



Publisher

<http://jssidoi.org/esc/home>

DYNAMICS OF HUMAN CAPITAL DEVELOPMENT AND COMPETITIVENESS IN SELECTED EUROPEAN COUNTRIES

Veronika Žárská ^{1*}, Eva Smetanová ²

^{1*,2} Alexander Dubcek University of Trencin, Faculty of Social and Economic Relations, Študentská 3, 911 50 Trenčín, Slovakia

E-mails:^{1*} veronika.zarska@tnuni.sk (Corresponding author); ² eva.smetanova@tnuni.sk

Received 17 May 2024; accepted 2 September 2024; published 30 September 2024

Abstract. Human capital is currently considered one of the fundamental factors determining countries' competitiveness and economic prosperity. Interest in this category has arisen due to globalization and permanent technological changes that emphasise the knowledge and skills of the workforce. Most countries invest in education, health care, research and development, or support cultural development to increase human capital in society and thus contribute to improving their competitiveness in the world market. This article focuses on identifying the level of human capital in seven European countries (the Czech Republic, Germany, Hungary, Poland, Romania, Slovakia, and Sweden), comparing it with the level of competitiveness within them, as well as identifying changes in the development of the mentioned variables in the monitored countries. The research was carried out during the period of 2013 - 2022, based on statistical data from Eurostat and data reported by the World Competitiveness Center. The level of human capital and competitiveness, as well as the dynamics of their development, was assessed using standardized variable method, comparison method, one-factor analysis of variance, and convergence method. The findings show that countries with above-average levels of human capital also show above-average levels of competitiveness. At the same time, those with below-average levels of human capital also show below-average levels of competitiveness. One-factor analysis of variance, however, indicates that there is no statistically significant change in the level of human capital or in the level of competitiveness in the monitored countries in the period of 2013 - 2022, which was also confirmed in the area of competitiveness by using the convergence method. On the one hand, the observed stability in development can be perceived positively, especially in highly developed countries. On the other hand, the lagging countries should try to keep the current development level and look for improvement opportunities to approach the most developed countries gradually.

Keywords: competitiveness; Germany; human capital; Romania; Sweden; V4

Reference to this paper should be made as follows: Žárská, V., Smetanová, E. 2024. Dynamics of human capital development and competitiveness in selected European countries. *Entrepreneurship and Sustainability Issues*, 12(1), 430-447. [http://doi.org/10.9770/jesi.2024.12.1\(28\)](http://doi.org/10.9770/jesi.2024.12.1(28))

JEL Classifications: E24, J24, O10

1. Introduction

The competitiveness of economies is an essential indicator of the position of countries on a global scale. Globalization and technological progress have brought increasing interest in this category. As a result, the tendency to compare the status of individual economies is growing stronger. Despite the lack of a uniform definition of competitiveness, several factors that are considered relevant from the point of view of its evaluation have been established. In addition to economic performance, prosperity, social or political stability, and many others, one of the key determinants that affect the competitiveness of any economy is human capital, which depends on the ability of society to adapt to changes flexibly. Human capital, like competitiveness, is a very complex concept. Increasing its level is achieved by investing in areas that have a greater or lesser impact on its creation, maintenance and use, which implies that it, in turn, has a negative impact on economic performance.

For this reason, the issue of human capital and its impact on competitiveness is constantly relevant, and increasing its level becomes one of the main priorities for all countries whose goal is to improve their competitiveness and ensure consistent, sustainable economic growth. In this context, it is therefore important to analyze the interrelationships between human capital and competitiveness, as well as the dynamics of the development of these variables in individual countries. At the same time, it is essential to bear in mind that the concept of competitiveness cannot be understood in an absolute sense; therefore, to label a country as competitive or uncompetitive can only be done in comparison with other countries.

Based on the mentioned facts, the main goal of this article was determined: to identify the level of human capital of seven European countries (the Czech Republic, Germany, Hungary, Poland, Romania, Slovakia, and Sweden) and to compare it with the competitiveness of the mentioned countries through the evaluation of normalized indicators. Subsequently, an analysis of the dynamics of the development of these variables in the monitored countries was carried out. To fulfil the set goal, the standardized variable method was used, which offered the possibility to evaluate data that were expressed in different units equally. In addition, the comparison method was used to compare the situation in individual countries and, finally, one-factor analysis of variance was used, by which it was possible to compare the average values of indicators in particular years in the monitored countries and assess whether there were statistically significant differences between them. The results of the one-factor analysis of variance were further verified in the field of competitiveness by the convergence method. The literature review in this article covers various theoretical approaches to the issue of competitiveness and human capital. Further, it specifies these concepts, discussing the sub-factors that affect competitiveness and human capital. The methodological part describes the choice of methods used to process data taken from Eurostat and the World Competitiveness Centre, as well as the reasons that led the researcher to choose the chosen methods. In the results section, the positions of the countries are compared in terms of the achieved level of human capital and competitiveness, and an analysis of the dynamics of the development of these investigated variables is offered. Subsequently, in the discussion, the results are compared with the studies of other authors. The conclusion states the limitations of the conducted research and the future possibilities of its direction.

2. Theoretical background

In the 21st century, when globalization and technological progress constantly influence the economic environment, the question of the competitiveness of individual countries is increasingly coming to the fore. Although the concept of competitiveness is very complex and there is no uniform definition of it, several factors have been established that are most often taken into account as determinants of competitiveness. According to Syromyatnikov et al. (2021), national competitiveness is widely seen as a set of institutions, management trajectories and other factors, including investment growth, progress in integration, development of innovation in production with a low level of productivity, etc., which largely influence the level of productivity of a country. However, the IMD World Competitiveness Centre (2023) draws attention to the fact that competitiveness cannot be assessed only based on economic performance and productivity. Although these are undoubtedly its important determinants, in addition to them, it is also necessary to take into account the political, cultural and social dimensions, so that the compiled competitiveness rankings reflect not only the economic performance of countries but also their ability to manage their competences to achieve long-term value creation. Competitiveness is perceived similarly by Virjan et al. (2023), who claim that although economic performance affects competitiveness, the relationship between these units is complex and dependent on a number of other factors. Therefore, if the goal of individual countries is to increase competitiveness, they must adopt a comprehensive strategy that will take into account not only economic performance but also a number of other social and environmental determinants. Despite the fact that competitiveness is not recommended to be assessed only on the basis of economic performance, as stated by Merdic and Hodzic (2021), its increase directly contributes to the support of economic growth. The same opinion is shared by Minhaj and Ahmed (2023), who claim that sustainable economic growth is essentially the driving force of success, as various factors that contribute to a country's competitiveness on a global scale depend on the rate of economic growth. Based on the above, the competitiveness of economies can be simply interpreted as a key factor on which the country's ability to attract investments, support and develop innovations or ensure sustainable economic growth depends. One of the decisive elements that currently affect the competitiveness of countries is the level of human capital. According to Båk et al. (2022), human capital as an element of intellectual capital enables better adaptation of

society to changing economic conditions at a reasonable level. The increase in human capital is the factor that most reduce inequality and most increases economic growth, thus contributing to the promotion of competitiveness. For this reason, it is recommended that public policies focus more on the development of human capital (Gaona & Vásquez, 2021). Titanic and Obadic (2015), who deal with the relationship between human capital and competitiveness in EU countries, find out that most of the new EU member countries have lower competitiveness than the old member countries. The reason is that they invest much more in infrastructure and the environment than in human capital. At the same time, most old member countries know the importance of investing in human capital. Human capital is defined as the combination of an individual's natural talent and abilities and the skills that an individual acquires during life through upbringing and education. This combination is completed by the individual's state of health (OECD, 2007), and thus, it plays a vital role in the economic development of countries. Education, health, and other factors that contribute to human capital development are often considered high-return investments.

Regarding human capital, attention is most often focused on education, especially tertiary education. According to Alam (2023), education promotes economic growth. This statement is also supported by other studies, such as Doré and Teixeira (2023), who agree that formal education is critical to growth. Still, at the same time, they emphasize that attention must also be focused on a range of factors in the field of education, such as teacher training, strengthening the school educational environment or reducing the inequality of opportunities. It means that not only quantity but also the quality of education matters. This statement is also supported by Pritchett (2024), who, following education and its support, states that attention should not be focused only on investing in education but also on its results, such as creating valuable skills. Leite & Cardoso (2023) deal with the issue of education in relation to the economic performance and competitiveness of economies. They present the results that the expansion of human capital leads to the improvement of the overall economic structure of the country, so it can be assumed that it also increases its competitiveness. According to them, investments in education, expanding its availability, and developing opportunities in research and development, where educated people can express themselves, should be supported. The positive influence of a high educational level on the development of the national economy was also noted by Mulliqi et al. (2018). They state that in individual countries, there is a clear positive relationship between the workforce's level of education and the economy's competitiveness. Economies with more tertiary-educated people tend to fare better in competitiveness assessments compared to countries where only a smaller proportion of the workforce is tertiary-educated. Although the focus is primarily on tertiary education, it should not be underestimated that, in addition to a relatively high number of educated people in the economy, there is also a relatively high number of people without education/only with basic education. As Carillo (2024) argues, while highly educated individuals are the driving force of technological innovation, a labour force without adequate education can hinder the adoption of these innovations, and thus, the effect that can flow from individuals with high levels of human capital is lost.

However, as the OECD (2007) definition shows, education and support in this area are not the only factors determining the level of human capital in countries. Equally important attention must also be directed to the field of healthcare. According to Avdeeva (2024), the level of education and health of individuals are the main elements forming the basis of human capital, which is one of the factors of the economic prosperity of countries. Shuyong et al. (2024) in their study point to the fact that the government's investments in healthcare have a demonstrably positive effect on the growth of the level of human capital, which in turn has a supporting effect for economic growth as well. Railaite and Čiutienė (2020) confirm that public administration spending on healthcare has a positive and significant effect on life expectancy, while the increase in life expectancy is associated with the extension of the active action of human capital on the labour market.

On the other hand, Jiang and Wang (2023) draw attention to the risks of excessive public expenditure on healthcare. According to them, although insufficient public expenditure on health in the short term hinders economic growth to a certain extent, the pressure to increase public expenditure on health could be counterproductive in the long term. Although increasing expenditure can contribute to improving the level of health of individuals, enriching medical and health resources and thus promoting the accumulation of human capital, it also brings a significant economic burden on public finances, which can have a negative impact on

economic development when diverting fewer financial resources to other, equally important areas for the development of human capital.

The situation where excessive investments were directed to the health sector in individual countries was visible during the recently ongoing COVID-19 pandemic. However, at that time, in addition to the fact that other areas were deprived of financial resources, one could also discuss the effectiveness of the investments in the health sector, since a significant part of it could only be aimed at ensuring anti-pandemic measures. Other studies point to the close connection between the field of education and the field of health. According to Baldanzi et al. (2021), there is a complementary relationship between education and health: if parents want to have better-educated children, they also increase investments in health. Such investments in health have a positive effect on long-term economic growth since it can be assumed that when people are healthier, they are more productive, and this fact could contribute to economic prosperity. On the other hand, Kirkpatrick et al. (2020) see the low level of education and poor health of the population as the main cause of differences in competitiveness between individual regions of the EU.

Although the majority of authors dealing with the issue of human capital examine its creation, maintenance and use mostly only in connection with its main determinants, such as the level of education, health or innovation ability, some pay attention to other aspects as well. One of them is culture. According to Bucci & Segre (2011), among other factors, investments in culture represent one of the essential engines of long-term economic growth. Culture generates significant economic income and stimulates the production of new ideas, technologies, etc., which contributes to the development of human capital in companies. At the same time, the World Competitiveness Centre (2023) considers the cultural dimension as important in relation to national competitiveness.

Debrah et al. (2018) state that human capital development and innovation are key determinants of international competitiveness. Much attention is focused on research and development as a basic prerequisite for creating innovations in connection with innovation capability. As reported by Islam et al. (2024), individual countries should allocate sufficient financial resources to support research and development since this is one of the main ways to ensure technological and infrastructural progress and thus support sustainable economic growth and overall competitiveness. The country's economic development, especially in the short term, depends primarily on the degree of orientation of educational and other state policies to ensure sufficient efficiency and intensity of investment in human capital (Koryakov et al., 2022). Other studies also support this idea (Nezhnikova, 2020; Di Cataldo & Rodríguez-Pose, 2017; Linhartová, 2020), which emphasize the importance of investments in individual areas determining human capital. Most studies examine human capital and its development only in relation to economic performance, while only a few ones (Mourao & Popescu, 2023; Liutak et al., 2023) focus on human capital and investments in it in relation to the overall competitiveness of countries. This fact thus provides considerable space for conducting research into this area.

This article will examine the impact of human capital on the competitiveness of the economies of seven European countries (the Czech Republic, Germany, Hungary, Poland, Romania, Slovakia, and Sweden) based on a comparison of the standardized values of indicators that can influence the level of human capital with the standardized values of WCI for the period of 2013 -2022. Since human capital is a very complex concept that includes many aspects, in this research it will be evaluated through the development of the level of several of its determinants, such as life expectancy, public administration expenditure on healthcare, population with tertiary education, population with lower than primary education, primary and lower secondary education, public administration expenditure on education, investment in research and development, as well as expenditure on culture. In the next part of the article, the focus will be on identifying the existence of statistically significant changes in the level of human capital or competitiveness in the monitored countries.

3. Research objective and methodology

This article aims to identify the level of human capital in seven European countries (Czech Republic, Germany, Hungary, Poland, Romania, Slovakia, and Sweden) and to compare it with the competitiveness of the mentioned countries through the evaluation of normalized indicators, and subsequently to identify the dynamics of the development of the mentioned variables in the monitored countries. Key factors influencing the level of human capital and the World Competitiveness Index (WCI) were included in the assessment. The analyzed period was 2013-2022, while statistical data from Eurostat and data reported by the World Competitiveness Centre were used. The choice of countries was not random. The researchers aimed to show how the V4 countries stand in the evaluation compared to the countries that are generally considered to be the most/least developed within the EU countries.

According to the definition of Becker (1975), human capital is a qualitative characteristic of an individual. It is necessary to express it quantitatively to evaluate it in relation to other variables. Since there is no definite agreement on how the level of human capital can be expressed most objectively, as it depends on many determinants, the researcher decided to use the standardized variable method to evaluate its level. This method is used where it is necessary to assess data expressed in different units. When implementing this method, it is necessary to distinguish between maximizing and minimizing variables. When calculating the standardized score, the relationship is then based on:

$$\text{if } x_j \text{ is the maximizing variable: } z_{ij} = \frac{x_{ij} - \bar{x}_j}{s_j}$$

$$\text{if } x_j \text{ is the minimizing variable: } z_{ij} = \frac{\bar{x}_j - x_{ij}}{s_j}$$

where $\bar{x}_j$ is the arithmetic mean, s_j is the standard deviation.

To express the level of human capital, the values of seven partial indicators were normalized. While in six cases, they were maximizing variables (life expectancy, public administration expenditure on health, share of the population with tertiary education, public administration expenditure on education, research and development expenditure, public administration spending on culture) and in one case, it was a minimizing variable (the share of the population with lower than primary education, primary and lower secondary education). Subsequently, for better data comparability, also the values of the world competitiveness index were standardized.

In the next part of the article, a statistical analysis of the competitiveness of the monitored seven EU countries is presented. The researchers' intention was to find out whether there were statistically significant changes in the competitiveness of the mentioned countries during the period 2013-2022. To carry out a statistical analysis of the competitiveness, a one-factor analysis of variance (ANOVA) was used. This method enabled the researcher to compare the average values of the competitiveness of the examined economies between individual years and determine whether the differences between them are statistically significant. First, the null and alternative hypotheses were formulated:

H0: There is no statistically significant change in the competitiveness of countries in individual years.

H1: There is a statistically significant change in the competitiveness of countries in individual years.

One-way analysis of variance (ANOVA) was also used to evaluate human capital. The researcher investigated whether there were statistically significant changes in the level of human capital in the seven countries monitored between 2013 and 2022. In this case, the hypotheses were formulated as follows:

H0: There is no statistically significant change in the level of human capital in the observed countries in individual years.

H1: There is a statistically significant change in the level of human capital in the observed countries in individual years.

By performing a one-factor analysis of variance, the researcher was able to identify how dynamic the development of the level of human capital and competitiveness was in individual countries during the monitored period. Therefore, the results of this analysis were intended to clarify whether the development of the selected variables in the monitored countries is stable or whether there are larger or smaller fluctuations that can tell about the specifics of individual economies.

In the area of competitiveness, the researcher subsequently verified the findings from the one-factor analysis of variance using the convergence method. First, the β -convergence method was applied, where the calculations were based on the regression equation:

$$(1/T) * \log(Y_{i,T} / Y_{i,0}) = \alpha + \beta * \log Y_{i,0} + \gamma * X_i + U_i$$

Subsequently, based on the relation $(1/T) * \log(Y_{i,T} / Y_{i,0}) = \alpha + \beta * \log Y_{i,0} + U_i$ σ -convergence was calculated.

4. Results

First, the level of human capital in the monitored countries was expressed. Table 1 introduces the standardized values of indicators affecting the level of human capital, which are cost indicators (expenditure of the Ministry of Health, education, culture and research and development) and result indicators (expected average life expectancy, share of the population with tertiary education, share of the population with less than primary, primary and lower secondary education) (Kwon, 2009). This procedure for each partial indicator allowed the researcher to monitor the position of each country in the particular area compared to the average.

Table 1. Standardized values of indicators affecting the level of human capital for the monitored countries (2013-2022)

	Average Life Expectancy at Birth	Public Administration Expenditure on Health	Share of the Population with Tertiary Education	Share of the Population with Lower than Primary Education and Primary and Lower Secondary Education	Public Administration Expenditure on Education	Expenditure on Research and Development	Public Administration Expenditure on Culture
The Czech Republic	0.213	0.010	-0.491	1.271	-0.299	-0.293	-0.120
Germany	1.081	1.351	0.255	-0.407	0.630	1.200	0.482
Hungary	-0.904	-0.789	-0.336	-0.493	-0.542	-0.596	0.240
Poland	-0.321	-0.808	0.421	0.927	-0.552	-0.661	-0.603
Romania	-1.287	-0.962	-1.425	-1.604	-0.903	-0.847	-1.333
Slovakia	-0.493	-0.442	-0.447	0.884	-0.526	-0.673	-0.637
Sweden	1.711	1.641	2.022	-0.578	2.192	1.870	1.970

Source: the researchers' own processing of data taken from Eurostat (2024)

The standardized values of the partial indicators affecting the level of human capital in the seven countries for 2013-2022, as stated in Table 1, provide a more detailed overview of how the individual countries manage to develop human capital. The stated standardized values of the partial indicators represent modified data that allow a direct comparison of the monitored countries in all areas, regardless of the original measures and units. The normalized values show significant differences among the compared countries in the monitored period. These differences can be caused by various factors, e.g. different approaches of the governments of the individual countries to support the selected areas. For better clarity of the position of the countries within the partial indicators, a ray graph based on a simple visualization, which enables a comparison of the performance of the monitored countries within the selected seven partial indicators, is introduced.

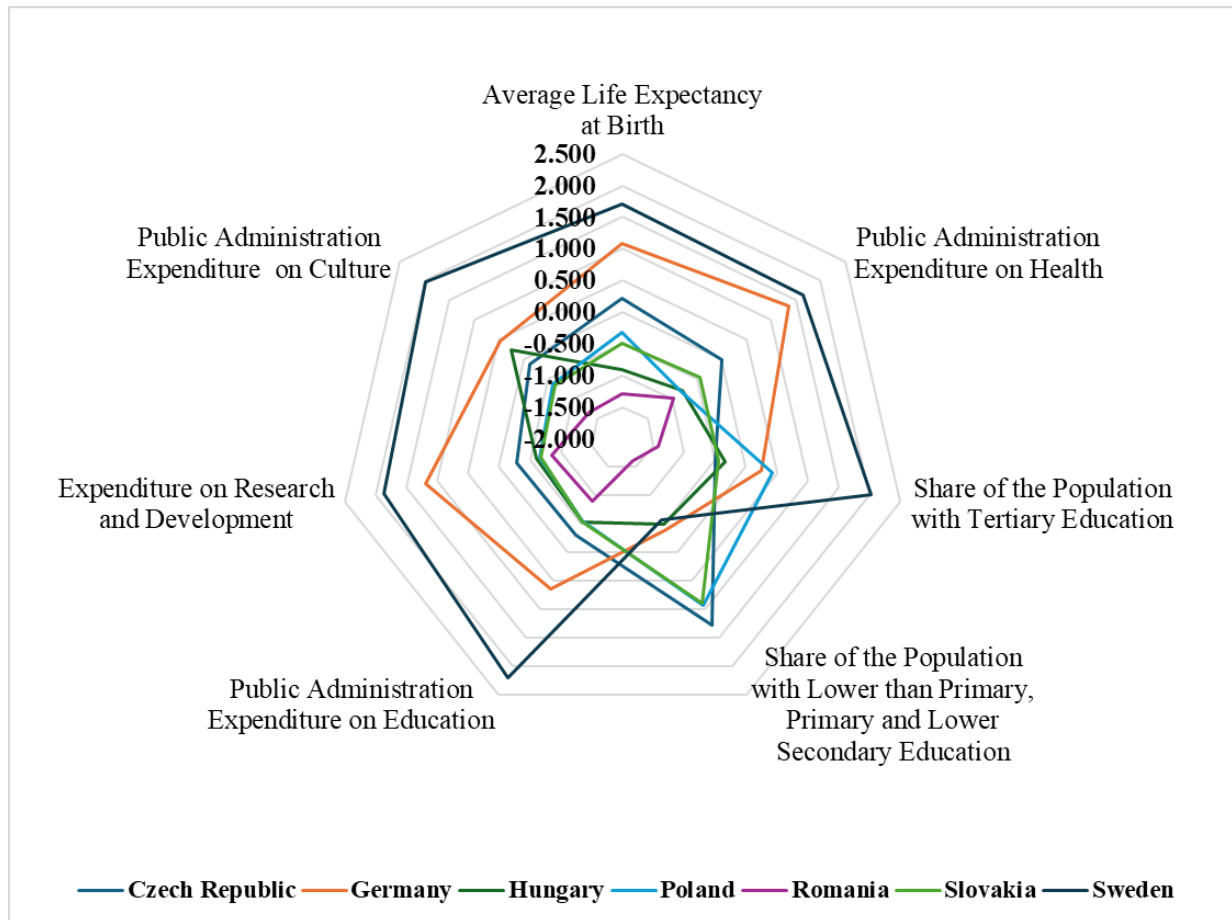


Figure 1. Visualization of the results within the partial indicators

Source: the researchers' own processing

In Sweden, the highest normalized score values were recorded for most indicators, except the share of the population with less than primary, primary and lower secondary education. This indicates the potential of this country to develop human capital. The high value of the standardized score, especially in the field of education (share of the population with tertiary education, public administration expenditure on education), indicates a strong orientation of the country towards increasing the educational level in society. However, even though there is a large number of people with higher education in the Swedish population, there is also a surprisingly large number of people with lower than primary education, elementary and lower secondary education, which, according to Carillo (2024), can represent an obstacle to the further development of the country. Thus, Sweden ranked second to last in the evaluation of this indicator. Germany, like Sweden, showed above-average normalized score values for most indicators, although it lagged behind Sweden. The smallest difference in the normalized score between these countries was observed for health expenditure, which, in absolute terms in recent years, has been even higher than in Sweden. However, due to lower health expenditure in the pre-pandemic period, Germany failed to overtake Sweden in the 2013-2022 summary evaluation. The relatively high value of the normalized score in Germany for expenditure on health and research and development may indicate the priority focus of the German government's policy. The Czech Republic showed the highest values of the normalized score among all monitored countries for the share of the population with lower than primary education, primary and lower secondary education. In other words, the Czech Republic showed the smallest share of such individuals in the population. Their low share is positive for every economy because such individuals often have difficulties succeeding in the labour market, and, as already indicated in the literature review, they can hinder the introduction of innovations (Carillo, 2024). The Czech Republic also showed average to slightly above-average values of the normalized score in the area of average life expectancy and public administration expenditure on health. This may be a signal that the Czech Republic will prioritize support in this area but has fallen behind in public administration investments in education, culture, as also in

investments in research and development. However, the lowest normalized score within the monitored indicators was reported for the share of the population with tertiary education with a value of -0.491. For Hungary, an above-average normalized score was recorded only for public administration expenditures on culture. In the remaining areas, Hungary reported below-average values for 2013-2022, with max. - 0.904 for life expectancy. The low value of the normalized score even for public administration expenditures on health indicates that the development of health care is not a priority for Hungary. In Poland, two above-average values were recorded in the normalized score – for the share of the population with lower than primary education, primary and lower secondary education and the share of the population with tertiary education, where it stood out in the evaluation better than, e.g., the Czech Republic or Germany. This fact indicates that the orientation of the countries is mainly in the field of education. In Slovakia, all values of the normalized score, except the share of the population with lower than primary education, primary and lower secondary education, where Slovakia ranked third, were negative. The situation was similar in Romania, which showed a deeper below average than Slovakia in all evaluated areas. The below-average values of the normalized score within individual indicators indicate that these countries face significant challenges in the area of human capital development.

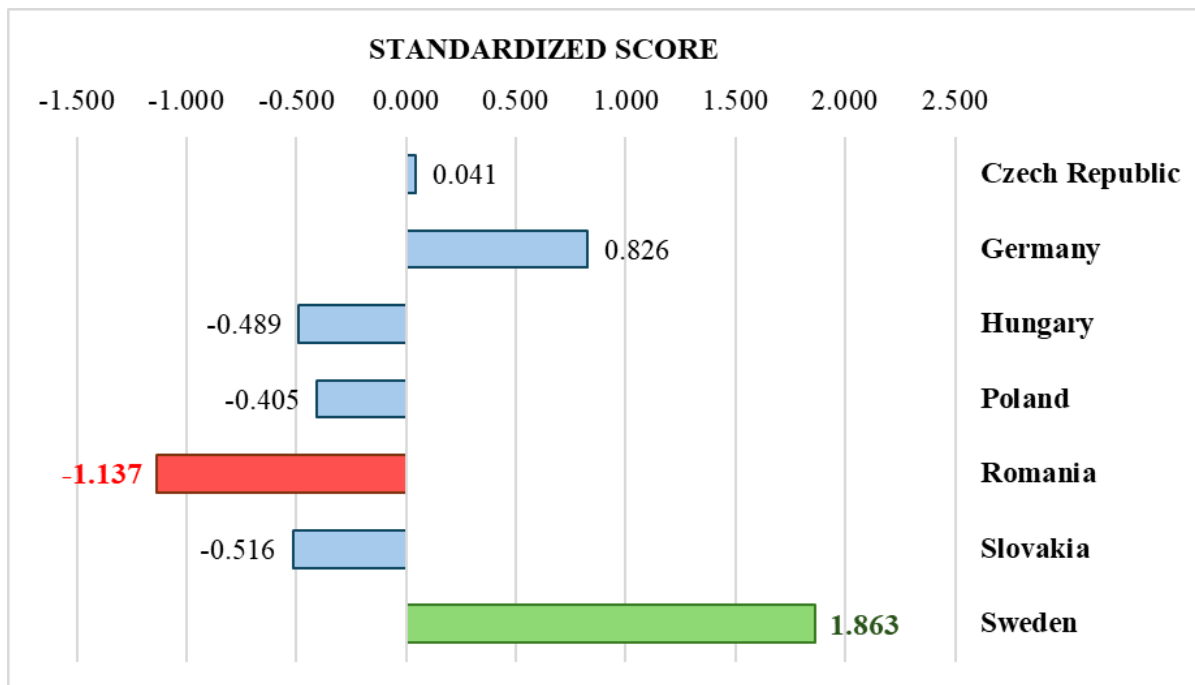


Figure 2. Normalized scores for all areas

Source: the researchers' own processing

Figure 2 shows normalized integrated values of the seven indicators affecting the level of human capital in the seven European countries for 2013-2022. The measured values shown in the graph are therefore a dimensionless number - an integral indicator that includes all monitored areas (life expectancy, public administration expenditure on health, share of the population with tertiary education, share of the population with lower than primary education, primary and lower secondary education, public administration expenditure on education, research and development expenditure, public administration expenditure on culture). The normalized values are visualized in a horizontal bar graph, where the x-axis shows the normalized values achieved by the monitored countries and the y-axis shows the individual countries. The normalized values can be negative or positive, reflecting whether countries lag behind the average in human capital development, or, on the contrary, perform better than the average. Sweden achieved the highest positive normalized score (1.863), significantly outperforming other countries, including Germany, with the second-highest score (0.826). However, based on the values achieved, it can be concluded that the difference between the two countries was enormous in favour of Sweden. According to the aforementioned evaluation, Sweden has created the best conditions for the development of human capital, and it also performed best in the evaluation of most partial indicators affecting the level of human capital. The exception is the value of the share of the population with lower than primary

education, primary and lower secondary education. However, Germany, with a plus score, can also be evaluated as a country with effective investments, especially in the area of health and a policy aimed at promoting human capital. Germany reported the second-highest normalized scores in five of the seven partial indicators. Among the countries with a positive score, the Czech Republic was only slightly better than the average with a value of 0.041. This value indicates that the Czech Republic lags significantly behind Germany and Sweden, and there is still considerable room for improvement, but compared to the remaining countries (Poland, Hungary, Slovakia, Romania), it has created better conditions for the development of human capital. Although the Czech Republic shows slightly below-average results in several partial indicators, the summary value of the normalized score is positive, on the basis of which the situation in the Czech Republic cannot be evaluated as negative. Although the Czech Republic lags behind the most advanced countries, it can be assumed that there is room for improvement that can be implemented in a relatively short time. The remaining monitored countries showed a negative normalized score, which means that they are below the average and the conditions they create for the development of human capital lag behind those created by Sweden, Germany or the Czech Republic. Poland shows a negative score with a value of -0.405, i.e. it ranks fourth among the seven monitored countries in the evaluation of human capital. Poland lags behind the average in several areas, but compared to Romania, this lag is not dramatic. The situation is similar in Hungary, which reached a score of 0.489, and in Slovakia, with a score of 0.516. In these countries, the conditions for the development of human capital are below average compared to Romania (-1.137), but it must be noted that all V4 countries still performed relatively well in the evaluation, and - with the exception of the Czech Republic - they create similar conditions for the development of human capital. Romania, with the lowest score of -1.137, shows the biggest deficit in the conditions for human capital development. This indicates significant deficiencies and the need for fundamental improvement in this area to approach the rest of the countries.

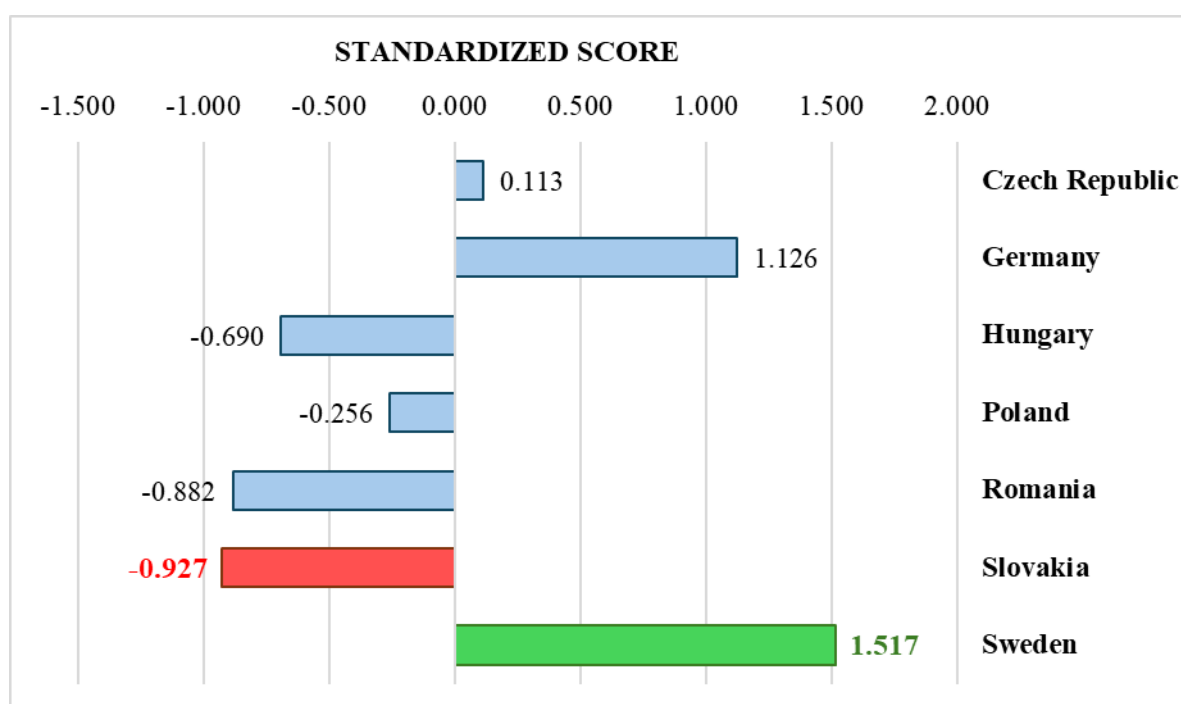


Figure 3. Normalized Score - World Competitiveness Index (2013-2022)

Source: the researchers' own processing

Figure 3 shows the normalized scores of the World Competitiveness Index (WCI) for the years 2013-2022 for the seven EU countries. The horizontal x-axis shows normalized WCI values, the vertical y-axis shows the individual EU countries. As in the previous case, the normalized values can be negative or positive based on which it is possible to evaluate how well the country performed in comparison with other countries. Sweden showed the highest positive normalized score (1.517) overall for the monitored years 2013-2022, which means that it is the most competitive country among the countries monitored. It also performed best in the evaluation of indicators affecting the level of human capital; based on this fact, it can be concluded that the creation of suitable

conditions for the development of human capital is reflected in the overall competitiveness of the country. Germany showed the second highest positive value of the normalized score (1.126) so it can also be marked as a country in which the development of human capital is reflected in its competitiveness in an adequate way. The last country where a positive, more precisely slightly above-average normalized score (0.113) was recorded was the Czech Republic. Within the monitored countries, the Czech Republic can also be marked as competitive but with some room for improvement. In the assessment of the level of human capital, it also showed a slightly above-average score. With minimal deviations for a positive value, in both comparisons, it was third among the seven countries. The remaining four countries showed a negative normalized score, i.e. they are below the average in the WCI comparison for the years 2013-2022. Poland achieved a normalized score of -0.256. Although it is below the average and is less competitive than the Czech Republic, Germany or Sweden, the lag is not very significant. Hungary's result (-0.690) already indicates a significant lag in the area of competitiveness. In the assessment of competitiveness, according to the normalized score, it ranks fifth among the seven countries examined, as well as in the assessment of the level of human capital. Romania (-0.882) and Slovakia (-0.927) showed the lowest negative scores in the evaluation of the competitiveness of the economy. These two countries fared the worst in the evaluation of the level of human capital, although Romania showed significantly worse results than Slovakia. Based on the comparison of the location of the countries in the two investigated areas, it is possible to state that the level of human capital in them correlates to a certain extent with their competitiveness but this relationship is not entirely clear-cut. It can be seen that despite the fact that Hungary, Poland and Slovakia showed similar scores when evaluating the level of human capital, greater differences were noted among them when evaluating competitiveness.

The standardized values of partial indicators affecting the level of human capital for the period 2013-2022 and their comparison with the standardized values of the World Competitiveness Index (WCI) for the same period in the seven EU countries pointed to significant differences among the analyzed countries. With regard to the results, it can be assumed that the creation of suitable conditions for the development of human capital can indeed be one of the factors that affect countries' competitiveness. Sweden and Germany have an above-average level of human capital and an above-average level of competitiveness, so it can be assumed that their high level of human capital is clearly reflected in their competitiveness. On the other hand, countries with a negative score, such as Slovakia and Romania, show a below-average level of human capital and a below-average level of competitiveness. However, it is not the case that the country with the worst-rated human capital is also the least competitive.

Significant differences in the level of human capital as well as in the level of competitiveness were found among the monitored countries. Since the researcher assumed that the goal of lagging countries should be to catch up with the most developed countries gradually, the next step was to identify whether there are statistically significant changes in the level of human capital, or competitiveness in the monitored countries in the period 2013-2022. The changes would indicate that the lagging countries really tend to approach the developed countries.

Table 2. One-factor analysis of variance of competitiveness for the years 2013-2022

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	965.839	9	107.3154	0.492703	0.873785	2.040098
Within Groups	13068.57	60	217.8096			
Total	14034.41	69				

Source: the researcher's own processing of data taken from <https://www.imd.org/centers/wcc/world-competitiveness-center/rankings/world-competitiveness-ranking/> (2024)

Table 2 offers the results of a one-factor ANOVA for the analysis of the competitiveness of the monitored countries between the years 2013-2022. The variability among the groups (965.839) is relatively low in comparison with the overall variability. The variability within the groups (13068.57) is relatively high which

means that most of the variability in the data is caused by differences within the given year, or differences in competitiveness among the countries, and not by differences among the individual years. The F-statistic reached a value of 0.4927, which is less than the critical value of 2.04, i.e., the differences between the average values of competitiveness in the individual years are not large enough to be statistically significant. The p-value is 0.87, which is more than the chosen level of significance $\alpha = 0.05$. Based on the above results, the null hypothesis that there is no statistically significant change in the competitiveness of the countries among the individual years can be accepted. That means that the average competitiveness is the same in all years and does not differ in any of them. It follows that the competitiveness of the Czech Republic, Poland, Hungary, Germany, Romania, Slovakia and Sweden did not change significantly during the years 2013-2022 and maintained relatively stable values. This can be positive for countries that have a high level of competitiveness and are focused on maintaining their current levels. However, it is not positive for the countries lagging behind; their goal should be to increase their competitiveness significantly. Therefore, the goal of further research could be to analyze the factors that can have an impact on competitiveness in the mentioned context and to find out whether – alike competitiveness – they develop consistently or whether there are certain deviations in their development despite the fact that this is not reflected in changes in the level of competitiveness.

Table 3. One-factor analysis of variance of the level of human capital for the years 2013-2022

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.00558	9	0.00062	0.00061	1	2.0401
Within Groups	61.3827	60	1.02305			
Total	61.3883	69				

Source: The researchers' own processing of data taken from <https://ec.europa.eu/eurostat/web/main/data/database> (2024)

Table 3 shows the results of one-factor ANOVA for the analysis of the level of human capital in the monitored countries for the period 2013-2022. The between-group variability (0.00558) is very low in comparison to the total variability (61.3883), while the within-group variability (61.3827) is almost identical to the total variability. This suggests that most of the variability in the data is due to the differences within a given year, which means differences in the level of human capital among the countries rather than differences among the years. The low value of the F-statistic (0.00061) compared to the critical value (2.04) signals that the differences among the average values of human capital in the individual years are not significant enough to be considered statistically significant. The p-value (1.0) is higher than the established level of significance $\alpha = 0.05$ so there is not enough evidence to reject the null hypothesis. It can be concluded that there is no statistically significant change in the level of human capital in the monitored countries in the studied period. The level of human capital in the Czech Republic, Poland, Hungary, Germany, Romania, Slovakia and Sweden did not change significantly in the period 2013-2022 and remained relatively stable, similar to the level of competitiveness. Such a result can be caused by the fact that the factors that formed the basis for assessing the level of human capital developed relatively consistently, and there were no significant fluctuations within them. This, similar to the case of competitiveness, can be positive for the countries with a high level of human capital, such as Sweden or Germany, but not for the countries that lag behind in their development.

When investigating the development of competitiveness, the results obtained from the one-factor analysis of variance were further refined by the convergence method.

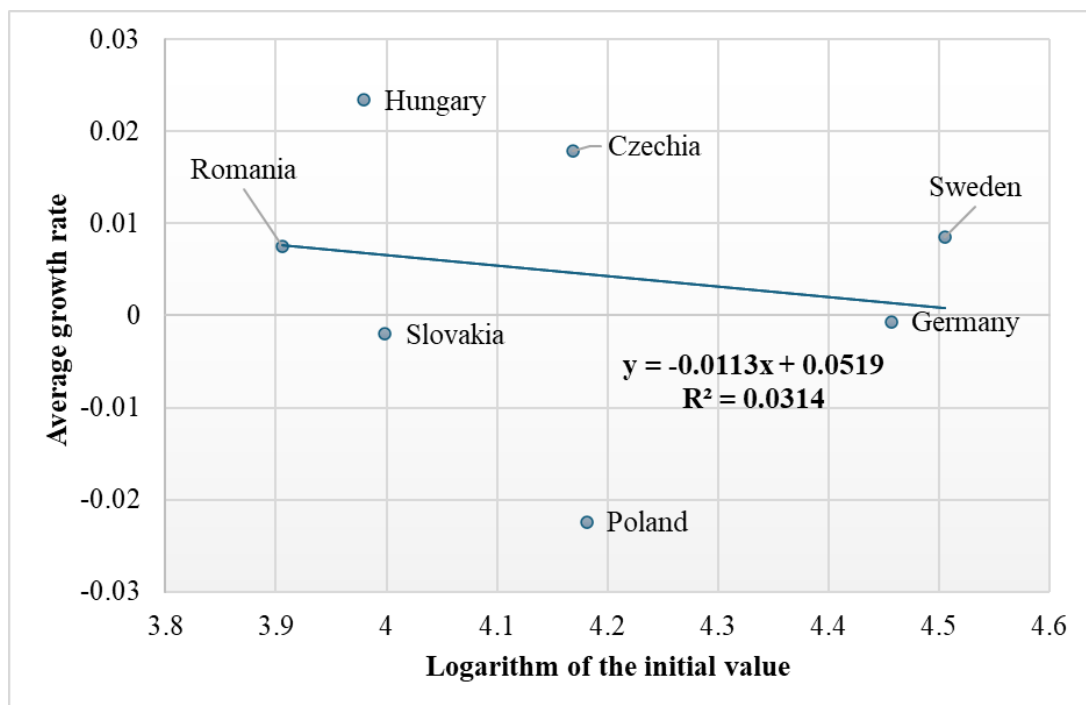


Figure 4. β - convergence in the field of competitiveness

Source: the researchers' own processing

Figure 4 introduces the results of β - convergence. The linear regression function, which took the form $y = -0.0113x + 0.0519$, has a decreasing tendency, which means there is a prevailing tendency towards weak convergence. This fact is confirmed by the negative coefficient -0.0113 . Overall, it can be concluded that the countries with a higher initial value of competitiveness had lower growth rates. The highest average growth rate was recorded by Hungary (2.34%) and the Czech Republic (1.79%), followed by Sweden (0.85%) and Romania (0.75%). A decrease in competitiveness between 2013 and 2022 was recorded in the remaining countries. In Germany (-0.06%) and Slovakia (-0.19%), the decrease was only insignificant; however, in Poland (-2.24%), it was more significant. The coefficient of determination reached a value of 0.0314. That means that the model explained only 3.14% of the total variability. Based on this, it can be concluded that the convergence results are insignificant, and the results of the one-factor analysis of variance were confirmed, which proved that there is no statistically significant change in the level of competitiveness in the monitored countries. A low value of the coefficient of determination may indicate that factors other than the initial level of competitiveness may have a more significant impact on increasing competitiveness, and thus the selected model could be improved in the future by including additional variables.

Since beta convergence evaluates the development of variables only on the basis of their initial and final state, which subsequently also indicates the rate of growth, it was supplemented by sigma convergence, which is based on standard deviations.

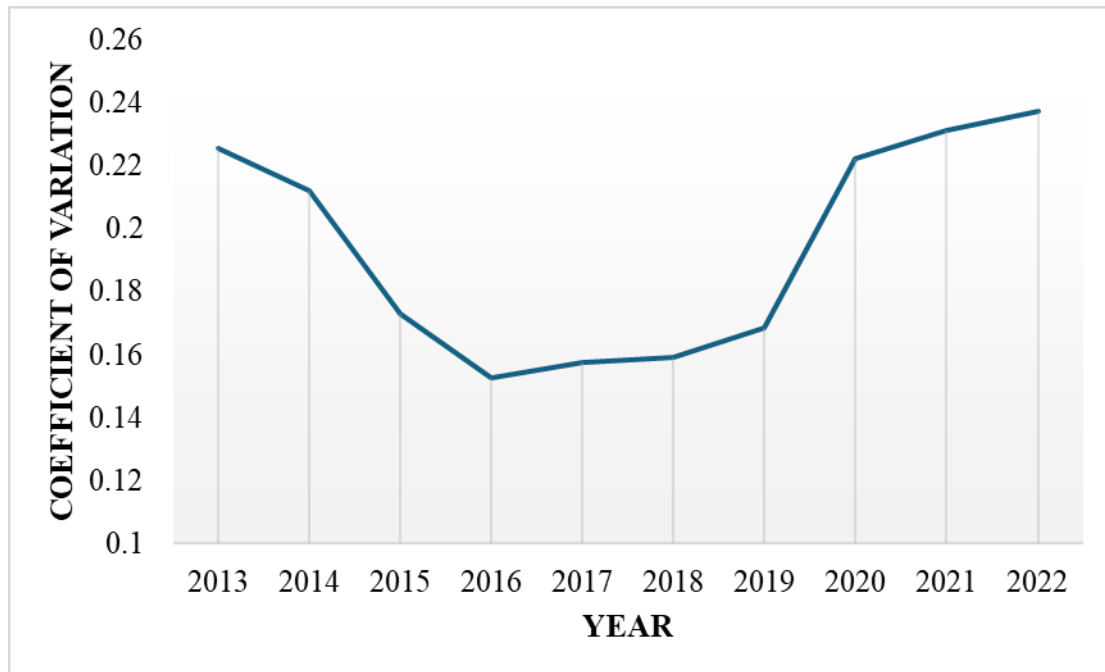


Figure 5. σ – convergence in the field of competitiveness

Source: the researchers' own processing

Figure 5 shows that the sigma convergence had an overall slightly increasing tendency in the observed period (from 0.225 in 2013 to 0.237 in 2022). However, as the graphic representation shows, until 2016, the differences in competitiveness between the seven monitored countries were decreasing that is the countries were getting closer to each other. In this period, the coefficient of variation decreased to 0.152. Subsequently, until 2018, the values of the coefficient of variation had been relatively stable which indicates that there were no significant changes in competitiveness among the monitored countries. Starting from 2019, the coefficient of variation began to grow, reaching a value of 0.237 in 2022. That shows that the differences in competitiveness between the monitored countries increased, which indicates a tendency for divergence in the period of 2019-2022.

5. Discussion

Multi-criteria methods, which include the normed variable method on which the research study is based, guarantee a certain degree of objectivity. On the other hand, subjectivity can be present in the evaluation by reflecting on the selected indicators (Ivanová & Masárová, 2018). In addition to the indicators, Laifa and Benhassine (2023) point out the possible degree of subjectivity when using multi-criteria methods. In this research, this fact mainly referred to expressions of the level of human capital, which can be evaluated on the basis of a considerable number of determinants. To reduce the degree of subjectivity as much as possible, the researcher chose those determinants that were most often investigated in various studies (see literature review) - life expectancy, public administration expenditure on healthcare, population with tertiary education, population with lower than primary education, primary and lower secondary education, public administration expenditures on education, investments in research and development, as well as expenditures on culture. Considering the standardized values of the partial indicators affecting human capital, where Sweden and Germany had the first two places among the seven examined countries in the evaluation of expenditure indicators for all four of them (public administration expenditure on health, education, culture and research and development expenditure) it can be stated that the most advanced economies realize that investment in areas which contribute to the development of human capital is the basis for the future economic advancement of countries (Nezhnikova, 2020; Koryakov et al., 2022) and should not be seen as a burden but as an investment - even though their effects are not manifested immediately but only after a certain time (Augustia et al., 2020). The position of Germany and Sweden not only in the evaluation of the partial indicators but also within the aggregate score of human capital and the level of competitiveness is not accidental. Other authors, such as Minhaj & Ahmed (2023), also consider investments in human capital and the development of other related areas

as key aspects to achieve maximum economic growth and secure an advantageous position in the competitiveness rankings. If we look at the result indicators within the partial indicators, it is necessary to state that the researcher's findings are in accordance with Mulliqi et al. (2018), who claim that countries with a larger number of university-educated population (Sweden) achieve higher competitiveness compared to countries in which a relatively small part of the population has university education (Romania). Considering the overall results of the countries in the field of human capital and their comparison with the results in the field of competitiveness, it can be assumed that the creation of suitable conditions for the development of human capital may indeed be one of the factors that affect the competitiveness of countries. In the countries where the level of human capital is above average (especially Sweden and Germany but also the Czech Republic), the level of competitiveness is also above average, and vice versa in the countries where the level of human capital is below average, the level of competitiveness is also below average (Poland, Hungary, Slovakia, Romania). Based on this, this research identifies with Schwab and Zahidi's (2020) statement that human capital is one of the key drivers of economic prosperity and productivity and thus of the overall competitiveness of countries. The results of the one-factor analysis of variance show that there is no statistically significant change in the level of human capital or in the level of competitiveness in the monitored countries in the individual years. In the field of competitiveness, the results were further refined by the convergence method, which confirmed the previous finding. Similar to Miron et al. (2022), who applied the convergence method to GDP development, no evidence in favour of absolute β - convergence was found. Stable development in the field of competitiveness as well as in the field of human capital can be viewed positively on the one hand - especially in the case of highly developed countries - but lagging countries should try not only to maintain the current level but also to look for opportunities for its improvement and more dynamic progress. This is also emphasized by Sener and Delican (2019), who also state that support for increasing competitiveness is more demanding in less developed countries than in the most developed countries. That is why less developed countries should create mechanisms that will enable them to maintain and support their level of competitiveness. Moreover, although the findings show that the level of human capital in the monitored countries did not change significantly. Miron et al. (2022) emphasize the role of human capital as a strategic element of competitiveness in strengthening the process in which lagging countries catch up with advanced countries. Most studies assess human capital in relation to the overall competitiveness of countries, which represents a broader approach - comparing to the usual focus on economic performance. However, the main contribution of this study lies in the proposed research design, which is described in detail in the methodological section of this study. The level of human capital is not expressed through complex indexes, such as the HCI, which is usually given by the World Bank, or the HDI, which is given by the UN. In this study, a less traditional approach was used, and a standardized variable method was used to express the level of human capital, which is not commonly used for this purpose. Another applied research procedure was also different from other similarly oriented studies. Most of them, such as Elistia and Syahzuni (2018), evaluate the interrelationship of the examined variables through causal analysis. Still, our research used comparative analysis, which was complemented by a number of other methodological procedures. These procedures were described in detail in the methodological section.

Conclusions

The aim of this study was to identify the level of human capital in seven European countries (Czech Republic, Germany, Hungary, Poland, Romania, Slovakia, and Sweden) and through the evaluation of standardized indicators to compare the mentioned countries in the area of competitiveness. Subsequently, the aim was to identify the dynamics of human capital development and competitiveness in the monitored countries. The goals set were achieved. The comparison of human capital in individual countries with the level of competitiveness shows that in countries where the level of human capital is above average (Sweden and Germany), the level of competitiveness is also above average. And vice versa, in the countries where the level of human capital is below average, the level of competitiveness is also below average (Poland, Hungary, Slovakia, Romania). Sweden achieved a position significantly above average in both areas. Germany ranked second in both places; however, while it was not far behind Sweden in terms of competitiveness, it was more significantly behind in terms of human capital. Out of the V4 countries, the Czech Republic fared best in the evaluation although it remained quite significantly behind Germany and Sweden.

Nevertheless, as the only country of the remaining countries included in the analysis in both areas, the Czech Republic showed slightly above-average values within the normalized score. On the contrary, Slovakia fared the worst among the V4 countries and was surpassed only by Romania in the level of human capital. In the evaluation of competitiveness, it even stood the worst of the monitored countries. The lagging countries should strive for more dynamic development in order to be able to approach gradually the countries that fared better in the evaluation. However, one-factor analysis of variance showed that between 2013-2022, there were no statistically significant changes in the level of human capital or the level of competitiveness in the monitored countries, and therefore, the development of the level of human capital and competitiveness in them is relatively stable. In the area of competitiveness, these results were confirmed by the convergence method. From the point of view of countries that have already reached a high level of development, stability can represent a certain degree of certainty for securing their position in the future. However, although stability is important, the priority for lagging countries should be to improve and ensure a more dynamic development of the level of human capital and overall competitiveness.

Although the main goal was fulfilled and the position of the countries in terms of their competitiveness and the level of human capital was identified, as well as the dynamics of the development of both investigated variables, it is important to point out the possible limitations of the conducted research. As previously mentioned, the use of multi-criteria methods introduces a certain degree of subjectivity into the analysis, depending on what indicators will be included in the evaluation (Ivanová & Masárová, 2018; Laifa & Benhassine, 2023). In the case of human capital, this problem is even greater because it is a qualitative characteristic of a person that needs to be expressed quantitatively using a range of different indicators. It is generally recommended to use income, cost and performance indicators (Kwon, 2009). However, the research conducted did not pay attention to the area of income. Another limitation could be the fact that the standardized variable method evaluates the position of countries in relation to an average value. This average value can, however, change depending on the characteristics of the countries included in the analysis. Considering the mentioned facts, the goal of future research could be to eliminate the inaccuracies resulting from the mentioned facts and to expand the research to a larger sample of countries.

References

- Alam, F. (2023). Human Capital and Economic Growth in India: The ARDL Approach. *Amazonia Investiga*, 12(68), 9–20. <https://doi.org/10.34069/AI/2023.68.08.1>
- Augustia, D., Permatasari, Y., Fauzi, H., & Sari, M. N. A. (2020). Research and Development Intensity, Firm Performance, and Green Product Innovation. *Journal of Security and Sustainability Issues*, 9(3), 1039–1049. [https://doi.org/10.9770/jssi.2020.9.3\(27\)](https://doi.org/10.9770/jssi.2020.9.3(27))
- Avdeeva, D. (2024). The Contribution of Human Capital to Economic Growth in Russia. *HSE Economic Journal*, 28(1), 9–43. <https://doi.org/10.17323/1813-8691-2024-28-1-9-43>
- Bąk, I., Wawrzyniak, K., & Oesterreich, M. (2022). Competitiveness of the Regions of the European Union in a Sustainable Knowledge-Based Economy. *Sustainability*, 14(7), Article 7. <https://doi.org/10.3390/su14073788>
- Baldanzi, A., Bucci, A., & Prettnner, K. (2021). Children's health, human capital accumulation, and R&D-based economic growth. *Macroeconomic Dynamics*, 25(3), 651–668. <https://doi.org/10.1017/S136510051900035X>
- Becker, G.S. (1975). Front matter, Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education. V *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, Second Edition*. NBER. <https://www.nber.org/books-and-chapters/human-capital-theoretical-and-empirical-analysis-special-reference-education-second-edition/front-matter-human-capital-theoretical-and-empirical-analysis-special-reference-education>
- Bucci, A., & Segre, G. (2011). Culture and human capital in a two-sector endogenous growth model. *Research in Economics*, 65(4), 279–293. <https://doi.org/10.1016/j.rie.2010.11.006>
- Carillo, M.F. (2024). Human capital composition and long-run economic growth. *Economic Modelling*, 137. <https://doi.org/10.1016/j.econmod.2024.106760>

Debrah, Y. A., Oseghale, R. O., & Adams, K. (2018). Human Capital, Innovation and International Competitiveness in Sub-Saharan Africa. V I. Adeleye & M. Esposito (Ed.), *Africa's Competitiveness in the Global Economy* (p. 219-248). Springer International Publishing. https://doi.org/10.1007/978-3-319-67014-0_9

Di Cataldo, M., & Rodríguez-Pose, A. (2017). What drives employment growth and social inclusion in the regions of the European Union? *Regional Studies*, 51(12), 1840-1859. <https://doi.org/10.1080/00343404.2016.1255320>

Doré, N.I., & Teixeira, A.A.C. (2023). The role of human capital, structural change, and institutional quality on Brazil's economic growth over the last two hundred years (1822–2019). *Structural Change and Economic Dynamics*, 66, 1-12. <https://doi.org/10.1016/j.strueco.2023.04.003>

Elistia, E., & Syahzuni, B. (2018). The correlation of the Human Development Index (HDI) towards economic growth (GDP per capita) in 10 ASEAN member countries. *Journal of Humanities and Social Studies*, 2(2), 40-46. <https://doi.org/10.33751/jhss.v2i2.949>

Gaona, L.B., & Vásquez, E.I. (2021). Capital humano, desigualdad y crecimiento económico en América Latina. *Revista de Economía Institucional*, 23(45), Article 45. <https://doi.org/10.18601/01245996.v23n45.13>

IMD World Competitiveness Center. (2023). World Competitiveness Booklet 2023. <https://imd.cld.bz/IMD-World-Competitiveness-Booklet-2023>

Islam, M.Z., Rahaman, S.H., & Chen, F. (2024). How do R&D and remittances affect economic growth? Evidence from middle-income countries. *Heliyon*, 10(9), e30160. <https://doi.org/10.1016/j.heliyon.2024.e30160>

Ivanová, E., & Masárová, J. (2018). Performance evaluation of the Visegrad Group countries. *Economic Research-Ekonomska Istrazivanja*, 31(1), 270-289. <https://doi.org/10.1080/1331677X.2018.1429944>

Jiang, W., & Wang, Y. (2023). Asymmetric Effects of Human Health Capital on Economic Growth in China: An Empirical Investigation Based on the NARDL Model. *Sustainability*, 15(6), Article 6. <https://doi.org/10.3390/su15065537>

Kirkpatrick, I.C.M., Horvat, T., & Bobek, V. (2020). Improving competitiveness between EU rural regions through access to tertiary education and sources of innovation. *International Journal of Diplomacy and Economy*, 6(1), 26-40. <https://doi.org/10.1504/IJDPE.2020.109633>

Koryakov, A., Kazaryan, I., Afonasyova, M., & Litvin, I. (2022). Measuring human capital: Methodological framework for assessing competitiveness and economic development. *Brazilian Journal of Political Economy*, 42(4), 1043-1061. <https://doi.org/10.1590/0101-31572022-3333>

Kwon, D.B. (2009). Human capital and its measurement. The 3rd OECD World Forum on "Statistics, Knowledge and Policy" Charting Progress, Building Visions, Improving Life Busan, Korea - 27-30 October 2009, from [https://www.academia.edu/24595168/The_3rd_OECD_World_Forum_on_Statistics_Knowledge_and_Policy_HUMAN_CAPITAL_A
ND_ITS_MEASUREMENT_KWON_DAE_BONG](https://www.academia.edu/24595168/The_3rd_OECD_World_Forum_on_Statistics_Knowledge_and_Policy_HUMAN_CAPITAL_AND_ITS_MEASUREMENT_KWON_DAE_BONG)

Laifa, I., & Benhassine, N. (2023). Evaluation of the Attractiveness of Tourism in Algeria: Multicriteria Method Applied to Areas of Tourist Expansion. *Geojournal of Tourism and Geosites*, 49(3), 988-997. <https://doi.org/10.30892/gtg.49314-1098>

Leite, D.W., & Cardoso, L.C.B. (2023). Human capital and technology in the growth of economic structure. *Investigacion Economica*, 82(323), 27-52. <https://doi.org/10.22201/fe.01851667p.2023.323.82953>

Linhartová, V. (2020). The Effect of Government Expenditure on Human Capital in the Czech Republic. *Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration*, 28(2), Article 2. <https://doi.org/10.46585/sp28021056>

Liutak, O., Baula, O., & Tkachuk, A. (2023). Simulation of the influence of investment and innovation activities on ensuring the international competitiveness of countries. *Informatyka, Automatyka, Pomiar w Gospodarce i Ochronie Srodowiska*, 13(2), 86-92. <https://doi.org/10.35784/iapgos.3470>

Merdic, A., & Hodzic, K. (2021). The Impact of National Competitiveness on the Economic Growth of European Economies. *Casopis Za Ekonomiju I Trzisne Komunikacije*, 11(2), 373-388. <https://doi.org/10.7251/EMC2102373M>

Minhaj, N., & Ahmed, R. (2023). Impact of Human Capital Development and Economic Growth on Global Competitiveness. *Global Economics Science*, 1-18. <https://doi.org/10.37256/ges.5120241632>

Miron, D., Holobiuc, A.-M., Cojocariu, R.C., & Budacia, A.E. (2022). Real Convergence in the Euro Area: Mirage or Reality? *Journal of Competitiveness*, 14(1), 100-117. <https://doi.org/10.7441/joc.2022.01.06>

Mourao, P.J.R., & Popescu, I.A. (2023). Investment, growth and competitiveness: The multiplier-accelerator in the 21st century. *Journal of Competitiveness*, 15(3), 60-78. <https://doi.org/10.7441/joc.2023.03.04>

Mulliçi, A., Adnett, N., Hisarciklilar, M., & Rizvanolli, A. (2018). Ľudský kapitál a medzinárodná konkurencieschopnosť v Európe s osobitným zreteľom na transformujúce sa ekonomiky. *Východoeurópska Ekonomika*, 56(6), 541-563. <https://doi.org/10.1080/00128775.2018.1502612>

Nezhnikova, E. (2020). Investment in human capital as the basis for the country's economic growth. *E3S Web of Conferences*, 164, 09046. <https://doi.org/10.1051/e3sconf/202016409046>

OECD. (2007). Human capital: How what you know shapes your life? Summary in Slovak. 6 p. ISBN-92-64-029095. <https://www.oecd-ilibrary.org/docserver/9789264029095-sumsk.pdf?expires=1715059959&id=id&accname=guest&checksum=16C4124D4F41E8CF364DCA5A5DAFFDA3>

Pritchett, L. (2024). Investing in Human Capital in Africa: A framework for research. *International Journal of Educational Development*, 107, 103048. <https://doi.org/10.1016/j.ijedudev.2024.103048>

Railaite, R., & Čiutienė, R. (2020). The Impact of Public Health Expenditure on Health Component of Human Capital. *Engineering Economics*, 31(3), Article 3. <https://doi.org/10.5755/j01.ee.31.3.25158>

Schwab, K., & Zahidi, S. 2020. The Global Competitiveness Report Special Edition 2020: How Countries are Performing on the Road to Recovery, WEF. https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2020.pdf

Sener, S., & Delican, D. (2019). The causal relationship between innovation, competitiveness and foreign trade in developed and developing countries. *Procedia Computer Science*, 158, 533-540. <https://doi.org/10.1016/j.procs.2019.09.085>

Shuyong, F., Shuyu, C., & Maimaituxun, M. (2024). Discussion on the Relationship Between Chinese Government's Investment in Health Human Capital and Economic Growth. *Journal of the Knowledge Economy*. <https://doi.org/10.1007/s13132-024-01771-w>

Syromyatnikov, D., Konev, P., Popov, M., & Sultanova, N. (2021). Practical Strategies to Improve National Competitiveness. *Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration*, 29(2), Article 2. <https://doi.org/10.46585/sp29021315>

Tijanic, L., & Obadic, A. (2015). Can we boost the competitiveness of the european union through reducing regional inequalities in human capital? *Engineering Economics*, 26(3), 295-305. <https://doi.org/10.5755/j01.ee.26.3.8029>

Virjan, D., Manole, A. M., Stanef-Puică, M. R., Chenic, A. S., Papuc, C. M., Huru, D., & Bănașu, C. S. (2023). Competitiveness—The engine that boosts economic growth and revives the economy. *Frontiers in Environmental Science*, 11. <https://doi.org/10.3389/fenvs.2023.1130173>

Funding: This research was supported by the project "Investments in human capital in the context of achieving sustainable economic growth of the Slovak Republic and strengthening its competitiveness"; project code MVP07_2024; with the financial support of the European Union within the call for Early Stage Grants, Recovery and Resilience Plan (project code: 09I03- 03-V05-00010, Component 9: More effective management and strengthening of research, development and innovation funding), dealt with within the Internal Grant Scheme of the Alexander Dubček University of Trenčín in the city of Trenčín.

Author Contributions: Conceptualization: *Veronika Žárská, Eva Smetanová*; methodology: *Veronika Žárská*; data analysis: *Veronika Žárská, Eva Smetanová*; writing—original draft preparation: *Veronika Žárská, Eva Smetanová*, writing; review and editing: *Veronika Žárská, Eva Smetanová*; visualization: *Veronika Žárská*. All authors have read and agreed to the published version of the manuscript.

Veronika ŽÁRSKÁ is the Assistant Professor at Faculty of Social and Economic Relations, Alexander Dubcek University of Trenčín, Slovakia. Research interests: human capital, competitiveness, economic performance.

ORCID ID: <https://orcid.org/0000-0003-0415-4907>

Eva SMETANOVÁ is the Assistant Professor at Faculty of Social and Economic Relations, Alexander Dubcek University of Trenčín, Slovakia. Research interests: issues of lifelong education, current issues of pedagogy, educational management, foreign language education, cognitive linguistics, psycholinguistics, sociolinguistics.

ORCID ID: <https://orcid.org/0000-0001-8430-8683>

Copyright © 2024 by author(s) and VSI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>

