

Digitalization, Quality of Life and Purchasing Power

MÁRK JÁNOS TÁTRAI
RESEARCHER

CORVINUS UNIVERSITY OF BUDAPEST

ROLAND Z. SZABÓ, PH.D
ASSOCIATE PROFESSOR

CORVINUS UNIVERSITY OF BUDAPEST
e-mail: zsoltroland.szabo@uni-corvinus.hu

SUMMARY

The World Economic Forum stated that while digitalization caused a rapid productivity growth, it has also had its disadvantages. Can digitalization be the catalyst of economic development? Our hypothesis contributes to the debate that the higher the level of digital development in a given country, the greater the quality of life and purchasing power it can achieve due to the benefits of various digital technologies. In our research, we investigated the relationship between the Digital Economy and Society Index (DESI), the Quality of Life Index (QLI) and the Purchasing Power Index (PPI) among the EU countries from 2014 to 2019. We acquired datasets from Eurostat and Numbeo and examined correlations between indices. We found a strong positive relationship between the level of digitalization, the quality of life, and the purchasing power.

Keywords: digitalization, ICT, transformation, European Union, middle income trap

Journal of Economic Literature (JEL) codes: E00, E01, E20, E21, I30, I31

DOI: <http://dx.doi.org/10.18096/TMP.2020.02.10>

INTRODUCTION

Digitalization is the driver of the Fourth Industrial Revolution. Bojár (2018), on the other hand, considers the name of the Fourth Industrial Revolution to be misleading. In his view, the essence of the processes taking place today and in previous decades can be grasped more accurately by the paths of IT development, moreover he rather writes about the Third IT Revolution. Besides, there are three degrees of the concept “digitalization” used in everyday life (of which only one is actually digitalization itself): (1) digital processing, (2) digitization/digitalization, and finally (3) digital transformation (Leonhard 2016). Digital processing means the conversion from analog to digital form. Digitization/digitalization is more than digital processing in that digital technologies are integrated into (business) processes. During digital transformation, organizations (e.g. companies) completely transition their operations into digital ones. In this study we examine the digital transformation of the economy and society and its relation to the quality of life and the purchasing power.

Digitalization and the various solutions associated with it significantly rearrange the production efficiency of each country (Kovács, 2017a). This has a positive effect on the country's global competitive market position, so it also serves further long-term

development. However Kovács (2017b), Bajmócy et al. (2019) and Lukovics et al. (2018) raise the question of whether digitalization has only positive effects. Bajmócy et al. (2019) suggest that digitalization only regenerates social inequalities as it helps developing each economy, meanwhile Lukovics et al. (2018) raise concerns in connection with autonomous driving and its further regulations.

The effects of digitalization on quality of life and purchasing power

Digitalization itself does not directly affect quality of life and purchasing power, but digital technologies stimulate innovation (Falk & Biagi 2015); moreover, the integration of digital technologies into the operation of companies improves productivity. Entrepreneurial managers (Hortoványi 2012) are making a number of new digital products and services available to a wide range of consumers that improve their quality of life and purchasing power. Quality of life and purchasing power can also be improved by creating new jobs, but it is important that if this is the case (‘growth model’), it only can be sustainable if it is employment-intensive (Georgescu & Herman 2019). On one hand, digitalization brings about a higher standard of living, but on the other hand, a higher standard of living enables to achieve a higher digitalization level by meeting rich customer's higher expectations (Hecht 2018). This could lead to a vicious spiral, where the rich become even richer.

At the same time, the quality of life and purchasing power of the poorest working groups could be significantly improved. An important challenge for policy makers is to reconcile pro-growth and pro-poor policies. As stated in the World Economic Forum's 2017-2018 report (Schwab 2018), a new growth model is needed that prioritizes the citizens of each country and the goal of improving their living standards. These types of measures would induce "real" growth instead of later "intention". Schwab (2016), in an earlier study, emphasizes great concern over the challenges what Industry 4.0 could induce concerning rising inequalities and welfare.

One such potential growth path is reindustrialization. The study of Nagy et al. (2019) examined how re-industrialization takes place in the ten new EU member states, if it has started, and what similarities can be discovered compared to the processes taking place in the EU15. As the intention to re-industrialize has already arisen not only in the official documents of EU, but also in the economic policies of some EU Member States, the urgency of the issue is clear. The study also examined what new division of labor could result from the Fourth Industrial Revolution among individual EU member states. With the help of a decomposition study, they came to the conclusion that, with the exception of a few countries (including Hungary), the growth of the manufacturing sector compensates for the negative labor intensity effect, therefore not only the sectoral GDP, but also the number of employees could increase.

In their study, Nevado-Peña et al. (2019) discovered a clear link between the assessment of the quality of life of the inhabitants of a given country and the technological characteristics of the affected (geographical) area. Niebel (2018) also suggests that economic development strongly correlated with digitalisation (ICT usage). Accordingly, the life satisfaction rate increases in parallel with the achievement of different technologies and higher levels of ICT readiness. Citizens living in cities with higher ICT capacity or a high uptake of digital solutions are more in need of sustainable and inclusive economic growth. Finally, the use of ICT by technology users leads to a better assessment of the efficiency and governance of public administration, emphasizing the importance of understanding between users and public services in the virtual sphere. However, Pozdnyakova et al. (2019) see a further restructuring in employment. From their perspective Industry 4.0 ends up in further (specialist) job losses due to the machine-induced reduction in human participation in production.

At the same time, the outbreak of the COVID-19 pandemic is creating a new economic environment in which companies face new challenges. The impact of the virus-induced situation affects each company differently. Fletcher and Griffiths (2020) highlight that the situation caused by the epidemic should lead to a different kind of behavior to encourage firms. According to them, different companies should implement higher-level digital solutions, the future of

less digitally developed companies is questionable, and companies that are more digitally advanced can offer more flexibility.

Based on the aforementioned debate, we have formulated the hypothesis that the higher the level of digital development in a given country, the greater the quality of life and purchasing power the country can achieve due to the benefits of various digital technologies.

MEASUREMENTS AND DATASETS

The Digital Economy and Society Index: DESI

DESI is the official index of the European Union for measuring the level of digitalization in the EU-28 countries. DESI is a composite index consisting of five main and several sub-indicators which shows the digital performance of European countries and the development of the digital competitiveness of the EU Member States. The main components of the DESI index are: (1) Connectivity, (2) Human Capital/Digital Skills, (3) Use of Internet Services by Citizens, (4) Digital Integration of Digital Technology by Businesses, (5) Digital Public Services.

In 2019, Finland ranked first among EU countries with a DESI of 69.9, while Bulgaria came in last with a DESI of 36.2. Hungary ranked 23rd out of 28 countries with a DESI value of 45.4.

Quality of Life Index: QLI

Measuring quality of life and, more broadly, well-being is relative. The standard GDP/capita indicator, which has been in use for many years, is becoming increasingly questionable. Researchers and world organizations are suggesting the introduction of additional soft indicators, including the Well-Being Index (Global Wellness Institute 2019), the Human Development Index (United Nations 2019), and the Happiness Index (Helliwell et al. 2020). Indicators that address such issues try to measure social well-being and its essence at the macro level rather than at the micro level.

At the same time, the development of a country's well-being is closely linked to its labor market performance. In the study of Fülöp (2018), the researchers' opinions examined by him differed on the expected effects of digitalization on the labor market. Nábelek et al. (2016) suggested approximately 500,000 jobs would be lost in Hungary, while Frey and Osborne (2017) predicted the loss of 47% of American jobs. Although there are pessimistic views about the labor market (and thus indirectly welfare) effects of digitalization, the level of digital development can also open up new opportunities for a country, thereby promoting the development of social welfare and the quality of life. Concerning digitalization, Frey and

Osborne (2017) as well as Cavaglia and Etheridge (2020) found that income distribution was different for routine and non-routine jobs. Frey and Osborne (2017) showed the risks of technological unemployment, while Cavaglia and Etheridge (2020) pointed out that digitalisation solutions induced higher labour demand.

However, the measurement of social well-being is questionable as some authors have a different point-of-view. Maasoumi and Racine (2016) suggest further research and indicator constructs to measure social well-being more effectively, which truly reflects the wellness of each country. Seth and Yalonzky (2020) criticised later deprivation measurements. The authors highlight the need for differentiation concerning deprivation between 'the poor and the poorest' for better policymaking.

A popular way for measuring quality of life is QLI, which consists of 6 main components: (1) Cost of living and purchasing power, (2) Affordability of housing, (3) Pollution indicators (including air, water, etc.), (4) Crime rates, (5) Health system quality, and (6) Commute times. The indicator can only be a positive number higher than 0, and its highest value was below 200 in the examined period. The indicator (in 2019) reported the values of 71 countries, of which Hungary ranks 41st (134.47). The highest value was achieved by Denmark (198.57) and the lowest by Egypt (83.98 (Numbeo, 2019a). It should be noted that for the periods examined, the QLI indicator was not available for all EU Member States in each year (e. g. Cyprus, Luxembourg and Malta 2019 data were missing).

Purchasing Power Index: PPI

Local Purchasing Power Index (Numbeo, 2019b) shows relative purchasing power in buying goods and services in a given city/country for the average net salary in that city/country. If domestic purchasing power is 40,

this means that the inhabitants of that city/country with an average salary can afford to buy on an average 60% less goods and services than New York City residents with an average salary.

The indicator's value can only be above 0. In 2019 Qatar had the highest value with 138.3, which was followed by Switzerland (129.7), Germany (116.2), and Denmark (114.39). The countries with the worst values were Albania (33.81), Ukraine (32.72), and Moldova (30.75). Hungary took the 29th place (54.66) among the 40 continental European countries (Numbeo 2019b).

RESULTS

The relationship between digital development (DESI) and quality of life (QLI)

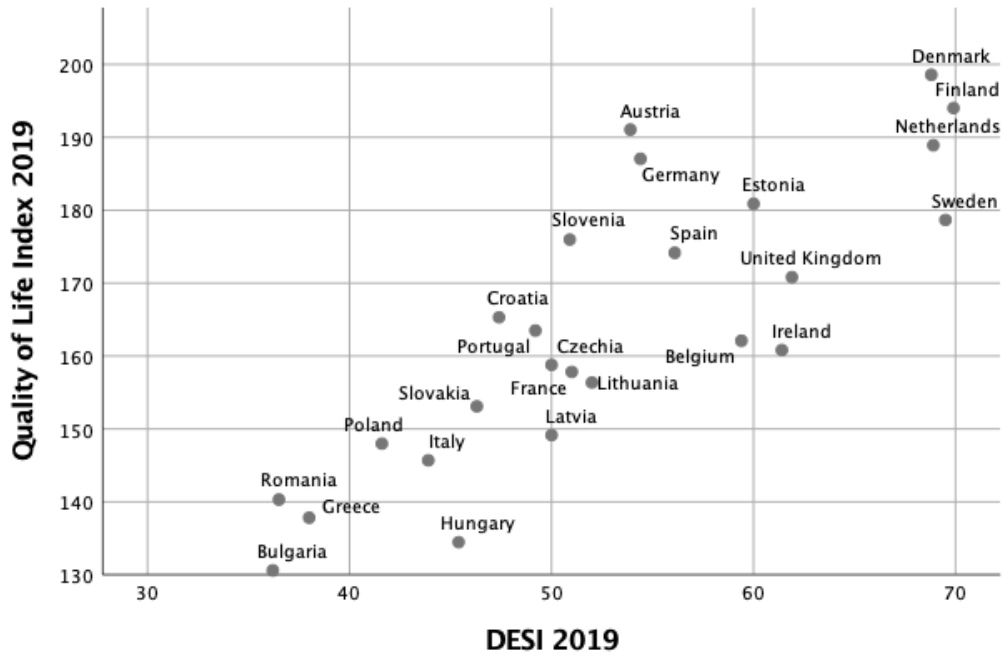
Our examination can be divided into three main findings (Table 1). On the one hand, the digital development and quality of life indicators (for the same period) show a strong positive relationship (Table 1, Figure 1). Thus, digitally developed countries have a higher quality of life. On the other hand, the relationship is also strongly positive regarding the change of these indicators from 2014 to 2019. Therefore, the increase in digital development has been accompanied by an increase in quality of life. Thirdly, there is a strong negative relationship between periodic indicators and periodic change indicators. This means that in more digitally developed countries, the development of digitization and quality of life grew more slowly than in less developed ones (convergence can be observed). This is understandable, since the higher the level of digital development or quality of life in a country, the more difficult it is to achieve progress in both digital development and quality of life.

Table 1.
The relationship between Digital Economy and Society Index (DESI) and Quality of Life Index (QLI)

		1.	2.	3.	4.
1. DESI 2019	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	28			
2. QLI 2019	Pearson Correlation	.835**	1		
	Sig. (2-tailed)	.000			
	N	25	25		
3. DESI change from 2014 to 2019	Pearson Correlation	-.759**	-.778**	1	
	Sig. (2-tailed)	.000	.000		
	N	28	25	28	
4. QLI change from 2014 to 2019	Pearson Correlation	-.839**	-.790**	.675**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	23	23	23	23

** Correlation is significant at the 0.01 level (2-tailed).

Data source: Eurostat (2019) and Numbeo (2019a)



Data source: Eurostat and Numbeo

Figure 1. Simple Scatter of Digital Economy and Society Index (DESI) by Quality of Life Index,

The relationship between digital development (DESI) and Purchasing Power Index (PPI)

Each country’s purchasing power and quality of life have a strong relationship with each other. That is why we have examined the relationship between Purchasing Power Index and DESI (Table 2, Figure 2). In this case, two conclusions can be drawn. Firstly, the digital development and purchasing power indicators (for the

same period) show a strong positive relationship. This means that the more digitally developed a country is, the higher the purchasing power level it achieves. Secondly, there is a moderate negative relationship between periodic digital development and periodic purchasing power indicators; however, digital development have a significant negative effect on the increase of purchasing power.

Table 2.

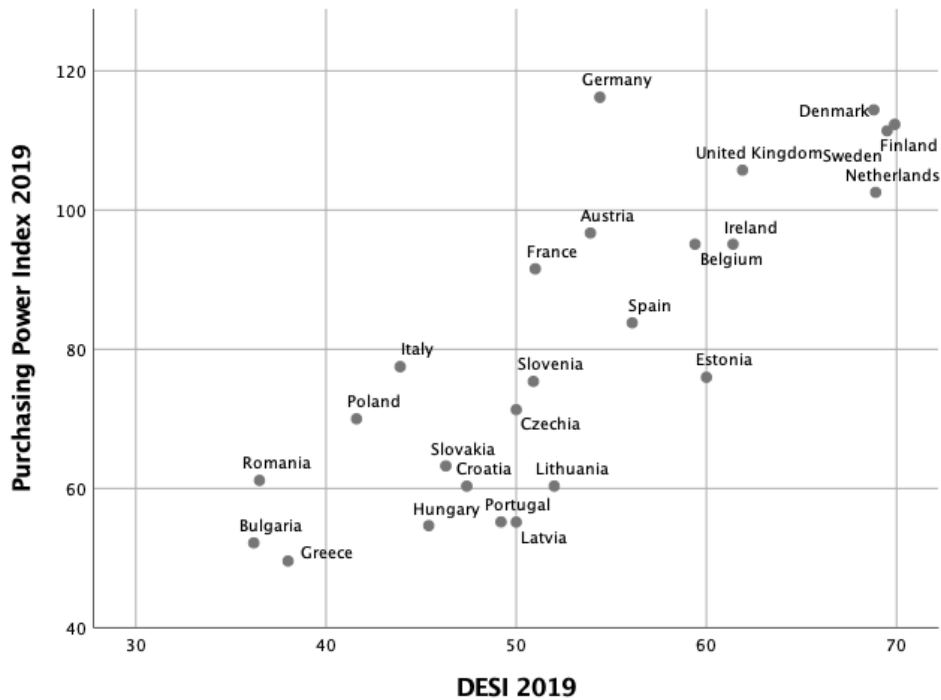
The relationship between Digital Economy and Society Index (DESI) and Purchasing Power Index (PPI)

		1.	2.	3.	4.
1. DESI 2019	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	28			
2. PPI 2019	Pearson Correlation	.824**	1		
	Sig. (2-tailed)	.000			
	N	25	25		
3. DESI change from 2014 to 2019	Pearson Correlation	-.759**	-.741**	1	
	Sig. (2-tailed)	.000	.000		
	N	28	25	28	
4. PPI change from 2014 to 2019	Pearson Correlation	-.376	-.485*	.295	1
	Sig. (2-tailed)	.085	.022	.182	
	N	22	22	22	22

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Data source: Eurostat (2019) and Numbeo (2019b)



Data source: Eurostat and Numbeo

Figure 2. Simple Scatter of Digital Economy and Society Index (DESI) by Purchasing Power Index.

CONCLUSIONS AND FINAL REMARKS

Our study contributes to the international debate on whether digitalization is a positive or a negative phenomenon. We examined relationships between the digital development, the quality of life and the purchasing power in European Union countries and found strong correlations. There is no significant changes regarding the order of the countries whether we are examining digitalization, quality of life, or purchasing power (Figures 1 and 2). Based on our results, digitalization contributes to improving the quality of life and the purchasing power, and these indexes can co-evolve even in developed countries. Hungary's digital development, quality of life and purchasing power is lower than the European Union average; however, based on the results, there is a possibility for convergence.

The results show that digitalization has a positive impact on broad layers of the economy and society. Therefore, the Fourth Industrial Revolution is not limited to IT or just industry, but affects all organizations and industries. Digitalization creates many opportunities to offer new products and services and thereby create new jobs. It can also help in increasing employment and in the inclusion of marginalized, poor sections of society.

Thus, while we can talk about a positive phenomenon overall, it is important not to forget about the potential losers and challenges. The losers of digitization will be countries, companies and individuals who are unable to rapidly disseminate, integrate or use digital technologies in their activities, or cannot cope with the challenges raised by digital technologies. Therefore, an efficient digital transformation is especially important for Hungary and for the prosperity of the people living here.

Acknowledgement

The article was prepared with the professional support of the New National Excellence Program of the Ministry of Innovation and Technology, code number ÚNKP-19-3

REFERENCE

- CAVAGLIA, C. & ETHERIDGE, B. (2020): Job polarization and the declining quality of knowledge workers. Evidence from the UK and Germany. *Labour Economics*. No. 66. <http://eprints.lse.ac.uk/id/eprint/105819>
- BAJMÓCY, Z., GÉBERT, J., MÁLOVICS, G. & PATAKI, G. (2019): Miről szól(hatna) a felelősségteljes kutatás és innováció? [What is responsible research and innovation about? – Contrasting the reform and transformative approaches] *Közgazdasági szemle*. 66. 286–304. <http://dx.doi.org/10.18414/KSZ.2019.3.286>
- BOJÁR, G. (2018): Negyedik ipari vagy harmadik informatikai forradalom? Az információ sok ezer éves hatalma. *Magyar Tudomány*, 179 (1): 37-46. DOI: 10.1556/2065.179.2018.1.4
- EUROSTAT (2019): DESI Dataset: <https://ec.europa.eu/digital-single-market/en/desi>
- FALK, M. & BIAGI, F. (2015): Empirical Studies on the Impacts of ICT Usage in Europe. Institute for Prospective Technological Studies Digital Economy Working Paper 2015/14. JRC98693.
- FLETCHER, G. & GRIFFITHS, M. (2020): Digital transformation during a lockdown. *International Journal of Information Management* 55. Article 102185. <https://doi.org/10.1016/j.ijinfomgt.2020.102185>
- FREY, C. B. & OSBORNE, M. A. (2017): The future of employment: how susceptible are jobs to computerisation?. *Technological Forecasting and Social Change*, 114, 254-280. <https://doi.org/10.1016/j.techfore.2016.08.019>
- FÜLÖP, Z. (2018): Az Ipar 4.0 foglalkoztatásra gyakorolt hatása. *Munkaügyi szemle*, 61 (6): 56-64.
- GEORGESCU, A. M. & HERMAN, E. (2019): Productive Employment for Inclusive and Sustainable Development in European Union Countries: A Multivariate Analysis. *Sustainability* 11, 1771, <https://doi.org/10.3390/su11061771>
- GLOBAL WELLNESS INSTITUTE (2019): Well-Being Index: <https://globalwellnessinstitute.org/industry-research/happiness-wellbeing-index/>
- HECHT, J. (2018): Meeting people's expectations. *Nature* 563: 141-143
- HELLIWELL, J. F., LAYARD, R., SACHS, J. & DE NEVE, J. E. (EDS.) (2020): World Happiness Report 2020. New York: Sustainable Development Solutions Network.
- HORTOVÁNYI, L. (2012): *Entrepreneurial Management*, Aula, Budapest
- KOVÁCS, O. (2017a): Az ipar 4.0 komplexitása – I. *Közgazdasági Szemle*. 64: 823-851. <http://dx.doi.org/10.18414/Ksz.2017.7-8.823>
- KOVÁCS, O. (2017b): Az ipar 4.0 komplexitása – II. *Közgazdasági Szemle*. 64: 970-987. <http://dx.doi.org/10.18414/KSZ.2017.9.970>
- LEONHARD, G. (2016): *Technology vs. Humanity. The Coming Clash Between Man and Machine*. Fast Future Publishing, San Bernardino, CA.
- LUKOVICS, M., UDVARI, B., ZUTI, B. & KÉZY B. (2018): Az önvezető autók és a felelősségteljes innováció. *Közgazdasági szemle*. 65. 949-974. <http://dx.doi.org/10.18414/KSZ.2018.9.949>
- NÁBELEK, F., STRURCZ, A. & TÓTH, I. J. (2016): Az automatizáció munkaerő-piaci hatásai, Járási munkaerő-piacok automatizációs kitettségének becslése. MKIK GVI Kutatási Füzetek 2016/4, 50 p.
- NAGY B., UDVARI B. & LENGYEL, I. (2019): Újraiparosodás Kelet-Közép-európában – újraéledő centrum-periféria munkamegosztás? *Közgazdasági szemle*, 66: 163-184.
- NEVADO-PEÑA, D., LÓPEZ-RUIZ, V.R. & ALFARO-NAVARRO, J. L. (2019): Improving quality of life perception with ICT use and technological capacity in Europe. *Technological Forecasting and Social Change*. 148, 119734, <https://doi.org/10.1016/j.techfore.2019.119734>
- NIEBEL, T. (2018): ICT and economic growth – Comparing developing, emerging and developed countries. *World Development*. 197-211. <https://doi.org/10.1016/j.worlddev.2017.11.024>
- NUMBEO (2019A): Quality of Life Index Dataset: <https://www.numbeo.com/quality-of-life/>
- NUMBEO (2019b): Local Purchasing Power Dataset. https://www.numbeo.com/cost-of-living/rankings_by_country.jsp?title=2019&displayColumn=5
- MAASOUMI, E., RACINE, R. J. (2016): A solution to aggregation and an application to multidimensional 'well-being' frontiers. *Journal of Econometrics*. 374-383. <http://dx.doi.org/10.1016/j.jeconom.2015.12.008>

- POZDNYAKOVA, U. A., GOLIKOV, V. V., PETERS, I. A. & MOROZOVA, I. A. (2019): Genesis of the Revolutionary Transition to Industry 4.0 in the 21st Century and Overview of Previous Industrial Revolutions. In: Popkova, E., Ragulina, Y., Bogoviz, A. (eds.) *Industry 4.0: Industrial Revolution of the 21st Century*. Studies in Systems, Decision and Control, vol 169. Springer, Cham. https://doi.org/10.1007/978-3-319-94310-7_2
- SETH, S. & YALONETZKY, G. (2020): Assessing Deprivation with an Ordinal Variable: Theory and Application to Sanitation Deprivation in Bangladesh. *The World Bank Economic Review*. 1-19. <https://doi.org/10.1093/wber/lhz051>
- SCHWAB, K. (2016): The Fourth Industrial Revolution. World Economic Forum. <https://luminariaz.files.wordpress.com/2017/11/the-fourth-industrial-revolution-2016-21.pdf>
- SCHWAB, K. (2018): The Global Competitiveness Report 2017-2018. World Economic Forum.
- UNITED NATIONS (2019): Human Development Index Dataset: <http://hdr.undp.org/en/content/2019-human-development-index-ranking>