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AN ANALYSIS OF INTELLECTUAL POTENTIAL AND ITS IMPACT ON THE SOCIAL AND ECONOMIC DEVELOPMENT OF EUROPEAN COUNTRIES

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Abstract

The research presented in this article seeks to evaluate the impact of intellectual potential on a country's competitiveness as measured by the most important indicators of economic growth and standard of living. The population with tertiary education as well as with the relevant professional competences required for entrepreneurship and employment form the study group. Intellectual potential indicators along with general and partial productivity indicators, i.e. multifactor productivity (MFP) and labour productivity (LP) respectively, are calculated for different population groups using various methods, with the impact of MFP and LP in relation to each other subsequently analysed. The research revealed that the factors with the greatest impact on LP are: the share of people in the employed population involved in R&D, the share of researchers in the total employed population, as well as the level of tertiary education in terms of the total population as well as for the economically active population and self-employed persons. It was also found that the intensity of the influence of intellectual potential on LP has decreased, but only insignificantly. This decrease indicates the need to strengthen the role of other resources in relation to economic development and improvements in competitiveness. Today, MFP, as the gross indicator of economic progress and standard of living, has no apparent dependence on most of the studies intellectual potential indicators with the exception of the share of professionals with tertiary education (correlation coefficient = 0.440). This finding suggests an increased need to balance the use of all production resources, in particular through innovative work and the development of skills which are not necessarily formed in the field of tertiary education, at least in its formal sector.

Keywords: competitiveness, education, intellectual potential, labour productivity, multifactor productivity, socio-economic development
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1. INTRODUCTION

The importance of the formation and capitalisation of intellectual potential is recognised today as a factor that affects competitiveness at different economic levels. By giving credence to

different interpretations of intellectual potential (e.g. talent, knowledge, employees, intelligent products embodied in technology, etc.), researchers continue to place the issue of the relationship between intellectual potential and sustainable economic development and, consequently, the achievement of social well-being, at the heart of modern economic development research (Markhaichuk & Zhuckovskaya, 2019). This area of research is one of the most important, both in terms of human resources and return on investment (Zygmunt, 2019). After all, the most significant factor affecting the formation of intellectual potential is the system of tertiary education and research that exists within a country, which is influenced by government funding to a lesser or greater degree. The impact of such investments should be positive within the context of the economic results obtained and their influence on future development.

On the basis of the findings of a study by Piotrowska (2019) examining age- and gender-differences among employees with regards to their motivation to undertake training, a number of recommendations were put forward regarding how to organize training for employees of different age groups with the goal of contributing to the overall growth of productivity within an economy.

Nevertheless, it would seem that finding the best investment alternative for enhancing intellectual potential remains problematic. This problem stems from the fact that quite frequently applicable research focuses either solely on the context of human empowerment (which is typical of work on human development and on associated educational vectors, including those enumerated in annual UNDP reports), on comparing countries' intellectual bases with reference to their overall competitiveness (World Economic Forum and other reports), or on the connections between the intellectual potential of the employed and gross economic performance indicators (with the emergence of the Solow growth model and its enhancement with human capital factors that take into account sectoral differences in employment within the Mankiw, Romer and Weil model). Furthermore, current research in this direction continues both at the country level (Beugelsdijk et al., 2018; Baltgailis, 2019; Mačerinskienė & Aleknavičiūtė, 2017), and enterprise level (Nimtrakoon, 2015; Brodowska-Szewczuk, 2019; Mačerinskienė & Survilaitė, 2019; Lentjushenkova, et al., 2019).

Focus has been placed on factors affecting the formation of the intellectual potential of a population, and most importantly related capitalisation of potential in the form of positive added value for human capital with regards to individual carriers and countries alike. These factors are quite often expressed not only in assessing relations with individual and social results, but also through the analysis of negative externalities in the form of migratory losses of people with a high level of education, which a priori means a decrease in the intellectual potential of corresponding donor countries or regions. This issue is especially acute in developing countries where a significant share of public spending goes on education while emigration flows result in a loss of highly educated professionals (Bilan, 2017; Libanova, 2019; Mishchuk & Grishnova, 2015; Gerasimov, et al. 2019; Hrivnak et al., 2019). New instruments created as a result of increased intellectual potential may also be used as a means to extend regional development (Civelek et al., 2019). Within this context, Koisova et al. (2018) identify significant regional differences that exist between the Czech and Slovak labour markets due to differences in primary potential, development opportunities, economic structures, demographics and infrastructure.

The research presented in this article seeks to fill a gap that has arisen in the field of assessing intellectual potential and its impact on the most important economic and social development indicators of countries. For this purpose, multifactor productivity (MFP) and labour productivity (LP) as expressed through different approaches are used as indicators. Many publications consider MFP to be a synonym for total factor productivity (TFP). In this study and in accordance with the OECD, MFP is used as a reflection of the difficulty or true capacity of capturing all factors that contribute to output growth (OECD, 2001).

On the basis of these indicators, it can be concluded that human resources can be reproduced directly (LP and the share of added value that belongs to labour, in the productivity numerator), or through the process of the redistribution of public goods (MFP). Such assessments are necessary for making decisions with regard to priorities in relation to public productivity management (Dobrovič et al., 2019), as these appraisals characterise the existing efficiency and therefore the appropriateness of financing the accumulation of the intellectual potential of a certain level and with a particular focus, as well as the results of stimulating the use of this potential in the economy.

2. THEORETICAL BACKGROUND

Differences in the development of human capital, especially the intellectual component, are very significant not only generally around the world, but also in groups of countries with relatively uniform economic and social development. In a key document, the European Commission (2010) acknowledged and outlined the uneven development within EU, simultaneously recognizing knowledge diffusion as an instrument of economic and social cohesion.

At the country level, studies into the links between economic development and factors affecting intellectual potential confirm the importance of analysing the factors of intellectual development. In their deliberations, researchers such as McCann & Ortega-Argilés (2015) proposed the use of the results of intellectual employment – quantified indicators of technology and knowledge diffusion – in factor analyses, whereas others like Beugelsdijk et al. (2018) added labour force indicators and the human capital of employees, whose impact was estimated through well-known and improved resource-production ratios. Other scholars (Capello & Lenzi, 2015; Dettori et al., 2012; Ciobanu et al., 2019) regularly use similar methodological principles to assess the differences in economic performance of European countries using information on the use of human capital.

From the point of view of maintaining the global competitiveness of the European economy, the methodology and methodological tools in current use for analysing human capital or economic development indicators are well developed. It is therefore possible to obtain a comprehensive multiple-criteria assessment of the development of human capital factors and regional differences using Hellwig's method of taxonomic measurement of development in a constant pattern (Balcerzak, 2016). By analysing the impact of sectoral employment differences and accumulated capital at different levels (Formánek, 2019), it is also possible to acquire an understanding of the impact of factors affecting intellectual potential, including educational influences, on the macroeconomic performance indicator GDP per capita (Androniceanu et al., 2019). Mendy &

Widodo (2018) also exemplify such possibilities in their study into the impact of different levels of education population. Even more pertinent to our study, Volchik et al. (2018) focus specifically on tertiary education.

Along more traditional lines, Pelinescu (2015) takes into account the impact of intellectual potential on economic development through the overall indicator of human capital, the main components of which are education and skills. Furthermore, a close link to the educational component of human capital is most evident in the countries where intellectual potential has not yet fully developed, such as is the case in European countries (Haseeb et al., 2019). Based on case studies of the dynamics and factors affecting the development of individual countries, Benos & Karagiannis (2016), Kasri (2011), Mendy & Widodo (2018) have confirmed that education level is a significant factor for economic growth.

At the same time, complex studies into the impact of the intellectual component of human capital on social and economic development in the form of multifactorial productivity require a multidisciplinary approach in which the links among these objects are emphasised in evaluations.

Until now, such relationships have mainly been evaluated indirectly – through overall indicators of human capital, with the allocation of its educational component, or vice versa – or through the analysis of the total intellectual capital (mainly at the enterprise level), in which human capital is only one factor together with structure (organisational) capital and relational capital (Sardo, 2018; Sydler et al., 2014).

Apart from this, measuring the impact of human capital factors or their constituents on certain multifactor productivity indicators at different levels has another limitation in terms of different approaches to which an indicator should be taken as multifactor productivity – so that it most closely reflects the outcomes of social and economic development over a certain period of time.

Multifactor productivity (MFP) is theoretically defined as the output determined by how efficiently and intensely the inputs are utilised during production (Comin, 2017). The factors affecting its creation (denominator) are known, with the productivity numerator expressed in different dimensions depending on the objectives of the study, i.e. gross output, GNP, GDP, added value (Van Biesebroeck, 2014). The common feature of all these approaches to measuring the MFP is that the factors affecting its creation remain unchanged: capital, labour, technology (Hulten, 2001; Prescott, 1998; Prakash & Garg, 2019).

With regards to labour, which is one of the main factors investigated in our study, its measurement is also based on various indicators, the most common of which, including in papers by the International Labour Organization, are employment and hours worked (Van Biesebroeck, 2014).

3. RESEARCH OBJECTIVES, METHODOLOGY AND DATA

For the purposes of this research, and in order to identify the factors affecting intellectual potential, we use an approach which allows the potential of human resources to be differentiated from intellectual capital, which in addition to human capital, includes other components – intangible assets in the form of technologies and other intellectual property.

Taking into account the existing basis for assessing the impact factors on macroeconomic development, and similarly the methodology applied to predict the development of the system of intellectual potential formation (Mishchuk et al., 2019), use is made of the indices that form the basis for monitoring the intellectual level of the population on various grounds in the estimates of the European Commission, in particular in Eurostat statistics, as indicators that characterise the intellectual potential of society. The initial statistical basis for assessing the factors that characterise intellectual potential are therefore as follows:

- population aged 15-74 with tertiary education (Eurostat, 2019a);
- economically active population aged 15-74 with tertiary education (Eurostat, 2019b);
- employed population aged 15-74 with tertiary education (Eurostat, 2019c);
- self-employed population aged 15-74 with tertiary education (Eurostat, 2019d);
- employees aged 15-74 with tertiary education (Eurostat, 2019e);
- managers, professionals, technical and associate professionals with tertiary education (Eurostat, 2019c);
- employed ICT specialists with tertiary education (Eurostat, 2019f);
- total R&D personnel and researchers (Eurostat, 2019g);
- researchers (Eurostat, 2019g).

Since absolute indicators are not suitable for a comparative analysis of intellectual potential, these indicators were transformed into relative ratios through the calculation of the share of the population with tertiary education in the respective structural group.

The MFP and LP indicators were used in order to calculate the performance indicators, the dependent variables that characterise the level of social and economic development of countries.

LP was estimated, as an expression of labour costs – hours of work (T) or employment (E), according to the following equations used by OECD (2001):

$$LP_1 = GDP/T \quad (1)$$

$$LP_2 = GDP/E \quad (2)$$

where GDP is gross domestic product at market prices.

Furthermore, attention was paid to the fact that labour productivity determines the standard of living of population of a particular country (OECD, 2001), which for inter-state comparisons can be evaluated using the following approach:

$$LP_3 = GDP/P \quad (3)$$

where P is population.

The standard of living is an indicator that reflects a country's ability to meet the needs of the general population. At the same time, it cannot be used in the analysis of the efficiency of public administration, and therefore of macro-level comparisons of social and economic development, because it does not reflect the resources used to organise the process of meeting the population's needs. Public administration is considered effective when the needs met exceed the resources

spent. For cross-national comparisons, it is worth analysing the correlation of these indicators. This means that it is important, within the context of social and economic development, to further analyse multifactor productivity. This can be estimated according to the national accounts system using the gross output based MFP equation (OECD, 2001), namely:

$$MFP = (Gross\ output)/(IMC+CE+CFC) \quad (4)$$

According to the System of National Accounts (SNA, 1993), gross output is calculated by the formula:

$$Gross\ output = GDP+IMC-TSP \quad (5)$$

where GDP is gross domestic product at market prices;

IMC is intermediate consumption;

CE is compensation of employees;

CFC is consumption of fixed capital;

TSP is taxes less subsidies on products.

Unlike the proposed OECD (2001) formula that only allows calculating the MFP index and estimating the MFP dynamics, the proposed formula 4 makes it possible to estimate the MFP level and subsequently makes cross-national comparisons of how much gross output falls on 1 monetary unit of investment in productive resources (capital, labour, intermediate goods and services). Thus, the MFP, calculated by the formula 4, will allow supplementing the information base for making investment decisions. Testing this approach (section "Results and Discussion") gives grounds to assert that the statistical information is sufficient for its application.

In addition, the formula does not require the weighing of statistics on gross output, capital, labour, intermediate inputs to prices as proposed by the OECD, but use the values of these indicators in monetary units, as they are presented in the statistical bases (section National Accounts) and may be subject to aggregation without weighing.

Research methods were used in accordance with the stated objectives:

- Objective no. 1: Identify regional differences in intellectual potential within EU – the method of graph analytics was applied;
- Objective no. 2: Evaluate the impact of a set of factors on the formation of intellectual potential and on the aforementioned indicators of social and economic development – correlation-regression analysis was applied.

For this study, a comparative analysis was conducted of data from the 28 EU member states for the period the 2015-2017. The research used statistical data from the official website of the European Commission, Eurostat, available under sections such as "Economy and finance→ National accounts", "Population and social conditions→ Demography and migration→ Population", "Labour Market→ Employment and unemployment", "Science, technology, digital society→ Research and development→ Digital skills" and others.

4. RESULTS AND DISCUSSION

The overall trends with regards to the reproduction of intellectual potential in EU are quite positive. After calculating the relevant indicators based on the existing data on tertiary education coverage, it can be concluded that over a quarter of the EU population has tertiary education – 26.39%. Ireland has the highest number of residents with tertiary education (37.26%), whereas Romania the lowest (14.23%) (calculations based on data from Eurostat, 2019a). The average share of the population with tertiary education in relation to the total economically active population in the EU member states is one third (33.27%). Once again, Ireland has the highest share (46.60%) and Romania the lowest (19.98%) (calculations based on data from Eurostat, 2019b).

Comparing these shares with the enrolment rate of population in the employment group suggests that the population with tertiary education is more likely to seek employment than the population that does not have tertiary education. More specifically, just over one-third of the employed population in EU has tertiary education (the EU average is 34.39%). Once again, the data reveals that Ireland has the highest share (48.05%) and Romania the lowest (20.51%) (calculations based on data from Eurostat, 2019c).

Given that the share of employees with tertiary education is higher than the availability of tertiary education in the economically active population, it is evident that the chances of gaining successful employment are better for those with an even higher level of education.

Whereas the previous indicators did not show very pronounced regional differentiation, the analysis of the intellectual level of the self-employed (who are actually the initiators and owners of micro- and small businesses) and employees clearly did, thereby also revealing the opportunities for their successful integration in the labour market (Figure 1). Of the total number of self-employed in EU, 35.13% has tertiary education. At the same time, the differences in the level of development of countries is very noticeable. For example, in Romania, 5.82% of the self-employed have tertiary education; as the country's level of development improves, this indicator also increases. In contrast, in Belgium, 50.63% of the self-employed have tertiary education (calculations based on data from Eurostat, 2019d).

In a similar vein, in 2017, the share of the population with tertiary education among the total number of employees was lower; the EU average was 34.55%. The lowest share was recorded in Italy (21.56%), while the highest in Ireland (49.47%) (calculations based on data from Eurostat, 2019e). When taking this fact into consideration, it is possible to conclude that the population with tertiary education is characterised by a higher ability to start their own business. However, it should be noted that tertiary education is the impetus for business creation in many EU member states such as Germany, France, the Czech Republic, Hungary, Austria, Holland and Belgium.

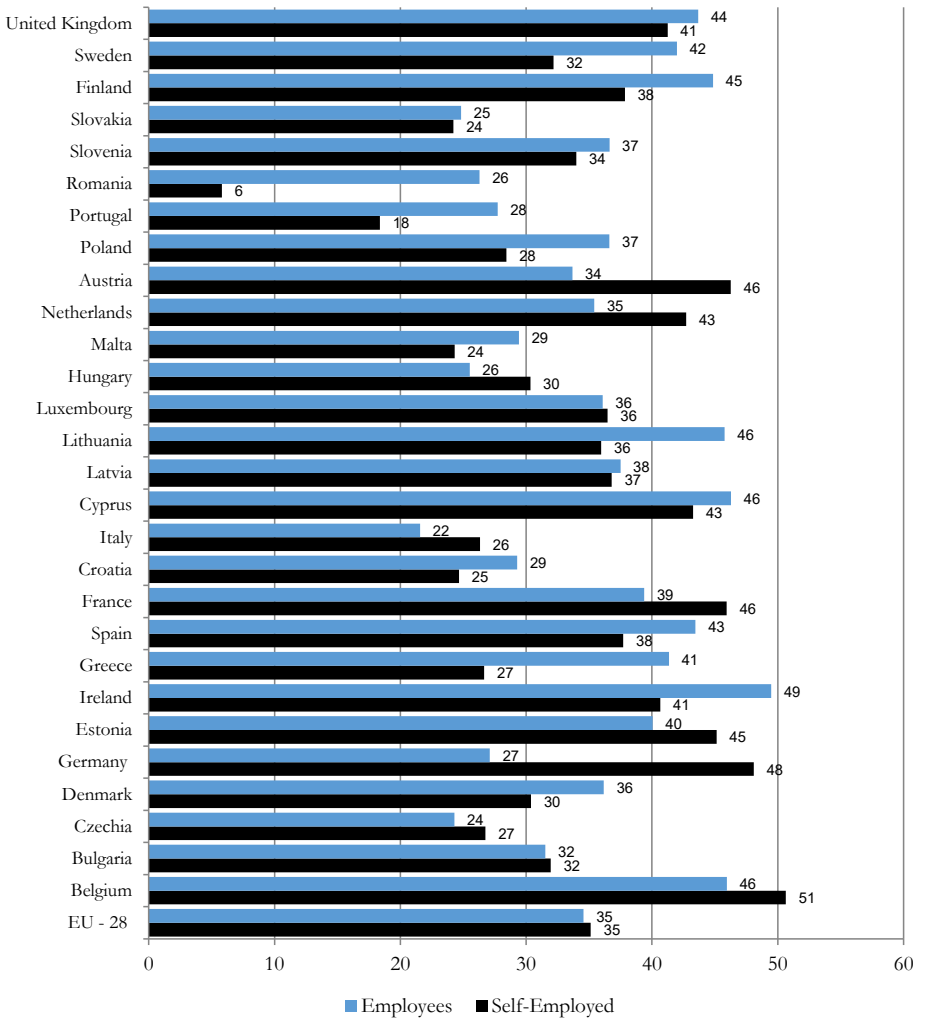

Fig. 1 – Share of self-employed population and employees with tertiary education in EU in 2017 (in %). Source: calculations based on data from Eurostat (2019d), Eurostat (2019e)

The analysis of employment according to occupational groups (Figure 2) shows that in most cases, having tertiary education is a requirement in EU for occupying positions within 'Professional' groups. We can state this by virtue of the fact that the EU average for professionals with tertiary education in relation to the total number of professionals in 2017 was 84.32% (minimum was 74.78% in Switzerland, maximum was 97.44% in Spain), while the share of managers with tertiary education in relation to the total number of managers in 2017 was 57.68% (minimum was 25.02% in Italy, maximum was 78.87% in Cyprus). In addition, 41.16% of technicians and associate professionals in the EU member states have tertiary education (19.91% in Luxembourg, 64.26% in Cyprus). It is therefore possible to conclude that in European countries, it is not a

requirement to have tertiary education in order to take up a managerial position (calculations based on data from Eurostat, 2019c).

In 2017, the majority of employed ICT specialists in the EU possessed tertiary education (EU average 62.31%). In many countries almost all employed ICT specialists have tertiary education, for example Ireland (84.05%), Lithuania (83.47%) and Cyprus (82.56%), whereas, surprisingly, other countries have very few, for example Italy (34.08%), Portugal (49.57%) and Germany (50.1%), where the share of employed ICT specialists with tertiary education is 1.5 – 2 times lower than the average (calculations based on data from Eurostat, 2019f).

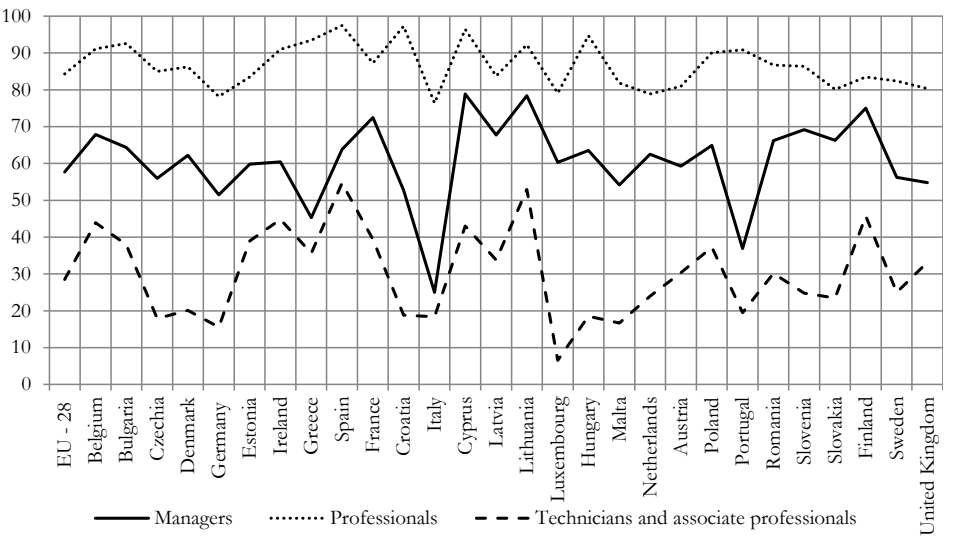

Fig. 2 – Share of employed population with tertiary education by major occupational groups in the EU in 2017 (in %). Source: calculated by authors, based on data from Eurostat (2019c)

With regards to total R&D personnel and number of researchers, the results show that such specialists are concentrated in Denmark, Finland, Luxembourg, Belgium, and the Netherlands, nations in which the share of R&D personnel and researchers in the total employed population in 2017 was 2.25%, 1.98%, 1.96%, 1.80% and 1.61% respectively (calculations based on data from Eurostat, 2019g). In contrast, in Romania and Cyprus, where hardly any scientific development work was shown to take place, the share was less than 0.5%. In 2017, the EU average for the share of R&D personnel and researchers was 1.35%, with the largest shares found in Denmark and Finland. The relevant EU average for researchers was two times lower at 0.86%.

As a result of the comparison of the dynamics of intellectual potential in European member states according to the selected indicators for the relevant population groups by tertiary education, it can be concluded that in the EU, the reproduction of intellectual potential has expanded: the values of all the analysed indicators increased approximately by 1% per year (Figure 3).

Our results also show that the level of intellectual potential in the EU is already quite high, so it can be said that despite certain regional differences the EU has formed sufficient intellectual

resources for economic development, as evidenced by the overall macroeconomic indicators for this group of countries.

Nonetheless, in order to assess the impact of a society's intellectual potential, which forms part of the objective no. 2 of this study, an appropriate analysis needs to be conducted as for the links to the social and economic development indicators of countries. To this end, the strength of the relationship is estimated by the correlation coefficients presented in Table 1.

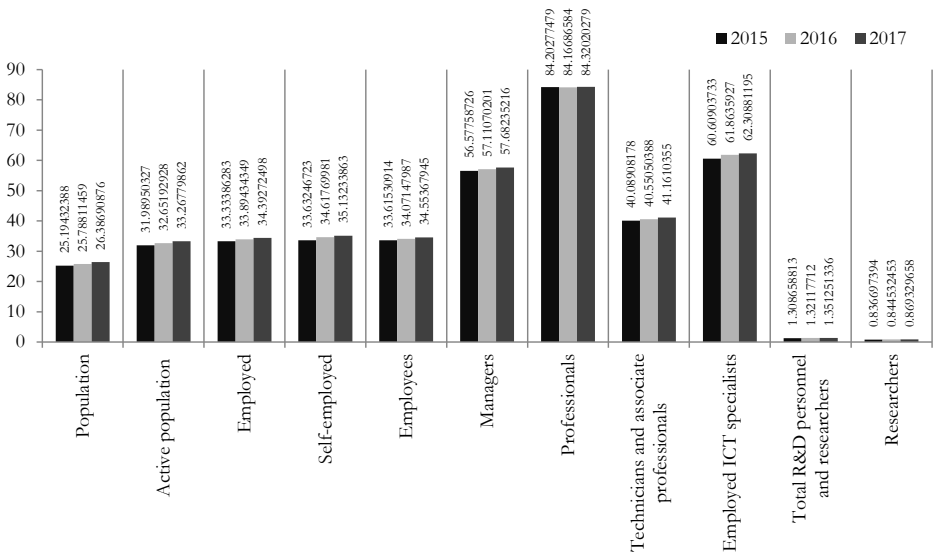

Fig. 3 – Dynamics of shares of population with tertiary education by employment status in EU member states for 2015-2017 (in%). Source: calculations based on data from Eurostat, 2019a-g

Tab. 1 – Correlation coefficients of the relationship between human intellectual potential and key social and economic development indicators in EU member states for 2015 – 2017 Source: calculations based on data from Eurostat, 2019a-j

Indicators of Intellectual Potential of Population	Year	Social and Economic Development Indicators			
		LP_1	LP_2	LP_3	MFP
Share of population with tertiary education (levels 5-8)	2017	**0.419**	**0.402**	**0.418**	-0.049
	2016	**0.501**	**0.487**	**0.506**	-0.140
	2015	**0.543**	**0.533**	**0.549**	-0.131
Share of economically active population with tertiary education	2017	**0.409**	**0.405**	**0.400**	0.018
	2016	**0.474**	**0.475**	**0.472**	-0.069
	2015	**0.515**	**0.517**	**0.513**	-0.052

Share of employed population with tertiary education	2017	**0.389**	**0.387**	**0.376**	0.040
	2016	**0.449**	**0.452**	**0.443**	-0.045
	2015	**0.484**	**0.487**	**0.477**	-0.027
Share of self-employed population with tertiary education	2017	**0.430**	**0.415**	**0.418**	-0.319
	2016	**0.554**	**0.543**	**0.552**	-0.378
	2015	**0.563**	**0.555**	**0.565**	-0.350
Share of employees with tertiary education	2017	0.328	0.333	0.315	0.181
	2016	**0.375**	**0.384**	**0.367**	0.099
	2015	**0.404**	**0.414**	**0.395**	0.118
Share of managers with tertiary education	2017	-0.046	-0.049	-0.028	-0.189
	2016	0.007	0.013	0.034	-0.275
	2015	-0.038	-0.045	-0.019	-0.224
Share of professionals with tertiary education	2017	-0.397	-0.368	-0.417	0.325
	2016	-0.194	-0.152	-0.210	0.220
	2015	-0.071	-0.025	-0.081	0.210
Share of technical and associate professionals with tertiary education	2017	-0.154	-0.150	-0.190	0.286
	2016	-0.123	-0.114	-0.156	0.242
	2015	-0.084	-0.075	-0.122	0.290
Share of employed ICT specialists with tertiary education	2017	-0.076	-0.060	-0.085	0.250
	2016	0.131	0.153	0.127	0.112
	2015	0.028	0.054	0.018	0.185
Total R&D personnel and researchers as % of total employed	2017	**0.759**	**0.736**	**0.742**	-0.379
	2016	**0.785**	**0.761**	**0.778**	-0.421
	2015	**0.783**	**0.765**	**0.773**	-0.368
Researchers as % of total employed	2017	**0.625**	**0.595**	**0.613**	-0.292
	2016	**0.641**	**0.605**	**0.635**	-0.336
	2015	**0.661**	**0.635**	**0.652**	-0.267

Note. The highlighted correlation coefficients are significant, determined by Student's t-test

Table 1 clearly shows that the labour productivity increase in EU member states is mainly due to the increase in the share of R&D personnel and researchers in the total employed population (correlation coefficient higher than 0.5). This indicates an increase in the quality of scientific research.

Nevertheless, the increase in the share of highly educated people in professional groups, in which tertiary education is compulsory, was found to be inversely related to labour productivity in Europe. This may either indicate that university education does not meet the requirements of the economy, or that other types of education are increasing in importance. A similar situation applies to the standard of living of the population, which as has been noted is most clearly described by the ratio of GDP to total population (corresponding relations are presented in Column 4 of Table 1).

However, it should be noted that the impact of intellectual potential on social and economic development is decreasing every year. For example, the correlation coefficient of labour productivity in terms of GDP divided by the hours worked and the share of population with tertiary education in 2015 was 0.543 (Row 3 of Table 1), in 2016 0.501 (Row 2), and in 2017 0.419 (Row 1). In addition, the correlation coefficient for the share of total R&D personnel and researchers in the total employed population remained almost unchanged throughout the whole period, which indicates the reliability of the indicator for assessing the intellectual potential of the population.

Unfortunately, the correlation analysis revealed that the intellectual potential of the population does not have a strong impact on multifactor productivity. The logical conclusion that flows from this is that in addition to the intellectual potential of the population, multifactor productivity is strongly influenced by other factors of production, such as material and technical means as well as the level of innovation and uses made of it according to the level of generated intellectual potential.

These results without a doubt reflect the effect of the law of diminishing marginal productivity, as the analysis uses statistics for a group of developed countries where the pace of potential intellectual development as well as economic growth can no longer be very high. As a result, the impact of intellectual labour is largely negated by limited production and marketing opportunities, including those with high added value. As a whole, however, it can be stated that given the dynamics and outcomes of the impact of intellectual potential on the most important macroeconomic indicators of social and economic well-being, there are two systems for the regulation and reproduction of intellectual potential: (1) market self-regulation, whereby the state predominantly supports those forms of education which generate the intellectual capacity and professional skills which are needed and which produce the most evident effect, i.e. R&D sector; and (2) stimulation of R&D employment, including personnel engaging in new and expanding research. Increasing R&D personnel has been shown to have a strong positive impact on LP, especially LP3, the main standard of living indicator.

5. CONCLUSION

In this study, an analysis was conducted of the dynamics and regional characteristics of intellectual potential in the EU along with the impact on labour productivity and multifactor productivity as indicators of sustainable economic growth and the standard of living of a population. The analysis confirmed the findings of other researchers who have investigated economic and social processes in the EU-28 from different points of view. These investigators have determined that EU member states have very heterogeneous indicators of economic development as well as historically different tendencies with regards to the formation of intellectual potential and its use in economic activity. As a general rule, it can therefore be said that those countries more economically developed, in particular the EU's founding member states, have gained the greatest benefits from harnessing the intellectual potential in their respective economies as reflected in improved opportunities in the labour market as well as in terms of self-employment and employment in groups of prestigious professions, i.e. generally high-paying ones. Nevertheless, other indicators of intellectual potential show that Ireland, Denmark and Finland are rapidly closing the gap with these countries.

Significant differences in the reproduction of intellectual potential in EU member states could to some extent influence the overall weak relationships among the majority of the EU-wide indicators and macroeconomic indicators for country development. At the same time, according to our results tertiary education coverage still has an impact on labour productivity, as evaluated by various methods. With regards to the coverage of the population with certain special types of education (ICT, management, technical, training of researchers), it is clear that it is advisable to support the accumulation of intellectual potential of the highest level of specialists: R&D personnel, including researchers. Higher education in universities, in addition to maintaining a certain positive impact on macroeconomic performance, has indisputable personal benefits, contributes to human development, and increases a society's ability to use human capital in the labour market. Nevertheless, another conclusion that can be drawn is that today the balanced use of all productive resources, including the development of professional skills, which do not necessarily form in the process of acquiring tertiary education in the formal sector, has a significant impact on social productivity as well as on the standard of living of a population.

In general, our approach makes it easier to compare the existing ratios of productivity factors with respect to their impact on various productive performance indicators that determine socio-economic development. Such theoretical refinements are useful for practical guidance on performance management.

In particular, the sample of countries shows a low impact of intellectual potential on multifactor productivity, and therefore a lack of efficiency in combining KLEMSMFP resources: capital (K), labour (L), energy (E), materials (M). Therefore, today there is a need not only to accumulate intellectual capital, but also to ensure appropriate proportions with physical capital (fixed and working capital). Intellectual potential should be developed not only within formal tertiary but also through non-formal education, which needs more development as a direction for future employer investment.

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