Danova, Monika; Vozárová, Ivana Kravčáková; Sira, Elena

Article

Innovations in human resources management : impact on economic growth

Reference: Danova, Monika/Vozárová, Ivana Kravčáková et. al. (2021). Innovations in human resources management : impact on economic growth. In: Marketing i menedžment innovacij (3), S. 53 - 65. https://mmi.fem.sumdu.edu.ua/sites/default/files/A533-2021-05_Danova%20et%20al..pdf. doi:10.21272/mmi.2021.3-05.

Marketing and Management of Innovations
Issue 3, 2021

ISSN 2227-6718 (on-line)
ISSN 2218-4511 (print)

https://doi.org/10.21272/mmi.2021.3-05

JEL Classification: I25, O11, O44

Monika Danova,
Ph.D., University of Presov, Slovakia
ORCID ID, 0000-0002-0818-4698
email: moni.danova@gmail.com
Ivana Kravcakova Vozarova,
Ph.D., University of Presov, Slovakia
ORCID ID, 0000-0002-3056-5294
email: vozarova.ivana@gmail.com
Elena Sira,
Ph.D., University of Presov, Slovakia
ORCID ID, /0000-0002-9907-1372
email: elena.sira1@gmail.com, elena.sira@unipo.sk

Correspondence author: elena.sira1@gmail.com

INNOVATIONS IN HUMAN RESOURCES MANAGEMENT: IMPACT ON ECONOMIC GROWTH

Abstract. *In recent years, human capital has become increasingly emphasized as a factor of economic growth. Managing human capital could stimulate the whole economy to better performance in competitiveness. Although these indicators include several variables, there is no precise determination of which indicator mostly affects the country's economic growth. This paper summarizes the knowledge and approaches of several authors in the field of economic growth, knowledge economy, competitiveness, innovations and individual elements affecting these areas. It outlines the findings and provides some insight into the impact of individual factors on economic growth across recent studies. The main goal is to obtain information about the impact of education, its support, and its influence on economic performance on the example of empirical data documenting the qualitative parameters of the workforce. The use of selected indicators indicated their impact on the change in economic performance. The partial objective is to identify an indicator or set of indicators that could express the impact of human capital on economic growth. The study involved research methods such as analyzes, statistical methods such as correlation and p-value, and prediction for the next period based on past developments. The research object is the V4 countries – the Czech Republic, Slovakia, Hungary, and Poland. The findings pointed to the strong impact of the analyzed factors on economic growth. Besides, they showed which of the known ways to increase the efficiency of the labor factor were actually or little used in the sample countries. Undoubtedly, there is also an indicative and interesting comparison within a group or with other economies at a comparable economic and social development level. Finally, improvements to the current situation were proposed. The systematization of literary sources and approaches to economic growth helps identify possible proposals for improving competitiveness in the future, using innovative approaches.*

Keywords: competitiveness, economic growth, education, human capital, management, V4 countries.

Introduction. Economic growth has long been of interest to economists. Many factors affect economic growth (Fila et al., 2020). Some indicators have a larger, others a smaller impact on the overall performance of the economy. The reason for examining this impact is pragmatic of increased GDP generation increases the nation's prosperity. In the long run, GDP growth also increases the growth and development capabilities of the economic system. It supports innovations and innovative approaches applied in several areas of the economy. Innovation activity is a powerful tool to achieve sustainable economic growth because new technology, development, production processes, and saving natural resources could provide any country with a significant international competitive advantage (Vovk and Braga, 2017). Remarkably, innovations could start the economic growth, improve its performance, and

Cite as: Danova, M., Kravcakova Vozarova, I., & Sira, E. (2021). Innovations in Human Resources Management: Impact on Economic growth. *Marketing and Management of Innovations*, 3, 53-65. http://doi.org/10.21272/mmi.2021.3-05

Received: 1 July 2021 **Accepted:** 18 August 2021 **Published:** 13 September 2021

increase its overall competitiveness. Besides, innovation has been widely seen as a key driver of economic growth (Rodionova and Kuzminykh, 2019).

Another approach of Bacho et al. (2019) claims that in today's global conditions of development, it is necessary to evaluate the influence of information management on the regulation of economic systems. The positive impact of GDP growth on the development capacity of the economy is illustrated by, e.g., a comparison of the economic development impact on the economies of East Asia and Latin America in the second half of the 20th century. Year-on-year GDP per capita growth in East Asia between 1960 and 2000 was 4.5%, while in Latin America, GDP grew by less than 2% year-on-year. As a result, at the end of this period, GDP creation in East Asia was seven times higher than at the beginning, while in Latin America, this increase was only double (Hanushek and Woessmann, 2015). The backwardness of economic growth is undoubtedly a problem mainly in less developed economies. The requirement to find an endogenous source of economic growth remains in the long run. It is unrealistic to expect that the economic performance growth would be achieved in the long run only by an extensive increase in the number of inputs. There is a need to find and use an alternative to extensive resources. Growth of the production productivity has been the subject of interest of the academic community and economic practice from the very beginning. Current trends identify the use of human capital as one of the options. Proponents of this theory argue that human capital positively affects economic growth, while appropriate investment could increase its value (Sakamoto, 2017; Shahabadi et al., 2018; Zhou and Luo, 2018).

They assume that a skilled workforce (Romer,1990a) with experience and cognitive abilities could use other resources more efficiently. This statement is confirmed by historical data. Sala and Silva (2011), on EU data (1999-2005), found an increase in labor productivity growth of 0.5% due to one hour of vocational training. Higher labor productivity was found in several comparative analyzes in countries with good access to education than in economies, where only a small percentage of the productive working population had higher education. Similarly, comparing labor productivity in economies with a higher share of university graduates is considered by Razzak and Timmins (2009). In the conditions of world integration of all spheres of the constantly changing environment, the urgent issues are improving communication in higher education through its reformation and innovative development (Pukala et al., 2019). An ILO analysis of a sample of 74 countries found that labor productivity in countries with around 30% tertiary education is more than three times the labor productivity of countries where the share of the university-educated population is only 10% (ILO, 2015). This paper discusses how differences in human capital are associated with differences in the rate of economic growth. The main goal is to obtain information on the impact of education, its support, and its effects on economic performance on the example of empirical data documenting the qualitative parameters of the labor force. The partial goal is to identify an indicator or set of indicators that could express the impact of human capital on economic growth.

Literature Review. As an important concept in developing any economy, economic growth is a crucial step in ranking economic development. Therefore, achieving a high and sustainable economic growth rate remains a central theme of many world economies. In recent years, there has been a growing debate about the determinants of economic growth and income distribution in individual countries (Mulungu and Ng'ombe, 2017). The economic theory could meet with several views on the nature and factors of economic growth, which focus on explaining the mechanism of economic growth, justifying, and quantifying the impact of the considered sources of growth. Sepashvili (2016) pointed out that technological achievements are a significant factor for development. The success of the country in science and research boosts the country's development. Although the number of empirical articles examining the sources of economic growth in different countries has increased significantly, country-specific empirical evidence to guide policy decisions in given economies remains debatable (Chirwa and Odhiambo, 2016). According to Khan and Majeed (2019), examining the determinants of economic growth is considered as the most active area of research in economics. However, growth models differ significantly from

exogenous (Solow, 1957) to endogenous, where growth is driven by technological change (Romer, 1990b). Kendiukhov and Tvaronaviciene (2017) set that most studies concern either the construction of empirical models and analysis of macroeconomic data for specific countries or the construction of theoretical models within neoclassical positions. A comparison of classical and newer theories of economic growth shows fundamental differences in views on the sources of economic growth. The oldest theories link economic growth to labor productivity growth, if labor productivity depends on the ratio between labor, physical capital, and other factors (technological progress). Increasing the share of more efficient capital and the exogenous impact of technological progress are considered to be sources of labor productivity growth. They do not anticipate an increase in labor productivity because of education. The endogenous theory of economic growth eliminates this shortcoming of the classical theory. Economic growth is created through endogenous forces internally in the economy and not through exogenous forces. That is at odds with the neoclassical growth model, which argues that external sources (such as technological progress) are the main sources of economic growth. A new element is an emphasis on the importance of education and innovation for long-term economic growth. Similar to endogenous theory, also the theory of market value combines economic growth with human capital. Its proponents have used their studies to verify the positive impact of intangible assets, such as research and development, patents, intellectual capital on the market value of companies and on their development, which ultimately leads to overall economic growth. Harris and Seetanah (2016) define human capital as a set of knowledge, abilities, and skills used in activities, processes, and services that stimulate economic growth. However, in the economic literature, the issue of human capital is viewed differently in individual theories of economic growth. It is well known that human capital has a positive effect on economic growth. However, most researchers measured the impact of human capital only on the education level. They did not consider many other influencing factors. Cognitive abilities are also an important factor, reflecting not so much in quantity as in the quality of education. They are often associated with innovation (Deng and Zhao, 2018). In addition, investment in education provides a return in the form of a skilled workforce, which could accelerate economic development and improve the quality of society. Countries closer to technological frontiers and paying more attention to research and innovation education make more significant technological progress, which increases labor productivity and economic growth. On the other hand, the prevailing low level of education and technology imitation would be reflected in the delay of stronger economic growth (Aghion et al., 2005). Mankiw et al. (1992) also stated the need to distinguish between the quantity and quality of the workforce. Human capital in the form of embodied knowledge and skills distinguish from the factor work. At the same time, they emphasized the importance of accumulating human capital for the economy's long-term growth. However, this means that the effects of investing in human capital could be expected in the long run. In the short term, this effect is not sufficiently visible.

Human capital is formed within the formal, non-formal, and informal education system. The informal system includes family education, self-education, self-learning, and learning from the media. Its formation is supported by the increased availability of books, magazines, newspapers, films, and the like. Non-formal education includes education for personal development, language teaching, computer courses for personal use, training in social roles, civic and political education, i.e., the education that is often referred to as complementary education in the sense that it complements the content provided by formal and informal education. However, the most important role in human capital formation is the formal education system. It includes pre-school education, compulsory primary education, secondary education, higher education, lifelong learning programs, and adult education, i.e., such education, after which the participant obtains a recognized level of education (Babic, 2005; Grdinic, 2014). Classical economic theory states that economic growth depends mainly on capital, labor, technological progress. It considers higher education as an important way to increase human capital. Higher education and economic development

are thought to interact and reinforce each other. In turn, higher education supports technological innovation by improving the quality of workers. Thus, it effectively supports economic growth.

On the other hand, economic growth is the material basis and condition for the development of education. Economic growth could also stimulate the development of higher education with increased social demand and the expansion of human capital (Zhou and Luo, 2018). The main tools for innovative human capital development are legal instruments, such as laws, regulations and strategies, and financial instruments and expenditures. It is also influenced by other factors, such as educational policy, infrastructure development tools (e.g., science parks), and social influence tools (Kuzmin et al., 2020).

Rosario et al. (2018) argued that human capital and innovation are crucial for economic growth. Besides, in the knowledge economy era (Mustafin, 2016), recognizing their importance is consensual. Despite many studies on the role of these factors in the economy, they consider it important to study the direct impact of human capital on economic growth and its indirect impact through the results of innovation. However, although the importance of intangible resources for the country's economic growth is generally acknowledged, empirical evidence of this impact is difficult to demonstrate due to the limitations of measuring intangible resources (Macerinskiene and Aleknaviciute, 2017).

The research shows an agreement on the importance of the human factor and the variability of approaches to assessing and quantifying its impact on economic growth. Some authors base the value of human capital on resources invested in human capital development. Wilson and Briscoe (2004), Cao et al. (2020), Hanushek and Woessmann (2015) published the identified links between economic growth and the level or length of education. Chu et al. (2020), Musila and Belassi (2004), Mercan and Sezer (2014), Kotaskova et al. (2018) linked economic growth to public expenditure on education. Other authors use labor productivity as an objective way to measure the positive impact of the human factor on economic growth (Romer, 1990a; Mankiw et al., 1992; Pelinescu, 2015; Diebolt and Hippe, 2019; Garza-Rodriguez et al., 2020). As already mentioned, the issue is the subject of many empirical studies. They aim to examine the presence of the dependence of GDP on human capital. It should provide a sufficient basis for taking possible national economic policy measures and modeling future regional economic development. As in many econometric analyzes, several questions arise. Above all, how to measure human capital. The second is the question of the causality of variables. Is human capital a dependent or independent variable?

According to Dobes (2001), there is probably an interaction between the two variables. Countries that are richer, growing faster, or have better institutions are likely to increase their education spending more easily. Subsequently, an educated, more innovatively efficient workforce increases productivity and GDP growth. As a result, the evolution of GDP and the human factor over time appears to be a movement in an imaginary spiral. Therefore, it is necessary to consider the mechanism of this action, as studies suggest that there are several channels through which human capital affects GDP.

In the next part of the study, human capital would be used as an independent variable and economic growth – as a dependent variable, i.e., determining variable, following the example of other authors. Thus, the paper deals with only one part of the indicated causal chain. However, it is necessary to comment on the methodological side of this analysis. The empirical part of this work also contributes to the clarification of this issue. This paper seeks to add new evidence to the existing literature on the relationship between economic growth and education, its availability, and its effects. The main goal is to obtain information about the impact of education, its support, and impacts on economic performance on the example of empirical data documenting the qualitative parameters of the workforce. By using selected indicators, their impact on the change in economic performance would be described. The partial objectives are:

- to identify an indicator or set of indicators that could be used to express the impact of human capital on economic growth;
- to select a suitable indicator used to measure human capital;

- GDP analysis;
- labor productivity analysis;
- analysis the expenditure on education;
- employment analysis, divided between secondary and tertiary education;
- patent application analysis.

According to the literature review and obtain information, previous aims, and analysis, the hypothesis was set as follows: Economic growth is a linear function of human capital.

Methodology and research methods. The basic mechanism mentioned in the scientific background is the effect of human capital on labor productivity and, thus, on the product of the economy. The literature on this topic reveals a broad methodological series from Solow's structural econometric models extended by Mankiw et al. (1992), known as MRW models, to convergence analyzes proposed by Barro et al. (1992), as panel models devoted to the analysis of data between countries. The models used in the literature provide an opportunity to highlight some derived limits either from the choice of indicators used, either in their expression (for example, rate, level, or logarithm) or in the calculation method. One of the main methodological problems is the selection of a suitable indicator used to measure human capital. Nonneman and Vanhoudt (1996) used the share of education expenditure in GDP as an indicator in the MRW model. They concluded that the relationship between human capital and economic growth is negligible. Murphy and Topel (2016) selected the weighted average of the population registered in tertiary, secondary, and primary education as a suitable indicator of human capital. The researchers concluded that there was a significant positive and direct relationship with economic growth. Prochniak (2011) examined the determinants of growth in post-communist member states from 1993 to 2009. He found that human capital measured by the population's educational level is one of the key growth factors. Izushi and Huggins (2004) used the number of people in research and development in the private sector, while Outreville (1999) used the share of university graduates in the workforce as a representative indicator.

Concerning the objectives set in this study, this analysis of the impact of human capital on economic growth rests on Hanushek's methodology (2013). Thus, economic growth (GDP) is a linear function of human capital (*HC*), other factors (*X*) and stochastic element (ε), that is expressed as in Eq. (1):

$$GDP = a + b \times HC + \varepsilon \quad (1)$$

where *a, b* are unknown parameters that quantify the strength of the relationship between the dependent variable and the independent variables; *GDP* – economic growth; *HC* – human capital; ε – stochastic element.

The hypothesis is: Economic growth is a linear function of human capital. The stated variability in the choice of the variable, which characterizes human capital, is accompanied by inconsistent conclusions from the performed analyses. Therefore, to eliminate the methodologically inappropriate calculation of the independent variable, the first step analyzed the correlations between the time-series of dependent variable data (*GDP*) and the time series of variables considered in the literature to quantify the value of human capital. The set of variables considered was designed to quantify:

- Available resources for the creation and growth of human capital. In line with Hanushek and Woessmann (2015), the criterion of education expenditure is appropriate for this purpose.
- Availability and success of the educational process. From the point of view of building human capital, the added value could be expected for employees with a secondary, alternatively tertiary level of education.
- Return on investment in human capital, expressing innovation capacity (number of patent applications).

This fact concretizes the relationship between GDP and human capital in a model where the dependent variable is GDP. The independent variables are expenditure on education, the labor force with a secondary level of education, the labor force with a tertiary level of education the number of patent applications. These variables could be considered to sufficiently capture human capital, having a significant effect on the dependent variable and at the same time not influencing each other. The regression model expressing the dependence of GDP on this set of variables is expressed as in Eq. (2):

$$GDP = a \times UF + b_1 \times ExpEdu + b_2 \times EmpSec + b_3 \times EmplTer + b_4 \times LP + b_5 \times PA + \varepsilon \quad (2)$$

where *a* – a constant that quantifies the change of the dependent variable due to the influence of unspecified variables; *UF* – factors not specified in the model; b_i – regression coefficients that quantify the strength of the relationship between the dependent variable and independent variables; *ExpEdu* – expenditure on education (in € per capita); *EmplSec* – the number of people with the secondary level of education per employee; *EmplTer* – labor force with the achieved tertiary level of education per employee; *LP* – labor productivity (in € per 1 employee); *PA* – patent applications per million inhabitants; ε – a stochastic element.

It is clear from the research that the different level of human capital indicators is reflected in the differences in their impact on GDP (Barro et al., 1992; Pelinescu, 2015). Therefore, a regression model that sufficiently credibly and representatively expresses the dependence of GDP on human capital in specific national conditions would be a slimming of the complex model (as in Eq. (2)) by variables with insignificant influence. For interpreting the regression coefficients as elasticity, the above relation was transformed into a log-linear equation as in Eq. (3):

$$\ln GDP = a \times \ln UF + \sum b_i \times \ln X_i + \varepsilon \quad (3)$$

where *Xi* – an independent variable serving as an indicator of the level of human capital.

The analyses involved annual data from the Eurostat database for the period 2000-2019. Data on the value of GDP were converted to constant 2015 prices using the implicit price index.

Results. The analysis of the time series of data revealed differences in the values of GDP per capita across the file. Table 1 and Figures 1-2 show the results of descriptive statistics of its development.

Table 1. Descriptive statistics of performance indicators in the V4 countries, 2000-2019

Indicators	Countries	total (€/inhab)		change (%)		
		min	max	min	max	aver
GDP/inhab	CZ	11 230.00	18 330.00	-5.23	6.45	2.65
	HU	7 900.00	18 330.00	-6.57	5.28	2.77
	PL	6 440.00	12 980.00	1.24	7.14	3.77
	SK	7 780.00	15 890.00	-5.63	10.74	3.88
	V4	6 440.00	18 330.00	-1.88	6.18	3.38
LP/empl	CZ	24 956.33	37 897.66	-2.96	5.38	2.25
	HU	21 216.76	29 036.28	-4.17	5.31	1.70
	PL	17 408.38	30 625.52	0.43	5.90	3.03
	SK	20 038.91	34 043.71	-2.88	8.15	2.86
	V4	19 633.39	32 010.98	-1.10	4.95	2.62

Sources: authors' calculations based on Eurostat (2021).

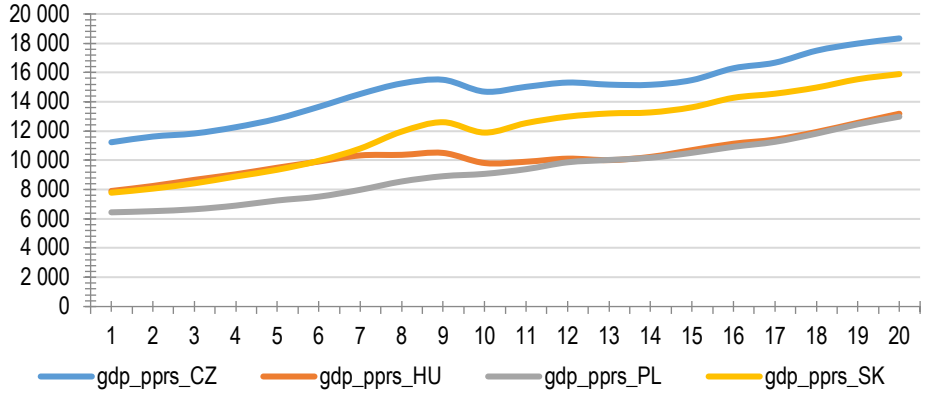

Figure 1. The trend of performance indicators (GDP)

Sources: developed by the authors based on Eurostat (2021).

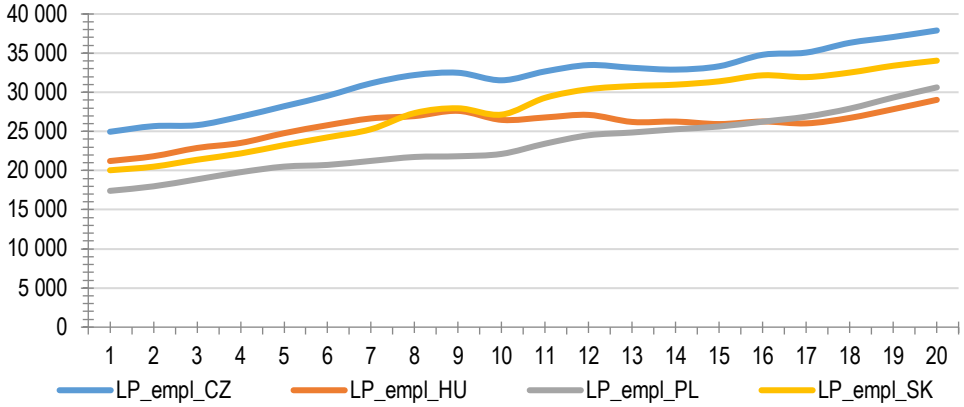

Figure 2. The trend of performance indicators (LP – labor productivity)

Sources: developed by the authors based on Eurostat (2021).

The analyzed data revealed differences in the value of GDP and its development in the V4 countries. Based on theoretical concepts, human capital should positively impact the level and growth of GDP. In line with this view, a lower rate of economic growth is evident in those V4 countries where the achieved labor productivity per employee exceeds the average of the sample. This development seems to be a continuation of the trends of the second half of the 20th century, when, as the result of economic growth, the originally poorer countries of Europe were approaching the level of pensions of richer countries. According to Saavides and Stengos (2009), such a development is a manifestation of declining marginal productivity of factors of production. A possible source of the observed development is, in addition to declining productivity of capital inflows, the low use of endogenous sources of growth such as human capital.

The assumption is also justified by the considerable variability of human capital indicators found by statistical analysis. Differences in its stock, use, and efficiency of the resources used to increase it, were identified across the V4 countries (Table 2 and Figures 3-4).

Table 2. Characteristic features of human capital development in V4 countries, 2000-2019

Indicators	Parameters	CZ	HU	PL	SK
Exp_Edu	min	3.56	3.98	4.56	3.61
% GDP	max	4.51	5.91	5.47	4.59
	StDev	0.26	0.59	0.28	0.24
Exp_Edu	min	430.11	355.50	313.63	304.98
€/inhab	max	690.48	561.95	538.99	654.99
	StDev	72.44	57.40	68.38	99.19
Empl_Sec	min	66.10	55.20	58.50	62.30
% of total	max	72.20	58.50	64.60	70.70
	StDev	2.18	0.95	2.01	2.39
Empl_Ter	min	9.50	11.70	9.20	8.20
% of total	max	21.70	22.50	28.20	23.10
	StDev	4.56	3.51	6.19	4.72
PA	min	6.48	9.83	1.13	2.08
nr/mil inhab	max	33.78	22.51	18.08	10.17
	StDev	8.13	4.03	5.85	2.56

Sources: authors' calculations based on Eurostat (2021).

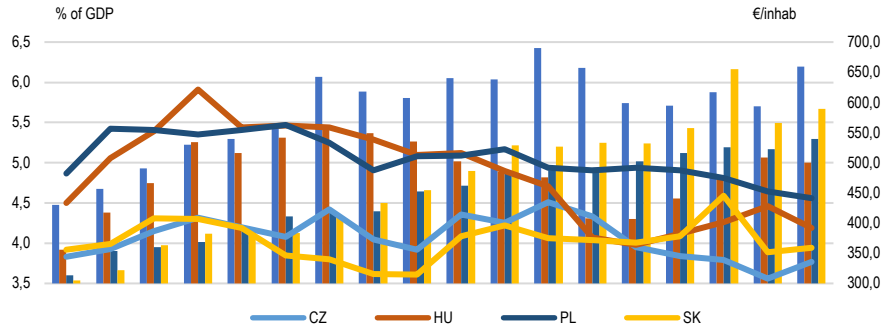

Figure 3. Development across analyzed countries (GDP)

Sources: developed by the authors based on Eurostat (2021).

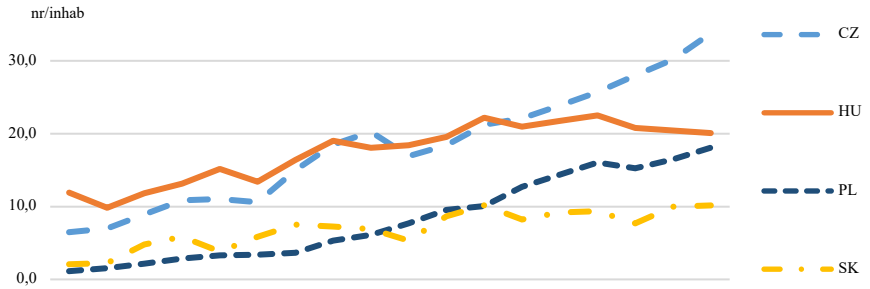

Figure 4. Development across analyzed countries (PA – patent applications)

Sources: developed by the authors based on Eurostat (2021).

Correlation analysis has shown that the relationship of GDP to individual human capital indicators is different, and variability is evident even when comparing across the group. The values of the correlation coefficient signal a strong positive correlation of regional GDP (and its share per capita) to the volume of

public resources spent on education, the number of the labor force with tertiary education, the number and value of patent applications, and labor productivity (Table 3). This finding is consistent with the results of similar studies (Pelinescu, 2015; Barro et al., 1992; Simeonova-Ganeva, 2010), which pointed to a positive relationship between the increasing concentration of university-educated population and labor productivity on GDP.

Table 3. Correlations of GDP/p.c. with human capital indicators

Countries	Correlations of GDP/per capita				
	ExpEdu (€ pprs)	EmplSec per inhabitant	EmplTer per inhabitant	LP (€ pprs)	PA (per mil prs)
CZ	0.848	-0.824	0.890	0.994	0.953
HU	0.409	0.797	0.826	0.850	0.792
PL	0.979	-0.986	0.982	0.991	0.974
SK	0.953	0.925	0.967	0.992	0.897

Sources: authors' calculations based on Eurostat (2021).

It is appropriate to note that the often emphasized indicator of expenditure on education, quantified as a percentage of the value of GDP, does not appear to be a positive factor influencing the growth of the value of human capital. Across the set, the correlation coefficient values for the relationship of public expenditure on education on GDP per capita signaled a weak to strong but always negative dependence of these variables. However, in line with Musila and Belassi (2004), a strong positive correlation of GDP (excluding HU) was found with their absolute value and their value per capita. The results of the correlation analysis were used in the construction of a model that comprehensively expresses the impact of human capital on economic growth (in the structure of independent variables as in Eq. 2). Thus, the log-linear regression analysis was performed separately for each V4 country (Table 4).

Table 4. Results of a log-linear regression analysis of the relationship between GDP and human capital

	Variable	Coef	t Stat	P-value	R^2	R^2-adj	Stand Error
1	2	3	4	5	6	7	8
CZ	Intercept	- 0.0794	- 0.0628	0.9510			
	ExpEdu_pprs***	- 0.1292	- 3.6340	0.0034			
	EmplSec_pprs**	0.6601	2.8720	0.0140			
	EmplTer_pprs	0.0834	1.1010	0.2925			
	LP_pprs***	1.0868	9.9990	0.0000			
	PA_pmilprs	0.0233	1.0490	0.3147			
					0.9979	0.9969	0.0071
HU	Intercept***	2.6028	3.7440	0.0028			
	ExpEdu_pprs	- 0.0358	- 1.1880	0.2577			
	EmplSec_pprs***	1.1318	22.7700	0.0000			
	EmplTer_pprs***	0.2352	6.0790	0.0000			
	LP_pprs***	0.8728	9.973	0.0000			
	PA_pmilprs	- 0.0406	- 1.7520	0.1052			
					0.9976	0.9966	0.0063

Continued Table 4

1	2	3	4	5	6	7	8
PL	**Intercept*** **	- 3.7335	- 1.7720	0.1018			
	ExpEdu_pprs	- 0.1075	- 0.69760	0.4987			
	EmplSec_pprs* **	1.0232	9.7800	0.0000			
	EmplTer_pprs	0.0191	0.1810	0.8594			
	LP_pprs* **	1.4838	8.4860	0.0000			
	PA_pmilprs	0.0038	0.1279	0.9003			
					0.9972	0.9961	0.0125
SK	**Intercept**	0.7314	0.5121	0.6178			
	ExpEdu_pprs	- 0.0012	- 0.0214	0.9833			
	EmplSec_pprs* **	0.8396	6.9820	0.0000			
	EmplTer_pprs **	0.2386	2.8480	0.0147			
	LP_pprs* **	0.9817	7.5960	0.0000			
	PA_pmilprs	- 0.0229	- 1.7630	0.1034			
					0.9980	0.9972	0.0134

Note: *,**,*** implies statistical significance at the respected 0.1, 0.05 and 0.01 values.
Sources: authors' calculations based on Eurostat (2021).

The regression analysis results showed that none of the factors *ExpEdu*, *EmplSec*, *EmplTer*, *LP,* and *PA* is unambiguously statistically significant (*p*-value was in some cases lower than 0.05). However, while the factors *EmplSec*, *EmplTer,* and *LP* have a positive effect on economic growth, the value of the regression coefficient showed that the effect of *ExpEd* is negative across the whole group of countries and the regression coefficient for *PA* varies from case to case both in absolute value and in the nature of the influence. It is in line with the findings of other studies dealing with the impact of higher education (Mankiw et al., 1992), education expenditure (Musila and Belassi, 2004; Mallick et al., 2016), and innovation (Petrariu et al., 2013; Rajapathirana and Hui, 2018; Atun et al., 2007) on economic growth. They claimed that higher levels of education and higher expenditure on education are a source of human capital and translate into higher economic growth. Despite the high coefficient of determination values, the high values of intercept found in Hungary and Poland signal a strong influence of other factors not explained by the model.

Conclusions. This document emphasized the importance of managing human capital in ensuring economic growth measured by GDP per capita. As expected, the analysis revealed a positive relationship between GDP per capita and the educational level of the workforce and its productivity. It also revealed a negative relationship between GDP per capita and public expenditure on education, measured as % of GDP. Given the differences in the size of the economies, this result was expected. It could be explained by heterogeneity in the size of economies and differences in the rate of utilization of the production capacity of all input capital. Besides, the analysis revealed significant differences in the number and value of patents filed (per capita), which indicates a different level of use of acquired knowledge and skills across the set of countries evaluated. In addition, negative regressor values in Hungary and the Slovak Republic resulted in this variable. The negative coefficients in these economies indicated the low value of this factor, the long-term but delayed nature of its operation at the beginning of the observed period. There is scope for further research on this phenomenon in the future. It would also be interesting to check how significantly other factors affect the performance of this indicator.

Based on these findings, the view persists that although the relationship between GDP/pprs and human capital indicators is influenced by the factors considered. None of variables could be considered as stand-alone or universally applicable to explaining the dependence of economic growth on human capital. It follows from the finding that each set of variables has manifested itself as a factor whose changes may trigger a change in GDP. However, the degree of impact is always different across the countries. In national conditions, it always reflects the influence of other national factors. However, in general, the highest elasticity of GDP could be stated against *LP* and *EmplSec*. Several possibilities for further research could also be seen in this area. If the set of analyzed countries is expanded and focused on these variables, the results could be interesting, as already indicated by this sample of V4 countries.

The findings pointed to the strength of the impact of the analyzed factors on economic growth. Besides, they indicated which of the known ways to increase the efficiency of the labor factor are used in the V4 countries, or, little used. Undoubtedly, the comparison across the group or against other economies at a comparison of economic and social development levels is also indicative and interesting. But this could already be the subject of further research.

Author Contributions: conceptualization, M. D., I. K. V. and E. S.; methodology, M. D.; software, M. D.; validation, M. D. and I. K. V.; formal analysis, M. D. and I. K. V.; investigation, M. D. and I. K. V.; resources, M. D. and E. S.; data curation, M. D. and I. K. V.; writing-original draft preparation, M. D., I. K.V. and E. S.; writing-review and editing, E. S.; visualization, E. S. supervision, M. D., I. K. V. and E. S.; project administration, M. D., I. K. V. and E.S.; funding acquisition, M. D., I. K. V. and E. S.

Funding: The project presented in this article is supported by the Cultural and Educational Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic, grant number KEGA 024PU-4/2020.

References

Aghion, P., Boustan, L., Hoxby, C., & Vandenbussche, J. (2005). *Exploiting states' mistakes to identify the causal impact of higher education on growth*. mimeo), Department of Economics, Harvard University. [Google Scholar]

Atun, R. A., Harvey, I., & Wild, J. (2007). Innovation, patents and economic growth. *International Journal of Innovation Management*, *11*(02), 279-297. [Google Scholar] [CrossRef]

Babic, Z. (2004). Participacija i ulaganje u obrazovanje u Hrvatskoj. *Privredna kretanja i ekonomska politika*, *14*(101), 28-53. [Google Scholar]

Bacho, R., Pukala, R., Hlibko, S., Vnukova, N., & Pola, P. (2019). Information management: The key driver of the economic ssystem'sdevelopment. *Marketing and Management of Innovations*, 3, 297-307. [Google Scholar] [CrossRef]

Barro, R. J., Mankiw, N. G. & Sala-i-Martin, X. (1992). Capital Mobility in Neoclassical Models of Growth Discussion Papers. 663. Retrieved from [Link]

Cao, S., Yu, N., Wu, Y., Wang, Z., & Mi, J. (2020). The educational level of rural labor, population urbanization, and sustainable economic growth in China. *Sustainability*, *12*(12), 4860. [Google Scholar] [CrossRef]

Chirwa, T. G., & Odhiambo, N. M. (2017). Sources of economic growth in Zambia: An empirical investigation. *Global Business Review*, *18*(2), 275-290. [Google Scholar] [CrossREf]

Chu, T. T., Hölscher, J., & McCarthy, D. (2020). The impact of productive and non-productive government expenditure on economic growth: an empirical analysis in high-income versus low-to middle-income economies. *Empirical Economics*, *58*(5), 2403-2430. [Google Scholar] [CrossRef]

Deng, L., & Zhao, Y. (2018). Effect Channels of Education Level and Cognitive Skill on Economic Growth. *Educational Sciences: Theory & Practice*, *18*(5). [Google Scholar] [CrossRef]

Diebolt, C., & Hippe, R. (2019). The long-run impact of human capital on innovation and economic development in the regions of Europe. *Applied Economics*, *51*(5), 542-563. [Google Scholar] [CrossRef]

Dobes, M. (2001). Human capital and economic performance. [Dissertation thesis, University of Economics in Bratislava, Bratislava]. Retrieved from [Link]

Eurostat. (2021). Database. Retrieved from [Link]

Fila, M., Levicky, M., Mura, L., Maros, M., & Korenkova, M. (2020). Innovations for Business Management: Motivation and Barriers. *Marketing and Management of Innovations*, 4, 266-278. [Google Scholar] [CrossRef]

Garza-Rodriguez, J., Almeida-Velasco, N., Gonzalez-Morales, S., & Leal-Ornelas, A. P. (2020). The impact of human capital on economic growth: the case of Mexico. *Journal of the Knowledge Economy*, *11*(2), 660-675. [Google Scholar] [CrossRef]

Grdinic, M. (2014). Higher Education as a Means of Achieving Economic Growth and Development–A Comparative Analysis of Selected EU and former Soviet Union Countries. *Central European Public Administration Review*, *12*(4), 93-114. [Google Scholar] [CrossRef]

Hanushek, E. A. (2013). Economic growth in developing countries: The role of human capital. *Economics of education review*, *37*, 204-212. [Google Scholar] [CrossRef]

Hanushek, E. A., & Woessmann, L. (2015). *The knowledge capital of nations: Education and the economics of growth*. MIT press. [Google Scholar]

ILO. (2015). Key Indicators of the Labour Market. Retrieved from [Link]

Izushi, H., & Huggins, R. (2004). Empirical analysis of human capital development and economic growth in Europe. In *Impact of education and training: third report on vocational training research in Europe: background report* (pp. 71-118). Office for Official Publications of the European Communities. [Google Scholar]

Kendiukhov, I., & Tvaronaviciene, M. (2017). Managing innovations in sustainable economic growth. *Marketing and Management of Innovations*, 3, 33-42. [Google Scholar] [CrossRef]

Khan, F. N., & Majeed, M. T. (2020). ICT and e-Government as the sources of economic growth in information age: Empirical evidence from South Asian economies. *South Asian Studies*, *34*(1). [Google Scholar]

Kotaskova, S. K., Prochazka, P., Smutka, L., Maitah, M., Kuzmenko, E., Kopecka, M., & Hönig, V. (2018). The impact of education on economic growth: The case of India. *Acta Universitatis Agriculturae Et Silviculturae Mendelianae Brunensis*, *66*(1), 253-261. [Google Scholar] [CrossRef]

Kuzmin, O., Bublyk, M., Shakhno, A., Korolenko, O., & Lashkun, H. (2020). Innovative development of human capital in the conditions of globalization. In *E3S Web of Conferences* (Vol. 166, p. 13011). [Google Scholar] [CrossRef]

Macerinskiene, I., & Aleknaviciūtė, R. (2017). National intellectual capital influence on economic growth in the European Union countries. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *12*(4), 573-592. [Google Scholar] [CrossRef]

Mallick, L., Das, P. K., & Pradhan, K. C. (2016). Impact of educational expenditure on economic growth in major Asian countries: Evidence from econometric analysis. *Theoretical & Applied Economics*, *23*(2). [Google Scholar]

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, *107*(2), 407-437. [Google Scholar] [CrossRef]

Mercan, M., & Sezer, S. (2014). The effect of education expenditure on economic growth: The case of Turkey. *Procedia-Social and Behavioral Sciences*, *109*, 925-930. [Google Scholar] [CrossRef]

Mulungu, K., & Ng'ombe, J. N. (2017). Sources of economic growth in Zambia, 1970–2013: a growth accounting approach. *Economies*, *5*(2), 15. [Google Scholar] [CrossRef]

Murphy, K. M., & Topel, R. H. (2016). Human capital investment, inequality, and economic growth. *Journal of Labor Economics*, *34*(2), 99-127. [Google Scholar] [CrossRef]

Musila, J. W., & Belassi, W. (2004). The impact of education expenditures on economic growth in Uganda: evidence from time series data. *The Journal of Developing Areas*, 123-133. [Google Scholar] [CrossRef]

Mustafin, A. N. (2016). Quality features of human capital in the present stage of development of innovative economy evidence from federal subject of Russian Federation - Republic of Tatarstan. I*Journal of Management and Business: Research and Practice,* 8(2), 61-69. Retrieved from [Link]

Nonneman, W., & Vanhoudt, P. (1996). A further augmentation of the Solow model and the empirics of economic growth for OECD countries. *The Quarterly Journal of Economics*, *111*(3), 943-953. [Google Scholar] [CrossRef]

Outreville, J. F. (1999). Financial development, human capital and political stability. United Nations Conference on Trade and Development. [Google Scholar]

Pelinescu, E. (2015). The impact of human capital on economic growth. *Procedia Economics and Finance*, *22*, 184-190. [Google Scholar] [CrossRef]

Petrariu, I. R., Bumbac, R., & Ciobanu, R. (2013). Innovation: A Path to Competitiveness and Economic Growth. The case of CEE Countries. *Theoretical & Applied Economics*, 20(5), 15-26. [Google Scholar]

Prochniak, M. (2011). Determinants of economic growth in Central and Eastern Europe: the global crisis perspective. *Post-communist economies*, *23*(4), 449-468. [Google Scholar] [CrossRef]

Pukala, R., Hlibko, S., Vnukova, N., & Davidenko, D. (2019). Usage of E-Technologies to Enhance Infocommunication in Financing Innovation. In *2019 IEEE International Scientific-Practical Conference Problems of Infocommunications, Science and Technology (PIC S&T)* (pp. 157-160). IEEE.[Google Scholar]

Rajapathirana, R. J., & Hui, Y. (2018). Relationship between innovation capability, innovation type, and firm performance. *Journal of Innovation & Knowledge*, *3*(1), 44-55. [Google Scholar] [CrossRef]

Razzak, W. A., & Timmins, J. (2010). Education and labour productivity in New Zealand. *Applied Economics Letters*, *17*(2), 169-173. [Google Scholar] [CrossRef]

Rodionova, E., & Kuzminykh, Z. (2019, August). Regional aspects of implementing innovations as a lever for economic growth and sustainable development in Russia. In *International Scientific-Practical Conference «Usiness Cooperation as a Resource of Sustainable Economic Development and Investment Attraction» (ISPCBC 2019).*[Google Scholar]

Romer, P. (1990a). Human Capital and Growth: Theory and Evidence. *Carnegie Rochester Conference Series on Public Policy*, 32(1), 251-286. [CrossRef]

Romer, P. M. (1990b). Endogenous Technological Change.*The Journal of Political Economy*, 98(5), 71-102. [Google Scholar]

Rosario, C., Costa, A. A., & da Silva, A. L. (2018). The impact of human capital and innovation on PPortugal'sEconomic Growth: an empirical study through structural equation models. *Economic and Social Development: Book of Proceedings*, 515-525. [Google Scholar]

Saavides, A. & Stengos, T. (2009). *Human Capital and Economic Growth*. Stanford, Stanford University Press. [Google Scholar]

Sakamoto, T. (2018). Four worlds of productivity growth: A comparative analysis of human capital investment policy and productivity growth outcomes. *International political science review*, *39*(4), 531-550. [Google Scholar] [rossRef]

Sala, H., & Silva, J. I. (2013). Labor productivity and vocational training: evidence from Europe. *Journal of Productivity Analysis*, *40*(1), 31-4. [Google Scholar] [CrossRef]

Seetanah, H. N. B. (2016). Does human capital contribute to economic growth in Mauritius?. *Development*, *40*(4), 248-261. [Google Scholar] [CrossRef]

Sepashvili, E. (2016). Globalized world economy, innovations and national policies for economic growth. In: Governing Business Systems. Theories and Challenges for Systems Thinking in Practice. 4 th Business Systems Laboratory International Symposium. Business systems book series . Business Systems Laboratory, Vilnius, Lithuania, pp. 174-176. ISBN 9788890824234 [Google Scholar]

Shahabadi, A., Kimiaei, F., & Afzali, M. A. (2018). The evaluation of impacts of knowledge-based economy factors on the improvement of total factor productivity (a comparative study of emerging and G7 economies). *Journal of the Knowledge Economy*, *9*(3), 896-907. [Google Scholar] [CrossRef]

Simeonova-Ganeva, R. (2010). Human Capital in Economic Growth: A Review of Theory and Empirics. *Economic Thought journal*, (7), 131-149. [Google Scholar]

Solow, R. M. (1957). Technical change and the aggregate production function. *The review of Economics and Statistics*, 312-320. [Google Scholar] [CrossRef]

Vovk, M., & Braga, D. (2017). Knowledge economy of the EU: strengths and weaknesses. *Marketing and Management of Innovations*, 4, 292-300. [Google Scholar] [CrossRef]

Wilson, R. A., & Briscoe, G. (2004). The impact of human capital on economic growth: a review. *Impact of education and training. Third report on vocational training research in Europe: background report. Luxembourg: EUR-OP*. [Google Scholar]

Zhou, G., & Luo, S. (2018). Higher education input, technological innovation, and economic growth in China. *Sustainability*, *10*(8), 2615. [Google Scholar] [CrossRef]

Моніка Даньова, Ph.D., Пряшівський університет в Пряшеві, Словаччина

Івана Кравчакова Возарова, Ph.D., Пряшівський університет в Пряшеві, Словаччина

Олена Сіра, Ph.D., Пряшівський університет в Пряшеві, Словаччина

Інновації в управлінні трудовими ресурсами: вплив на економічний розвиток

Науковою спільнотою все більше уваги приділяється дослідженню інновацій в управлінні трудовими ресурсами як фактору економічного зростання країни. Авторами зазначено, що управління трудовими ресурсами сприяє підвищенню рівня конкурентоспроможності економіки. Однак, серед наукової спільноти відсутній єдиний загальноприйнятий підхід щодо виявлення факторів конкурентоспроможності, які мають найбільший вплив на економічне зростання країни. У рамках даної статті узагальнено теоретичні напрацювання та підходи у галузях економічного зростання, економіки знань, інновацій та конкурентоспроможності. На основі аналізу наукових публікацій, авторами висвітлено вплив окремих факторів на економічне зростання країни. Головною метою статті є визначення впливу рівня освіти, ефективності державної підтримки розвитку освіти на рівень конкурентоспроможності країни. Підґрунтям дослідження стали емпіричні дані щодо якісних параметрів ефективності управління трудовими ресурсами. Авторами визначено канали впливу ефективності управління трудовими ресурсами на економічне зростання країни. Для досягнення поставленої мети, у ході дослідження застосовано методи економетричного аналізу та прогнозування, а також кореляційний метод, коефіцієнт кореляції Пірсона та ретроспективний аналіз. Об'єктом дослідження обрано країни Вишеградської четвірки (Чехія, Словаччина, Угорщина та Польща). За результатами дослідження виявлено статистично значущий вплив досліджуваних факторів на економічне зростання країни. Авторами систематизовано фактори, які підвищують рівень ефективності управління трудовими ресурсами у досліджуваних країнах. Представлено результати порівняння рівнів економічного та соціального розвитку досліджуваних країн, а також систематизації наукових напрацювань та підходів до економічного зростання, що стало базисом для формування пропозицій щодо підвищення конкурентоспроможності країн на основі інноваційних підходів.

Ключові слова: конкурентоспроможність, економічне зростання, освіта, трудові ресурси, менеджмент, V4 країни.