Vilnius University Press

Contents lists available at Vilnius University Press

Ekonomika
2025, vol. 104(1), pp. 139–163

ISSN 1392-1258 eISSN 2424-6166
DOI: https://doi.org/10.15388/Ekon.2025.104.1.8

Features of the Relationship between Corruption, Human Capital Components and Economic Growth (Case of EU Candidate Countries)

Olena Stryzhak

Simon Kuznets Kharkiv National University of Economics, Ukraine,
Email: ssssellennnn@gmail.com

Abstract. The changing geopolitical situation in the European region has actualized the issues of further EU enlargement. As a result, the relevance of studying many aspects of the functioning economic systems of candidate countries has increased. In this context, the purpose of this article is to identify the features of the relationship between economic growth, corruption, and human capital components in EU candidate countries. The study uses annual data for nine EU candidate countries from 1996 to 2021. The research methodology includes the following methods: correlation analysis; logarithm procedure; calculation of the Augmented Dickey-Fuller (ADF) test; calculation of the Granger causality test. The study found no causality in the cases of Albania, Bosnia and Herzegovina, North Macedonia, and Ukraine. The analysis showed that there is a causal relationship from Control of Corruption (CC) to GDP only in Moldova in the long term. In Montenegro, Serbia, and Turkiye, there is a causality from GDP and Life Expectancy at Birth (LEB) to CC. There is a direct causality from Education Index (EI) to GDP in Moldova, from LEB to EI in Georgia, and from LEB to GDP in Serbia and Montenegro. The study found differences in both the direction and strength of causality between components of human capital, control of corruption, and economic growth in the EU candidate countries. In some cases, there is no such relationship. All calculations were carried out using Statistica and EViews.
Keywords: economic growth, human capital, corruption, ADF-test, Granger causality, EU candidate countries

1. Introduction

Further enlargement of the European Union raises issues of uneven economic development of candidate countries. Ensuring long-term economic development depends largely on a country's ability to ensure a sustainable rate of economic growth. Various factors can either favour or hinder economic growth. For example, human capital significantly contributes to economic growth potential, while corruption often impedes it. Consequently, scholars are interested in investigating the impact of these factors on economic growth.

Several studies examine the relationship between human capital, corruption, and economic growth. For example, countries in Sub-Saharan Africa (SSA) face challenges

Received: 06/02/2024. **Revised:** 09/04/2024. **Accepted:** 05/01/2025

such as human capital drain, poverty, inequality, and corruption, which ultimately lead to slower economic growth (Usman et al., 2022). Both corruption and human capital affect growth - insignificantly in developed countries and significantly in developing countries. Moreover, the less corruption, the higher the rate of economic growth (Fatmawati, Suman, & Syafitri, 2018). Human capital contributes to economic growth, while corruption leads to slower growth and eventually economic stagnation (Ikazaki, 2014). Ihnatenko et al. (2019) highlight the importance of controlling corruption, alongside managing labour, to regulate economic development in developing countries. In East, West, and South Asia, human capital generally has a positive influence on growth, but corruption can either accelerate or hinder this effect (Mudassaar & Rehman, 2019). In ASEAN countries, both human resource development and the level of corruption affect economic growth (Nurjannah et al., 2023).

Corruption is one of the major challenges for candidate countries on the path to EU membership. One of the main conditions for accession to the EU for candidate countries is to reduce the level of corruption. Most scholars support this position. Thus, Chrun (2023) highlights the importance of anti-corruption reforms for candidate countries seeking EU accession. Apergis and Pinar (2023) point out that rising corruption leads to increased party polarization and more support for populist parties in the EU that oppose further enlargement. Further EU enlargement has both opponents, who argue that the lack of rule of law in candidate countries could lead to greater instability in the EU, and supporters, who believe it would enhance the EU's geopolitical status (Outeda, González, & Troitiño, 2020).

Abdulla (2021) notes that eliminating corruption can increase aggregate output by 18-20 percent, as observed in the US from 1980 to 2000, thereby stimulating the formation of human capital stocks. Using panel data from 35 SSA countries for the period 1996-2018, Bazie, Thiombiano, and Maiga (2023) determined that corruption reduces the returns on education, which is not conducive to human capital accumulation.

In the case of Tunisia from 1987 to 2016, human capital amplifies the effect of corruption (Chokri & Anis, 2020). Generally, studies confirm the negative impact of corruption on growth and the positive impact of human capital. However, modern research does not sufficiently address the mutual influence of corruption, human capital, and economic growth across countries with different levels of economic development. In this context, the purpose of this article is to identify the features of the relationship between economic growth, corruption, and components of human capital in EU candidate countries.

The realization of the research objective involves verifying the following hypotheses:

H1: The strength of the relationship between the level of economic development and the level of corruption differs among EU candidate countries;

H2: The strength of the relationship between the level of corruption and human capital development indicators is different for EU candidate countries;

H3: The strength of the relationship between economic development and human capital development indicators varies across EU candidate countries.

The structure of the study is as follows: a theoretical background, which includes an analysis of the relationship between human capital and economic growth and an assessment of the relationship between economic growth and corruption; a section on data and research methods; a section describing the procedures and results of the study; and finally, discussions and conclusions.

2. Literature Review

2.1. Economic growth and human capital

Research on the relationship and mutual influence of economic performance and human capital has been conducted since the theory of human capital emerged as a scientific concept. Most studies confirm the positive influence of human capital on economic growth. Pelinescua (2015) emphasizes the important role of human capital in achieving economic growth. Additionally, scholars note that human capital contributes to financial and economic development (Saroj et al., 2023) and increases the well-being of the population (Kucharčíková, 2014).

Some researchers confirm this relationship using large samples. For instance, Ali et al. (2018) analysed data from 132 countries, Bayraktar-Sağlam (2016) studied data from 90 countries for the period 1970-2010, and Matousek and Tzeremes (2021) examined data from 100 countries for the period 1970-2014. They note that the positive effect of human capital on economic growth increases with higher levels of education. Several studies analyse specific groups of countries. Adeleye et al. (2022) support these findings for 19 MENA countries over the period 1980-2020. Eftimoski (2022) and Ogbeifun & Shobande (2022) obtained similar results for OECD countries.

At the same time, there is a negative relationship between education and economic growth in resource-rich countries, as often a highly educated labour force remains untapped in a resource-based economy (1990-2019, Saudi Arabia example) (Almutairi, 2023). Meanwhile, Yu (2015) points out that human capital, in interaction with social capital, can contribute to growth. Furthermore, human capital influences growth in Brazil (de Abreu Pereira Uhr et al., 2020).

Nevertheless, research shows that this relationship varies across countries. Ali et al. (2022) found it to be positive and significant in high-income countries but insignificant in low-income countries. Sultana, Dey, and Tareque (2022) found it to be positive for 93 developing countries, while increasing life expectancy limits economic growth in 48 developed countries. Ali et al. (2021) identified a significant positive relationship between human capital and economic growth for 12 low-income countries from 1980 to 2016. Meanwhile, Qadri and Waheed (2013) revealed that the return on human capital investment is greater in low-income countries. Analyses for 1970-2010 by Akpolat (2014) showed that investment in physical capital and education is more effective in developed countries than in developing ones.

In addition, the relationship between the analysed indicators varies by regions. Consequently, many researchers emphasize the importance of considering regional and country-specific contexts.

There is a great deal of research focusing on the African continent. Human capital leads to economic growth in 9 SSA countries (Kagochi & Durmaz, 2020), in 22 African countries (Boccanfuso et al., 2013), and in 35 SSA countries for the period 1980-2008, with health contributing more than education (Ogundari & Awokuse, 2018). Human capital impacts economic growth in Mauritius (Neeliah & Seetanah, 2016), Kenya in the long run (Alani, 2018), South Africa from 1993 to 2016 (Ngepah et al., 2021), and Ethiopia from 1980 to 2020 (Wegari, Whakeshum & Mulatu, 2023). Human capital along with technology has a significant positive impact on economic growth in Nigeria (Sulaiman et al., 2015). However, this contribution is insignificant for 9 SSA countries during 1980-2014 (Karambakuwa et al., 2020). Mengesha & Singh (2023) highlight the role of higher and secondary education and the impact of education along with life expectancy on growth in Ethiopia. Khalafalla & Suliman (2013) found that the quality of education plays a significant role in ensuring economic growth in Sudan for the period 1982-2009. Enrollment in higher education has a positive and significant impact on growth in the short run in Nigeria from 1984 to 2016, while enrollment in secondary and primary education does not (Raifu et al., 2021).

Scientists are also interested in determining the link between growth and human capital in Asia. Researchers found such a relationship in Indonesia (Affandi et al., 2019; Prasetyo & Kistanti, 2020), India (Khan, Ganai & Bhat, 2022), and in multiple countries including Indonesia, Malaysia, Philippines, Thailand, and Vietnam (Rahman et al., 2022). Similar findings were observed in Saudi Arabia (Mahmood & Alkahtani, 2018; Islam & Alhamad, 2023) and Pakistan in both the long and short term (Luqman & Soytas, 2023). For certain South Asian countries (data from 1981-2016), human capital also had a significant impact (Qamruzzaman et al., 2021). This relationship was evident in Malaysia (Mohamad Rusli & Hamid, 2014), Singapore in the long run (Maitra, 2016), and in ASEAN countries (Budsayaplakorn & Sompornserm, 2021). However, Wang et al. (2022) found that the economic growth rate lagged behind human capital growth in Shandong Province, China, from 2005 to 2019. Academics conclude that both quantitative and qualitative characteristics of human capital are important. Human capital reduces poverty and promotes growth in East Java Province (Chotib, Suharto & Lucik, 2019). Health expenditure positively impacts Pakistan's economic growth rate in the short run, while education expenditure does so in the long run (Azeem et al., 2013). Overall, spending on education contributes to growth in East and South Asia (Siddiqui & Rehman, 2017).

Scholars also address the issues of growth in America. For example, increasing human capital does not contribute to economic growth in Honduras (Villela & Paredes, 2022), but it has a positive long-term impact in Brazil (Doré & Teixeira, 2023). This influence is greater in counties with a high quality of life (USA, 2000-2007) (Fan, Goetz & Liang, 2016). Increasing educational attainment reduces inequality and accelerates growth in Latin America from 1980 to 2009 (Gaona & Vásquez, 2021). Thus, it can be concluded

that the direction and strength of the relationship between the analysed indicators vary across most countries and regions.

In some countries, the relationship between human capital and growth is unidirectional. The results of the Granger causality test showed that there is unidirectional causality from both health and education expenditure to growth rate in Bangladesh (Islam & Alam, 2022). Budsayaplakorn and Sompornserm (2021), using data from 1990 to 2018 and the Granger causality test, determined that education growth causes GDP growth in 10 ASEAN countries. Chani et al. (2014), using the Granger causality test for Pakistan, determined that inequality in human capital does not lead to inequality in income, whereas inequality in income causes inequality in human capital. Mehrara and Musai (2013), using a sample of 101 developing countries and applying the Granger test, found a strong long-run causal relationship from GDP to human capital with no feedback effect for the period 1970-2010. The results of the study by Sehrawat and Giri (2017) for the period 1984-2013 in Asian countries, using the Granger test, showed that causality runs from growth to human capital.

In other cases, the relationship is bidirectional. Anoruo and Elike (2015), using the dynamic least squares method, confirmed this fact for 29 African countries. Qamruzzaman et al. (2021) reached similar conclusions for South Asian countries for the period 1981-2016, and Boztosun et al. (2016) found this relationship for Turkiye over the period 1961-2011 in the long run. A Granger test of data from 1971 to 2010 showed that this relationship is bidirectional in Mexico and that it is significantly greater than the impact of physical capital (Garza-Rodriguez et al., 2020).

Jihène (2013), using the Granger test, determined that growth and higher education are cointegrated in Japan and Korea over the period 1960-2012, while they are not in Tunisia and Morocco. Using regression data analysis, Duan et al. (2022) found that the link between human capital indicators and growth is non-linear in BRICS countries during the period 2000-2018. Zolkover et al. (2021), using the Granger test and cognitive modelling, determined that the influence of human capital on the Ukrainian economy is ambiguous. On the one hand, human capital contributes to economic development. On the other hand, this positive impact is offset by state policies that increase investment in education and healthcare and by the incompetence of public authorities.

Human capital can significantly or insignificantly affect economic growth. Therefore, researchers do not limit themselves to analysing just human capital; they introduce other factors to identify patterns and features of their impact on growth. The complementarity of foreign direct investment (FDI) and human capital affects growth in North Africa (Mohamed Sghaier, 2022; Özdoğan Özbal, 2021) but does not have a significant impact in SSA for 1999-2017 due to insufficient skilled labour in the region (Anetor, 2020). Foreign financial flows can have both negative and positive impacts on growth. High levels of human capital reduce the negative effects of financial flows on growth (Dinh Su & Phuc Nguyen, 2022). Rajab and Zouheir (2023) found that in 15 least developed African countries, human capital and FDI do not significantly contribute to economic growth. The reason is the lack of education of the workforce to absorb the investment. Using data from

Pakistan for the period 1980-2017, the Granger causality test showed that human capital influences growth through FDI (Habib-Ur-Rahman, Ghazali & Bhatti, 2020).

Therefore, numerous recent studies indicate that human capital and economic growth are interrelated. However, determining the features and manifestations of this relationship requires additional study. While differences in the relationship between countries that vary significantly in economic development, geographical location, cultural context, and political system are understandable, differences in countries with similar socio-economic conditions raise many questions. One such question is: why do some countries see high returns on similar levels of human capital investment in the form of increased labour productivity and GDP growth, while others do not? This suggests that there are factors that either enhance or negate the effect of human capital. The number and degree of impact of these factors vary from country to country.

2.2. Economic growth and corruption

Corruption is a significant factor that complicates the implementation of socio-economic policies and slows development. It is one of the most substantial obstacles to achieving the state's development goals. Corruption hinders the efficient allocation of resources, worsens the business environment, discourages inward investment, and causes brain drain.

Widespread corruption hinders the realization of free competition and a market economy. Businesses that cannot receive preferences find themselves at a disadvantage compared to local favourites. High levels of corruption make doing business more difficult and significantly increase transaction costs. As a result, large companies are forced to either engage in corrupt relations with local elites or move their activities to countries with better institutional conditions. For small and medium-sized firms, high levels of corruption can lead to a significant decline in income and the transfer of some activities to the shadow economy to reduce overall business costs. Hence, corruption directly impacts the economy in most countries and regions, typically negatively. Numerous studies confirm this. Corruption adversely affects economic growth in many countries, including Nigeria (Odi, 2014), Indonesia (Alfada, 2019), Ghana (Forson et al., 2015), India (Bhattacharyya & Jha, 2013), Vietnam (Anh et al., 2016), South Africa (Olamide & Maredza, 2023), and African countries in general (d'Agostino et al., 2016). Ikazaki (2014) notes that if corruption is widespread, growth rates may be negative. Kunieda et al. (2016) also confirm this. The mechanisms by which corruption impacts the economy vary. Gründler and Potrafke (2019), based on an analysis of data from 175 countries for 2012-2018, concluded that corruption negatively affects growth by reducing FDI and increasing inflation.

Scholars note that corruption holds back GDP levels and growth rates in both developed and developing countries. Afonso et al. (2022) found that for 48 countries from 2012 to 2019, higher corruption levels were associated with lower economic activity levels. Using a case study of 13 Asian countries from 2009 to 2018, Das et al. (2020) proved that corruption slows down growth in the region. Although there are some instances where corruption may incentivize innovation, generally, it is an obstacle to long-term growth.

In general, the level of corruption is higher in developing countries, and its impact

on growth is ambiguous. Spyromitros and Panagiotidis (2022) assessed manifestations of corruption in 83 developing countries from 2012 to 2018 and determined that it negatively affects growth. However, scholars argue that corruption does not necessarily hinder growth when other factors favour it. Typically, corruption hinders economic activity, but scholars have come to the equivocal conclusion that, under certain conditions, developing economies can benefit from increased corruption. For example, Nguyen & Luong (2020) found that corruption positively affected growth in Asian developing countries from 2000 to 2015. By applying the Granger causality test to data from the Gulf countries for 2003 to 2016, Belloumi & Alshehr (2021) determined that corruption does not lead to economic growth. While sometimes positive manifestations of corruption are possible, such as bribery helping to eliminate bureaucratic procedures, the overall impact is generally negative.

Despite the individual benefits that corruption provides to certain interest groups – such as preferential business terms, access to government funding, public transfers, subventions and subsidies, tax incentives, concessional loans, direct government support, and tax evasion - all these factors can act as growth stimulators in the short term, as they contribute to income growth. However, this relationship does not account for the lost budget revenues, the negative societal image of the state, and the further deterioration of the country's reputation. These issues negatively affect the inflow of foreign investment and worsen business conditions, ultimately leading to decreased long-term growth.

Corruption affects all spheres of society and ultimately reduces the efficiency of human capital implementation. A study of Vietnamese provinces showed that corruption generally has a negative impact on human capital, despite some local advantages (Thi Hoa, 2020). Furthermore, corruption negatively affects the education system in African universities (Seka, 2013).

This study aims to identify the features of the relationship between key indicators of a country's development: economic growth, corruption levels, and human capital development, focusing on European Union candidate countries.

3. Data and methods

This study uses annual data from 1996 to 2021[1] for nine EU candidate countries. These countries are making important political and economic decisions to align their domestic regulations with EU requirements. The implementation of reforms is a complicated process, often slowed down by corruption and the disinterest of certain groups in the necessary changes.

The research uses the following World Development Indicators (2023) for analysis:

GDP – GDP per capita (current US$) to assess the level of economic well-being;

CC – Control of Corruption: Estimate, an indicator of the state of corruption in the country (Kaufmann, Kraay & Mastruzzi, 2010);

[1] The period 1996-2021 is the time period for which comparable data are available for all countries. The indicator control of corruption began to be published in 1996, 2021 is the year for which data are available for all analysed countries.

LEB – Life Expectancy at Birth (years);

EI – Education Index, calculated based on *EYS* (Expected Years of Schooling, years) and *MYS* (Mean Years of Schooling, years):

$$EI = \frac{\frac{EYS}{18} + \frac{MYS}{15}}{2}$$

The last two indicators characterize the level of human capital development in society.

The research methodology includes the following methods:

- correlation analysis: to determine the relationship between indicators;
- logarithm procedure: to transform time series into logarithmic form;
- calculation of the Augmented Dickey-Fuller test: to check the stationarity of time series;
- determination of the first and second differences of logarithms: for non-stationary time series to bring them to stationary form;
- calculation of the Granger causality test: to determine the direction of causality between indicators.

4. Results

The main problem for EU candidate countries is that corruption and insufficient support for human capital development exacerbate the existing gap in economic development indicators compared to EU member states. To address this issue, it is necessary to determine the direction of these impacts.

In the preliminary stage, we determine whether there is a relationship between the analysed indicators by calculating the correlation between indicators across countries (Table 1).

Table 1. Pearson correlation coefficients between GDP, CC, LEB and EI

Indicator	GDP	CC	LEB
Albania			
CC	0,86		
LEB	0,83	0,85	
EI	0,91	0,84	0,86
Bosnia and Herzegovina			
CC	-0,36		
LEB	0,61	0,06	
EI	0,91	-0,45	0,48
Georgia			
CC	0,94		
LEB	0,90	0,94	
EI	0,82	0,84	0,80

Indicator	GDP	CC	LEB
Moldova			
CC	0,02		
LEB	0,80	-0,35	
EI	0,91	-0,27	0,95
Montenegro			
CC	0,86		
LEB	0,83	0,88	
EI	0,94	0,92	0,92
North Macedonia			
CC	0,74		
LEB	0,85	0,68	
EI	0,96	0,66	0,89
Serbia			
CC	0,77		
LEB	0,81	0,80	
EI	0,91	0,83	0,95
Turkiye			
CC	0,60		
LEB	0,87	0,22	
EI	0,76	-0,00	0,94
Ukraine			
CC	0,46		
LEB	0,62	0,39	
EI	0,76	0,60	0,61

Note: The noted correlations are significant at the level $p < 0.05$
Source: Author's computation with data from World Bank using Statistica

Table 1 shows that in most cases, there is a significant relationship between the indicators. However, this relationship varies from country to country, and the correlation coefficients can be both positive and negative. Therefore, the next stage of the study is to identify the specific features of these relationships. Graphs of the indicators by countries are presented in Figure 1.

Since the original data had different units of measurement, it was necessary to convert the time series into logarithmic form. Logarithmic values make the analysis more meaningful and easier to interpret, as they bring the series within a single range. Additionally, because the Control of Corruption indicator ranges from -2.5 to 2.5, we adjusted it to a positive scale before applying the logarithm by adding 2.5 to each value, resulting in a new scale from 0 to 5. Graphs of the logarithms of the indicators by countries are presented in Figure 2.

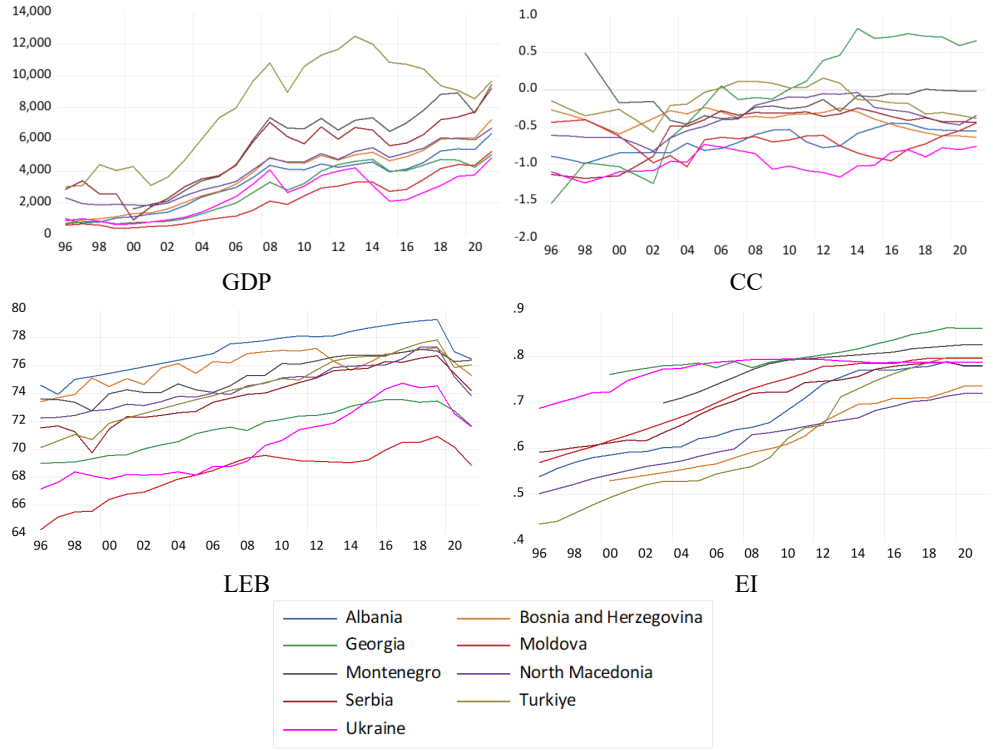

Figure 1. Graphs of indicators by countries

Source: Author's computation with data from World Bank using EViews

Figure 2 shows that the graphs of the logarithms of the analysed indicators exhibit trend areas, indicating the possible non-stationarity of these time series. Additionally, some trends have similar trajectories. Therefore, the next stage of the study is to determine the order of integration of the series, i.e., to check whether these series are stationary. To do this, the paper calculates the Augmented Dickey-Fuller Unit Root Test (ADF-test) for the series lgGDP, lgCC, lgLEB, and lgEI. The stationarity check procedure is performed separately for each time series.

The p-values for the logarithms of the indicators, their first and second differences by countries are provided in Table 2.

The essence of the Dickey-Fuller test is to compare the calculated test value with McKinnon's τ-statistic. The series is considered stationary if the p-value is less than 5% and McKinnon's τ-statistic is greater than the absolute values of the critical value at the 1%, 5%, and 10% significance levels. As shown in Table 3, most of the time series for all countries are non-stationary, with non-stationary series highlighted in grey. However, some series, such as lgCC (Moldova, Montenegro), lgGDP (North Macedonia), and lgEI (Montenegro, Turkiye, Ukraine), are stationary. Thus, the results of the ADF-test indicate that most logarithmic time series are non-stationary, necessitating the use of logarithmic time series on the scale of first and second differences in the next step of the research.

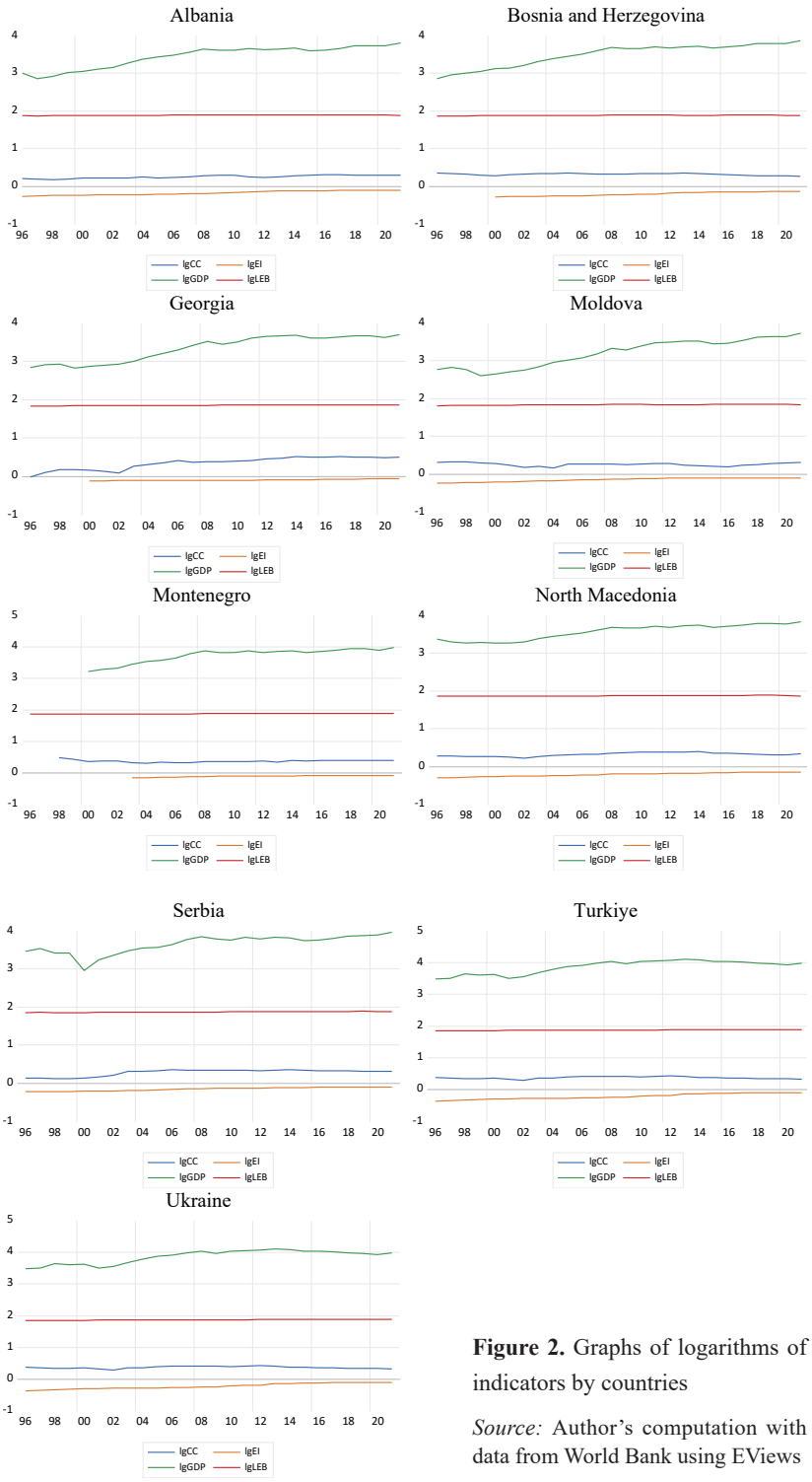

Figure 2. Graphs of logarithms of indicators by countries

Source: Author's computation with data from World Bank using EViews

Table 2. P-values for the analysed indicators

Country	Indicator	p-value for the logarithm of the indicator (lg)	p-value for 1 difference logarithm of the indicator (D1lg)	p-value for 2 difference logarithm of the indicator (D2lg)
Albania	GDP	0.0058	0.0003	0.0001
	CC	0.0427	0.0333	0.0006
	LEB	0.9978	0.0009	0.0000
	EI	0.0801	0.2604	0.0360
Bosnia and Herzegovina	GDP	0.8088	0.0265	0.0001
	CC	0.9139	0.0829	0.0001
	LEB	0.8604	0.0007	0.0020
	EI	0.7403	0.3835	0.0029
Georgia	GDP	0.6929	0.0106	0.0000
	CC	0.1450	0.0017	0.0003
	LEB	0.4323	0.4997	0.0000
	EI	0.9255	0.3225	0.0000
Moldova	GDP	0.6382	0.0481	0.0000
	CC	0.0466	0.0035	0.0000
	LEB	0.9845	0.0056	0.0014
	EI	1.0000	0.2035	0.0002
Montenegro	GDP	0.6797	0.0362	0.0010
	CC	0.0322	0.0043	0.0000
	LEB	0.5619	0.0015	0.0001
	EI	0.0585	0.6695	0.2306
North Macedonia	GDP	0.0187	0.0193	0.0002
	CC	0.9383	0.0656	0.0001
	LEB	0.0992	0.0742	0.0016
	EI	0.9056	0.0032	0.0000
Serbia	GDP	0.3250	0.0008	0.0112
	CC	0.9710	0.0211	0.3149
	LEB	1.0000	0.0340	0.0001
	EI	0.9975	0.0725	0.0000
Turkiye	GDP	0.9169	0.0043	
	CC	0.8792	0.0029	
	LEB	0.9438	0.0007	
	EI	0.0261	0.0366	
Ukraine	GDP	0.8223	0.1060	0.0009
	CC	0.6372	0.0019	0.0000
	LEB	0.4087	0.9562	0.0000
	EI	0.0000	0.8695	0.1361

Source: Author's computation with data from World Bank using EViews

The classical way to transform non-stationary series into stationary ones is by taking successive differences. Using the first differences of the logarithms of the indicators is one de-trending method. The next step is to apply the Dickey-Fuller testing procedure to the transformed series. If the series in the first difference of logarithms is stationary, the analysis can proceed to determine the causality between the analysed indicators. If the series remains non-stationary, it is transformed to the second difference. The Dickey-Fuller Unit Root Test is then calculated for the second difference of logarithms, and the stationarity check procedure is repeated.

The results of the Dickey-Fuller test (Table 3) show that all four indices are stationary in first differences of logarithms for Turkiye only, as McKinnon's τ-statistics are smaller than the critical values at the 1%, 5%, and 10% significance levels. For the other countries, some indicator series are stationary, while others are non-stationary. Including variables in different types of differences for causal analyses is not desirable. Therefore, the next stage is to transform the series into stationary ones for all countries except Turkiye by converting them to the second difference of logarithms.

The results of the Dickey-Fuller test for the second difference of logarithms demonstrate that the null hypothesis of a unit root is rejected ($p < 0.05$) for all four time series in Albania, Bosnia and Herzegovina, Georgia, Moldova, and North Macedonia. Consequently, we can assume stationarity of these time series for all indicators in these countries. In Serbia, three of the four series are stationary, except for the D1lgEI series. However, the null hypothesis cannot be rejected for D2lgEI (Montenegro), D2lgCC (Serbia), and D2lgEI (Ukraine), indicating that these series are non-stationary in the second difference. Therefore, these three time series were excluded from further causality analyses.

The next step is to determine the causality between the analysed indicators. Unlike correlation analysis, causal analysis allows us to determine the dynamics of the interaction, specifically the direction of causal relationships.

The study uses Granger's test to determine the causal relationship between the variables. Since the Granger test is sensitive to the number of lags (m), it is appropriate to perform this test for different values of m. Tests were calculated for lags $m = 2, 3, 4$, and 5. The choice of the number of lags is also supported by the rule that the number of lags should not exceed the number of observations divided by 4.

The paper examines the results of causal analysis using F-statistic values and their corresponding p-values to determine causality. The results of the Granger test are used to verifies the null hypothesis that "A does not Granger Cause B." The criterion for accepting or rejecting the hypothesis is based on the obtained p-value. To reject the null hypothesis at the 5% significance level, the p-value must be less than 0.05. If the p-value is less than 0.05, the null hypothesis is rejected.

Table 3 provides a visual representation, illustrating the direction of causality between the analysed variables.

Table 3. Interpretation of the Granger causality test

Lag / Country	m=2		m=3		m=4		m=5	
	F-Statistic	**Prob.**	**F-Statistic**	**Prob.**	**F-Statistic**	**Prob.**	**F-Statistic**	**Prob.**
Georgia	2 difference							
	no relationship between the indicators		no relationship between the indicators		no relationship between the indicators		11.9161	0.0162
				lgLEB → lgEI				
Moldova	2 difference							
	4.00713	0.0375	no relationship between the indicators		no relationship between the indicators		3.73120	0.0486
	lgEI → lgGDP				lgCC→ lgGDP			
				3.74643	0.0481			
				lgEI → lgGDP				
Montenegro	1 difference							
	6.92969	0.0081	5.34963	0.0162	no relationship between the indicators		no relationship between the indicators	
	lgLEB → lgGDP		lgLEB → lgGDP					
		7.66412	0.0034					
		lgLEB → lgCC						
Serbia	1 difference							
	9.95332	0.0012	10.9475	0.0005	6.96868	0.0039	4.33112	0.0276
	lgLEB → lgGDP		lgGDP → lgCC		lgGDP → lgCC		lgGDP → lgCC	
		5.14265	0.0121	10.3903	0.0007	9.54035	0.0021	
		lgLEB → lgGDP		lgLEB → lgCC		lgLEB → lgCC		
	2 difference							
	13.0152	0.0004	4.77461	0.0170	no relationship between the indicators		no relationship between the indicators	
	lgLEB → lgGDP		lgLEB → lgGDP					
Turkiye	1 difference							
	4.12331	0.0336	4.91490	0.0142	4.43234	0.0198	3.56791	0.0469
	lgGDP → lgCC		lgGDP → lgCC		lgLEB → lgCC 6.21196 0.0092 lgLEB → lgCC		lgGDP → lgCC	
		7.09653	0.0034					
		lgLEB → lgCC						

Source: Author's computation with data from World Bank using EViews

The analysis showed that there is a long-term causal relationship from CC to GDP only in Moldova. In Montenegro, Serbia, and Turkiye, there is a causal relationship from GDP and LEB to CC. This suggests that high income and education levels lead to less corruption in the long run. Thus, the control of corruption has no direct impact on economic growth and human capital components in the analysed countries. At the same time, there is a direct causal relationship from EI to GDP in Moldova, from LEB to EI in Georgia, and from LEB to GDP in Serbia and Montenegro. Discrepancies in the direction and strength of the relationship between these indicators, as well as the reasons for the absence of such relationships, can be explained by differences in the institutional

systems of society and the socio-economic situations in these countries. The study found no evidence of causality in the relationships between the analysed variables for Albania, Bosnia and Herzegovina, North Macedonia, and Ukraine.

The progress of EU candidate countries is often assessed through official evaluations by the European Commission based on the Copenhagen criteria[2]. Additionally, progress can be determined by comparing the state's position in international rankings, which display the country's advancements in various measurements. Table 4 presents the positions of EU candidate countries in several international rankings, reflecting their political, economic, and institutional progress.

Table 4. Comparison of positions of EU candidate countries in international rankings

Country	Economic Freedom			Freedom in the World			Rule of Law Index			Corruption Perception Index		
	Year		Trend	Year		Trend	Year		Trend	Year		Trend
	Value			Value			Value			Value		
Albania	2005*	2021		2013*	2021		2015*	2021		2012*	2021	
	7,05	7,60	0,55	63	66	3	0,52	0,49	-0,03	33	35	2
Bosnia and Herzegovina	2005	2021		2013	2021		2015	2021		2012	2021	
	6,31	6,66	0,35	62	53	-9	0,57	0,52	-0,05	42	35	-7
Georgia	2005	2021		2013	2021		2015	2021		2012	2021	
	7,41	7,71	0,30	60	60	0	0,65	0,61	-0,04	52	56	4
Moldova	2005	2021		2013	2021		2015	2021		2012	2021	
	6,54	7,18	0,64	65	61	-4	0,48	0,51	0,03	36	36	0
Montenegro	2005	2021		2013	2021		2015	2021		2012	2021	
	6,05	7,59	1,54	72	63	-9	-	-		41	45	4
North Macedonia	2005	2021		2013	2021		2015	2021		2012	2021	
	6,88	7,06	0,18	64	66	2	0,55	0,53	-0,02	43	39	-4
Serbia	2005	2021		2013	2021		2015	2021		2012	2021	
	5,82	6,85	1,03	78	64	-14	0,5	0,49	-0,01	39	38	-1
Turkiye	2005	2021		2013	2021		2015	2021		2012	2021	
	6,39	6,32	-0,07	61	32	-29	0,46	0,42	-0,04	49	38	-11
Ukraine	2005	2021		2013	2021		2015	2021		2012	2021	
	5,41	6,17	0,76	57	60	3	0,48	0,51	0,03	26	32	6

Note:
The maximum progress for the period is highlighted in red in the table, and the minimum in blue;
* - the minimum year for which there are indicator values for all analysed countries.
Source: Author's computation with data from:

- Economic Freedom (scale from 0 (worst value) to 10 (best value). https://www.fraserinstitute.org/economic-freedom/
- Freedom in the World (scale from 0 (worst value) to 100 (best value). https://freedomhouse.org/;
- WJP Rule of Law Index (scale from 0 (worst value) to 1 (best value). https://worldjusticeproject.org/rule-of-law-index/
- Corruption Perception Index (scale from 0 (worst value) to 100 (best value). https://www.transparency.org/

[2] - stability of institutions guaranteeing democracy, the rule of law, human rights and respect for and protection of minorities;

- a functioning market economy and the ability to cope with competitive pressure and market forces within the EU;

- the ability to take on the obligations of membership, including the capacity to effectively implement the rules, standards and policies that make up the body of EU law (the 'acquis'), and adherence to the aims of political, economic and monetary union.

The information in Table 4 shows a decline in all indicators for Turkiye, which is confirmed by the existence of a causality from all indicators to control of corruption. Bosnia and Herzegovina shows no progress in the analysed indicators. Ukraine, despite having low index values compared to the other analysed countries, demonstrates the most significant improvement in these values. In general, the data in Table 4 are consistent with the results of the Granger causality test and demonstrate progressive movement towards achieving the Copenhagen criteria targets for the majority of candidate countries.

5. Discussions

The role of human capital in socio-economic development is well established and is often accepted as an axiom. A more skilled, educated, and healthy workforce ultimately shows higher productivity and, as a result, earns higher wages (Benos & Karagiannis, 2016; Annabi, 2017; Kampelmann et al., 2018; Ezoji et al., 2019; Yu et al., 2022). Increased labour productivity leads to improved economic growth indicators and rates, contributing to the economic well-being of citizens and society as a whole. This logic justifies the need to invest in human capital by improving healthcare and education systems (Romer, 1990). However, in reality, this does not always happen. Often, countries recognize the importance of human capital for growth but do not adequately invest in its development. Additionally, the return on investment in human capital can vary from country to country even with similar levels of funding. Clearly, there are factors that either hinder or facilitate the realization of human capital's potential.

The European Union countries recognize the need to develop human capital. Furthermore, several studies focus on the role of human capital in ensuring economic growth in Europe. Human capital significantly contributes to economic growth in Macedonia (Lazarov & Petreski, 2016), Slovakia (Rafaj & Rehák, 2017), and various EU regions (Laskowska & Dańska-Borsiak, 2016). Barcenilla-Visús & López-Pueyo (2018) highlight the impact of human capital on total factor productivity and, consequently, on economic growth in EU countries. In the context of the formation of Society 5.0, which emphasizes the integration of digital technologies into society, the importance of managing human capital development is increasing (Stryzhak, 2022). This increasing importance cannot be ignored.

There are many factors influencing the relationship between human capital and economic growth, and these factors vary from country to country. Scholars have attempted to explain the reasons for these variations. For instance, Khalfaoui & Derbali (2021) conclude that this relationship depends on the efficiency and productivity of human capital rather than on labour market mechanisms. In Kazakhstan, the low economic effect of investments in healthcare and education indicates inefficiency and a non-innovative economy (Kussaiynov et al., 2020). These findings confirm that numerous factors influence the level of human capital development.

The positive impact of human capital on the economy is evident, especially in developed countries with low levels of corruption. Although developed countries have not

completely eliminated corruption, its negative impact on socioeconomic relations is more significant in developing countries.

While the study did not show a causal relationship for countries such as Albania, Bosnia and Herzegovina, North Macedonia, and Ukraine, at the same time, it is worth noting some patterns that were identified for these countries. In Albania, Bosnia and Herzegovina and North Macedonia there is an average level of life expectancy and gross domestic product production, with an average level of education for Albania and Bosnia and Herzegovina, and low for North Macedonia, and an average level of corruption in society for Bosnia and Herzegovina and North Macedonia and high for Albania compared to other analysed countries. The absence of pronounced causal relationships in this case can be explained by the transformation of the institutional system of society in these countries, since a number of reforms necessary for EU accession are being implemented there.

The situation in Ukraine is fundamentally different: with high levels of both corruption and education, there is a low level of both GDP production and life expectancy. This can be explained by the low quality of state institutions, lack of mechanisms of public control over the use of allocated funds, when public expenditures on education and health care are distributed using corrupt schemes, and most of the funds do not reach the addressees. Also, with a high level of corruption, a formally high level of education is not an indicator of its quality, which ultimately does not lead to high labour productivity and high return on human capital, expressed in the corresponding levels of GDP production.

There is no doubt that EU candidate countries need to implement the successful experiences of developed EU countries in managing human capital and overcoming corruption. Reducing corruption and ensuring sustainable GDP growth rates is possible through the implementation of institutional norms that have proven effective in developed economies. However, harmonizing legislation with EU requirements does not guarantee the effective operation of these norms. It is essential for society to accept them, which is a long process. Nevertheless, the desire to integrate into the common European space provides a strong incentive for many countries to implement reforms more quickly than they were initially adopted by developed countries.

Corruption remains one of the main challenges to the implementation of the European development path for EU candidate countries. It obstructs the realization of human capital and limits competition in the labour market by providing undue benefits based on corrupt ties. For businesses, corruption manifests mainly through unfair advantages granted to corrupt business structures by lobbying for the interests of ruling elites. On one hand, the fight against corruption is the responsibility of the legislative and executive branches of the state; on the other hand, it is the personal responsibility of every citizen. In this context, it is important to establish not only an anti-corruption legislative framework but also to foster a culture of non-acceptance of corruption within society. Increasing transparency, tightening public control over authorities at all levels, and strengthening the mechanisms of fair punishment will help prevent corrupt practices and reduce the motivation to participate in corruption schemes.

The issues surrounding further enlargement of the EU are closely related to the strengthening of China's position in the international arena and the increasing influence of the USA. The admission of new candidate countries to the EU has heightened the significance of many problematic moments related to political, economic, cultural, and religious aspects. As Basheska (2022) found, EU enlargement is primarily a political process. Nevertheless, the rule of law, rather than political interests, should play a decisive role in EU enlargement. Membership in the EU does not guarantee prosperity and economic well-being for candidate countries without the implementation of necessary legal and institutional reforms, including those to control corruption (Mahmutefendic, 2019).

The problem of EU enlargement has not only a geographical but also an economic and political basis. Both the level of GDP in candidate countries and the development of their legal systems are important, especially in terms of compliance with legal norms in society. As Economides, Featherstone, & Hunter (2023) and Dabrowski (2022) remark, issues of further EU enlargement are closely related to integration. Integrating the economies of candidate countries into the EU economic system involves not only economic considerations but also the political will of both the governments and citizens of EU countries.

6. Conclusions

The study found differences in both the direction and strength of the causal relationships between components of human capital, corruption control, and economic growth in EU candidate countries. In some cases, no such relationship exists.

The testing of hypothesis H1, which posits a possible relationship between the level of economic well-being and the level of corruption, showed a statistically significant correlation between these indicators for all countries except Bosnia and Herzegovina and Moldova. Granger causality was found from CC to GDP in Moldova and from GDP to CC in Serbia and Turkiye.

The testing of hypothesis H2, which examines the relationship between the level of corruption and human capital development indicators, showed a statistically significant correlation for all countries except Moldova. The study found a weak correlation between CC and EI in Bosnia and Herzegovina. The calculations also revealed a causal relationship from LEB to CC in Montenegro, Serbia, and Turkiye.

Hypothesis H3, which assumes a relationship between the level of economic well-being and human capital development indicators, was confirmed for all countries without exception using Pearson correlation. The Granger test showed a causal relationship from EI to GDP in Moldova and from LEB to GDP in Serbia and Montenegro.

The absence of a causality between GDP indicators and human capital components, in the author's opinion, does not mean that it does not exist. It is likely that a relationship exists but manifests indirectly through other factors not included in this analysis. For example, Altinok & Arslan M.O. (2020) discovered there is bidirectional causality between real GDP and public expenditures for Albania and Bosnia and Herzegovina and

unidirectional from real GDP to public expenditures for North Macedonia. Xhindi, Kripa & Shestani (2020) found a causal two-way relationship between health expenditure and GDP per capita for Albania. Lazarov & Petreski (2016) figured out that human capital, expressed by gross enrollment in secondary education, contributes to economic growth, expressed by real GDP per capita in Macedonia. In the case of Ukraine Letunovska, Abazov & Chen Y. (2022) determined that an increase in the level of health leads to an increase in the level of competitiveness at the regional level, Zolkover et al. (2021) concluded that HCI has an impact on GDP, but an increase in education and health expenditure does not lead to economic growth.

Additionally, it should be noted that the absence of a direct significant causality from control of corruption to important indicators of socio-economic development in countries with high levels of corruption, such as Albania, Bosnia and Herzegovina, North Macedonia, and Ukraine, suggests a complex interaction. The average CC values for the analysed period were -0.70, -0.41, -0.40, and -0.99, respectively (World Development Indicators, 2023). This suggests that corruption is closely interrelated with other indicators not examined in this paper. This phenomenon requires more careful study, which can be addressed in future research by including additional variables in the analysis.

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