

## Can Human Capital Index Serve as A Blueprint for Economic Growth of The EU – Countries? \*

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### Abstract

Human Capital plays critical role in sustainable economic growth of each country. The Human Capital Index (HCI) combines demographic, education, and health dimensions on a complementary statistical and econometric basis. It is used by the World Bank in the area of human development for monitoring and comparison purposes, in time and space. The aim of the research article is to provide a more detailed look at the level of human capital from a country's macroeconomic perspective in relation to the country's income group and whether it is part of the EU or not. The basic methodology for measuring a country's human capital is the Human Capital Index. The data for the analysis of the Human Capital Index (HCI) were obtained from The World Bank Human Capital Project database. The results of non-parametric testing (Chi-Square Test of Independence) and rates of association between variables (using Cramér's V) indicate that there is statistically significant difference between Income group of each country and EU – membership, as well as European region. The average value of the human capital index of the Eastern European countries ( $M = 0.66$ ) lies at the level of Slovakia. Nevertheless, Slovakia lags behind the average HCI value of EU countries ( $HCI = 0.71$ ) 5 points. In addition, the hypothesis about Membership in the EU and Income group of each country was confirmed. The result has shown when countries are part of the EU, their residents earn higher incomes, which placing them into the high-income group.

**Keywords:** human capital, human capital index, economic growth.

### Introduction

The Europe 2020 refers to the EU - strategy ensuring the economic revival of the European Union. It should enable the EU to achieve growth that is smart (development of knowledge and innovation), sustainable (a greener, more resource efficient and more competitive economy) and inclusive (strengthening employment and social and territorial cohesion). The growth cannot be achieved without a significant contribution of people's skills, knowledge or value, commonly known as human capital (Dankyi et al., 2022; Pelinescu, 2015; Zhang & Wang, 2021). While human capital directly and indirectly synthesizes economic growth (Rahim et al., 2021). Xu and Li (2020) state because people are the carrier of innovation, innovative human capital is the combination of human and innovation, which is the core of regional economies.

Without a high - quality system of education and training, dissemination of knowledge and expertise, and research activities, the development of a country's human capital cannot be assured (Hanushek & Woessmann, 2007). According to Shultz and Hanushek (2012), the inaction of state institutions in reforming education will result in slow growth and greater income inequality of countries.

Ongoing investment in human capital is the key to the country's economic growth and its sustainable development. Health expenditure, along with other educational measures of human capital help sustain growth (Sultana et al., 2022).

According to Khan et al. (2023) human capital, globalization, and gross fixed capital formation also affect economic growth across income groups.

There are many scientific studies dealing with association between human capital and economic growth of the country in academic databases. Their authors have worked the topic up from natural resources and ecology (Danish et al., 2019; Ahmed et al., 2020), different region (Ogundari & Awokuse, 2018) or tourism (Fahimi et al., 2018) point of view.

The rest of our paper is structured as follows. The section 2 presents data and the methodology used to reach the results, section 3 provides results and discussion related to our research, while the last section concludes the results.

## Data and Methodology

The scientific goal of our study was to investigate what impact can have the European region, Income groups and EU – membership on achieving better economic result of the country. In the first phase, we looked at the impact of European region and Income groups in relation to membership of the EU.

The article aims to provide a more detailed look at the level of human capital from a country's macroeconomic perspective in relation to the country's income group and whether it is part of the EU or not. The basic methodology for measuring a country's human capital is the Human Capital Index (HCI). Forty European countries (N = 40) were included in the research. The researchers ensured the objectivity of the measurement by using data obtained from online databases of international non-profit organisations. The data for the analysis of the Human Capital Index were obtained from The World Bank Human Capital Project database. The World Bank methodology was used to calculate the HCI, which is tracked as of 2018.

### *Human Capital Index (HCI)*

The Human Capital Index (HCI) measures the productivity of the next generation of workers against a benchmark of full education and full health. And it is composed of three components:

- “Survival” component - this component of the index reflects the fact that not all children born today will reach the age when the process of human capital accumulation through formal education is completed. According to the World Bank, the criterion of "complete education" is defined as 14 years of schooling. The criterion of "full health" is defined as 100% adult and no stunting. The probability of survival to age 5 is calculated by subtracting the under-five mortality rate from 1. The under-five mortality rate is obtained from the United Nations Inter-Agency Panel on Child Mortality Estimates (IGME, 2022s).
- “School” component - this component of the index combines information on the quantity and quality of education. The quantity of education is measured as the number of years of schooling. The quality of education is reflected by harmonised test results from the main international programmes testing pupil achievement.
- “Health” component - this component of the index combines information on adult survival rates, defined as the proportion of 15-year-olds who live to 60 years of age. The second component is the stunting rate for children under 5 years of age.

The HCI measures current education and health outcomes because they can be influenced by current policy interventions to improve the quantity and quality of education and health.

The conceived hypotheses were following:

- **H<sub>1</sub>:** There is a statistically significant relationship between a country from a particular part of Europe and the income group of the country (high-income, upper-middle-income and lower-middle-income countries).
- **H<sub>0</sub>:** There is no statistically significant relationship between the two nominal variables.

## Results and Discussion

The World Bank methodology was used to calculate the HCI, and then we compared the individual components of the human capital index and the HCI values of the Slovak Republic and European countries. The basic distribution of the set of countries is presented in the table below.

In the analysis of the data, the primary distribution of countries was from a territorial point of view. 70% of the countries are members of the European Union. Of these countries, 86% are high-income countries and 16% are upper-middle-income countries.

**Table 1 Descriptive table for Human Capital Index (internal construct)**

	Harmonized Test Scores	Learning-Adjusted Years of School	Expected Years of School	HUMAN CAPITAL INDEX 2020
Mean	488.51	10.33	13.18	0.71
Std. Deviation	37.67	1.21	0.7	0.07
Minimum	374	7.3	11.03	0.56
Maximum	543	11.74	13.94	0.8
Skew	-1.15	-0.98	-1.34	-0.7
Kurtosis	0.93	-0.04	1.35	-0.62

Source: own processing based on the datasets.

Notes:

\* School attendance 1 - Estimated Years of Schooling (0-14)

\* Scores - Harmonized Test Scores (300-625)

\* School Attendance 2 - Number of Years of Schooling Adjusted by Education

\* HCI - Human Capital Index

Table 2 shows the values of the components of the human capital index of the Eastern European countries. The distribution of the quartiles is as follows: Quartile Q1: 0.595; Quartile Q2: 0.66; Quartile Q3: 0.725. IQR interquartile range: 0.13. Quartile deviation QD: 0.065. Mean M= 0.66. Median = 0.66.

**Table 2 HCI and its components of Eastern European countries**

Country	Expected Years of School	Harmonized Test Scores	Learning-Adjusted Years of School	HUMAN CAPITAL INDEX 2020
Bulgaria	12,3	441	8,7	<b>0,61</b>
Czechia	13,6	512	11,1	<b>0,75</b>
Hungary	13,0	495	10,3	<b>0,68</b>
Moldova	11,8	439	8,3	<b>0,58</b>
Poland	13,4	530	11,4	<b>0,75</b>
Romania	11,8	442	8,4	<b>0,58</b>
Slovakia	12,6	485	9,8	<b>0,66</b>
Ukraine	12,9	478	9,9	<b>0,63</b>
Belarus	13,8	488	10,8	<b>0,70</b>

Source: own processing based on the datasets.

Table 3 shows the values of the components of the human capital index of the Northern European countries. The distribution of the quartiles is as follows: Quartile Q1: 0.74; Quartile Q2: 0.775; Quartile Q3: 0.7925. Interquartile range IQR: 0.0525. Quartile deviation QD: 0.0262. Mean M= 0.765. Median = 0.775.

**Table 3 HCI and its components of Northern European countries**

Country	Expected Years of School	Harmonized Test Scores	Learning-Adjusted Years of School	HUMAN CAPITAL INDEX 2020
Denmark	13,4	518	11,1	0,76
Estonia	13,5	543	11,7	0,78

Finland	13,7	534	11,7	0,80
Iceland	13,5	498	10,7	0,75
Ireland	13,9	521	11,6	0,79
Latvia	13,6	504	11,0	0,71
Lithuania	13,8	496	11,0	0,71
Norway	13,7	514	11,2	0,77
Sweden	13,9	519	11,6	0,80
United Kingdom	13,9	520	11,5	0,78

Source: own processing based on the datasets.

Table 4 shows the values of the components of the human capital index of the Southern European countries. The distribution of the quartiles is as follows: Quartile Q1: 0.64, Quartile Q2: 0.71, Quartile Q3: 0.7525. Interquartile range IQR: 0.11. Quartile deviation QD: 0.055. Mean M= 0.69, Median = 0.71 .

**Table 4 HCI and its components of Southern European countries**

Country	Expected Years of School	Harmonized Test Scores	Learning-Adjusted Years of School	HUMAN CAPITAL INDEX 2020
Bosnia and Herzegovina	11,7	416	7,8	0,58
Croatia	13,4	488	10,4	0,71
Cyprus	13,6	502	10,9	0,76
Greece	13,3	469	10,0	0,69
Italy	13,3	493	10,5	0,73
Malta	13,4	474	10,2	0,71
North Macedonia	12,8	436	8,9	0,63
Portugal	11,0	414	7,3	0,56
Serbia	13,9	509	11,3	0,77
Slovenia	13,3	457	9,8	0,68
Spain	13,6	521	11,4	0,77
Turkey	13,0	507	10,5	0,73

Source: own processing based on the datasets.

Table 5 shows the values of the components of the human capital index of the Western European countries. The distribution of the quartiles is as follows: Quartile Q1: 0.74; Quartile Q2: 0.76; Quartile Q3: 0.76. IQR interquartile range: 0.02. Quartile deviation QD: 0.01. Mean M= 0.75. Median = 0.76.

**Table 5 HCI and its components of Western European countries**

Country	Expected Years of School	Harmonized Test Scores	Learning-Adjusted Years of School	HUMAN CAPITAL INDEX 2020
Austria	13,4	508	10,9	0,74
Belgium	13,5	517	11,2	0,76
France	13,8	510	11,3	0,76
Germany	13,3	517	11,0	0,75
Luxembourg	12,4	493	9,8	0,69
Netherlands	13,9	520	11,5	0,79

Switzerland	13,3	515	10,9	0,76
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Source: own processing based on the datasets.

We then looked at the relationships between the income group of countries and the part of Europe in which the country is located as well as whether the country is part of the EU to get a clearer view of the country's economic growth potential.

To test the dependence of the nominal variables, bivariate inductive statistics methods were used by non-parametric test - Chi-square test of independence and coefficients to determine the dependence of each variable for nominal data Cramer's V. The data were analysed in the statistical software DATAtab and the statistical module Python. Hypotheses were tested at a significance level of  $p \leq 0.05$ ; maintaining the primary rule of Chi-Square Test of Independence, where theoretical frequencies did not fall below 5 in 80% and  $X > 1$  was valid for the other values. The null and alternative hypotheses were tested, and we report these in the individual results. The following hypotheses were analysed:

H<sub>1</sub>: There is a statistically significant relationship between a country from a particular part of Europe and the income group of the country (high-income countries, upper-middle-income countries and lower-middle-income countries).

H<sub>0</sub>: There is no statistically significant relationship between the two nominal variables.

**Table 6 Chi-Square test for Europe part and Income group**

Chi <sup>2</sup>	17.88
df	6
p	.007

Source: own processing based on the datasets.

From the results of the  $\chi^2$  test we can say that there is a statistically significant relationship between the part of Europe in which a particular country is located and its income group ( $\chi^2 = 17.88$ ,  $df = 6$ ,  $p = .007$ ). The calculated p-value (.007) is below the established significance level of 5%. The Chi2 test is therefore significant, and the null hypothesis was rejected, with the strength of this relationship being moderately significant (Cramér's V = .47).

The distribution of high-income countries is as follows - 43.5% of countries are situated in Northern Europe, 34.5% are in Southern Europe and 22% is located in Eastern Europe. Countries defined through upper middle - income group are most located in Southern Europe (17%).

To find out any dependency between different income groups and the membership in European union we have explored the following hypothesis:

H<sub>1</sub>: There is statistically significant association between the EU\_country and particular Income Group (high-income country, upper middle – income, lower middle - income )

H<sub>0</sub>: There is no statistically significant association between both nominal variables

**Table 7 Chi-Square test for Europe part and Income group**

Chi <sup>2</sup>	21.63
df	2
p	<.001

Source: own processing based on the datasets.

We reject alternative hypothesis H<sub>1</sub> at the significance level of  $p > .05$ , and accept null hypothesis H<sub>0</sub>. There is no statistically significant dependence between the researched variables ( $p = .001$ ,  $\text{ChiSQ} = 21.63$ ,  $df = 2$ ). Based on the results, we can state that particular Income group is typical for countries in EU. The result has shown when countries are part of the EU, their residents earn higher incomes, which placing them into the high-income group. On the other side, there is no lower middle-income country in the EU.

A Chi2 test was performed between variables EU\_country and Income Group. There was a statistically significant relationship between EU\_country and Income Group,  $\chi^2(2) = 21.63$ ,  $p = <.001$ , with strength effect size measured

through the Cramér's coefficient ( $V = 0.73$ ). The calculated p-value of  $<.001$  is lower than the defined significance level of 5%. The Chi2 test is therefore significant, and the null hypothesis is rejected.

## Conclusion

Human capital in the cultural and creative industries is a key topic. And its impact in this sector has been strengthening significantly in recent years on the country's economic growth. In our article we have discussed the economic growth of the country from the perspective of the European region, the income group of the country as well as the fact whether the country belongs to the EU or not as well as the European region. Based on the results, we can state that there is a statistically significant dependence between the part of Europe (European region) in which a particular country is located and its income group. While the most high-income countries are situated in Northern Europe. It is the countries of Northern Europe that achieve the highest values in Human Capital Index, with leading countries as Sweden (HCI = 0,80) and Finland (HCI = 0,80).

The average value of the human capital index of the Eastern European countries ( $M = 0,66$ ) lies at the level of Slovakia. Nevertheless, Slovakia lags behind the average HCI value of EU countries (HCI = 0,71) 5 points. Also the hypothesis about Membership in the EU and Income group of each country was confirmed. The result has shown when countries are part of the EU, their residents earn higher incomes, which placing them into the high-income group. On the other side, there is no lower middle-income country in the EU.

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