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Original Paper

Development of selected economic and social indicators - a case study of V4 countries

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ABSTRACT
European communities were seen as a possibility to improve living standards in member countries and removing social and economic disparities among them while ensuring peacetime for its members. The success of first members led to membership of 27 countries with different backgrounds and quality of life. The year 2004 proved to be a challenge when 10 new, less developed countries entered the EU. The opportunities for these countries expanded and soon there was an increase of foreign investments leading to increase of the GDPs and economies. Since then, there have been several negative plights, highly affecting economic performance. The last one was the COVID-19 pandemic that slowed down the whole world. This paper investigates the relationship between selected social and economic indicators in NUTS2 regions of the V4 countries – Poland, Slovakia, Czech Republic and Hungary. The goal was to find correlations between the GDP and gross fixed capital formation (GFCF) and social indicators such as unemployment rate, severe material deprivation and at-risk-of-poverty. Our results indicate correlation between the indicators, and we observe a positive impact of economic development on social conditions of the inhabitants, thus leading to better quality of life in observed countries.

KEYWORDS: gross domestic product, gross fixed capital formation, unemployment rate, employment rate, severe material deprivation, at-risk-of-poverty

JEL CLASSIFICATION: E10, E22, E24, I32, I38

INTRODUCTION

Establishing the European communities was seen as a way of improving the social and economic situation of the member states. It was meant to decrease the differences between urban and rural areas as well as individual member states. Throughout time the European

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communities were joined by new members and in 1993 they merged into the European Union. It was a relatively stable period and a promising project. Later, in 2004 the biggest enlargement of 10 new members occurred, including the V4 countries of Slovakia, Czech Republic, Hungary, and Poland. Their inhabitants believed in improving the living standards and equalization to older members and thus leveling the social and economic development. Unfortunately for them, this process needed a longer period due to several reasons. Apart from the historical aspects a global economic crisis in 2010 occurred and slowed down the whole process (Schwarcz et al., 2021). Furthermore, with turbulent political development and the breakout of the COVID-19 pandemic, the situation got worse for certain economic segments. The member states were not ready for such a situation, and the EU played an important role in finding solutions. The key focus was economic development and small and medium enterprises. Despite being an opportunity for refocused businesses, it hit dramatically main segments such as e.g. automotive, tourism, and food industry. The pandemic affected over 1 million jobs in the automotive industry only. Lowering tourism led to a decrease in air transportation when the traffic was down from 86 to 91% leading to several bankruptcies of smaller airlines. The food industry represents the triple helix consisting of hotels, restaurants, and cafés (HORECA). While restaurants could adapt to lessen the negative impacts due to changes in consumer behavior with the increase of deliveries, the hotels and cafés faced different challenges namely in lower numbers of users. On the other hand, food retailers have seen rises in demand, especially frozen food ("Impacts of the COVID-19 pandemic on EU industries | Think Tank | European Parliament, n.d.) ("The European Union in the COVID-19 storm," n.d.).

The COVID-19 pandemic introduced new challenges to the EU economy, including liquidity constraints and reduced cash flow. In response, the EU swiftly implemented measures aimed at easing access to credit, loans, and direct grants. These measures were recommended by the International Monetary Fund (IMF) specifically concerning small and medium-sized enterprises (SMEs). To mitigate the negative impact on unemployment, the EU also introduced measures to support income, wage subsidies, and initiatives focused on employers to retain their workforce. However, consumption faced significant challenges due to inflation during the period from 2020 to mid-2022. Interestingly, research has shown a negative relationship between the level of public debt and the intensity of economic support provided. Despite these complexities, the support measures implemented by the EU played a crucial role in lessening the pandemic's impact on economic growth, consumption patterns, and investment growth. (Cepoi et al., 2024).

One of the ways to boost the economy and foster capital formation is through investments. Investments not only stimulate economic activity but also positively impact employment rates and contribute to overall economic growth. Afiat et al. (2021) in their analysis found out a positive correlation between economic growth and gross fixed capital formation. This finding is further supported by Danawati et al. (2016); their research emphasizes that investments play a pivotal role in determining output levels. Afiat contends that investments serve as the bedrock for future development, creating job opportunities and ultimately reducing unemployment. When coupled with population growth, investment becomes a driving force in shaping economic progress (Afiat et al., 2021). Similar results were found by Pasara et al. (2020) who realized their research in South Africa. The unemployment, gross fixed capital formation formed the basis for economic development. The difference to European countries was the political situation which led to sanctions during the 1980s. In the 1990s a new government was formed, and the situation started to improve. It took more than 20 years to increase the average

economic rate from 1.4% to 5.2.% in 2004-2007 period. On the other hand, there was no correlation between economic growth and unemployment rate due to uncertainties in specific sectors (Pasara and Garidzirai, 2020).

We saw that investments form an important role in economic development but to increase them we need to either accumulate domestic capital or create conditions to attract foreign direct investments (FDI). They became so popular that in some cases they became the main funding source (OECD, 2014). These play an important role in boosting the economies, for example Slovakia and its automotive industry that started to develop in the 1990s when Volkswagen entered Slovak market. Entering the EU was the period that helped to boost the production and flow of FDIs, especially KIA and PSA Peugeot Citroen, both automotive producers who, apart from creating job positions, also made conditions for subcontractors that created even more job opportunities. By 2014 foreign capital accounted for 98% of automotive production (Pavlínek, 2018; Pavlínek, 2023). Moreover, the positive impact is not only the access to financial sources from outside but also the new interactions between the investor and beneficiary, e.g. access to new innovations or technologies. Amighini et al. (2017) found a positive relation between FDI and domestic gross fixed capital formation (GFCF) and claims that foreign investors engaged in productive activities increase the profitability of domestic investment more than those who are focused on trade. Thus, contributing more to GFCF whereas the trade focused investors are creating only channels for production mobility between the countries (Amighini et al., 2017).

Gross fixed capital formation in the Euro Area underwent a sharp decline during the COVID-19 pandemic, surpassing the contraction observed during the 2010 financial crisis. Initial predictions attributed this decline to reduced investments in machinery and equipment during the two quarters of 2019/2020. As a result, GDP decreased by 15%, and GFCF dropped by 23% due to rapid countermeasures such as lockdowns. However, the recovery was swifter compared to the financial crisis because the 2010 downturn unfolded gradually over several years. Additionally, the lack of investment during the pandemic was partially offset by robust support from the EU and national governments (Licchetta and Meyermans, 2022)

In the context of employment dynamics across countries and regions, Gross Fixed Capital Formation (GFCF) and research and development (R&D) investments play crucial roles. GFCF contributes to job creation through investments in physical assets, while R&D expenditure influences innovation ratios and overall competitiveness. A recent analysis examined the combined impact of GFCF, R&D spending, and European structural funds on employment at the NUTS2 level. The findings revealed several key points:

- GFCF and Cohesion Fund: GFCF, particularly when combined with the cohesion fund, significantly influences employment. Regions that prioritize GFCF tend to experience positive effects on job creation.
- R&D Expenditure: Surprisingly, R&D expenditure showed a rather non-significant impact on employment. This suggests that other factors play a more dominant role in shaping employment outcomes.
- Structural Funds Interaction: Interestingly, the interaction between structural funds and GFCF had a negative rather than positive effect. Further investigation is needed to understand this counterintuitive relationship.
- Innovation-Driven Impact: Overall, positive employment impacts were observed primarily in regions with a higher rate of innovative enterprises.

This study sheds light on the intricate relationship between investment strategies, structural funds, and employment dynamics. Policymakers and businesses should consider these findings when formulating strategies for sustainable economic growth (Destefanis and Ur Rehman, 2022).

Economic development alone is insufficient to ensure sustainable advancement. Focusing more on quantitative than qualitative aspects of knowledge, creativity and innovation will lessen the country´s competitivity. In V4 countries, these aspects are lower compared to the EU, due to the similar historical development but still there are high differences between V4 members, especially Czech Republic compared to the rest. GDP per capita is one of the economic indicators reflecting social differences as well. In Czech Republic it is over 90% of EU average. Further analysis has shown that in Czech Republic there are more innovative based job position as well as higher expenditures on R&D. there is a positive correlation between the salary levels compared to the number of innovative jobs (Csath, 2021).

Gross Domestic Product (GDP) at current market prices by NUTS 2 regions refer to the total value of goods and services produced within specific subnational regions (NUTS 2) of a country, measured in monetary terms without adjusting for inflation. It provides insights into regional economic performance and distribution. On the other hand, gross value added (GVA) represents the value added by each sector of the economy (including production, services, and construction) after accounting for intermediate consumption (inputs used in production). In summary, GDP and GVA provide essential insights into economic performance, and their analysis at the NUTS 2 level allows for a more granular understanding of regional trends. Researchers and policymakers rely on these indicators to inform economic policies and decision-making. (Eurostat, 2024).

Measuring social disparities is a bit complicated compared to economics because of availability of general statistics based on income or employment. According to the world bank, extreme poverty line was set at $2.15 per person per day. Anyone living on less than this amount is considered to be in extreme poverty. In 2019, approximately 701 million people globally were in this situation. The COVID-19 pandemic exacerbated global poverty, increasing the number of people in extreme poverty by about 70 million to 719 million (“Measuring Poverty Overview,” n.d.).

The EU-SILC (European Union Statistics on Income and Living Conditions) provides a comprehensive framework to assess poverty and living conditions across EU member states. It defines monetary poverty based on the risk-of-poverty threshold, which is set at 60% of the national median equivalised disposable income. Here are some key points:

- At-risk-of-poverty thresholds: Different thresholds are calculated, such as 40%, 50%, 60%, and 70% of the national median equivalised disposable income.
- At-risk-of-poverty rate: This rate measures the percentage of the population with an equivalised disposable income below the poverty threshold.
- Impact of Social Transfers: The data show how pensions and other social transfers affect the risk of poverty.
- Persistent Poverty: The persistent at-risk-of-poverty rate indicates the percentage of persons remaining at risk over a four-year period (“EU statistics on income and living conditions (EU-SILC) methodology - monetary poverty - Statistics Explained,” n.d.).

This paper fills a gap in the current literature by examining the regional correlations between economic growth and social vulnerability in the V4 countries specifically during the post-pandemic recovery period. Unlike national-level studies, our research highlights persistent regional disparities at the NUTS2 level, showing that increased capital formation does not always lead to an immediate reduction in poverty risk in these specific contexts. These findings offer a critical empirical foundation for regional policymakers to better align investment strategies with social stabilization measures.

MATERIAL AND METHODS

The main aim of our paper is to investigate the relationship between social and economic indicators within the NUTS 2 regions of Slovakia, Czechia, Poland, and Hungary. Specifically, we seek to understand how variations in social well-being indicators (such as unemployment rate, household income, and material deprivation) correlate with economic performance indicators gross domestic product, and gross fixed capital formation (GDP and GFCF). The partial aim is to identify commonalities or disparities across these regions regarding the impact of specific indicators on economic growth (GDP) and investment (GFCF).

The methodological approach comprised several key steps. The first step was a literature overview. We conducted an extensive literature review within our area of interest. Based on this review, we carefully selected social and economic indicators that we deem crucial for our analysis. Secondly, we selected the indicators and divided them into two groups. The first group included the following indicators, which we chose for detailed analysis:

- Gross Domestic Product (GDP) at market price
- Gross Fixed Capital Formation (GFCF)

The second group consisted of additional indicators:

- Unemployment rate
- Employment rate (overall and specifically for young people)
- Long-term unemployment
- Severe material deprivation
- At-risk-of-poverty indicator

The last step was statistical analyses performed on the first group of indicators. Our goal was to explore correlations between the first group of economic indicators (GDP and GFCF) and the second group of social indicators. For this purpose, we used correlation analysis to find the dependency between mentioned groups indicators. Correlation analysis is a statistical method used to assess the strength of the relationship between two continuous variables that are measured numerically. The Pearson correlation coefficient serves as a statistical measure for quantifying the linear relationship between two variables, X and Y, and falls within the range of +1 to -1.

Specifically:

- The value of +1 indicates the strongest possible positive correlation
- The value of -1 indicates the strongest possible negative correlation.

Therefore, the closer the coefficient is to either of these extremes, the stronger the correlation represented by the data.

Pearson's correlation coefficient:

$$p_{X,Y} = \frac{cov\,(X,Y)}{\sigma_X \sigma_Y} = \frac{\mathrm{E(XY)} - E(X)E(Y)}{\sqrt{E\,(X^2) - E^2(X)}\sqrt{E\,(Y^2) - E^2(Y)}},$$

where *p* represents the Pearson correlation coefficient; *cov* denotes the covariance; *σ* is standard deviation; *E* stands for the mean.

Specifically, we investigated whether any relationship existed between economic performance and social well-being. However, this research proved to be arduous as in Poland, and partially Hungary, not all the social indicators were available. These proved to be unobtainable.

Our research centered on the NUTS 2 regions of Slovakia (4 regions), Czechia (8 regions), Poland (17 regions), and Hungary (8 regions). Across all these regions, we sought to identify commonalities or differences in the impact of specific indicators on GDP and GFCF. Our findings are summarized in tables and charts. Additionally, certain indicators are visually represented through maps.

RESULTS AND DISCUSSION

After 20 years of the V4`s membership in the EU, we see neither catching up with the old member states countries, nor the V4 countries among themselves. All of them are economically rising but still not enough. When we take a look at the GDP per capita, we can see that Czechia is leading with almost 25% difference compared to Poland and Hungary. Polish population is diminishing its national GDP and highlighting the lower quality of life in the country. Making Polish and Hungarian inhabitants, economically speaking, equal. Some models indicated that Hungary could catch up with Slovakia, but the COVID-19 decreased the GDP per capita more than it did in Poland and Slovakia. In Czechia it was similar but still, the Czech people maintained the leading position (Figure 1).

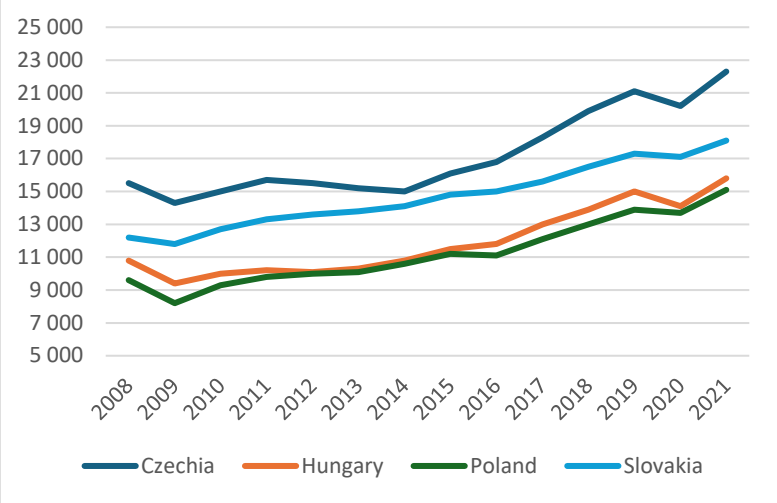

Figure 1 The development of GDP per capita in V4 countries in €

Source: Eurostat, 2024

Thus, it looks like the Czechia and Slovakia are both "leaders" in the V4. But upon a closer look at the gross fixed capital formation, we see a different story. The leader in investments is Poland, having twice the investments than Czechia and four times more than Slovakia. This makes us to assume that polish economy is far developed than in the rest of the V4 countries (Figure 2).

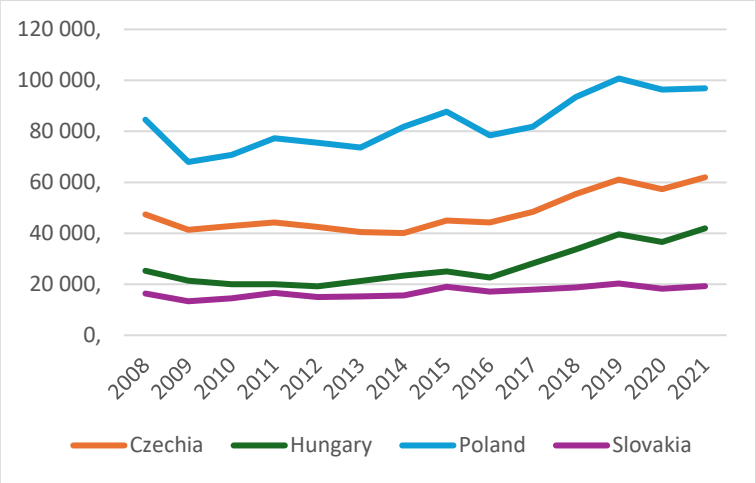

Figure 2 The development of GFCF in the V4 countries in €

Source: Eurostat, 2024

From social point of view, the unemployment rate is commonly used indicator. All the countries had problems when entering the EU. All of them reacted to global crises similarly, by reducing costs and thus leading to increase of unemployment rate. Yet, Slovakia remains the leader of the negative trend having almost thrice more unemployed people than similarly large Czechia and Hungary. Poland was competing with Hungary but in the end, the power of investments has shown its strengths in creating more job positions (Figure 3).

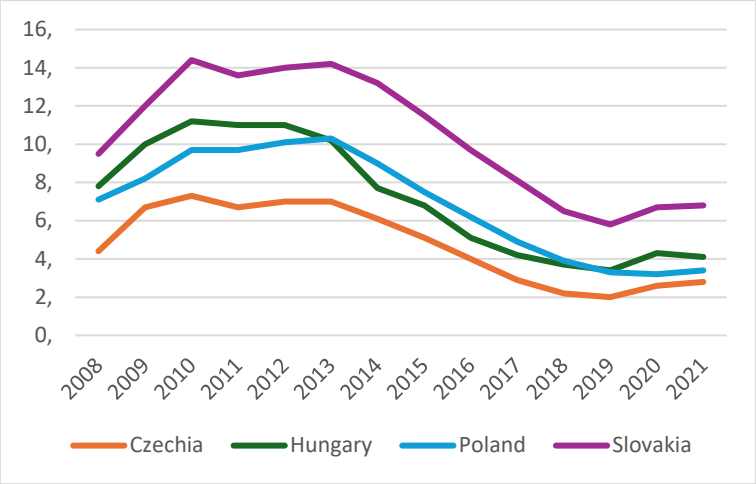

Figure 3 The development of unemployment in the V4 countries in %

Source: Eurostat, 2024

Gross domestic product (GDP) refers to the total value produced, assuming that it takes labor to produce it. Therefore, we decided to see if there is a correlation between the GDP and the unemployment rate. Common logic would suggest a negative correlation, meaning that the increase in production would lead to a decrease in the unemployment rate. Our research showed a negative correlation between the GDP and the unemployment rate in all the selected regions (Figure 4). In Hungarian and Polish regions there was a high to very high negative correlation. In Czechia was the situation the same apart from the Praha region where the correlation was moderate. In the case of Slovakia, the correlation was low negative in the Bratislava region while in the rest of the country, it was high negative. Overall, we can state that with the rise of GDP, there is a decrease in the unemployment rate. However, long-term unemployment development is different (Figure 5). While it is true that GDP has a positive impact on unemployment in general, people lacking jobs for more than 12 months are less adaptable, making them more vulnerable and enjoying less positive impact from the economy. In all the countries the correlation was moderate to high, in capital regions it was low to negligible.

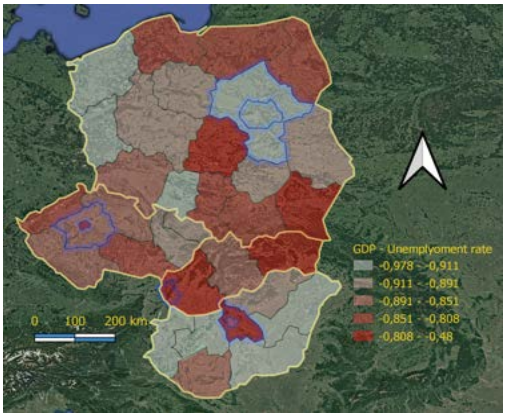

Figure 4 GDP – unemployment rate

Source: Eurostat, processed in QGIS, 2024

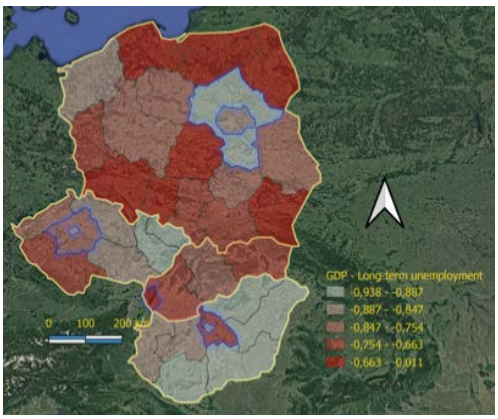

Figure 5 GDP – long-term unemployment rate

Source: Eurostat, processed in QGIS, 2024

We came to the same results when we calculated the correlation between the GDP and the employment rate (Figure 6). In most regions, there was a very high positive correlation with some exceptions with high positive correlation. Based on these we can assume that the GDP level has a positive impact on the employment of the population. On the other hand, it does not guarantee an increase in employment of young people. There are differences of impact across all the regions. In Czechia, there is mostly low and negligible positive correlation while only one region (Severovýchod) has a moderate positive correlation. In the capital there was the lowest positive correlation measured. On the other hand, in Hungary there was a stronger positive correlation measured. Pest region is the one to have a low positive correlation, followed by Észak-Magyarország with moderate positive correlation. In the rest of the country the results indicate a highly positive correlation. In Poland, the Warszawski stołeczny has a low negative correlation, indicating that the positive changes in GDP have no positive impact on employment of young people (Figure 7). In seven regions we calculated moderate and high positive correlation while in the rest of the country only low to negligible correlation. In Slovakia, the lowest correlation was also measured in the region with the capital. Mostly, there was only moderate correlation and in Stredné Slovensko we observed high positive correlation.

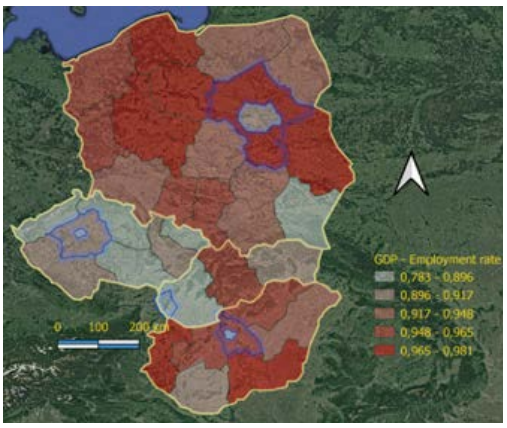

Figure 6 GDP – employment rate

Source: Eurostat, processed in QGIS, 2024

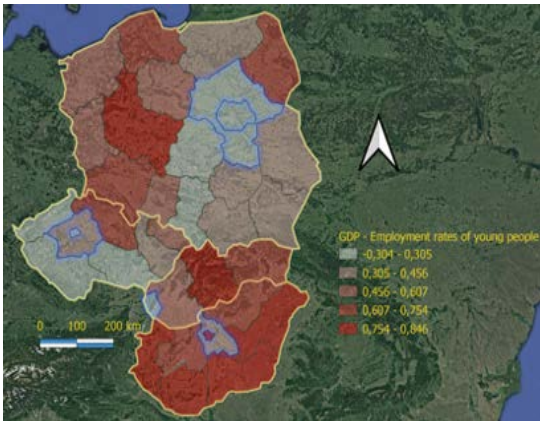

Figure 7 GDP – employment of young people

Source: Eurostat, processed in QGIS, 2024

Finding correlation between the GDP and living standards proved to be difficult. Measuring the living standards can be done through the level of severe material deprivation or risk of poverty. However, we could not find both data in Poland and in Hungary we found only at risk of poverty indicator. Therefore, the following text shall describe mainly Slovakia and Czechia. In Czechia, there is a high negative correlation between the GDP and severe material deprivation, indicating that the increase of the GDP should lead to decrease of severe material deprivation. This correlates to the development of income of households which is increasing along with the GDP. However, in Slovakia, the situation is developing differently, even though the income is developing similarly to Czechia.

In the region with the capital city there is only moderate negative correlation, while in neighboring Západné Slovensko region there is a very high correlation. In the rest of the country there is a high correlation, indicating that the increase of the GDP leads to decrease of the people suffering from severe material deprivation. This development would lead us to believe that the number of people at risk of poverty would be developing favorably as well. Regardless, the poverty, growing in certain regions, is even increasing in the others. In Czechia, the negative correlation between the GDP and poverty was measured only in four regions and in three only negligible. Otherwise, we observed a slight increase in poverty. In Severovýchod region there was even a high positive correlation, indicating an increase of people at risk of poverty. In Slovakia, in western regions there is a high negative correlation indicating a decrease of poverty with rising GDP. On the other hand, the central and eastern parts are indicating rise of poverty. In Hungary, the development is similar, in half the country, there is a moderate to high negative correlation compared to negligible to moderate positive correlation in the rest of the country. On the contrary to the other countries, in Hungarian capital region there is a rising poverty level while rising GDP.

Further, we decided to find the impact of the gross fixed capital formation (GFCF) on the selected second group of indicators. Firstly, we looked at the correlation between the GFCF and unemployment rate (Figure 8). Our assumptions were that the increase of GDP could either lead to decrease of unemployment due to creation of new job positions or increase of unemployment due to supplementing labor with capital. In Czechia we saw a moderate to high negative

correlation indicating that increasing the capital would lead to decrease of unemployment rate. Negligible correlations could be seen only in Severozápad and Moravskoslezsko regions. In Hungary in majority of regions there was a high negative correlation except the Pest region with moderate negative correlation. In Poland, like Czechia, the majority of region have moderate to high negative correlation except for Lubuskie and Świętokrzyskie regions where we observed a negligible positive correlation. In Slovakia, there was also a high negative correlation apart from Bratislavský kraj with negligible negative correlation. These results indicate that capital formation has a positive impact on the development of unemployment rate. Almost identical relation is between the GFCF and long-term unemployment (Figure 9).

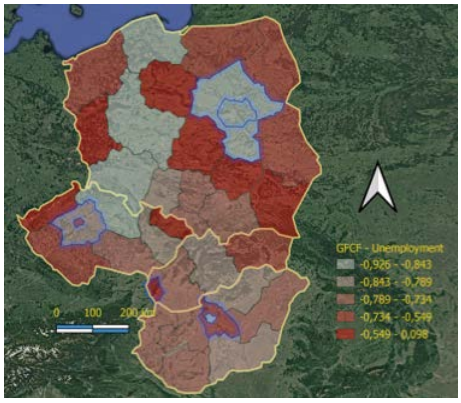

Figure 8 GFCF – unemployment rate

Source: Eurostat, processed in QGIS, 2024

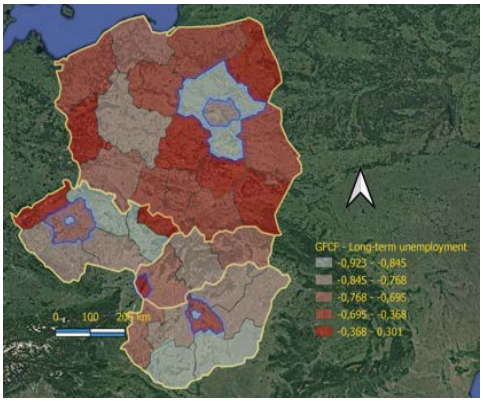

Figure 9 GFCF – long-term unemployment rate

Source: Eurostat, processed in QGIS, 2024

The impact of GFCF on employment rate is similar to the GDP. In most regions, there is a moderate to high positive correlation with slight exceptions, where we observed an opposite effect with negligible correlation in Świętokrzyskie region.

Lastly, we decided to look at the correlation between the GDP and GFCF. We assumed that the increase in GDP would lead to increase in GFCF. In Czechia, we observed high to very high positive correlation, indicating the strong connection between the GDP and GFCF. In Moravskoslezsko and Severozápad we observed low to moderate correlation. In Hungary the result has shown us high to very high correlation. In Poland the situation was slightly different. While in most regions there was high to very high correlation in Świętokrzyskie there was a negligible negative correlation. This region is located south of the capital and based on our previous research it seems as one of the less developed. Slovakia, on the other hand is a completely different case. Most regions have moderate correlation between the GDP and the GFCF and only the capital region Bratislavský kraj has a very high positive correlation. In Czechia and Slovakia, we also observed an impact on living conditions such as severe material deprivation. Along with Hungary, we also saw mainly a positive impact on number of people at risk of poverty.

Table 1 displays findings from analysing the relationships among specific economic and social indicators, which were utilized in creating the maps mentioned earlier.

Table 1 Correlation analysis results

Name	GDP - GFCF	GDP - UNEMP	GDP - Income	GDP - EmYP	GDP - Em	GDP - LT_Un	GFCF-UN	GFCF - LT_UN	GFCF - Income	GFCF-EM
Hungary	0,97	-0,90	1,00	0,85	0,95	-0,92	-0,84	-0,89	0,97	0,87
Budapest	0,95	-0,81	0,98	0,84	0,87	-0,88	-0,84	-0,92	0,94	0,85
Pest	0,81	-0,79	0,98	0,43	0,95	-0,75	-0,55	-0,49	0,84	0,75
Közép-Dunántúl	0,88	-0,91	0,99	0,75	0,96	-0,88	-0,78	-0,82	0,88	0,80
Nyugat-Dunántúl	0,75	-0,94	0,97	0,81	0,97	-0,87	-0,73	-0,70	0,85	0,75
Dél-Dunántúl	0,95	-0,88	0,99	0,76	0,91	-0,92	-0,78	-0,88	0,92	0,82
Észak-Magyarország	0,93	-0,91	0,98	0,62	0,96	-0,92	-0,84	-0,84	0,94	0,87
Észak-Alföld	0,92	-0,93	0,98	0,77	0,93	-0,94	-0,77	-0,80	0,87	0,77
Dél-Alföld	0,95	-0,92	0,99	0,79	0,97	-0,93	-0,84	-0,86	0,94	0,87
Czechia	0,97	-0,88	1,00	0,49	0,90	-0,89	-0,87	-0,88	0,97	0,81
Praha	0,98	-0,67	0,99	0,21	0,85	-0,87	-0,69	-0,91	0,96	0,82
Střední Čechy	0,97	-0,87	0,97	0,33	0,91	-0,79	-0,79	-0,73	0,98	0,88
Jihozápad	0,86	-0,85	1,00	0,22	0,91	-0,74	-0,72	-0,78	0,89	0,64
Severozápad	0,50	-0,83	0,99	0,31	0,84	-0,85	-0,18	-0,15	0,51	0,18
Severovýchod	0,93	-0,88	1,00	0,64	0,90	-0,85	-0,93	-0,85	0,91	0,83
Jihovýchod	0,87	-0,84	1,00	0,27	0,87	-0,86	-0,78	-0,80	0,87	0,64
Střední Morava	0,92	-0,90	0,99	0,46	0,90	-0,89	-0,83	-0,87	0,92	0,76
Moravskoslezsko	0,30	-0,90	0,98	0,50	0,90	-0,91	-0,29	-0,18	0,33	0,08
Poland	0,91	-0,87	0,99	0,54	0,97	-0,76	-0,85	-0,75	0,91	0,86
Malopolskie	0,92	-0,84	0,99	0,42	0,94	-0,75	-0,74	-0,64	0,91	0,82
Śląskie	0,69	-0,83	0,99	0,15	0,95	-0,68	-0,75	-0,68	0,70	0,61
Wielkopolskie	0,88	-0,90	0,99	0,81	0,98	-0,82	-0,87	-0,78	0,88	0,84
Zachodniopomorskie	0,80	-0,93	0,99	0,47	0,96	-0,85	-0,70	-0,37	0,81	0,74
Lubuskie	0,27	-0,91	0,99	0,58	0,96	-0,66	0,04	0,30	0,29	0,15
Dolnośląskie	0,88	-0,87	0,99	0,75	0,94	-0,60	-0,88	-0,70	0,91	0,88
Opolskie	0,70	-0,92	0,98	0,51	0,95	-0,01	-0,80	-0,42	0,71	0,75
Kujawsko-pomorskie	0,45	-0,89	0,99	0,59	0,97	-0,77	-0,47	-0,44	0,42	0,34
Warmińsko-mazurskie	0,79	-0,84	0,99	0,44	0,94	-0,57	-0,67	-0,44	0,79	0,67
Pomorskie	0,58	-0,81	0,99	0,72	0,97	-0,24	-0,85	-0,70	0,56	0,64
Łódzkie	0,42	-0,77	0,99	0,30	0,95	-0,63	-0,11	0,13	0,41	0,21
Świętokrzyskie	-0,04	-0,90	0,98	0,36	0,95	-0,77	0,10	0,22	-0,16	-0,09
Lubelskie	0,75	-0,91	0,99	0,45	0,98	-0,75	-0,58	-0,43	0,74	0,66
Podkarpackie	0,70	-0,77	0,99	0,33	0,85	-0,54	-0,32	-0,11	0,69	0,40
Podlaskie	0,90	-0,83	0,99	0,67	0,95	-0,18	-0,73	0,22	0,88	0,80

Warszawski stołeczny	0,93	-0,92	0,99	-0,30	0,90	-0,87	-0,89	-0,77	0,96	0,91
Mazowiecki regionalny	0,86	-0,98	0,99	0,19	0,97	-0,93	-0,88	-0,84	0,86	0,93
Slovakia	0,87	-0,80	0,98	0,65	0,91	-0,75	-0,80	-0,71	0,83	0,85
Bratislavský kraj	0,91	-0,48	0,97	0,25	0,78	-0,17	-0,23	0,08	0,84	0,57
Západné Slovensko	0,45	-0,76	0,96	0,61	0,87	-0,74	-0,78	-0,69	0,50	0,72
Stredné Slovensko	0,76	-0,87	0,98	0,76	0,95	-0,84	-0,82	-0,78	0,75	0,82
Východné Slovensko	0,44	-0,81	0,98	0,65	0,92	-0,69	-0,70	-0,70	0,39	0,59

Source: Own processing based on Eurostat data, 2024

This paper has empirically examined the relationship between Gross Domestic Product (GDP), Gross Fixed Capital Formation (GFCF), and various socio-economic indicators within the Visegrád Four (V4) countries. The findings suggest a robust correlation between investment, particularly in the form of GFCF, and the economic vitality of a nation, as evidenced by GDP growth and employment rates.

Amighini et al. (2017) provide a global perspective, underscoring the positive influence of industry-level capital formation on developing economies' GDP. This aligns with our findings in the V4 context, where GFCF has been shown to significantly bolster GDP and employment rates.

Csath (2021) emphasizes the necessity of balanced economic and social development, a principle that is echoed in our study's observation of disparities in social conditions despite similar economic growth trajectories among the V4. This highlights the complexity of translating economic gains into social progress.

Pasara and Garidzirai (2020) investigate the causality effects among capital formation, unemployment, and economic growth in South Africa. But their findings of a causal relationship also support our studies' conclusions about the positive impact of GFCF on employment rates.

Pavlínek's works (2018, 2023) provide a sector-specific lens, focusing on the automotive industry's transition and global production networks. These studies offer a granular view of how sectoral shifts in investment can influence economic outcomes, relevant to our broader analysis of GFCF impacts.

CONCLUSIONS

This paper was focused on confirming the direct impact of the gross domestic product (GDP) and gross fixed capital formation (GFCF) on economy and social conditions in the V4 countries. There are several proofs that investments can help boost economic development and thus helping to improve the social conditions in countries. We observed that in V4 countries there was a similar development from economic point of view, however, there remain large disparities from social point of view. Poland, compared to the rest of the V4 countries, is a large economically strong country with increasing GDP and GFCF having the second lowest unemployment level. However, Czechia, having one third of inhabitants and three quarters of

GFCF compared to Poland managed to have lower unemployment level and the GDP per capita was over 30% higher than in Poland. While Slovakia was improving as well and having the second-best GDP per capita, the level of unemployment remains the highest and the level of investments remains the lowest. As for comparison these countries we decided to look at the correlation between GDP and GFCF to other indicators such as unemployment, employment, income and other social indicators. There are relatively similar developing trends and relation with minor differences among the regions, especially those having a capital city. In the end, we confirmed that the level of investment measured through gross fixed capital formation has a high positive impact on the GDP of countries and their employment rates. Similarly, the GFCF has moderate to high impact on employment rates in most of the regions.

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CONFLICT OF INTEREST

The authors declare no conflict of interest or competing interest.

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