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The Competitiveness of the Visegrad Group Countries in the Global Economy and the EU*

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Abstract:

Purpose: *To analyse changes in the international competitiveness of the Visegrad Group (V4) countries, i.e., Poland, Czech Republic, Slovakia and Hungary, in the 2014-2024 period. Particular attention is drawn to the impact of two major external shocks, the COVID-19 pandemic and the war in Ukraine, on foreign trade structures, on the development of the comparative advantages found, and the intensity of intra-industry trade.*

Design/Methodology/Approach: *The study uses a comparative analysis of macroeconomic data on foreign trade from the Eurostat and UNCTAD bases. The international competitiveness is evaluated by means of trade structure ratios following the LALL technological classification, Balassa's revealed comparative advantages (RCA), and Grubel-Lloyd intra-industry trade (IIT) indexes. The analysis is applied to total trade, trade with the EU27, and with non-EU27 countries.*

Findings: *The results of the research indicate, that the Visegrad Group countries have improved their competitive standing both in the European Union and in the global economy. They increased their share in global exports and imports in the period examined and continued the process of economic convergence with the EU. The V4 countries' export competitiveness relied on medium-tech sectors, especially the automotive industry. The high IIT values reaffirm a profound integration of the V4 economies into the European and global trade links. In parallel, competitive advantages were strengthened in raw materials and medium-tech sectors and weakened in some high-tech sectors, particularly after 2020. The COVID-19 pandemic failed to undermine the competitiveness of V4 in a longer term. On the other hand, the war in Ukraine had more effect on the trade structures and comparative advantage of these economies.*

Practical Implications: *The results suggest the maintenance of a long-term competitiveness in the V4 countries requires a transition from the advantages based mostly on labour costs to a development model based on innovation. More expenditure on research and development, the development of high-tech sectors, and improving the technological potential of the regional economies are necessary.*

Originality/Value: *The paper's value lies in an all-round analysis of the trade competitiveness of the V4 countries that also includes the changes of comparative advantages, trade and intra-industry trade structures at the time of two major economic and geopolitical*

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crises: the COVID-19 pandemic and the war in Ukraine. The analysis has also demonstrated that the rising economic significance of the V4 countries was not balanced with a growing specialisation in high-tech sectors.

Keywords: *The Visegrad Group, international competitiveness, foreign trade, comparative advantages, intra-industry trade, the COVID-19 pandemic, war in Ukraine.*

JEL codes*: F14, F15, O11, O52, R11.*

Paper type: *Research Paper*

1. Introduction

The research underlying this paper was designed to analyse the competitive advantages of the Visegrad Group countries against the background of the global economy including the EU. The Visegrad Group countries are among the fastest-developing economies of the Central and Eastern Europe. Ever since they joined the EU, their economic significance has risen steadily in terms of their shares in both output and international trade.

Despite the numbers of studies concerning the processes of economic convergence and integration of the Central and Eastern Europe countries and the European Union, relatively few analyses address changes in comparative advantages, trade structures and the intensity of intra-industry trade at the time comprising two major economic shocks: the COVID-19 pandemic and the war in Ukraine. Those events had a considerable impact on the world economy and international trade relations.

The paper aims to analyse changes in the international competitiveness of the Visegrad Group countries in 2014-2024. Particular attention is drawn to the changes of foreign trade structures, comparative advantages, and the intensity of intra-industry trade as far as total trade and trade with the EU27 and non-EU27 countries are concerned.

The following hypotheses are adopted:

a) The Visegrad Group countries improved their international competitiveness in 2014-2024 despite the major external shocks.
b) The trade competitiveness of the V4 countries relies primarily on medium-tech, not high-tech sectors.
c) The comparative advantages of the V4 countries are stronger in their trade with countries outside the EU than in the intra-community trade.

d) The war in Ukraine had more impact on the competitive advantages of the V4 countries than the COVID-19 pandemic did.

2. The Theoretical Foundations of International Trade and Competitiveness of the Visegrad Group Economies

The analyses of international trade and the competitiveness of national economies go back to the classical theories of political economy. Adam Smith's theory of absolute advantages assumes countries specialise in the production of goods where they enjoy lower absolute costs (Smith, 1776). The concept is developed with David Ricardo's theory of comparative advantages, according to which even a country absolutely less effective in all areas may derive benefits from trade by specialising in the production of goods with relatively lower alternative costs (Ricardo, 1817).

The Heckscher–Ohlin model, explicating the structure of international trade with how differently countries are equipped with production factors (Heckscher and Ohlin, 1933), is fundamental to the neoclassical current. The model, in spite of its multiple expansions, has been subject to empirical criticisms (Leontief paradox), which has paved the way for new theories of trade.

Contemporary approaches developed by Paul Krugman, among others, address the benefits of scale, product diversification, and intra-industry trade (Krugman, 1979, 1980). These theories are particularly useful when analysing medium-developed economies, such as the V4 countries, strongly integrated into the European Union market and taking part in global value chains.

The application of classic and contemporary theories of international trade to the analysis of trade exchange by the Visegrad Group countries – Poland, Czechia, Slovakia, and Hungary – is particularly reasonable given the unique nature of their economic development, structure of foreign trade, and integration into the European and global economies.

First, the classical theories (Smith, Ricardo) supply the essential analytical apparatus for explaining the benefits of international trade to countries with relatively lower initial income that, following their systemic transformations, have quickly joined the international division of labour. With reference to the V4 countries, the theory of comparative advantages helps to interpret their export specialisation in moderate and medium-tech sectors, initially based on relatively low costs of labour and advantageous alternative costs.

Second, the Heckscher–Ohlin model remains useful to analysing the initial stage of the V4 countries' integration into the European Union market, when the trade structure was to a large extent determined by the differences in equipment with production factors, especially medium-qualified human capital and labour resources. On the other hand, the empirical limitations of the model, apparent e.g., in the

Leontief paradox, are also clear in the V4's case and point to the need for more advanced theories.

Third, the new concepts of international trade (Krugman) are particularly appropriate to an analysis of contemporary patterns in the V4 countries' trade. These economies exhibit high shares of intra-industry trade, a strong specialisation in regional production networks, and the importance of benefits of scale and product diversification. The theories can explain the preponderance of trade with highly developed countries, especially in the European Union, in spite of the relatively similar factor structures.

Fourth, the dynamic conception of international competitiveness (Porter, OECD) is necessary for the purposes of analysing long-term development prospects of the V4 economies. These countries are in the process of transition from cost competitiveness to a competitiveness founded on quality, innovation, and the ability to generate added value. The discrimination between competitiveness and competitive position enables a simultaneous assessment of current trade performance and development potential.

The economics literature lacks an unambiguous definition of an economy's international competitiveness. It's most commonly understood as a country's ability to generate a continued growth of national income and employment in the conditions of open economy (OECD 1992; Porter 1990).

The following distinctions need to be made between:

- Competitiveness – a processual and dynamic concept,
- Competitive position – a static concept that refers to a country's status in international trade, rankings or export structures.

Competitiveness is multidimensional and encompasses the following factors:

- Cost (labour productivity, unit costs),
- Structural (technological advancement of exports),
- Institutional (quality of governance, macroeconomic stability),
- Innovative (R&D, human capital).

A tension between cost competitiveness, based on the relatively low costs of labour, and quality competitiveness, associated with innovation and added value, is important in the case of the Visegrad Group countries.

The contemporary approach to the competitiveness of national economies departs from simple cost advantages to the benefit of dynamic and systemic ones. M. Porter's diamond model of national competitiveness is crucial here (1990), including:

- Factor conditions,
- Demand conditions,
- Supporting and related industries,
- Firm strategy, structure, and rivalry.

The analysis is supplemented with:

- The concept of global value chains (GVC),
- Institutional approach (North, 1990),
- The theory of dynamic and innovative competitiveness (Aghion and Howitt, 1998).

With regard to the V4 countries, the analysis of competitive advantages requires the following to be taken into account:

- A strong integration into the German production base,
- The structural dualism (international corporations vs. domestic sector),
- Demographic and technological challenges.

The application of Porter's model, the institutional approach, and the concept of global value chains provide for an all-round analysis of the V4 countries' competitive advantages that addresses their strong links with foreign corporations, the structural dualism of their economies, and limitations arising from demographic and technological conditions. These models help move beyond the static conception of trade and better capture the mechanisms of long-term competitiveness growth.

3. Research Methodology

The evaluation of international competitiveness requires a set of quantitative ratios. This paper analyses trends in basic macroeconomic categories, including GDP, GDP per capita, GDP growth rate, unemployment rate, HICP – inflation rate, general government balance (% of GDP), current account net balance (% of GDP), and Unit Labour Cost (ULC) in 2014-2025. The ULC is computed as: $ULC=\frac{W}{Y/L}$; where: W– average wage; Y/L– productivity of labour. This measure of cost competitiveness is of particular importance when examining the countries of Central and Eastern Europe.

As part of the analysis of trade competitiveness, the changes of foreign trade structure indicators for the Visegrad Group countries were assessed, as well as:

a) The intensity of intra-industry trade ratios - developed by H. Grubel and P.J. Lloyd (1971, 1975) - the formula is as follows (in this study, calculated using 3-digit SITC classification):

$$IIT=\frac{x_{iA}+m_{iA}-|x_{iA}-m_{iA}|}{x_{iA}+m_{iA}}$$

where: IIT – the intensity of intra-industry trad; x_{iA} – exports of commodity group *i* from country *A;* m_{iA} – imports of commodity group *i to* country *A.*

The *IIT* index ranges from 0 to 1, the higher it is, the more intensive the intra-industry trade. If it's 0, it means a 100% inter-industry exchange, if $IIT=1$, then 100% of the trade with a given country is intra-industry. The indicator expressed as a percentage shows the share of intra-industry trade in the total trade.

The average value, especially weighted average (in this study, export shares serve as weights), of *IIT* ratios can be treated as the composite indicator of international intra-industry trade.

b) The revealed comparative advantages indicators (RCA) - derived from Balassa (1965). The formula is as follows (in this study, calculated using a 3-digit SITC classification):

$$RCA=ln\left(\frac{x_{iA}}{m_{iA}}\div\frac{X_A}{M_A}\right)$$

where: RCA – the revealed comparative advantages; x_{iA} – the exports of commodity group *i* from country *A;* m_{iA} – the imports of commodity group *i to* country *A;* X_A – the total exports of country *A;* M_A – the total imports of country *A.*

If RCA_i is greater than zero, it points to revealed comparative advantages and to the intensity of this advantage. RCA_i below zero denotes the absence of a revealed comparative advantage with either a smaller or greater intensity. The logarithmic form of the formula makes it possible to maintain the symmetricality of the positive or negative RCA_i ratios in a range around zero.

The average value, especially the weighted average (in this study, export shares serve as weights), of RCA_i ratios can be treated as the composite indicator of international inter-industry competitiveness.

The application of quantitative competitiveness measures (ULC, RCA, IIT) is of particular use to V4 research as it helps to:

- Identify sectors with continued comparative advantages,
- Assess the degree of integration into the European market,
- Analyse changes in the structures of cost and non-cost competitiveness,
- Compare countries in the region.

Statistics from Eurostat (macroeconomic data) and UNCTAD (international trade data) are utilised. The foreign trade analysis employs the LALL technological classification (Lall, 2000) that categorises commodities based on the SITC nomenclature. Commodities in international trade are divided into 5 major groups:

a) Primary products—unprocessed agricultural goods, minerals, and fuels
b) Resource-based manufactures, including
    a) agro-based – agricultural, food, and forestry products (food processed to a low degree, tobacco products, wood, and leather)
    b) other – the remaining products, chiefly mineral (refined fuels, cement, glass, basic chemicals and processed metal ores);
c) Low technology manufactures, including:
    a) textile, garment and footwear – labour-intensive goods
    b) other products – simple metal and plastic products, furniture, toys, and containers;
d) Medium technology manufactures, including:
    a) Automotive – motoring industry products
    b) Process – processing industry products, i.e., advanced chemicals, plastics, synthetic materials, iron and steel products
    c) Engineering – engineering industry products, i.e., machinery, engines, generators, and specialist industrial equipment;
e) High technology manufactures, including:
    a) electronic and electrical – computers, microprocessors, telephones, telecommunications, radio and TV equipment
    b) other – space aircraft, air-planes, pharmaceuticals, medical apparatus and optical instruments.

This classification serves to evaluate the competitive capacities of countries based on data for their international trade.

4. Research Results

4.1 Selected Macroeconomic Indicators for the Visegrad Group

The Visegrad Group countries (V4 – Czechia, Hungary, Poland, Slovakia) form a geographically and demographically important region of the European Union. In 2025, they covered approx. 533 000 km², that is, 12.6% of the EU27 area, and had 62.4m inhabitants, or 13.8% of the EU27 population. The region is dominated by Poland in both territorial and demographic terms (Table 1).

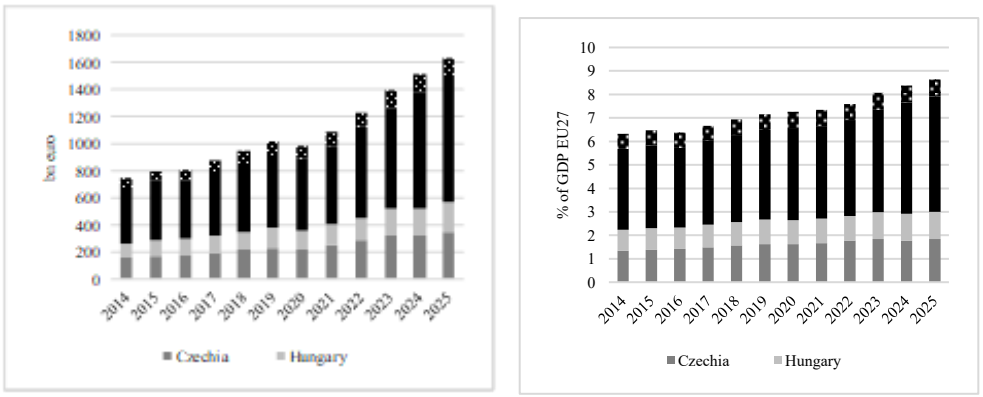
Table 1. *The area and population of the Visegrad Group countries compared to the EU in 2025*

	Czechia	Hungary	Poland	Slovakia	V4
Area:					
total (K km^2)	78.9	93.0	312.0	49.0	532.9
% V4	14.8	17.4	58.5	9.2	100.0
% the EU27	1.9	2.2	7.4	1.2	12.6
Population:					
total (m)	10.9	9.5	36.5	5.4	62.4
% V4	17.5	15.2	58.5	8.7	100.0
% the EU27	2.4	2.1	8.1	1.2	13.8

Source: *Eurostat.*

In 2014-2025, the V4 countries experienced a dramatic GDP growth. The total GDP of the region rose from € 750.6bn to € 1 625.0bn, thus nearly doubling. The share of the V4 countries in EU27 GDP generation expanded from 6.3% to 8.6%, evidence of a gradual reinforcement of the region's economic standing in the EU27. Poland contributed the most to the Visegrad Group's economy, its share in its GDP ranged 55-57% during the entire period examined.

Figure 1. *The GDP of the Visegrad Group countries in 2014-2025 (current prices, %, € bn)*



Source: *The authors' compilation based on the Eurostat data.*

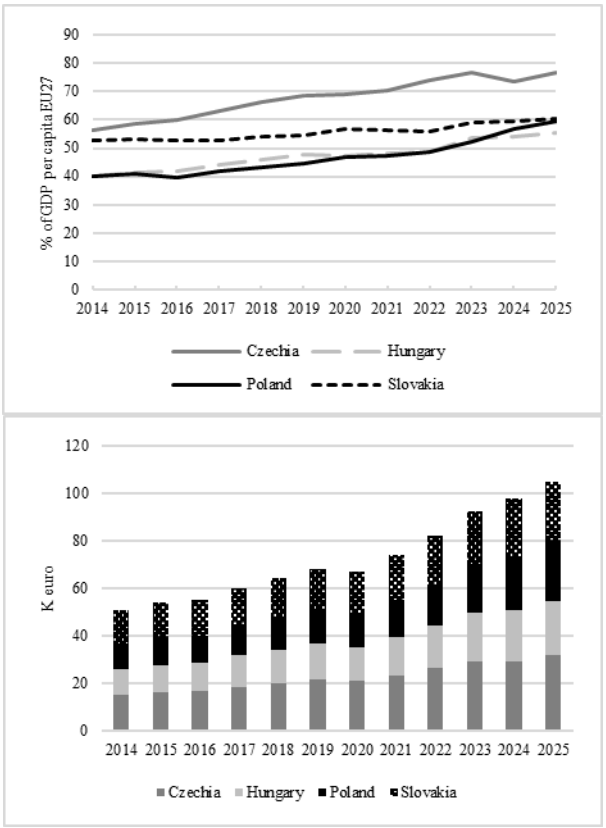
In 2014-2025, the structure of GDP generation by the V4 countries was increasingly similar to the EU27s economic structure. The average ratio of structural similarity rose from circa 88% to 94%, proof of a progressive sector convergence.

The significance of industry declined (its share dropping from around 27% to 22%) while that of services (public administration; professional, scientific and technical activities; real estate activities) rose. Nonetheless, the share of industry in the V4 countries continued to be higher than the EU27 average, which reaffirms the role of the production sector in the regional economy.

A systematic convergence of GDP per capita with the EU27 average could be observed at the time under analysis as well. The average GDP per capita of the V4 grew from about € 13K to more than € 26K, while its relationship to the EU27 average climbed from 47% to 63%.

It should be noted Czechia continued attaining a maximum GDP per capita in the whole period studied (an increase from € 15K in 2014 to € 32K in 2025), whereas the fastest growth rate was noted in Poland (approx. 8% a year, compared with 4% in the EU27). These figures suggest a gradual bridging of the developmental gap between the V4 countries and the EU27.

Figure 2. *GDP per capita of the Visegrad Group countries in 2014-2025 (current prices, %, €K)*

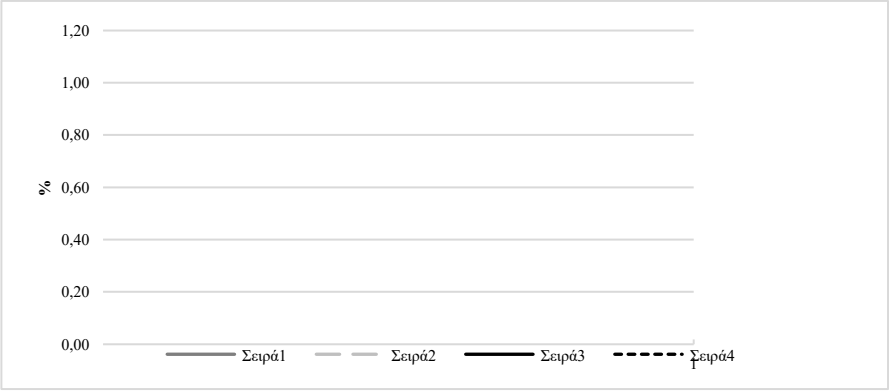


Source: *The authors' compilation based on the Eurostat data.*

At the time under review, the V4 economies developed faster on average than the EU27 economy did. The advantage was especially pronounced in 2014-2019, when the V4's average rate of economic growth was 2 percentage points greater than of the EU. The COVID-19 pandemic in 2020 slowed the economies of both the V4 and the entire EU a lot. Following a dynamic bounce-back in 2021, the differences

between the rate of economic growth in the V4 and the EU27 gradually shrank, but the geopolitical situation in the region (the war in Ukraine) was not conducive to economic development.

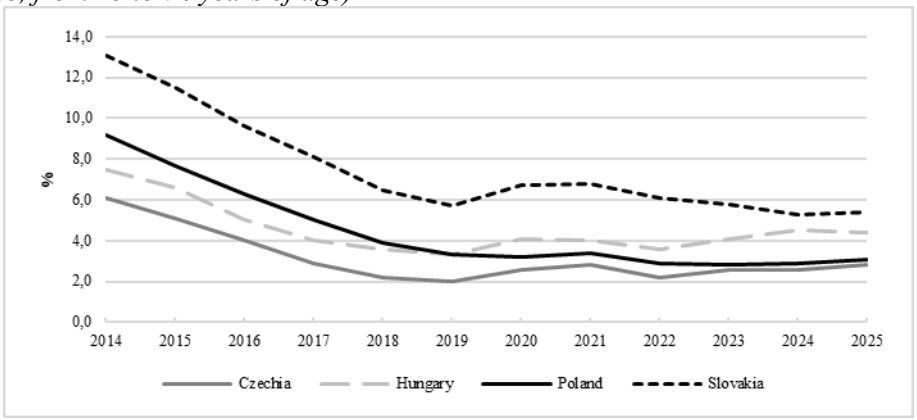
Figure 3. *Real GDP growth rate (GDP at market prices; chain linked volumes, percentage change on previous period)*



Source: *The authors' compilation based on the Eurostat data.*

The dynamic economic growth was accompanied by a gradual improvement in the job market. The average rate of unemployment in the V4 countries diminished from 9% in 2014 to around 4% in 2019-2025 and continued lower than the EU27 average the whole time. A temporary rise in unemployment was reported in 2020 as a consequence of the pandemic, however, the adverse effects of the crisis were quickly mitigated.

Figure 4. *Total unemployment rate (the percentage of population in the labour force, from 15 to 74 years of age)*



Source: *The authors' compilation based on the Eurostat data.*

As the unemployment declined, labour productivity was observed to rise. The changes in this regard were most dramatic in Poland, where real labour productivity

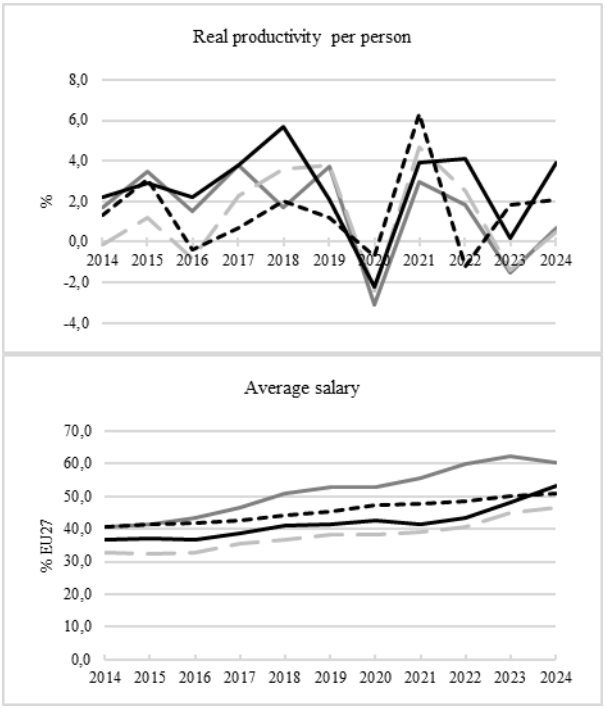
grew by an annual average of 2.7%. The improvement was more modest in the remaining countries of the region (ca. 1-1.5% a year), yet considerably greater than the EU27 average (0.6% per annum). Wages rose together with the labour productivity.

In 2014-2025, the average rate of wages growth in the V4 group ranged 6-7%, that is, double that of the EU27. The wage growth dynamics were high starting with 2017 (with the exception of 2020 – the COVID-19 pandemic). As a result, the average wages in the V4 gradually approached the EU27 average, though remaining lower.

In 2014, the average V4 wage corresponded to a mere 38% of the EU27 average, whereas it reached ca. 53% in 2024. The changes of wages and labour productivity affected the unit costs of labour.

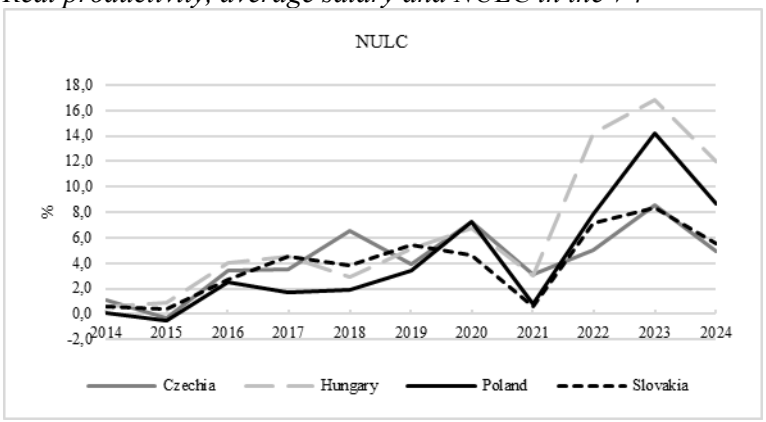
Beginning in 2016, the NULC rose rapidly in all the countries of the region (especially in Poland and Hungary after 2022). It gradually reduced the cost advantage, a key factor in the competitiveness of the region's economies before.

Figure 5. *Real Productivity and average salary 2014-2024*



Source: *The authors' compilation based on the Eurostat data.*

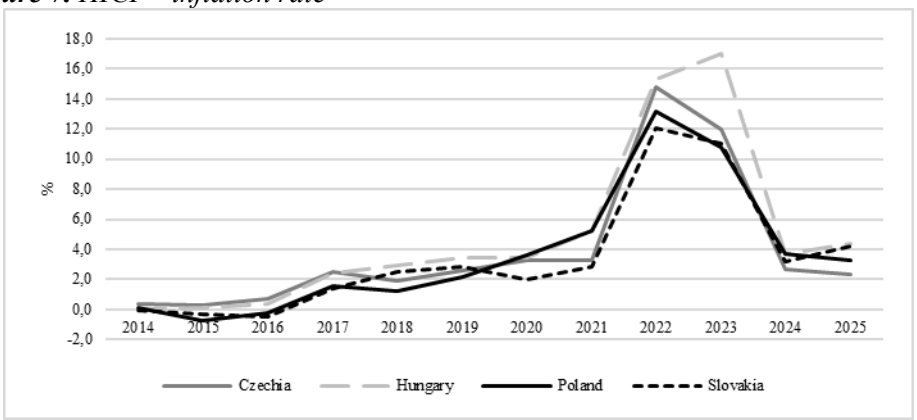
Figure 6. *Real productivity, average salary and NULC in the V4*



Source: *The authors' compilation based on the Eurostat data.*

Following a time of relative price stability in 2014-2020, the V4 countries experienced a period of strong inflation. The inflation pressure peaked in 2022-2023, when the average inflation in the region reached 13-14%. The high inflation was a consequence of the COVID-19 pandemic, disruptions of global supply chains, and the impact of the war in Ukraine, including the raw materials and energy crisis. Since 2024, the inflation has been gradually returning to the targets set by the central banks.

Figure 7. *HICP - inflation rate*

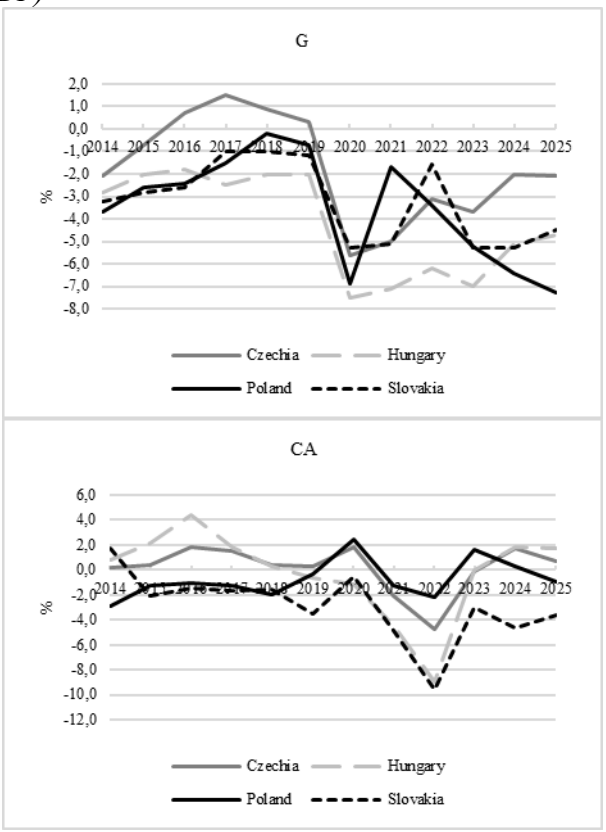


Source: *The authors' compilation based on the Eurostat data.*

The V4 countries' public finances deteriorated significantly following the outbreak of the COVID-19 pandemic. Until 2019, most states of the region had maintained relatively stable balances of the central and local government sector, with Czechia even reporting budget surpluses. Deficits rocketed in 2020. Despite a partial improvement in the subsequent years, the fiscal disequilibrium has remained higher, due for instance to the need for financing the protective measures.

The geopolitical tensions and all of the associated impacts have been of little help in stabilising the situation.

Figure 8. *General government deficit/surplus [G] and current account [CA] net balance (% of GDP)*



Source: *The authors' compilation based on the Eurostat data.*

The current account balances changed in 2014-2025 as well. The COVID-19 pandemic failed to cause any dramatic changes, however, most V4 countries recorded a considerable impairment of the relationship between the current account balance and GDP in 2021-2022, first of all associated with the rising prices of energy and raw materials and the changing rates of exchange in foreign trade. The situation gradually improved over the next years, though the scale of the process varied across the economies of the region.

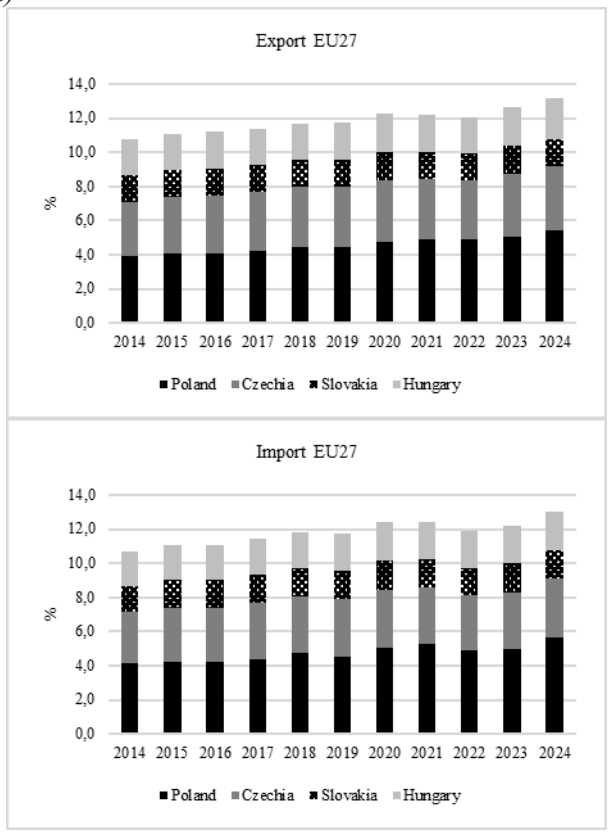
4.2 The Foreign Trade of the Visegrad Group

In 2014-2024, the Visegrad Group countries steadily expanded their combined share in the global commodity exports (from 3.1% in 2014 to 3.8% in 2024) and imports (from 3.0% in 2014 to 3.6% in 2024). These shares grew the most for Poland (from 1.1% to 1.6%), Czechia's share remained steady at ca. 1%, Hungary's was 0.6-0.7%,

and Slovakia's ranged around 0.4-0.5%. This is evidence of a gradually increasing significance of the V4 states in the world economy, a growth of their export competitiveness and a rising demand for imported goods.

The importance of the V4 states in the EU trade rose consistently in the period studied, too. The total share of V4 expanded from approx. 10% in 2014 to about 13 % in 2024 as far as the EU27 exports and imports are concerned. Poland was the largest exporter and importer among these countries, its share climbed form 4% to ca. 6%. Czechia accounted for around 3.5% of the EU trade, Hungary for about 2-2.5%, and Slovakia for approximately 1.6%. The figures corroborate a rising competitiveness of the Central European economies in the Union market (especially Poland, which reinforced its position) and a proceeding integration into the common EU market.

Figure 9. *The shares of the Visegrad Group countries in the EU27 commodity trade in 2014-2024 (%)*



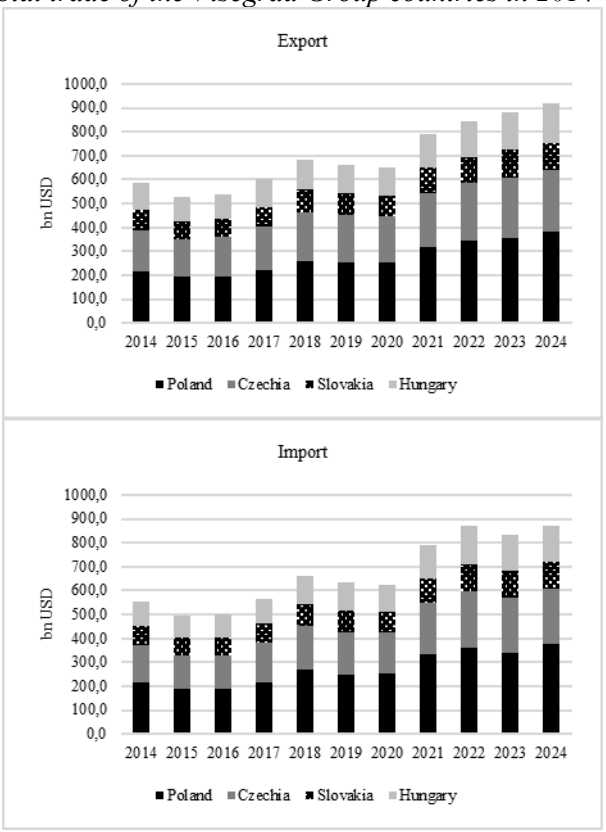
Source: *The UNCTAD data.*

The value of all the Visegrad Group countries' trade displayed a rising trend in 2014-2024, despite some temporary drops in 2015, 2019, and 2020. Poland remained the greatest exporter and its exports rose from $ 214.5 bn in 2014 to $

380.3bn in 2024. Czechia followed, with Slovakia recording the lowest values of exports. The combined value of the V4 states' exports increased from $ 587.1bn to $ 919.0bn, a growth of more than 56%. Their imports also rose clearly, to attain the value of $ 871.6bn in 2024, compared with $ 555.3bn in 2014. The growth of imports was particularly strong after 2020, with the economies recovering from the pandemics and the rising prices of raw materials and intermediate goods.

The trade balances of the V4 states fluctuated in the period reviewed. Czechia maintained the steadiest surplus. Poland, Slovakia, and Hungary experienced both trade surpluses and deficits, with the poorest performance to be recorded in 2021 and 2022.

Figure 10. *The total trade of the Visegrad Group countries in 2014-2024 ($ bn)*

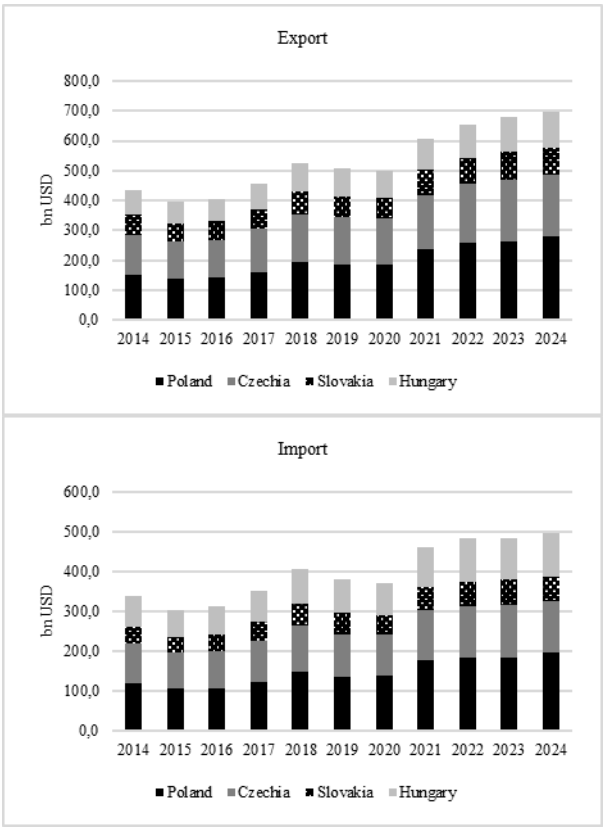


Source: *The UNCTAD data.*

The value of the V4 countries' exports to the European Union states persisted in rising across the time studied, to grow from $ 435.4bn in 2014 to $ 696.8bn in 2024. Poland accounted for most of the trade, and its exports to the EU were worth $ 281.1bn in 2024. The V4 states maintained a high share of the EU market as far as the structure of exports is concerned. Nearly 80% of the Czech and Slovakian and more than 70% of Polish and Hungarian exports ended in the EU27 market.

The combined share of the V4 exports to the EU ranged about 75%, proof of the consistently dominant role of the European Union as the key trade partner for the region.

Figure 11. *The scale of the Visegrad Group countries' trade with the EU27 in 2014-2024 ($ bn)*



Source: *The UNCTAD data.*

In 2014-2024, the value of imports from the EU rose as well, reaching a combined total of $ 497.6bn in 2024, compared to $ 338.4bn in 2014. Contrary to the exports, the share of EU imports showed a slightly declining trend. For the entire Visegrad Group, the ratio fell from 61% in 2014 to 59% in 2024. Hungary noted the maximum dependence on supplies from the EU (more than 70%), the EU27 imports ranged 52-55% for Poland and Slovakia.

The EU27 imports accounted for ca. 65% of total imports into Czechia in 2014; they began to decline in 2019 to reach about 56% in 2024. This may suggest a gradual diversification of import routes and a growing significance of partners from outside the European Union. Nevertheless, the figures reaffirm the crucial importance of the EU market for the Visegrad Group economies, with the scale of trade demonstrating a profound integration of the V4 countries into the common European market.

The trade exchange with the EU continued to generate trade surpluses for all the V4 countries. Poland and Czechia recorded the highest positive balances, over $ 83.5bn and 76.8bn in 2024, respectively. This points to a great competitiveness of the Visegrad Group exports in the EU market.

Germany was unquestionably the crucial trade partner for the V4 countries, especially in respect of exports. Intraregional trade was important as well, particularly for Slovakia. The Visegrad Group countries were clear trade leaders for Slovakia with regard to both exports and imports; for Czechia, Slovakia and Poland came second and third. Czechia is also the second biggest trade partner in Polish exports and fifth in imports. This is evidence of strong trade links among the economies of the region.

Table 2. *The shares of selected EU countries in the Visegrad Group trade (average for 2014-2024, %)*

	Czechia	Hungary	Poland	Slovakia	Czechia	Hungary	Poland	Slovakia
	Export				Import			
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EU27	**79.4**	**74.5**	**73.6**	**79.2**	**60.5**	**72.5**	**54.5**	**56.1**
Germany	32.4	26.5	27.6	21.7	23.7	24.6	21.5	16.5
France	4.9	4.2	5.7	6.0	3.0	3.8	3.5	3.2
Italy	3.9	5.2	4.6	4.8	4.1	4.4	5.0	3.4
Austria	4.3	4.3	2.0	5.6	2.8	6.4	1.6	2.9
Netherlands	3.4	3.2	4.4	2.3	2.8	4.9	3.8	1.4
V4	**17.6**	**12.6**	**11.4**	**26.3**	**15.0**	**16.1**	**6.7**	**20.6**
Czechia	x	4.0	6.3	11.7	x	5.0	3.3	10.2
Poland	6.4	4.0	x	7.8	7.9	5.7	x	5.6
Slovakia	8.0	4.6	2.6	x	4.7	5.4	1.7	x
Hungary	3.2	x	2.6	6.8	2.4	x	1.6	4.8

Source: *The authors' compilation based on the UNCTAD data.*

The analysis shows a steadily growing significance of the Visegrad Group states in both the global and European Union trade. Poland stands out in this connection, raising its shares in exports and imports the fastest in the period examined. The EU remained the key direction of exports for all the states in the region, accounting for around three quarters of their foreign trade.

The positive trade balance with the EU upholds the high competitiveness of the V4 economies in the common European market. Strong trade ties among the V4 countries persisted, especially for Slovakia and Czechia, for which the intra-group exchange was a major part of foreign trade.

The similarities in foreign trade structures presented in Table 3 suggest a high convergence of both import and export structures of the V4 countries. The ratios are

in the range 0.7 to 0.9 most of the time, proof of a considerable similarity of the commodity trade structures of the countries discussed.

As far as exports are concerned, the commodity structures were most similar between Czechia and Hungary (0.872) as well as Czechia and Slovakia (0.866). This demonstrates similar profiles of export specialisations of these economies, due to similar industrial structures, among other things. The similarity is minimum between Poland and Slovakia (0.733), suggesting some more marked differences in the structures of commodities they export.

In respect of geographical destinations, the structures are more similar for trade with the EU than with third parties. Thus, the V4 countries pursue more similar export strategies in the EU market, whereas their specialisations are more varied when exporting out of the EU.

Table 3. *The ratios of structural similarities in the trade of the Visegrad Group countries (average for 2014-2024)*

	export			import		
	total	UE	non-UE	total	EU	non-EU
Poland—Czechia	0.788	0.792	0.748	0.866	0.911	0.771
Poland—Slovakia	0.733	0.783	0.529	0.859	0.863	0.827
Poland—Hungary	0.752	0.753	0.710	0.860	0.854	0.812
Czechia—Slovakia	0.866	0.900	0.705	0.912	0.893	0.869
Czechia—Hungary	0.872	0.859	0.866	0.910	0.896	0.807
Slovakia—Hungary	0.782	0.803	0.676	0.896	0.833	0.862

Source: *The authors' compilation based on the UNCTAD data.*

The structures are even more similar in the case of imports. The similarity ratio is maximum between Czechia and Slovakia (0.912) and minimum between Poland and Slovakia (0.859). The V4 countries import similar ranges of goods, associated with similar production and consumption needs.

Like in respect of exports, the import structures were more similar in the trade with the EU than with third-party countries. This upholds a strong integration of the Visegrad Group states into the common European market and similar economic ties with the EU partners.

The data in Table 4 point to some distinct similarities in the trade structures of the Visegrad Group countries while uncovering certain differences in the export and import specialisations of the individual economies. In 2014-2024, medium and high-tech products played a central role in the V4 exports. This was true of trade with both the EU27 and third-party countries. In Slovakia, Czechia and Hungary, medium and high-tech products accounted for ca. 70% of their exports, more in trade with third-party countries than in exports to the EU27 (it was more than 80% of Slovakian exports to third-party states).

The relatively high (maximum among the countries studied) share of high-tech products in Hungarian exports (more than 25%) is noteworthy and confirms a high technological competitiveness of that country. The Polish exports were more diverse. Medium and high-tech products included around a half of the exports from Poland, with resource-based manufactures: agro-based (ca. 12% of total exports) playing a major part, too. Low-tech products (Furniture, Articles of plastic, Manufactures of base metal) had great shares in Poland, Czechia, and Slovakia, too.

Following on a detailed analysis of the export structures of the V4 countries, some major shifts can be noted that took place in 2014-2024. The significance of high-tech products in exports rose (particularly in Hungary and Czechia), that of high materials-consuming industries reduced (chiefly in Poland), and the automotive sector acquired more importance (mainly in Slovakia). Some short-term changes in exporting structures were caused by the COVID-19 pandemic.

In 2021, the exports of high-tech electronic products increased. The pandemic drove up the global demand for electronic or ICT equipment, with Hungary (a major centre of electronics manufacture in Central Europe) benefiting more than the other countries of the region. In parallel, the importance of automotive products diminished, especially in Slovakia and Czechia.

This was a result of temporary factory shutdowns, interruptions of global chains of supply and a falling demand for cars in the initial phase of the pandemic. The military conflict in Ukraine (particularly in 2022), in turn, boosted the shares of raw materials and agricultural products in the V4 exports, most likely an effect of growing prices of raw materials and food in international markets.

Table 4. *The commodity structures of the Visegrad Group trade (average for 2014-2024, %)*

Country/group of products	export			import		
POLAND	total	UE	non-UE	total	UE	non-UE
Primary products	9.5	9.4	9.8	14.4	9.6	20.3
Resource-based manufactures: agro-based	12.6	12.6	12.6	7.3	10.1	3.9
Resource-based manufactures: other	5.3	5.2	5.6	6.3	6.5	6.0
Low technology manufactures: textile, garment and footwear	5.1	5.8	3.3	6.6	3.6	10.1
Low technology manufactures: other products	17.2	18.5	13.8	12.3	14.4	9.8
Medium technology manufactures: automotive	10.1	11.0	7.7	8.5	11.5	4.8
Medium technology manufactures: process	8.4	8.3	8.6	10.5	14.1	6.1
Medium technology manufactures: engineering	17.3	14.8	24.4	15.7	16.6	14.6
High technology manufactures: electronic and electrical	10.4	10.9	9.2	11.3	6.6	16.9
High technology manufactures: other	2.6	2.1	4.0	4.5	4.8	4.2
Unclassified products	1.4	1.5	1.1	2.7	2.2	3.3
Total	100	100	100	100	100	100
CZECHIA	export			import		
	total	UE	non-UE	total	UE	non-UE
Primary products	3.6	4.0	1.8	9.8	8.1	12.4
Resource-based manufactures: agro-based	6.6	6.9	5.4	5.9	8.1	2.6

Resource-based manufactures: other	3.4	3.7	2.4	4.6	5.8	2.8
Low technology manufactures: textile, garment and footwear	3.3	3.6	2.1	4.3	2.8	6.6
Low technology manufactures: other products	14.3	15.0	11.5	13.3	16.7	8.2
Medium technology manufactures: automotive	19.5	19.3	20.3	9.5	11.8	5.8
Medium technology manufactures: process	5.8	5.7	6.1	8.5	11.1	4.5
Medium technology manufactures: engineering	19.4	18.1	24.3	17.4	19.6	14.1
High technology manufactures: electronic and electrical	19.2	19.0	19.9	20.7	8.8	38.6
High technology manufactures: other	3.2	2.8	4.8	4.8	5.5	3.7
Unclassified products	1.8	1.9	1.4	1.3	1.6	0.7
Total	100	100	100	100	100	100
	export			import		
SLOVAKIA	total	UE	non-UE	total	UE	non-UE
Primary products	3.6	4.2	1.2	10.8	6.9	15.6
Resource-based manufactures: agro-based	6.8	7.2	5.1	6.3	9.0	2.9
Resource-based manufactures: other	4.2	4.9	1.3	4.7	5.8	3.3
Low technology manufactures: textile, garment and footwear	3.7	4.2	2.1	4.3	2.5	6.6
Low technology manufactures: other products	11.9	13.2	6.9	12.2	15.6	7.8
Medium technology manufactures: automotive	30.4	25.4	49.3	15.6	21.3	8.4
Medium technology manufactures: process	5.0	5.6	2.7	6.5	8.8	3.5
Medium technology manufactures: engineering	15.3	15.5	14.4	16.9	17.8	15.7
High technology manufactures: electronic and electrical	16.5	17.1	14.1	16.6	8.2	27.5
High technology manufactures: other	1.1	1.0	1.3	4.4	3.8	5.1
Unclassified products	1.6	1.6	1.5	1.8	0.3	3.6
Total	100	100	100	100	100	100
	export			import		
HUNGARY	total	UE	non-UE	total	UE	non-UE
Primary products	6.5	6.8	5.7	10.8	8.0	18.4
Resource-based manufactures: agro-based	6.6	7.1	5.1	6.1	7.5	2.7
Resource-based manufactures: other	5.0	5.0	5.1	5.1	5.4	4.4
Low technology manufactures: textile, garment and footwear	2.1	2.2	1.8	3.4	3.6	2.8
Low technology manufactures: other products	7.3	7.7	6.1	9.8	11.2	6.1
Medium technology manufactures: automotive	16.0	15.2	18.2	9.2	11.3	3.7
Medium technology manufactures: process	5.9	6.3	4.7	7.9	8.5	6.3
Medium technology manufactures: engineering	22.0	22.5	20.7	20.1	19.9	20.3
High technology manufactures: electronic and electrical	18.6	18.0	20.2	17.1	13.2	27.6
High technology manufactures: other	7.3	6.4	9.8	5.5	5.7	5.1
Unclassified products	2.7	2.7	2.5	4.7	5.5	2.6
Total	100	100	100	100	100	100

Source: *The authors' compilation based on the UNCTAD data.*

Medium and high technology industrial products also prevailed in the importing structures of the V4 countries, though to a lesser extent than in exports. They constituted approximately 60% of their imports, both from the EU27 and third-party countries, in 2014-2024.

The relatively high share of V4 primary products in imports to V4 countries (more than 10% on average, particularly from third-party countries, where they formed ca. 17% of the imports) deserves attention. Petroleum oils, oils from bitumen. materials, crude and natural gas were imported above all else. The share of low-tech products

was relatively high, too (around 15%); like in the case of exports, furniture, articles of plastic, and manufactures of base metal were mostly imported.

Like in respect of exports, the COVID-19 pandemic brought about some visible, short-term changes in the import structures. First of all, the imports of electronic products rocketed dramatically in 2020 (especially in Hungary). This was due to a rising demand for ready-made electronic products, on the one hand, but also for components used in their manufacture.

In turn, the outbreak of the war in Ukraine had no clear effect on the structure of imports from the EU27 while changing that from non-EU27 importers. The shares in the imports of basic and materials-consuming products could be observed to expand. This was an undoubted direct result of the energy crisis and the need for more imports of raw materials and basic products from alternative sources.

The growth of raw materials and food prices in international market played a role, too. The changes were mostly apparent in 2022. The import of basic products accounted for 24% of all the imports from third-party countries in Hungary, 21% in Poland and Slovakia, and 17% in Czechia.

A marked commitment of the V4 countries to the development of intra-industry trade could be noted at the time under review. That was led by Czechia, where the share of intra-industry trade in total trade continued rising to reach around 75% in the final year of the period.

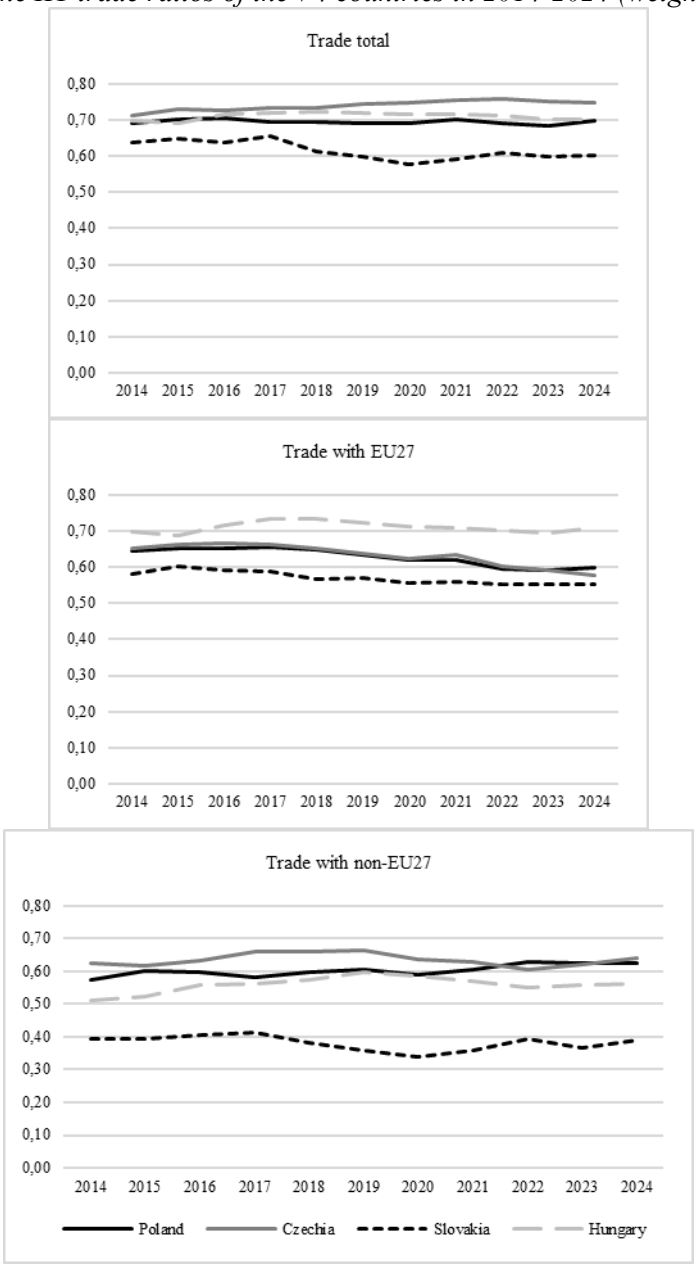
Poland and Hungary reached comparable average total IIT values, though with different sectoral structures. The intra-industry trade there comprised approximately 70% of total trade. Slovakia displayed the weakest commitment in this respect, which clearly tended to decline.

In Poland, the IIT weighted average was in the range of 0.67-0.70. The ratio became relatively stable in 2014-2019. The pandemic brought a minor drop to 0.67 in 2020, a result of international trade disruptions and a temporary reduction of industrial output. It bounced back to 0.69 as soon as 2021, though, to return to its pre-crisis values in the following years. The war in Ukraine didn’t cause a marked collapse of Poland’s intra-industry trade, the economy was quick to adjust its trade routes and took advantage of the relatively strong integration into the EU market. The Polish trade structure proved resistant to the consequences of both the pandemic and the military conflict.

Czechia exhibited the maximum IIT level among the states analysed. Its weighted average rose from 0.71 in 2014 to 0.75 in 2024. A distinct growth trend could be noted in 2014-2019, reaching its maximum of 0.74 immediately before the pandemic. 2020 saw a fall to 0.70, connected in particular with some issues of the automotive sector, the foundation of the Czech exports. The ratio quickly recovered

in the subsequent years, however, and reached 0.75 as soon as 2023. Importantly, the war in Ukraine didn't disrupt the rising trend, although the Czech economy was heavily dependent on the imports of energy raw materials from the East.

Figure 12. *The IIT trade ratios of the V4 countries in 2014-2024 (weighted average)*



Note: ** The respective shares in national exports served as the weights*
Source: *The authors' compilation based on the UNCTAD data.*

In Hungary, the IIT weighted average developments were more variable than in Poland or Czechia. It grew to 0.72 in 2014-2017 and stabilised around 0.72 till 2020. The pandemic failed to trigger a strong decline, as the value remained at 0.72 in 2020, evidence of a high resistance of the Hungarian industrial exports. Only after the outbreak of the war in Ukraine did it drop a little to 0.71 in 2022 and 0.70 in 2023-2024.

The changes in Slovakia progressed differently. The IIT weighted average diminished from 0.64 in 2014 to 0.60 in 2024, a sign of a gradually weakening significance of intra-industry trade. In 2014-2019, the ratio remained relatively steady at 0.64-0.68, reaching its maximum of 0.68 in 2018. The pandemic caused it to fall abruptly to 0.58 in 2020, the most severe decline among the states examined.

That was primarily due to a heavy concentration of the Slovakian economy on the automotive industry. Following a brief bounce-back in 2021, the ratio proceeded to reduce in 2022-2024. The war in Ukraine and the associated disruptions of energy and component supplies exacerbated the process of IIT's decrease.

The level of intra-industry trade between the V4 and EU states was relatively high, too, proof of an advanced integration of the V4 economies and the common European market and their major role in European production networks. Hungary exhibited a maximum intensity of intra-industry trade with the EU27. The significance of intra-industry trade for Poland and Czechia was very similar while tending to diminish (like in the case of Slovakia).

The IIT value for total trade was greater than for the trade with the EU, however, in the entire time reviewed. The difference between both the ratios expanded towards the end of the period, suggesting the intensity of the V4's intra-industry trade rose faster in the global exchange than in the trade with the EU.

The intensity ratios of intra-industry trade (IIT) with countries outside the European Union in 2014-2024 indicate the exchange with out-of-the EU partners was distinctly more specialist than the intra-Union trade. The weighted averages of IIT were lower than for the total trade, which means trade relations with third-party states more often relied on comparative advantages and the exchange of goods from various economic sectors.

The intra-industry trade in primary and resource-based sectors remained moderate (0.5-0.6) in all the countries studied during the time analysed. This is due to the fact trade in raw materials and agricultural products is usually intersectoral, as it's connected to the comparative advantages of individual economies. Resource-based sectors (particularly those relating to energy, metals, agricultural and food products) were especially sensitive to the effects of the war in Ukraine. However, despite the rising raw material prices after 2022, an abrupt collapse of IIT did not come to pass.

A highly intensive intra-industry trade in all the V4 group countries (IIT ratios in excess of 0.8) could be noted for products of relatively low technological advancement, both clothing and other low-processed products.

As far as medium-tech industries are concerned, high IIT (approx. 0.8 and more) were recorded by all the countries for the engineering sector (one of the best developed areas with regard to the standard of intra-industry trade) and processing industry. Meanwhile, high IIT ratios for automotive industry were noted for Poland (ca. 0.7), they were a little lower for Czechia and Hungary (0.5-0.6), but Slovakia is an interesting case where the IIT for the automotive industry continued to decline. This is evidence of a growing export specialisation and an increasingly intra-sectoral exchange.

The intra-industry trade in high-tech products, especially electronic and electrotechnical products, was relatively low, too, though clearly far more intensive with the EU27 (0.6-0.8) than with third-party countries (0.4-0.6). Such high values point to a rising significance of technologically advanced production in the V4's trade with the EU27.

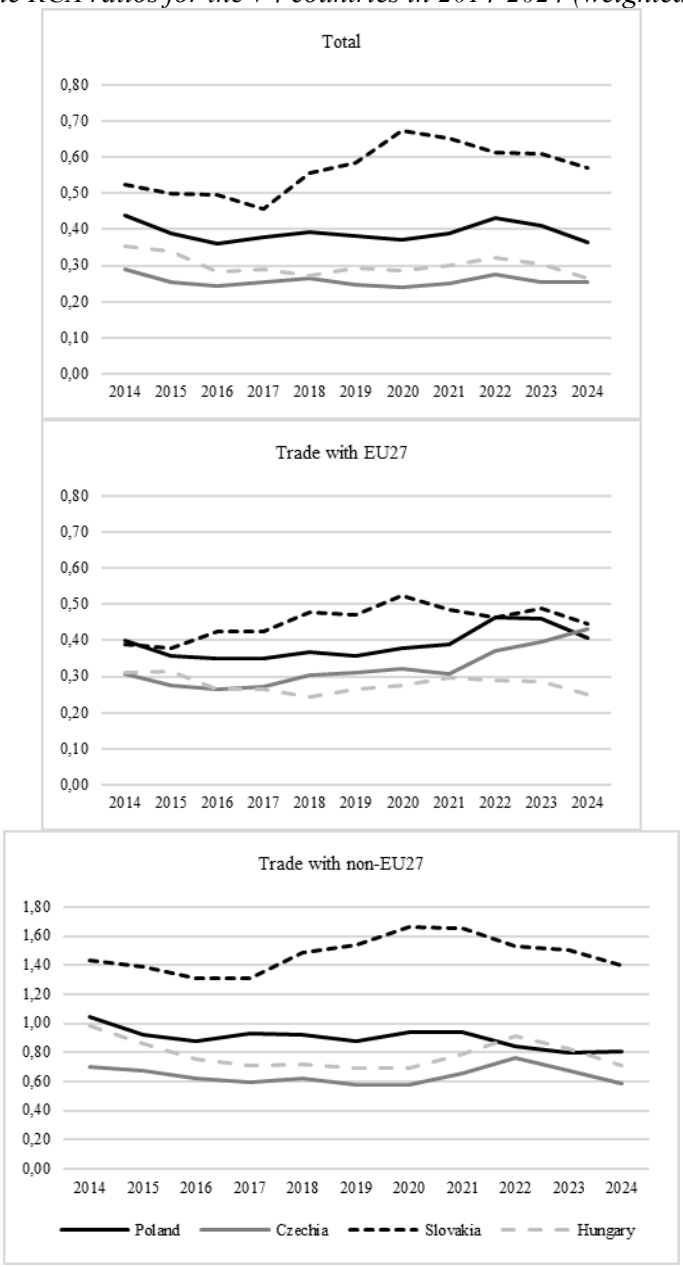
The COVID-19 pandemic brought the IIT temporarily down, first of all in sectors requiring extensive chains of supply, such as automotive and electronic sectors. The declines were passing in most cases, however, and the ratios recovered as early as 2021-2023. The war in Ukraine, in turn, had the strongest effect on energy- and raw material-consuming sectors, yet it didn't lead to a chronic collapse of intra-industry trade. Czechia and Poland proved the most resistant, whereas Slovakia suffered the consequences more acutely as its trade was highly concentrated on the automotive industry.

In 2014-2024, the V4 countries retained their comparative advantages in total trade as well as trade with the EU-27 and third-party countries (Fig. 12). The advantages were apparent in all the commodity groups. Not a passage from an advantage to its absence, but a strengthening or weakening of the existing competitive advantages is the key development.

Competitive advantages in total trade and trade relations with the EU were the most notable for Primary products, some medium-tech sectors (chiefly automotive in Slovakia), and resource-based manufactures: other; on the other hand, they were the weakest for electronic and high-tech sectors.

It should be pointed out all the countries displayed clearly greater competitive advantages in their trade with third-party countries than with the EU27. A stronger specialisation in basic products and raw material-consuming sectors, a relative good position of medium-tech industry, and a weakening position in the high-tech sector (particularly after 2020) could be observed in addition.

Figure 13. *The RCA ratios for the V4 countries in 2014-2024 (weighted average)*



Note: ** the appropriate shares in national exports served as the weights*
Source: *The authors' compilation based on the UNCTAD data.*

At the time analysed, Poland enjoyed the strongest competitive advantages for basic products (the RCA values for trade with third-party countries were many times higher than for trade with the EU27) and raw material processing. The greatest change involved a rise of comparative advantages in the automotive sector (from

0.02 in 2014 to 0.27 in 2024). In parallel, these advantages declined for electronic product trade. The competitive advantages remained the most stable for Czechia.

They were most apparent in basic product trade and automotive sector. The advantages weakened for electronic product trade, though chiefly concerning third-party countries (the position of the Czech electronic sector became stronger in the trade with the EU27).

Slovakia was the most highly specialised economy of the region. It enjoyed distinct competitive advantages in the automotive sector and retained high and continued advantages in basic product trade. A maximum weakening of comparative advantages was noted (like in Poland) for electronic and high-tech products. Hungary, in turn, demonstrated the greatest RCA variability, in particular, a reduction of competitive advantages for the automotive industry and their growth for processing and electronic industries.

The COVID-19 pandemic did not cause the V4 countries to forfeit their competitive advantages, on the contrary, they were reinforced (especially in Slovakia and Hungary). The pandemic helped to temporarily entrench the V4 countries' competitive advantages in the EU market.

Some greater changes to the competitive advantages were triggered by the Russian invasion of Ukraine. The strengthening of competitive advantages for the trade in basic products and a weakening for the trade in high-tech products are among the central changes.

5. Conclusion

The foregoing analysis has reaffirmed that the Visegrad Group countries reinforced their economic positions both in the European Union and the global economy in 2014-2024. Their share in the world exports and imports and their significance to trade within the European Union expanded at the time. Poland played a particularly important role as it was the quickest to boost its share in international trade and contributed to the growth of the entire group's economic potential to the greatest degree

The analysis of macroeconomic ratios identifies a proceeding process of convergence of the V4 and EU economies. The countries of the region exhibited a more rapid economic growth than the EU27 did, a rising GDP, and a persistently good situation in the job market. In parallel, rising salaries and unit costs of labour indicated a gradual shrinking of cost advantages, for years a key pillar for the competitiveness of Central European economies.

Our results corroborate a very high degree of the V4 countries' integration into the common European market. The European Union has remained the central

destination for exports from the countries examined, accounting for approximately 75% of their foreign trade. In parallel, the positive trade balance generated with the EU is proof of the persistently strong competitive position of the V4 countries in the European market.

The commodity structure of the V4 countries' trade shows their export competitiveness primarily relies on medium-tech sectors. The automotive industry played a special role, remaining the key area of specialisation for Czechia and Slovakia. Hungary maintains a relatively strong position in high-tech sectors, while Poland displays the most diversified structure of exports among the states reviewed.

The high values of IIT ratios uphold a significant role of intra-industry trade in the V4 countries' international exchange. This is evidence of a profound integration of their economies into European and global value chains. Czechia exhibited a maximum intensity of intra-industry trade, whereas Slovakia experienced a gradual reduction in its significance, due to a growing export specialisation in the automotive sector.

The analysis of RCA ratios has affirmed the presence of competitive advantages in all the V4 countries for both the total trade, trade with the EU, and third-party countries. The results suggest some major structural shifts, however. Competitive advantages in basic products, raw material-consuming sectors, and some branches of medium-tech industry, especially automotive, became stronger in the period studied. In parallel, the advantages weakened in a range of high-tech sectors, particularly electronics and other technologically advanced sectors. The tendencies became especially apparent following 2020.

Our study has also shown the COVID-19 pandemic did not cause the international competitiveness of the V4 countries to deteriorate chronically. On the contrary, a temporary strengthening of competitive advantages and a continuing high intensity of intra-industry trade could be noted in multiple cases.

The war in Ukraine had a far more powerful impact, its consequences raised the importance of basic and raw material-consuming products and a weaker position of some high-tech sectors.

Our results suggest the conclusion that, despite a growing economic importance of the V4 states in Europe and worldwide, the future competitiveness of the region cannot be founded solely on cost advantages and participation in European production networks.

The retention of long-term competitiveness requires more innovative economies, a greater share of domestic added value in exports, the development of high-tech sectors, and a stronger capacity for creating and absorbing state-of-the-art technologies.

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