considering that 42% of the European citizens do not possess basic digital skills and 37% of labor force does not possess adequate digital skills. Finally, some econometric aspects regarding the relationship between welfare and population's digital skills are revealed, as well as conclusions on further research and directions for action.*

*Keywords: innovation, digital technologies, human capital, the COVID-19 pandemic, digital skills.*

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## 1. Introduction

The digital age means a series of transformations generated by the information technology in the economy and society as a whole, including in human capital and its well-being. The adoption of digitization in a broad sense involves four essential elements: e-commerce, e-government, e-public services; automation (use of industrial robots); creation and power of digital networks and platforms; the use of digital data to computerize human resource management practices (ILO, 2019, p.4).

In the context of digitization and new technologies, the labor market demand for a highly skilled, efficient and responsible, stable and loyal workforce is constantly growing, and the education system, as well as the social and family environment, are becoming important factors in shaping the labor supply. The rapid pace of change means that each sector of activity needs a constant updating of professional qualifications, in addition to the accumulation of knowledge and skills. A high level of education increases flexibility in the labor market, offering the possibility for workers to move from one activity to another, depending on the requirements of society. The role of education in providing access to labor market (employment) is reflected in the increased employment opportunities for the educated population. An educated person has more chances to integrate into the labor market, to find a job according to his/her level of competence/skill, has a greater openness to lifelong learning, to the diversification of professional qualifications, having superior economic and social performance.

There is already an extensive literature on human capital in the digital society, on the effects of digitization in society, on the major changes caused by this complex process, especially in the context of Covid-19 crisis, which has led many companies and governments to re-evaluate their digital programs to overcome the limitations imposed by social distancing in order to protect the population.

## 2. Literature review

There is an extensive literature on the impact of digitization on business growth and business performance.

Thus, some studies analyse the impact of digitization on companies highlighting effects such as: changing strategies and business models (Rachinger et al., 2018; Coupette, 2015; Kaufmann, 2015; Loebbecke and Picot, 2015; Matzler et al., 2016; Kahre et al., 2017). In the opinion of Parviainen et al. (2017), the impact of digitization may be approached in three ways: i) internal efficiency aimed at improving the working methods, rescheduling production processes; internal opportunities; ii) external opportunities, i.e., business opportunities in the field of existing business (new services, new consumers, etc.) and iii) destructive changes, in the sense of completely changing the role of business.

Significantly, the literature fails to cover all aspects of the impact of digitization on the economy and society, with many studies being case studies in areas such as medical, health, transportation, education, trade, manufacturing, smart cities, public services, e-government, technological innovation, company / region-specific issues with a focus on the destructive changes affecting the business models, consumption, media audiences and the music industry.

Another series of studies has focused on the development of human capital, its evolution and contribution to economic growth and welfare, but too few have taken into account the factors that influence the digital capabilities of human capital. Thus, some studies have focused on the influence of human capital on economic development, highlighting a positive relationship, a significant role being attributed to capital accumulation and education in explaining the differences in national welfare levels (Mankiew, Romer and Weil, 1992). Other studies have looked at the extent to which digitization affects human capital, highlighting the existence of a link between digitization and employment, salary and level of education (Frey and Osborne, 2013; Zaldo, 2019), between digitization and job satisfaction, work-life balance, increasing employee dedication, performance and satisfaction (Cijan, Jenič, Lamovšek, 2019); between digitization and poverty reduction (Kwilinski, Vyshnevskyi, Dzwigol, 2020).

Raeskyesa, Lukas (2019), using a panel model and three sets of digitization indicators (connectivity - 5 indicators, usage intensity - 3 indicators and skills - 3 indicators) as explanatory variables, highlighted for the ASEAN countries with average incomes for the period 1999-2014 a significant positive effect determined on the GDP per capita by human capital (coefficient 0.91); mobile phone subscriptions also have a significant positive effect (coefficient 0.015) while the Internet has a higher impact (0.038).

Buchi, Festic, Latzer (2019) analyzed the effects of Internet overuse on the well-being of population and found that 23% of the Swiss Internet users used this tool too much and that this overuse negatively affected the level of welfare. Moreover, social pressure has positively influenced the Internet overuse, which has led to the need to further investigate the impact of ICT innovations on society and on the change in the behavior of human capital.

Balsmeiera, Woerter (2019) show, based on a survey conducted in Sweden, that digitization is associated with an increase in the employment of highly qualified people and a decrease in that of those with low qualifications, effects that are not found if e-commerce or cooperation support systems are taken into account. At the same time, the demand for averagely qualified or low-skilled staff is on a downward trend or remains unchanged, a conclusion in line with the study conducted by Acemoglu and Restrepo (2017).

Starting from the finding on certain limits regarding the measurement of digitization degree and of its impact on the economy and society as a whole, the international organizations (ITU, OECD, IMF, World Bank, UNCTAD, EU Statistical Office, etc.) tried to identify specific indicators to measure them, without reaching a consensus. Thus, broad sets of indicators determined by quantitative measurement or based on questionnaires are used to measure the impact of digitization and human capital on economies and society (Stiglitz, Sen and Fitoussi, 2009; IMF Report, 2018; OECD, 2019).

The impact of digitization on human capital skills leads to new skills and abilities needed for future jobs, synthesized on five levels by experts (World Economic Forum, 2021). These five levels of qualification would envisage:

- level 1: knowledge and skills, abilities and attitudes, which means that individuals must acquire principles and theories related to the field of study, and independently use the context or theoretical knowledge, have the necessary ability to perform tasks at work, have a pro-learning behaviour, to use emotional intelligence and to be able to overcome different situations, to possess psychic, psychomotor, cognitive and sensory skills that allow them to perform at work;
- level 2: includes technology and digitization, business, innovation and creativity, industrial specialization and language;
- level 3: involves technological design and programming; use of technologies, monitoring and control;
- level 4 refers to: web development; human-technology interaction, cyber security and security applications; scientific analysis of data; mobile phone development; computational thinking; computer networks and hardware, artificial intelligence;
- level 5 includes skills in HTML and CSS development, Web design, front-end and back-end Web Development; and Web analytics.

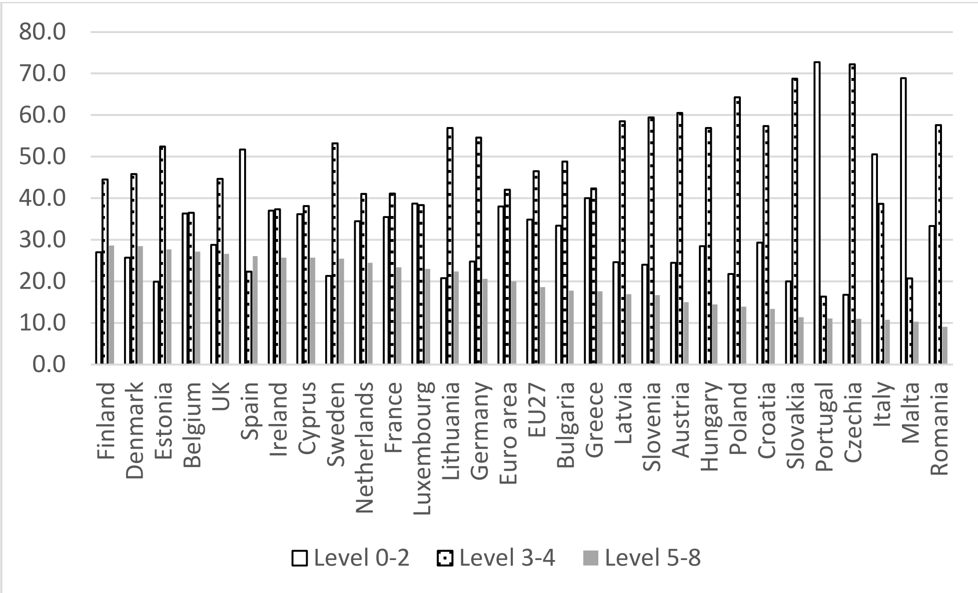
At the same time, experts estimate that by 2025, about 50% of employees will have to retrain, and 40% of current employees with basic qualifications would expect that the needs for these jobs to change in the next 5 years (WEF, The Future of Jobs Report, 2020).

## 3. Factors influencing the digital skills of human capital

Human capital is extremely important in economic development, especially during the expansion of digitization. The *education level* is the key factor for growing the human capital, with the EU's development programs paying particular attention to increasing the level of population training in order to have access to better-paying jobs. The analysis of education level highlights major discrepancies between the EU member countries. Thus, in 2005, only 18.6% of the EU-28 population aged 16-64 had tertiary education (levels 5-8), as compared to 20% in the Eurozone (Figure 1). At country level, the highest share (over 27%) was recorded in Finland (28.6%), Denmark (28.5%) Estonia (27.7%), Belgium (27.2%). At the opposite end, with the lowest shares were Romania

(9.1%), Malta (10.3%), Italy (10.8%), the Czech Republic, Portugal and Slovakia (about 11%).

Figure 1. The structure of population aged 16-64 by levels of education in the EU countries in 2005 (%).



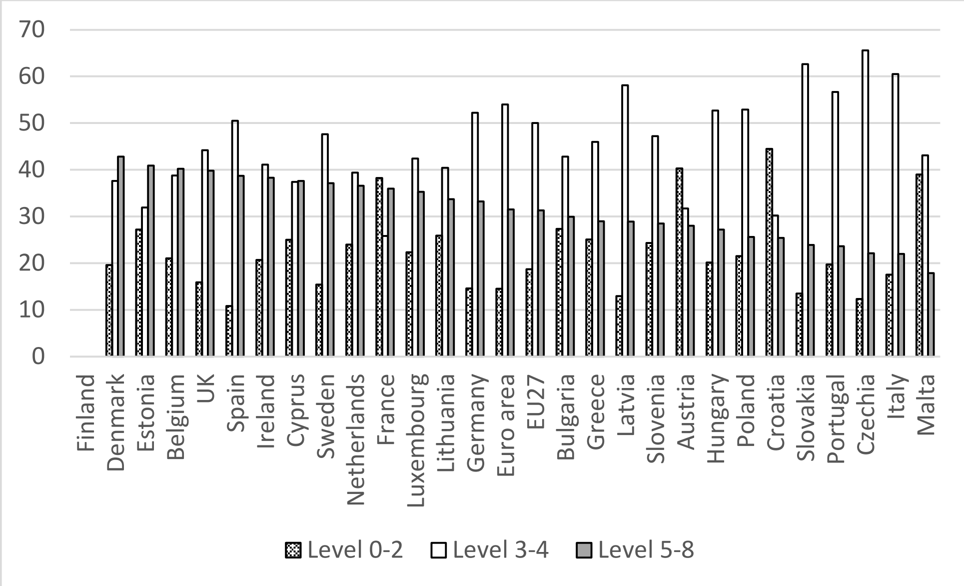

*Source. Authors' processing by Eurostat data, table [edat_lfs_9903], accessed 13 August 2021*

It is worth mentioning that the majority of population is in terms of education level in the area of upper secondary and post-secondary education (levels 3-4), with an average of 46% in the EU-28 countries, above the Eurozone level (42%). At country level, with 72.2%, the Czech Republic holds the first place in the EU-28 from this perspective, followed by Slovakia (68.7%), Poland (64.3%) and Austria (60%).

The lowest level of human capital education (levels 0-2-primary) was recorded in 2005 in Portugal (72.7%); Malta (68.9%), Spain (51.7%). In Romania, about 33.3% of population aged 16-64 completed less than primary and lower secondary education (levels 0-2) and 57.6% upper and post-secondary education (levels 3-4).

The efforts of countries to increase human capital by stepping up the educational process have led to some changes in the hierarchy of countries in 2020, with Ireland, Luxembourg and Cyprus at the top of the EU-27 countries with the highest level of tertiary education of population aged 16-64 years (40%), as shown in Figure 2.

Figure 2. The structure of population aged 16-64 by levels of education in the EU countries in 2020 (%)




*Source. Authors' processing by Eurostat data, table [edat_lfs_9903], accessed 13 August 2021.*

Regarding the population aged 16-64 with upper secondary and post-secondary education (levels 3-4) it is found that the EU-27 average was 46% in 2020 (decreasing by 0.5 percentage points as compared to 2005), while in the Eurozone it increased slightly to 42.8% (by 0.8 percentage points as compared to 2005) amid the growing share of population with tertiary education. The highest levels were recorded in the Czech Republic (65.6%), Slovakia (62.6%), Croatia and Romania (about 60%) and Poland (58.1%). At the opposite end were Spain (25.8%), Portugal (30.2%), Malta (31.7%) and Luxembourg (31.9%).

If we look at population aged 16-64 with low levels of education, one may see that its share decreased significantly between 2005 and 2020, with the largest reductions being recorded in Malta and Portugal (over 28 percentage points), Greece (17.4 percentage points), Italy (15.2 percentage points), Bulgaria (about 12 percentage points). In Romania, the decrease in the share of this category of population was by 9.6 percentage points, approximately the same as in Slovakia (9.5 percentage points), while in Sweden it was the smallest decrease (by 0.6 percentage points, from 21.3% to 20.7%). The only country that recorded a slight increase in 2020 as compared to 2005 was Denmark (from 25.7% to 25.9%, respectively).

These figures highlight the need to step up efforts to increase the level of education, especially tertiary education, and to diminish the share of population with low levels of education in order to integrate them into the labor market and train the skills needed for the new digital technologies.

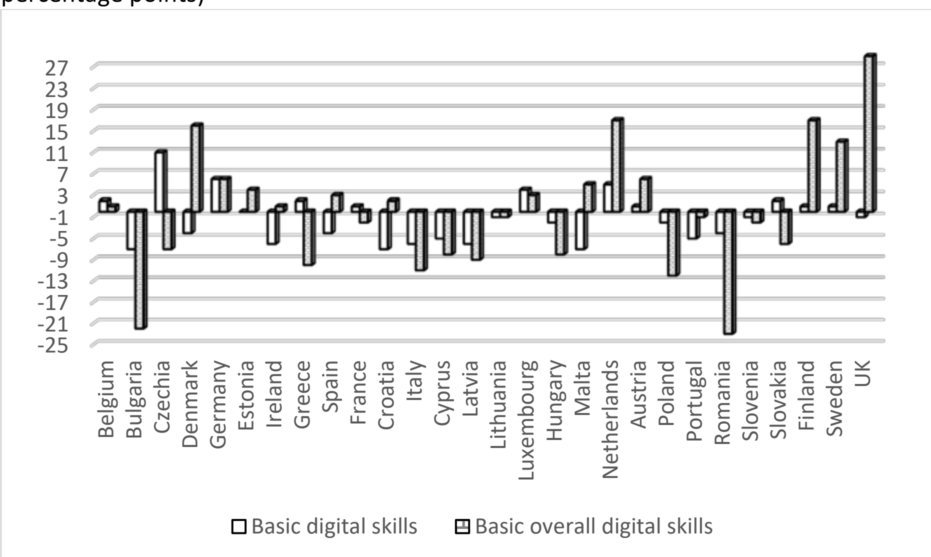
The *acquisition of digital skills* either through formal education or through informal education programs is a key factor for the growth of human capital in the age of digitization, their presence being necessary for the use of new technologies at the workplace and in other activities.

The analysis of human capital in the EU Member States from this perspective shows that in the period 2015-2019 the share of people with poor digital knowledge in the total number of individuals increased by 6 percentage points at EU-27 level and by 5 percentage points at EU-28 level, reaching 29% and 28% of the total of individuals, respectively. The largest increases in the number of individuals with a low level of digital knowledge were recorded in Luxembourg (172%), Italy (52.38%), Bulgaria (52%) and the largest decreases in the Netherlands (-20%) and the UK (-16.67%).

At the same time, it is mentioned that in 2019 Romania had the highest share of people with low digital knowledge (43%), followed by Latvia (42%), Cyprus (41%) and Bulgaria (38%), while at the opposite end were the Netherlands (16%), Finland (19%), and the UK (20%).

These data show that a significant share of population in some countries (Romania, Latvia, Cyprus, Bulgaria) is less prepared for an expansion of digitization in the economy, the efforts of these countries needing to be directed towards the digital education of people, especially of those employed.

Figure 3. Change in the share of individuals with digital knowledge at baseline and above baseline in the EU countries as compared to the EU average in 2019 calculated against total individuals (in percentage points)

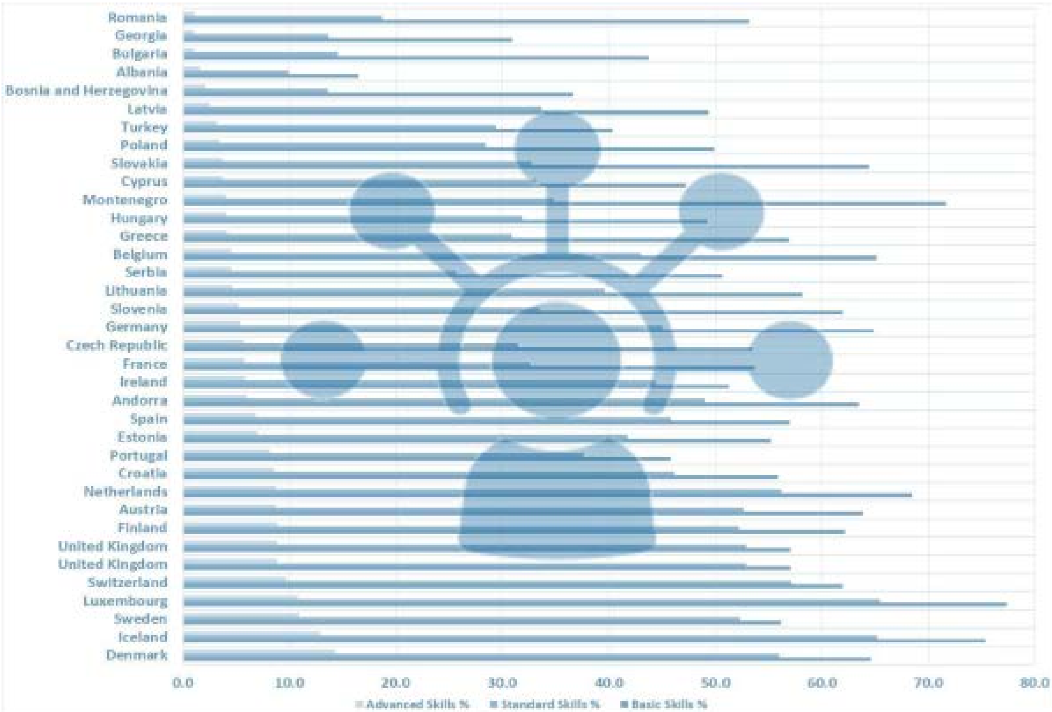



*Source: Eurostat data processing, table [isoc_sk_dskl_i] accessed at 13.06.2021.*

Moreover, the analysis shows that only 33% of all the EU-28 individuals had above-average digital knowledge and 25% had average knowledge in 2019, while across countries the gap varies widely between 11 percentage points (pp) above the EU-28 level in the Czech Republic, followed by Germany (6 pp) and Luxembourg (4 pp) in the case of the share of individuals with basic digital knowledge and 29% in the case of individuals with digital knowledge above the basic ones in the United Kingdom (29 pp) followed by the Netherlands and Finland with 17 pp (Figure 3).

On the other hand, with the largest negative differences against the EU28 average, namely the countries with the lowest levels of basic knowledge, there were: Bulgaria, Croatia, Malta (-7 pp) followed by Ireland, Italy, Latvia (-6 pp) and Portugal (-5 pp) and in the case of knowledge above the basic level Romania (-23 pp), Bulgaria (-22 pp), Italy (-11 pp) and Greece (-10 pp). In these countries with low levels of basic knowledge and above basic knowledge, there is a need to step up the staff digital training efforts, especially of the persons trained to cope with future economic developments and future labor market requirements.

Figure 4. Basic, standard and advanced digital skills in the EU countries in the period 2017-2019




*Source: Adapted from ITU (2021) Digital trends in Europe 2021, p.11, Figure 13.*

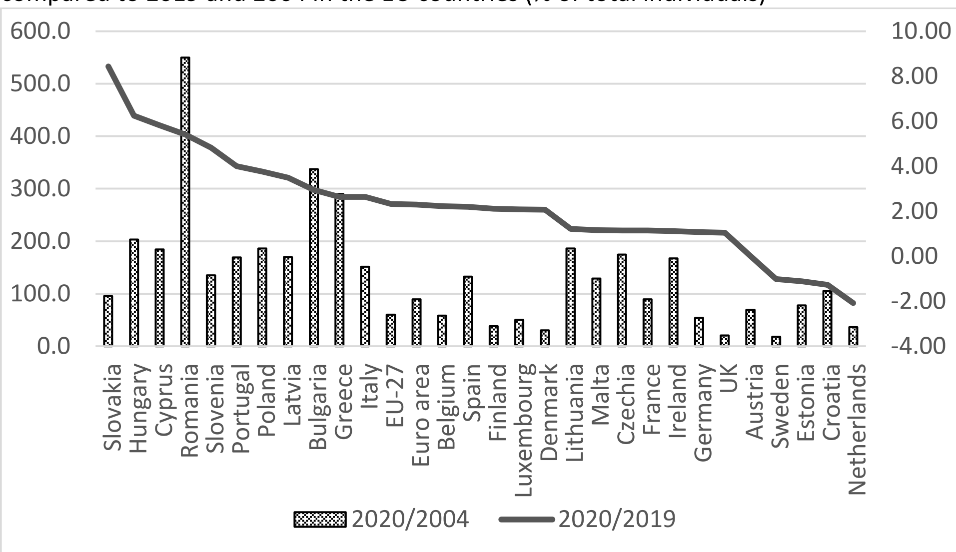
The ITU specialists (2021) consider three broad categories of *digital skills*, defined as follows: i) *basic skills* that involve the knowledge of four activities based on the use of computers, namely: copying or moving documents or folders; use of copying and saving tools or moving information within a document; sending tabbed emails and transferring files from one computer to another; ii) *standard skills* that include the following four computer-based activities: using mathematical formulas in an Excel sheet; connecting and installing devices; creating electronic presentations with specialized software, finding, downloading, installing and configuring programs; iii) *advanced skills* that involve writing programs using specialized programming languages.

According to these definitions, the situation of digital skills of population of the EU countries in the years 2017-2019 is presented in Figure 4.

It should be noted that the level of these skills varies greatly among the EU countries, the countries with the highest level of advanced digital skills being Denmark, Sweden and Luxembourg with percentages between 10 and 15%. 13 countries had over 60% basic digital skills levels, including: Denmark, Luxembourg, Finland; Austria, the Netherlands, Germany, Slovenia, Belgium and Slovakia. In terms of countries with standard skills, 10 countries recorded levels above 50%, including: Denmark, Sweden, Luxembourg, UK, Finland, Austria and the Netherlands. Another 7 countries experienced levels between 40 and 50% of which we exemplify: Croatia; Estonia, Spain, Ireland; Germany and Belgium. Bulgaria and Romania had standard skills levels below 20%.

The existence of digital skills allows the population to connect through Internet networks and perform extremely different activities depending on its digital skills.

Figure 5 Increase in the use of Internet by individuals in the last three months in 2020 as compared to 2019 and 2004 in the EU countries (% of total individuals)




Note: 2020 as compared to 2019 - right axis. For France, data for 2019 as compared to 2018. Left axis - increases in 2020 as compared to 2004. Exception: France; the year 2019 compared to the year 2006; Croatia compared to 2007, Belgium and Malta compared to 2005.
*Source: Eurostat data processing, table [isoc_ci_ifp_iu].*

Regarding the share of individuals who used the Internet in 2020 in the last three months, there is an increase by 2.33% as compared to 2019 at the level of the EU-27 countries, and by 2.30% at the level of the Eurozone. The highest increases as compared to 2019 (over 5%) were recorded in Slovakia (8.43%), Hungary (6.25%), Cyprus (5.81%) and Romania (5.41%) (Figure 5, right axis).

Compared to 2004, the largest increases in Internet use in the last three months were recorded in Romania (by 5.5 times); Bulgaria (3.3 times), Greece (2.9 times), Hungary (more than 2 times), Poland and Lithuania (more than 1.8 times), the Czech Republic (1.75 times) and Portugal and Ireland (more than 1.6 times), as shown in Figure 5 (left axis).

## 4. Presentation of the model and results

To highlight the impact of digitization and human capital in the digital economy on welfare, we used econometric techniques.

Starting from the fact that many of the studies used multiple regressions as a method, considering the possibility offered to use time series, transversal and panel data (Asteriou, 2009), in the paper we chose as method the panel models.

The general model is:

$Y_{it}=\alpha_i+\beta_i X_{it} + \theta_i+\gamma_t+\varepsilon_{it}$,

where $Y_{it}$ is the dependent variable for each i = country and t = time;

$X_{it}$ represents the independent variables, and corresponds to the linear predictor from the OLS regression, in which $\beta_i$ and $\alpha_i$ (i = 1 ... N) have an unknown intercept for each entity, which will be estimated on empirical data. $\theta_i$ represents the country effect and $\gamma_t$ the time effect and $\varepsilon_{it}$ is the error term with multivariate normal distribution N (0, σ2).

The indicators chosen as variables were:

- gross domestic product per capita (YP) expressed in millions of Euros, 2010 prices, as proxy for the indicator of population welfare (dependent variable)
- gross value added created by the ICT sector (ITV) expressed in millions of Euros, 2010 prices, as proxy for the direct impact of digitization on population welfare
- value of ICT equipment in gross capital formation by economy (ITGF) expressed in millions of Euros, 2010 prices, as proxy for the direct impact of digitization on population welfare
- total number of workers (L) expressed in million people as an indicator of macroeconomic variables that influence welfare
- human capital expressed by the HDI index, which captures both the effect of education and the effect of human capital health, given that Knowles S., Owen P.D. (1995) have demonstrated that the relationship between per capita income and per capita health is stronger than the level of education of human capital or per capita income;

- expenditure on research and development (R&D) expressed in Euro / inhabitant, given the importance of research efforts in the development and promotion of new technologies with indirect effects on population welfare
- Internet access of households (Ih) expressed as percentage of total housing as proxy for the ability of population to access new technologies.

The data used in the model are annual data for the period 2000-2020 from the Eurostat database, and from UNCTAD for the Human Development Index.

The results of statistical description of the dependent and independent variables included in the models (mean, median, maximum and minimum values, standard deviation, skewness and kurtosis coefficients) are presented in Table 1.

Table 1.Statistical description of data

| | ITV | L | HDI | RD | Ih | ITGF | YP |
|---|---|---|---|---|---|---|---|
| Mean | 20020.24 | 8075.55 | 0.86 | 1.46 | 67.14 | 3654.54 | 24594.02 |
| Median | 6129.40 | 4119.87 | 0.87 | 1.26 | 73.00 | 1644.65 | 21460.00 |
| Maxim | 157581.80 | 45269.00 | 0.96 | 3.87 | 98.00 | 25368.60 | 88120.00 |
| Minim | 194.60 | 146.40 | 0.72 | 0.23 | 3.00 | 9.80 | 2990.00 |
| Std, Dev, | 31878.11 | 10471.39 | 0.05 | 0.87 | 22.33 | 4877.14 | 16295.78 |
| Skewness | 2.19 | 1.77 | -0.49 | 0.74 | -0.79 | 1.97 | 1.50 |
| Kurtosis | 7.05 | 5.22 | 2.77 | 2.56 | 2.80 | 6.87 | 6.15 |
| Observations | 559 | 560 | 560 | 550 | 498 | 532 | 585 |
| Number of countries | 28 | 28 | 28 | 28 | 28 | 26 | 28 |

*Source: Authors' calculations.*

It should be noted that data on the indicator of value of ICT equipment in gross capital formation by economy (ITGF) for Poland and Croatia is missing from the Eurostat statistics.

Statistical analysis of data shows significant differences between the indicators, the standard deviation oscillating in a wide range (between 0.005 and 31878.11), depending on the unit of measurement of the indicator used. The skewness coefficients show that the distribution for all indicators has a right deviation, except for the HDI and Ih indicators and above zero. Kurtosis coefficients indicate that the variables have a relatively normal distribution with values lower than 3, except for the ITV, ITGF, Yp and L variables, which have a leptokurtic distribution, with values above 3, which indicates that these indicators do not have a normal distribution, existing a number of values apart. In order to solve this problem, the variables were transformed by logarithm and afterwards the series were tested in order to determine stationarity. The results of the stationary tests can be provided upon request.

Although for some series the Levin, Lin & Chu tests indicate stationary level with fixed effects, the rest of the tests invalidate this conclusion, the result of most tests indicating that the series are stationary in 1$^{st}$ order difference with fixed effects.

We then proceeded to test several models with both fixed and random effects, the results of the Chow and Hausman test indicating that the fixed effects model is the right one.

Given that some of the series of indicators used in the model lacked data, an incomplete data model was used to estimate component errors in multiple ways (Davis, 2002[4]).

We chose a standard error correction panel model (PCSE) developed by Beck and Katz (1995[5]) combined with a seemingly uncorrelated regression model (SUR) that allowed the model results to be robust to both different forms of longitudinal and temporal dependence[6] and in the presence of heteroskedasticity.

The results of the model are presented in Table 2.

Table 2. Period SUR (PCSE) panel model with standard errors and corrected covariance to highlight the influence of human capital and digitization on population welfare in the EU Member States

| Variables | Coefficients | Standard errors | t-Statistic | Probabilities |
|---|---|---|---|---|
| C | -0.00364 | 0.002064 | -1.76221 | 0.079 |
| DLOG(ITV?) | 0.105854 | 0.022791 | 4.644512 | 0.000 |
| DLOG(L?(-1)) | 0.220701 | 0.075005 | 2.94248 | 0.0035 |
| DLOG(HDI?) | 2.106969 | 0.327051 | 6.442324 | 0.000 |
| DLOG(RD?(-1)) | 0.040609 | 0.013524 | 3.0027 | 0.0029 |
| DLOG(IH?(-1)) | 0.029705 | 0.013337 | 2.22722 | 0.0266 |
| DLOG(ITGF?) | 0.01918 | 0.006364 | 3.013906 | 0,0028 |
| Fixed effects 26 countries and period | | | | YES |
| $R^2$ | | | | 0.72034 |
| $R^2$ adjusted | | | | 0.68159 |
| F statistic | | | | 18.5906 |
| Probability F Statistic | | | | 0.0000 |
| Schwartz Criterion | | | | -4.31862 |
| Durbin Watson | | | | 1.8379 |

*Source: Authors' processing. Data for Poland and Croatia for the ITGF indicator is missing.*

A value of 0.72034 for $R^2$ shows the magnitude of the influence or the ability of predictor variable to simultaneously describe the response of the variable in the model and is higher than 0.5, i.e., it is strong in explaining the response to variation. It is also noted that the probability of the statistical F test is lower than 0.05, which shows that

[4] David, P.,(2002), Estimating multi-way error components models with unbalanced data structure, Journal of Econometrics, vol106, Issue 1, pp. 67-95.
[5] Beck, N. and Katz, J.N., (1995), What to do (and not to do) with Time- Series Cross Section Data, American Political Science Review, Vol. 89, No. 3.
[6] Baurer (Panel data model. Lecture 15. https://www.bauer.uh.edu/rsusmel/phd/ec1-15.pdf.

the significance of level of influence of the predictor variable in response to variation is statistically significant.

The test for fixed effects shows that the hypothesis that the cross-section effects are redundant is strongly rejected, the statistical values as well as the associated p value indicating this conclusion for both models. The test for fixed effects is presented in Table 3.

Table 3. Fixed effects test

| Effects Test | Statistic | d.f. | Prob. |
|---|---|---|---|
| | | | |
| Cross-section F | 2.859907 | -25.332 | 0.000 |
| Cross-section Chi-square | 73.91856 | 25 | 0.000 |
| Period F | 18.75912 | -15.332 | 0.000 |
| Period Chi-square | 232.6532 | 15 | 0.000 |
| Cross-Section/Period F | 8.819294 | -40.332 | 0.000 |
| Cross-Section/Period Chi-square | 274.3773 | 40 | 0.000 |

*Source: Authors' processing.*

The next two values strongly reject the hypothesis that there are no effects of the time period taken into account. The latest test results assess the significance of all effects and reject the idea of a single intercept in the model.

The literature highlights that in the case of panel models it is sufficient to test multicollinearity and heteroskedasticity, the test results highlighting the lack of multicollinearity and self-correlation of errors.

## 5. Conclusions

The statistically significant positive level of the coefficients of the model variables highlights the beneficial effect of digitization on well-being in line with other studies, the motivation being that they are partly “a result of increased access to basic services” (Sabbagh et al., 2012, p. 16).

The model shows a positive relationship between population and the development of the ICT sector (coefficient 0.105854), statistically significant, but also between welfare and the introduction of digital technologies represented by the value of these technologies in gross fixed capital formation in the economy (coefficient 0.01918), statistically significant but with a weaker effect. One possible explanation would be the insufficient preparation of human capital to take full advantage of these new digital technologies. These results are in line with the generally accepted idea in the literature that digitization has a positive impact on employment (Zaldo, 2019) and poverty reduction (Kwilinski, Vyshnevskyi, Dzwigol, 2020) and, therefore, on population welfare.

Significantly, the influence of human capital expressed through the Human Capital Development Index, which includes both the educational and health components, is statistically positive and significant in relation to GDP per capita, in line with the conclusions of De la Fuente and Doménech (2006). Moreover, the level of the Ih indicator, which expresses the degree of digitization, also indicates a positive and significant relationship on the welfare of population.

The negative impact of the economic crisis is highlighted by the negative sign of the coefficients for the years 2008-2009, but also 2012-2013, which confirms the hypothesis of the W-shape of the evolution of this crisis in the European economies.

Digitization has direct effects (through the contribution of the IT and telecommunications sector and digital equipment in the economy) - significantly positive coefficients, the contribution of the sector being higher on welfare as compared to that determined by the presence of ICT equipment in the economy.

**Limitations:** The work and model did not take into account the negative effects of digitization on job loss for those who will not keep up to update their knowledge and skills in line with the new technological developments.

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