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THE LEVEL OF SOCIO-ECONOMIC DEVELOPMENT OF THE VISEGRÁD COUNTRIES IN 1995–2023

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Abstract
This article aims to analyse the level of socio-economic development of the Visegrád countries (V4) from 1995 to 2023. It presents the situation prior to EU accession, the pre-pandemic period, the effects of the pandemic in 2020–2021, and the years 2022–2023. The data source for the analysis is World Bank Data. This study employed taxonomic analysis, a non-model method. Eleven variables were analysed over the study period. The analysis revealed an increase in socio-economic development in the period considered and a statistically significant decrease in the demographic development change dynamics index during the pandemic.

Keywords: socio-economic development, taxonomic analysis, Visegrád Group.

1. Introduction

At the turn of the 21st century, Central and Eastern Europe became a region of profound political, social, and economic transformation. The symbolic starting point of this process is generally considered to be the strikes in Poland (Lublin, Chełm, Gdańsk, Szczecin) in 1980, which culminated in the establishment of the Independent Self-Governing Trade Union "Solidarity" in the same year (see Rynio et al. 2022). On 4 June 1989, Poland held its first partially free parliamentary elections, marking the beginning of systemic transformation. Poland entered a period of deep political and economic reforms, which resulted in a process of democratisation and the liberation of the countries of the region from the dominance of the Soviet Union.

This process encompassed many Central and Eastern European countries — including Poland, Czechoslovakia, Hungary, Bulgaria, Romania, and the Baltic States — which regained sovereignty and began democratising political, social, and economic life. In Poland, Czechoslovakia, and Hungary, these processes were particularly dynamic, also involving changes in the forms and principles of foreign policy and regional cooperation.

As a result of internal transformations and changing international relations, a declaration of cooperation between Poland, Czechoslovakia, and Hungary was signed on 15 February 1991 in the Hungarian town of Visegrád. The signatories were President of the Republic of Poland Lech Wałęsa, President of Czechoslovakia Václav Havel, and Prime Minister of Hungary József Antall. After the dissolution of Czechoslovakia, cooperation continued among four countries — as the Visegrád Group (V4). The fundamental objective of the agreement was to strive for the full restoration of state sovereignty, democracy, respect for human rights and freedoms, and to strengthen political, economic and cultural cooperation in the transformed geopolitical reality of Central Europe. The countries also declared their intention to join Euro-Atlantic structures — the European Union and NATO.

The Visegrád Declaration initiated a process of multifaceted cooperation that continues to this day. Its strategic objectives included efforts to integrate with the EU (Czechia, Poland, Slovakia, and Hungary acceded to the EU on 1 May 2004) and to join NATO structures

(Czechia, Poland, and Hungary joined NATO on 12 March 1999, and Slovakia on 29 March 2004), supporting economic development, and enhancing the investment attractiveness of the region. From the outset, cooperation among the Visegrád Group countries was multifaceted, gradually expanding into new areas (see Czyż and Kubas 2014, pp. 179–214). Currently, key areas of Visegrad Group (V4) cooperation include such things as (see Wilczewska 2022, pp. 125–148; Olszyk 2024, pp. 32–59; Czyż and Kubas 2014):

- efforts to strengthen regional cooperation through:
  - deeper political, economic, cultural and social cooperation while preserving state sovereignty (establishment in 2000 of the International Visegrád Fund (IVF) — an instrument to support projects in culture, education, civil society and innovation. The Fund operates by providing grants: Visegrád Grants — for cooperation projects between the three countries; Visegrád+ Grants — for V4 projects involving the Eastern Partnership/Western Balkans; Strategic Grants — multi-year projects addressing key regional challenges;

- joint institutions and projects:
  - Visegrád Patent Institute (VPI) — operating since 2015 as an international authority for patents under the PCT system.
  - joint research and expert projects in such areas as economic policy, energy transition, and countering disinformation;

- energy and infrastructure initiatives:
  - expansion of transport and energy networks (e.g., Via Carpatia, gas and rail networks).
  - energy cooperation, diversification of energy sources, and integration with EU infrastructure projects (TEN-T, military mobility);

- regional security and stability initiatives:
  - cooperation on military, energy and cybersecurity, also in the NATO context, particularly in relation to the war in Ukraine;

- leveraging the region's investment attractiveness:
  - low labour costs, highly qualified workforce, favourable geographical location, and access to the EU market;

- utilising EU funds:
  - effective acquisition and management of EU funds for infrastructure development, education and entrepreneurship, etc;

- pursuing economic convergence:
  - reducing disparities in development levels among V4 countries and supporting the socio-economic cohesion of the region;

- promoting the shared values and identity of Central Europe
  - building a positive image of the region as an area with a common cultural and historical

heritage;

- support for the Eastern Partnership and the Western Balkans:
  - actions supporting democratization, development and integration of neighbouring countries into Euro-Atlantic structures;

- coordinating governmental positions within the EU structures:
  - consultations on migration policy, energy policy, the EU budget, and the future of the European integration process.

This article hypothesises that the socio-economic development level of the Visegrád Group countries increased in 1995–2023. The following research questions were considered:

1. Do the development processes of the countries, in spatial terms, lead to a convergence of their development levels?
2. Has EU accession altered the trends in the magnitude of changes in the dynamics of socio-economic development?
3. Has the COVID-19 pandemic altered the trends in the magnitude of changes in the dynamics of socio-economic development?

2. Method of Analysis

The analysis covers 29 years (1995–2023), focusing on the 4 EU member states. Indicators were then used to describe urban development in terms of socio-economic outcomes. All indicators used meet the formal requirements relating to quantitative analyses. Their diagnosticity was analysed and then transformed into intensity indicators (Kosiedowski 2001). The taxonomic analysis applied in the study has been described in publications such as Krawczyk 2017, 2023, 2024; Krawczyk and Marzec 2024, 2025. The analysis resulted in a specific map of the demographic development of the countries, categorising the objects studied in terms of time and space.

3. Results

The characteristics described in Tables 1, 2, and 3 were adopted for the taxonomic analysis.

Table 1. Economic characteristics

Characteristics	Symbol	Specification	Coefficient of variation	S/D *
Economic	E1	Foreign direct investment, net inflows (% of GDP)	245.21	S
	E2	Inflation, consumer prices (annual %)	24.51	D
	E3	GDP per capita	48.38	S
	E4	Unemployment, total (% of total labour force)	41.32	D

*Stimulant/Destimulant

Source: Own elaboration based on Jerczyński 1971; Swianiewicz 1989; Ziółkowski 1997, Pociecha, Podolec, Sokołowski 1998;

Ratajczak 2000; Wiatrak 2000; Kosiedowski 2001; Rakowski, Pakulska 2001; Madras-Kobus 2001; Ponikowski 2002; Roeske-Słomka 2003; Wysoki, Łuczak 2004; Ponikowski 2004; Kapusta 2004; Brol 2004; Tokarski, Stepień, Wojnarowski 2006, Malina, Malina 2005; Młodak 2005, 2006; Roszkowska 2005; Lira, Wysocki 2004; Rosner 2007; Rosner, Stany 2007a; Rosner, Stany 2007b; Rosner, Stany 2007c; Czornik 2008; Ziemniańczyk 2010; Głuszczuk 2011; Kocura-Bera 2011; Szubska-Włodarczyk 2014; Kołodziejczyk 2014; Kiniorska 2014; Ludwiczak 2014; Adamowicz, Janulewicz 2016; Chądzyńska 2016; Krawczyk 2017; Konecka-Szydłowska, Maćkowiak 2016; Parysek 2018; Malina 2020; Kozubek, Konecka-Szydłowska 2022; Krawczyk 2023, 2024; Krawczyk, Marzec 2024, 2025; Eurostat 2025; Statistics Poland 2025, World Bank Open Data 2025.

Table 2. Social characteristics

Characteristics	Symbol	Specification	Coefficient of variation	S/D *
Social	S1	Population growth (annual %)	-3,719.18	S
	S2	Life expectancy at birth, total (years)	2.93	S
	S3	Net migration	603.73	S
	S4	Individuals using the Internet (% of population)	60.34632	S

*Stimulant/Destimulant

Source: *Own elaboration based on Jerczyński 1971; Swianiewicz 1989; Ziółkowski 1997, Pociecha, Podolec, Sokołowski 1998; Ratajczak 2000; Wiatrak 2000; Kosiedowski 2001; Rakowski, Pakulska 2001; Madras-Kobus 2001; Ponikowski 2002; Roeske-Słomka 2003; Wysoki, Łuczak 2004; Ponikowski 2004; Kapusta 2004; Brol 2004; Tokarski, Stepień, Wojnarowski 2006, Malina, Malina 2005; Młodak 2005, 2006; Roszkowska 2005; Lira, Wysocki 2004; Rosner 2007; Rosner, Stany 2007a; Rosner, Stany 2007b; Rosner, Stany 2007c; Czornik 2008; Ziemniańczyk 2010; Głuszczuk 2011; Kocura-Bera 2011; Szubska-Włodarczyk 2014; Kołodziejczyk 2014; Kiniorska 2014; Ludwiczak 2014; Adamowicz, Janulewicz 2016; Chądzyńska 2016; Krawczyk 2017; Konecka-Szydłowska, Maćkowiak 2016; Parysek 2018; Malina 2020; Kozubek, Konecka-Szydłowska 2022; Krawczyk 2023, 2024; Krawczyk, Marzec 2024, 2025; Eurostat 2025; Statistics Poland 2025, World Bank Open Data 2025.*

Table 3. Ecological characteristics

Characteristics	Symbol	Specification	Coefficient of variation	S/D*
Ecological	K1	Forest area (% of land area)	20.45516	S
	K2	Electricity production from renewable sources, excluding hydroelectric (% of total)	102.45	S
	K3	People using safely managed sanitation services (% of population)	9.49	S

*Stimulant/Destimulant

Source: *Own elaboration based on Jerczyński 1971; Swianiewicz 1989; Ziółkowski 1997, Pociecha, Podolec, Sokołowski 1998; Ratajczak 2000; Wiatrak 2000; Kosiedowski 2001; Rakowski, Pakulska 2001; Madras-Kobus 2001; Ponikowski 2002; Roeske-Słomka 2003; Wysoki, Łuczak 2004; Ponikowski 2004; Kapusta 2004; Brol 2004; Tokarski, Stepień, Wojnarowski 2006, Malina, Malina 2005; Młodak 2005, 2006; Roszkowska 2005; Lira, Wysocki 2004; Rosner 2007; Rosner, Stany 2007a; Rosner, Stany 2007b; Rosner, Stany 2007c; Czornik 2008; Ziemniańczyk 2010; Głuszczuk 2011; Kocura-Bera 2011; Szubska-Włodarczyk 2014; Kołodziejczyk 2014; Kiniorska 2014; Ludwiczak 2014; Adamowicz, Janulewicz 2016; Chądzyńska 2016; Krawczyk 2017; Konecka-Szydłowska, Maćkowiak 2016; Parysek 2018; Malina 2020; Kozubek, Konecka-Szydłowska 2022; Krawczyk 2023, 2024; Krawczyk, Marzec 2024, 2025; Eurostat 2025; Statistics Poland 2025, World Bank Open Data 2025.*

Foreign direct investment refers to net inflows of investment aimed at acquiring a lasting interest (10 per cent or more of voting shares) in an enterprise operating in an economy other

than that of the investor. It is the sum of equity, reinvestment of profits, other long-term capital, and short-term capital. This characteristic shows the net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, divided by GDP.

Inflation, as measured by the consumer price index, reflects the annual percentage change in the cost per average consumer of purchasing a basket of goods and services, which may be fixed or changed at specified intervals, e.g. annually.

GDP per capita is the gross domestic product divided by the middle population. GDP is the sum of the gross value added of all resident producers in the economy plus any product taxes and less any subsidies not included in product value.

Unemployment refers to the share of the labour force that is out of work but available and looking for employment.

Annual rate of population growth. Population is based on the de facto definition of population, which includes all inhabitants, regardless of legal status or citizenship.

Life expectancy at birth indicates the number of years an infant would live if the prevailing mortality patterns at birth remained the same throughout his or her life.

Net migration is the total number of net migrants over the period, i.e. the number of immigrants minus the number of emigrants, including both citizens and non-citizens.

Individuals using the Internet are people who have used the Internet in the last 3 months (from any location). Internet access may be via a computer, mobile phone, personal digital assistant, arcade machine, digital television, etc.

Forest area refers to land with natural or planted stands of trees of at least 5 metres in height, both for timber production and not, and excludes tree stands in agricultural production systems (e.g. fruit plantations and agroforestry systems), as well as trees in urban parks and gardens.

Electricity production from renewable sources, excluding hydroelectric, includes geothermal, solar, tidal, wind, biomass and biofuels.

Percentage of people using improved sanitation facilities not shared with other households, where waste is safely disposed of in situ or transported and treated off-site. Improved sanitation facilities include flush or pour-flush toilets connected to piped sewer systems, septic tanks, or pit latrines.

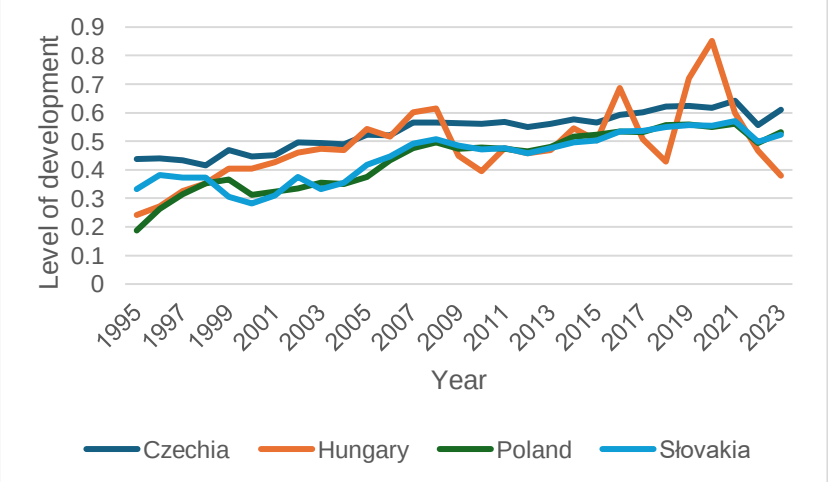

Figure 1: Level of economic development in 1995–2023
Source: *Own elaboration based on World Bank Open Data*

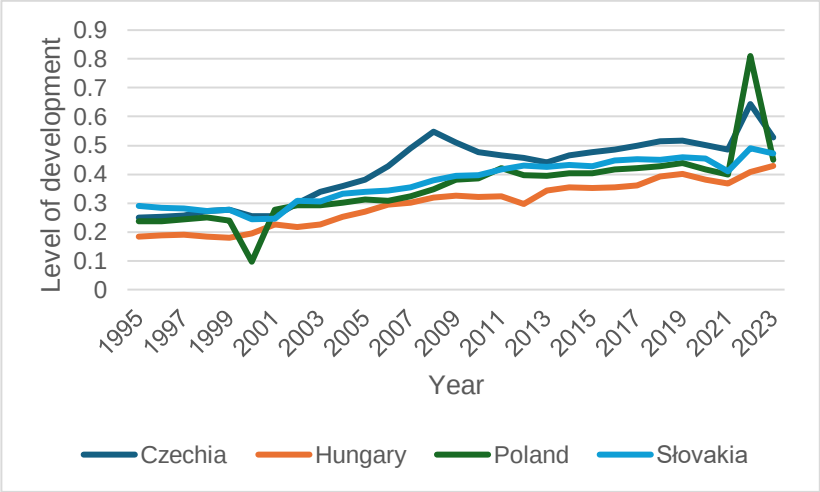

Figure 2: Level of social development in 1995–2023
Source: *Own elaboration based on World Bank Open Data*

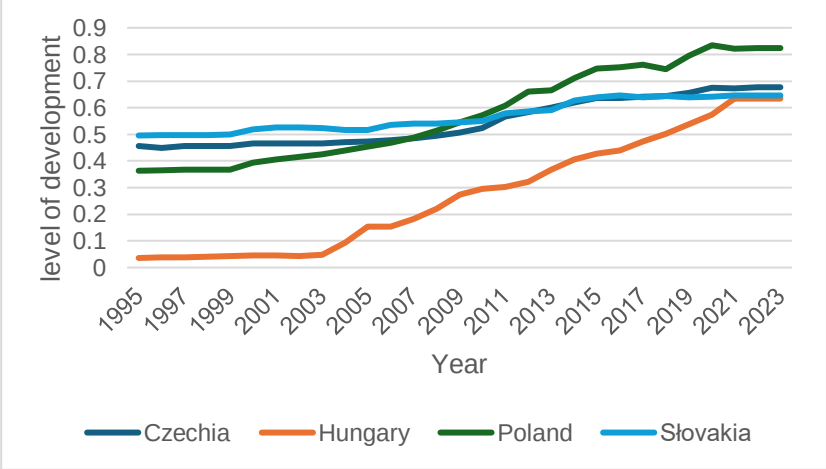

Figure 3: Level of ecological development in 1995–2023
Source: *Own elaboration based on World Bank Open Data*

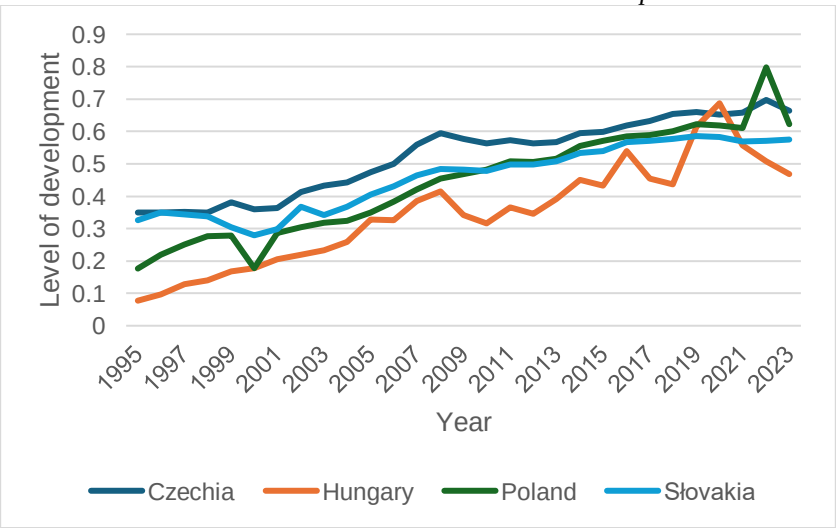

Figure 4: Level of socio-economic development in 1995–2023
Source: *Own elaboration based on World Bank Open Data*

The level of socio-economic development and its components (economic, social, ecological) show growth in the period under review, with fluctuations around an upward trend (Figures 1, 2, 3, 4).

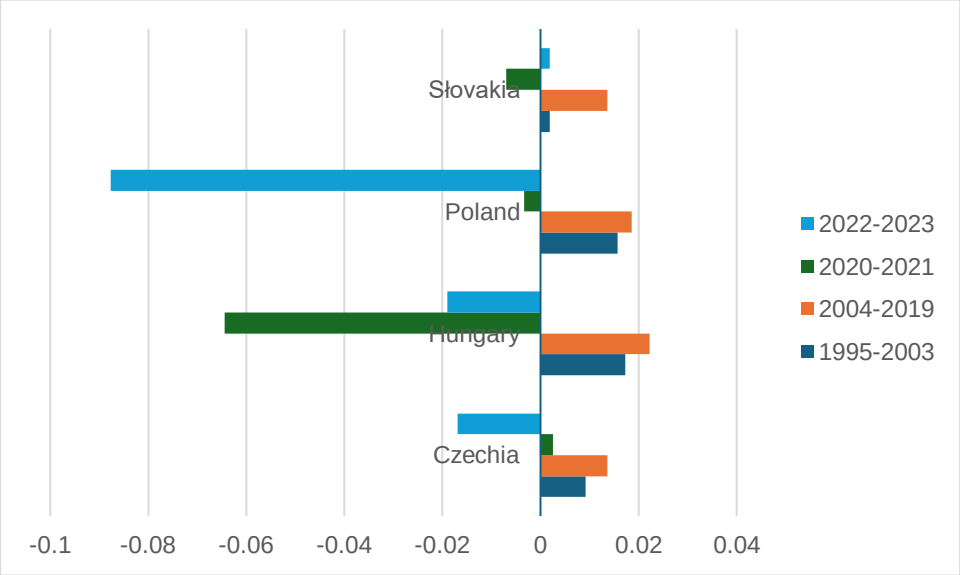

Figure 5. Average annual rate of change in the level of socio-economic development in 1995–2003, 2004–2019, 2020–2021, 2022–2023

Source: *Own elaboration based on World Bank Open Data*

The research question was whether EU accession altered the observed trends in the differentiation of socio-economic development levels. The findings show that the average annual rate before EU accession (0.0110) was lower than after accession (0.0170). Student's t-test for dependent samples revealed a statistically significant difference: t(4)= -3.103; p =0.053. It should be noted that the result of the t-test is influenced by the sample size. For the same effect size of the independent variable, the t-statistic will increase as the sample size grows. This means that even a large difference between the means will turn out to be statistically insignificant for small samples, which is what we observe here. Cohen's d value of 0.018 indicates a negligible effect size, suggesting no relationship between EU accession and changes in the dynamics of change (Figure 5, Tables 4, 5, 6) (Bedyńska, Brzezicka 2007).

The research question was whether the pandemic altered the observed trends in the differentiation of socio-economic development rate. The results show that the average annual rate before the pandemic (0.0170) was higher than during the pandemic (-0.0180). Student's t-test for dependent samples revealed a statistically significant difference: t(4)= 2.016; p =0.137. Cohen's d value of 2.208 indicates a large effect size, suggesting a relationship between the dynamics of change before the pandemic and the decline in the dynamics during the pandemic (Figure 5; Tables 4, 5, 6) (Bedyńska, Brzezicka, 2007).

The research question was whether the pandemic altered the observed trends in the differentiation of socio-economic development. The findings indicate that the average annual rate during the pandemic (-0.0180) was lower than after the pandemic (-0.03039). Student's t-test for dependent samples revealed a statistically significant difference: t(4)= 0.451; p = 0.683.

Cohen's d value of 1.203 indicates a large effect size, suggesting a relationship between the dynamics of change during the pandemic and the increase in the dynamics after the pandemic (Figure 5; Tables 4, 5, 6) (Bedyńska, Brzezicka, 2007).

Table 4. Average annual rate of change

Average annual rate of change	Mean	Standard deviation	N
(AARC) 1995–2003	0.0110	0.0070	4
(AARC) 2004–2019	0.0170	0.0042	4
(AARC) 2020–2021	-0.0180	0.0312	4
(AARC) 2022–2023	-0.0303	0.0392	4

Source: *Own elaboration based on Jerczyński 1971; Swianiewicz 1989; Ziółkowski 1997, Pociecha, Podolec, Sokołowski 1998; Ratajczak 2000; Wiatrak 2000; Kosiedowski 2001; Rakowski, Pakulska 2001; Madras-Kobus 2001; Ponikowski 2002; Roeske-Słomka 2003; Wysoki, Łuczak 2004; Ponikowski 2004; Kapusta 2004; Brol 2004; Tokarski, Stepień, Wojnarowski 2006, Malina, Malina 2005; Młodak 2005, 2006; Roszkowska 2005; Lira, Wysocki 2004; Rosner 2007; Rosner, Stany 2007a; Rosner, Stany 2007b; Rosner, Stany 2007c; Czornik 2008; Ziemniańczyk 2010; Głuszczuk 2011; Kocura-Bera 2011; Szubska-Włodarczyk 2014; Kołodziejczyk 2014; Kiniorska 2014; Ludwiczak 2014; Adamowicz, Janulewicz 2016; Chądzyńska 2016; Krawczyk 2017; Konecka-Szydłowska, Maćkowiak 2016; Parysek 2018; Malina 2020; Kozubek, Konecka-Szydłowska 2022; Krawczyk 2023, 2024; Krawczyk, Marzec 2024, 2025; Eurostat 2025; Statistics Poland 2025, World Bank Open Data 2025.*

Table 5. Test for dependent samples

Average annual rate of change	Mean	Standard deviation	Standard error of the mean	T	df	Significance one-tailed P	Significance two-tailed P
(AARC) 1995–2003 and (AARC) 2004–2019	-0.006	0.0038	0.0019	-3.103	3	0.027	0.053
(AARC) 2004–2019 and (AARC) 2020–2021	0.035	0.0347	0.0173	2.016	3	0.069	0.137
(AARC) 2020–2021 and (AARC) 2022–2023	0.0123	0.0548	0.0274	0.451	3	0.341	0.689

Source: *Own elaboration based on Jerczyński 1971; Swianiewicz 1989; Ziółkowski 1997, Pociecha, Podolec, Sokołowski 1998; Ratajczak 2000; Wiatrak 2000; Kosiedowski 2001; Rakowski, Pakulska 2001; Madras-Kobus 2001; Ponikowski 2002; Roeske-Słomka 2003; Wysoki, Łuczak 2004; Ponikowski 2004; Kapusta 2004; Brol 2004; Tokarski, Stepień, Wojnarowski 2006, Malina, Malina 2005; Młodak 2005, 2006; Roszkowska 2005; Lira, Wysocki 2004; Rosner 2007; Rosner, Stany 2007a; Rosner, Stany 2007b; Rosner, Stany 2007c; Czornik 2008; Ziemniańczyk 2010; Głuszczuk 2011; Kocura-Bera 2011; Szubska-Włodarczyk 2014; Kołodziejczyk 2014; Kiniorska 2014; Ludwiczak 2014; Adamowicz, Janulewicz 2016; Chądzyńska 2016; Krawczyk 2017; Konecka-Szydłowska, Maćkowiak 2016; Parysek 2018; Malina 2020; Kozubek, Konecka-Szydłowska 2022; Krawczyk 2023, 2024; Krawczyk, Marzec 2024, 2025; Eurostat 2025; Statistics Poland 2025, World Bank Open Data 2025.*

Table 6. Effect for dependent samples

Average annual rate of change	Cohen's D	Hedges' correction
(AARC) 1995–2003 and (AARC) 2004–2019	0.018	0.013
(AARC) 2004–2019 and (AARC) 2020–2021	2.208	1.598
(AARC) 2020–2021 and (AARC) 2022–2023	1.203	0.871

Source: *Own elaboration based on Jerczyński 1971; Swianiewicz 1989; Ziółkowski 1997, Pociecha, Podolec, Sokołowski 1998; Ratajczak 2000; Wiatrak 2000; Kosiedowski 2001; Rakowski, Pakulska 2001; Madras-Kobus 2001; Ponikowski 2002; Roeske-Słomka 2003; Wysoki, Łuczak 2004; Ponikowski 2004; Kapusta 2004; Brol 2004; Tokarski, Stepień, Wojnarowski 2006, Malina, Malina 2005; Młodak 2005, 2006; Roszkowska 2005; Lira, Wysocki 2004; Rosner 2007; Rosner, Stany 2007a; Rosner, Stany 2007b; Rosner, Stany 2007c; Czornik 2008; Ziemniańczyk 2010; Głuszczuk 2011; Kocura-Bera 2011; Szubska-Włodarczyk 2014; Kołodziejczyk 2014; Kiniorska 2014; Ludwiczak 2014; Adamowicz, Janulewicz 2016; Chądzyńska 2016; Krawczyk 2017; Konecka-Szydłowska, Maćkowiak 2016; Parysek 2018; Malina 2020; Kozubek, Konecka-Szydłowska 2022; Krawczyk 2023, 2024; Krawczyk, Marzec 2024, 2025; Eurostat 2025; Statistics Poland 2025, World Bank Open Data 2025.*

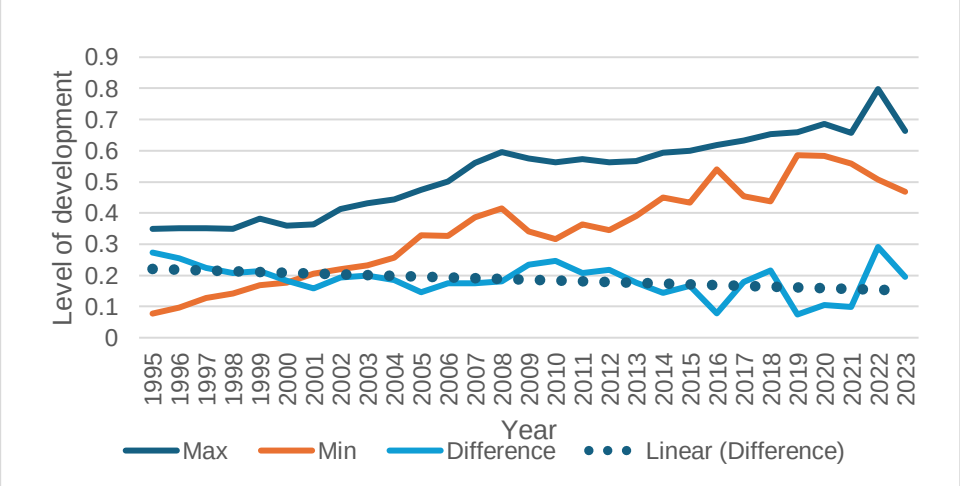

Figure 6. Convergence of development levels among V4 countries in 1995–2023
Source: *Own elaboration based on World Bank Open Data*

The research question here was whether the socio-economic development processes of V4 countries lead to a convergence of development levels in spatial terms. The analysis shows that, based on the selected characteristics, the socio-economic development levels of the V4 countries are converging, and this convergence occurs at progressively higher levels of development (Figure 6).

4. Conclusion

The article presents the socio-economic situation of the V4 countries from 1995 to 2023. The period under study exhibited an upward trend in the values describing the condition of this area. It was found that the level of socio-economic development of the V4 countries increased over the period 1995–2023. Finally, there are a few points to consider:

- The research question was whether the socio-economic development of EU countries led to a convergence of development levels in spatial terms, based on the selected characteristics. It was demonstrated that the disparity in the level of socio-economic development of V4 countries in spatial terms is diminishing. In the case of the V4 countries, the increase in socio-economic development is occurring at progressively higher levels.
- The research question was whether the pandemic altered the observed trends in the differentiation of socio-economic development rate. It was established that there is a relationship between the dynamics of change before the pandemic and the decline in the dynamics during the pandemic.
- The research question was whether the pandemic altered the observed trends in the differentiation of socio-economic development. It was found that there is a relationship between the dynamics of change during the pandemic and the increase in the dynamics after the pandemic.
- The research question was whether EU accession altered the observed trends in the differentiation of socio-economic development levels. It was found that there is no relationship between the accession of V4 countries to the EU and changes in the dynamics of change.

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