POLAND
COMPETITIVENESS REPORT
2025

Edited by
Arkadiusz Michał Kowalski
Marzenna Anna Weresa

Reconfiguring global value chains and shaping competitive advantages

SGH Publishing House

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List of Abbreviations

CEE	Central and Eastern Europe
CoCOM	Coordinating Committee for Multilateral Export Controls
DVA	domestic value added in export
ESG	environmental, social responsibility, governance
EU	European Union
FDI	foreign direct investment
FVA	foreign value added in export
GATT	General Agreement on Tarif and Trade
GDP	gross domestic product
GVC	global value chains
HDC	highly developed country
HS	Harmonized Commodity Description and Coding System
HS4	Harmonized Commodity Description and Coding System 4-digit codes
IMF	International Monetary Fund
LDC	less developed country
NAFTA	North American Free Trade Agreement
NES	not elsewhere specified
NWC	New Washington Consensus
OECD	Organization for Economic Co-operation and Development
OLS	ordinary least squares
PCSE	panel-corrected standard errors
PPP	purchasing power parity
RCA	revealed comparative advantage
REER	real effective exchange rate
SGH	SGH Warsaw School of Economics
SITC	Standard International Trade Classification
TDI	trade defence instruments
TFP	total factor productivity
TiVA	trade in value added
UN	United Nations
USSR	Soviet Union
WITS	World Integrated Trade Solutions
WTO	World Trade Organisation

Preface

Marzenna Anna Weresa, Arkadiusz Michał Kowalski

The concept of competitiveness is currently experiencing a renaissance in economic, political and social analyses [Draghi, 2024; Letta, 2024; Richardson et al., 2024]. The contemporary approach emphasises the multidimensionality of this concept but also points to numerous limitations in its interpretation. In the traditional view, productivity was considered as a key element of competitiveness [Porter, 1990, 2008], reflected in the growth of gross domestic product and other economic and financial indicators. Further research introduced a broader social and environmental context into the discourse [Aiginger, Vogel, 2015], which evolves by adapting to changing conditions and new global challenges such as climate change, the gradual decline in biodiversity, the pandemic and its effects, the energy crisis, economic and social inequalities, armed conflicts, etc. In light of these changes, it is proposed to redefine the concept of competitiveness towards a systemic perception linked with ensuring environmental and social sustainability, which means striving to maximise social value while rationally using limited natural resources and minimising the environmental and social costs of this usage [Richardson et al., 2024]. The question of the future of Europe's competitiveness is being explored [Draghi, 2024]. Setting priorities for shaping competitiveness in the European Union has significant economic policy implications, especially in light of the crises that have affected the world in the past five years (including COVID-19, geopolitical tensions, and the energy crisis). Threats have emerged due to increasing integration with global value chains (GVCs). The disruption of supply chains, as well as difficulties in accessing raw materials or markets, have highlighted the need to increase resilience to external shocks and diversify the geographical structure of international trade and investment links [EIB, 2024].

This monograph contributes to the ongoing discussion on the competitiveness of an open economy in the context of increasing integration within GVCs. Taking into account the global and European context, the authors of the monograph aim to assess the competitiveness of the Polish economy and its changes during the period 2015–2023 in comparison with other EU member states, in relation to Poland's position in global and European value chains.

This monograph consists of two parts divided into chapters. The first part is a diagnosis of the current competitive position of the Polish economy, while the second part analyses the ability to compete in international markets.

The starting point are theoretical remarks on the evolution of the concept of competitiveness in the context of increasing linkages within GVCs, which is discussed in Chapter 1, while Chapters 2–4 outline Poland's competitive position in GVCs compared to other EU countries. A detailed analysis has been conducted on foreign direct investments and Poland's international competitiveness in the context of foreign trade. Chapters 5 and 6, which provide additional insights into Poland's competitive position, focus on the traditional perspective of competitiveness, emphasising income convergence and factor productivity.

The chapters included in Part II of the monograph explore the competitive capacity of the Polish economy in the framework of its participation in GVCs. The analysis starts with investigating the impact of GVCs on labour market transformations in Poland (Chapter 7) and innovation (Chapter 8). In turn, Chapter 9 contains an analysis of the main directions of Poland's policy regarding participation in global value chains. Chapter 10 discusses the legal conditions of Poland's participation in GVCs.

The monograph concludes with a summary presenting the key findings from the conducted research, both in relation to the emerging theory of competitiveness and economic practice. In the summary, recommendations for economic policy are outlined, aimed at reshaping Poland's role in GVCs and enhancing its focus on high value-added operations. The recommendations also concern ways to support Poland's pro-competitive development and achieve goals beyond traditionally understood economic growth.

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Part I

The Competitive Position of Poland in the European Union: The Importance of Global Value Chains

Chapter 1

Global Value Chains and Competitiveness – A Theoretical Approach

Marzenna Anna Weresa, Arkadiusz Michał Kowalski

1.1. Introduction

Global value chains (GVCs) in the broadest sense refer to the relocation of production processes to multiple countries, allowing companies and economies to specialise in specific phases of the production process. Global value chains are interconnected stages of production that are carried out by companies located in many different countries. This means specialising in specific segments of the international production process and collaborating within integrated, vertical production systems, which requires sharing knowledge, experience or technology. Global value chains have transformed the way businesses operate worldwide, fostering both collaboration and competition, while simultaneously impacting the dynamics of international trade and foreign direct investment. The discussion around GVCs also encompasses issues related to economic policy that could support the participation of domestic companies in international production, enabling them to move within the GVCs to stages of production with higher value added. Global value chains influence the dynamics of global trade, where the production of a single product often involves inputs from several countries at different stages of the value chain. Linkages within GVCs can be an opportunity for businesses and economies to enhance competitiveness, but they also present new challenges arising, among other things, from the tightening of international trade and technological connections.

The aim of this chapter is to discuss the concept of GVCs in the context of economic competitiveness. Building on the definition of GVCs outlined above, the following subsections will present the concept of GVCs and their role in shaping the competitiveness of economies. The sources of competitiveness in global value chains will be discussed, such as access to innovation and knowledge, including Industry 4.0 technologies, integration within global value chains, cost efficiency, and also possessing the appropriate resources. Furthermore, the role of global value chains in shaping

international competitiveness will be analysed, including their impact on economic growth, export development, technology transfer, risk distribution, and cost reduction associated with international expansion, as well as achieving greater economies of scale and lowering unit production costs. Simultaneously, the challenges associated with participating in global value chains will be presented, including the risk of excessive dependence on foreign suppliers, as well as the issue of inequality in the distribution of value added.

1.2. The concept and development of global value chains

The concept of global value chains is an extension of Michael Porter's [1985] value chain concept, which incorporates the activities of enterprises in international markets. According to Porter's approach, the value chain consists of two main categories of business processes:

- primary activities,
- support activities.

Both of these categories are essential for creating value for the customer and achieving a competitive advantage. Primary activities include the following business processes:

- inbound logistics, including the procurement of raw materials, warehousing and inventory management,
- operations – production, which includes all activities related to the manufacturing of goods and services using raw materials and components,
- outbound logistics related to distribution and transportation to recipients,
- marketing and sales involving the creation of strategies and execution of activities aimed at potential customers, including pricing, distribution channel selection, advertising, etc.,
- after-sales services involving customer support in terms of repairs, technical assistance, or other additional services provided to maintain customer contact.

The second group of activities – support activities promote the efficiency of core functions. In Porter's value chain model, these are:

- research and development activities related to the development and market introduction of new products,
- human resource management,
- creation and maintenance of the enterprise infrastructure, both tangible and intangible,
- procurement.

The entire value chain of the company can be carried out independently by the enterprise in a single market, or individual activities can be distributed among different companies worldwide. Enterprises use outsourcing and offshoring to optimise their operations by relocating various functions of their value chain to different locations. Outsourcing allows for the benefits of scale and scope, which can be carried out by a single company or divided among multiple enterprises from different countries [De Backer, Miroudot, 2013, p. 7].

The development of GVCs can stem from cost factors, as relocating certain business processes to countries with cheaper production factors can significantly reduce costs. GVCs can also be driven by markets when international corporations relocate part of their processes to developing countries to leverage the growth potential of local markets. Global value chains enable companies to optimise production by outsourcing or offshoring various tasks, utilising low-cost manufacturers or accessing emerging markets with high potential.

This issue is further discussed in the next subsection.

1.3. Global value chains and the competitiveness of economies – a review of selected theoretical approaches

The starting point for analysing the relationship between GVCs and the competitiveness of economies is to refer to the concept of competitiveness, particularly its international dimension, a dimension that is manifested in a country's economic relations with foreign markets, including elements such as competitiveness in foreign trade and investment competitiveness [Kowalski, Weresa, 2021, p. 19]. Trade competitiveness is defined in the literature as the ability to sell domestic goods and services in foreign markets. In the modern knowledge-based economy, trade competitiveness involves not only the trade of goods and services but also the exchange of patents and licences, which shape innovation and, consequently, affect the competitiveness of the economy. In the context of international trade, a manifestation of competitiveness, in the static sense, are the comparative advantages of a country (or region). In the dynamic sense, it refers to competitive advantages in trade, which may result from an active economic policy of the country [Misala, 2014; Weresa, Kowalski, 2021].

The second aspect related to the international dimension of competitiveness is the flow of production factors between countries, particularly foreign direct investment (FDI). It is a country's ability to attract productive capital, as well as other production factors (technology, labour), and utilise them for sustainable development and increasing

the level of prosperity. The flow of production factors between a country and foreign markets also includes their transfer abroad to other international locations, as well as the ability to derive benefits from this transfer.

The elements constituting international competitiveness, such as trade competitiveness (comparative advantages in trade), investment competitiveness (attractiveness for FDI inflow and utilisation of domestic productive capital surpluses abroad), and technological competitiveness (ability to attract and utilise foreign technologies for development), are linked to international connections within GVCs, driven by foreign trade and FDI (along with an entire package of resources transferred abroad such as technology, know-how, labour, skills, etc.).

Trade exchange, FDI and technology transfer are explained through international trade theory, the theory of international flows of production factors, and international production. Various strands of theoretical considerations, as well as empirical studies, have demonstrated the existence of links between trade and direct investment, which under certain conditions can be either substitutive or complementary [Blanga-Gubbay, Rubínová, 2023]. The synthesis of various theories leads to the identification of several groups of factors that determine the undertaking of international economic cooperation, regardless of its form (trade or FDI). The most important of these are: absolute or comparative advantages (classical trade theories), differences in factor endowments (Heckscher–Ohlin–Samuelson model), innovation gap and technological advantages (neo-technological theories), differences in transaction costs (internalisation theory), locational advantages (so-called new trade theories, location theory, and the eclectic theory of international production).

However, from the perspective of a company operating in international markets, in light of international business theories, FDI flows can be explained by referring to the investors' pursuit of leveraging the company's ownership advantages. This advantage stems from the company's possession of tangible resources and specific intangible assets, such as technology, know-how and innovative organisational or marketing solutions. The advantages leveraged by relocating the entire production process or part of the value chain abroad can bring additional benefits, including a reduction in transaction costs, a mechanism that is described by the eclectic OLI paradigm (ownership, location, internalisation), widely discussed in the literature [Dunning, 1981; Dunning, Lundan, 2008].

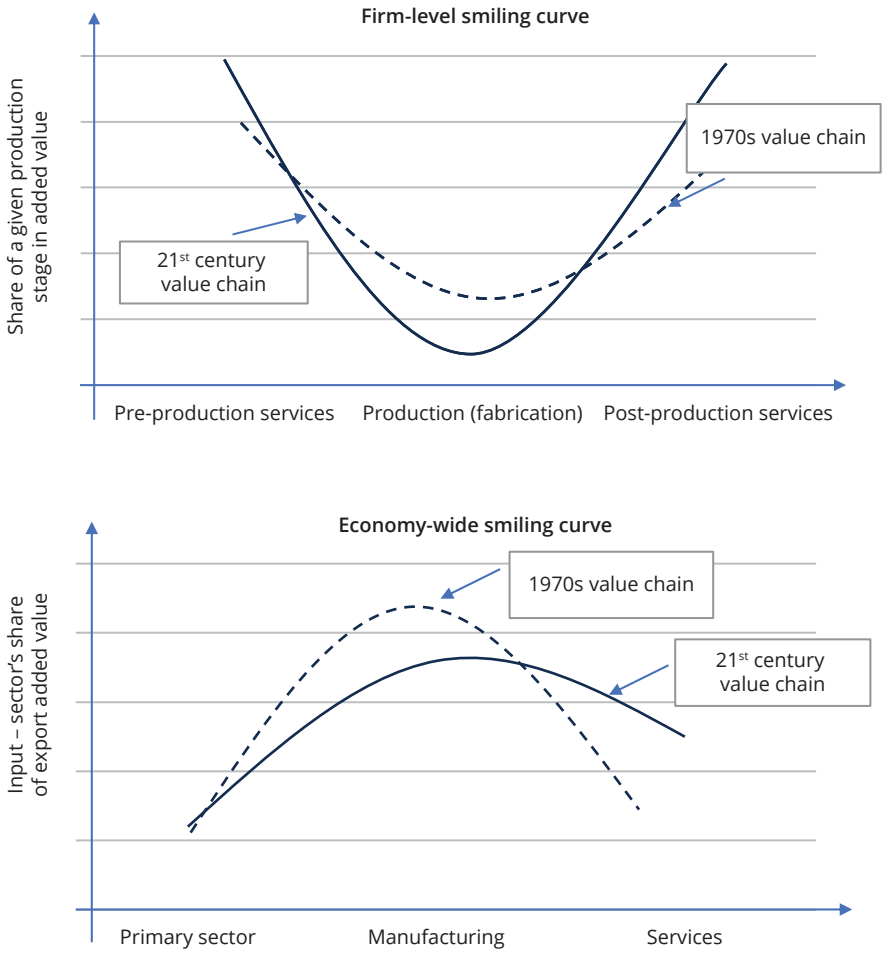
Multinational corporations (MNCs) implement GVC strategies to enhance efficiency through the integration of specialised activities and innovation, leveraging regional advantages in terms of costs, technology and knowledge, and adapting to changing market conditions and strengthening their competitiveness. Foreign direct investment (FDI) plays a crucial role in developing linkages within GVCs, facilitating

not only the transfer of capital but also the flow of knowledge, technology and skills [Weresa, 2020].

Another approach to analysing the activities of multinational companies in foreign markets and their involvement in GVCs is the knowledge-capital model. The existence of relative differences in skilled labour resources between countries motivates multinational companies to fragment production and establish foreign subsidiaries linked either horizontally or vertically [Markusen, 2002]. This leads to the formation of GVCs. When trade costs are moderate or high, and countries are similar in size and skilled labour resources, horizontal linkages are formed, with foreign subsidiaries conducting activities similar to the parent company. In contrast, vertical linkages and the dispersion of activities within the value chain across different markets, meaning a transfer of only selected elements of the value chain, occur when trade costs are low or moderate and countries differ significantly in terms of skilled labour resources [Markusen, 2002; Markusen, Strand, 2009]. The choice of horizontal or vertical FDI type affects the relationships between subsidiaries of multinational companies and the development of GVCs, resulting in these two types of FDI shaping different structures of multinational companies and their organisational models: the linear 'snake' model, based on production fragmentation, and the 'spider' structure, associated with horizontal FDI [Baldwin, Venables, 2013]. Both structures can interpenetrate. Most production networks are complex blends of both elements, referred to as a so-called sneaker-like structure [Jones, Demirkaya, Bethmann, 2019]. The development of this concept shows that the structure of international business activities and the links between the parent company and its subsidiaries are crucial for both the analysis of the motivations for locating production capital abroad and the development and functioning of GVCs. The analysis of this issue, using data on global value chains, showed that vertically integrated companies (the 'snake' model) develop trade between subsidiaries. Horizontal structures of international companies (the 'octopus' model) are less significant for the development of intra-company trade between its various locations [Davis, Markusen, 2020]. As a result, the functioning and development of global value chains largely depend on whether the structures of international companies take the form of an 'octopus', a 'snake' (meaning whether horizontal or vertical linkages are created), or a combination of both structures. This also partly determines the impact of GVCs on economies, i.e., on local production, the labour market, technology transfer and spillover effects, as well as the country's participation in the international division of labour, particularly trade exchange. It is worth mentioning here the concept of functional specialisation in trade, which is one of the newer approaches to global value chains [Timmer, Miroudot, de Vries, 2019; de Vries, Jiang, Lemmers, Wei, 2021]. This approach complements the analysis of vertical linkages within trade specialisation, using value

added in exports as a measure. This is another approach to the conceptualisation of GVCs [Bontadini, Evangelista, Meliciani, Savona, 2024], taking into account the value chain functions related to trade specialisation, while also considering the tangible and intangible factors determining this specialisation, indicating the link between GVCs and a country's trade competitiveness.

Figure 1.1. Changes in the distribution of total value added across different segments of the value chain (the so-called smiling curve)



Source: own elaboration based on Baldwin, Ito [2021].

Another approach to analysing GVCs in the context of competitiveness involves determining the share of value added contributed by each primary or supporting activity within the company's value chain. Since value-added results from the contribution of

production factors to the creation of a good/service, this proportion is greatest in the parts of a company's value chain that require a high input of human capital, or in activities where the company has a strong market position due to product differentiation, brand strengthening, or loyalty programmes. Figure 1.1 illustrates the distribution of total value added across different parts of the value chain and its evolution over time from both the company and the country perspective.

In the 21st century, a shift in the distribution of value creation within GVCs has been observed. One of the trends is the rising ends of the 'smiling curve', which means that in companies, the stage of the value chain related to the production of goods and services is characterised by a declining share in value added, while the contribution of R&D and marketing activities increases. From the perspective of the economy, the 'smiling curve' has flattened. Primary sectors have a relatively decreasing share in value creation, while the opposite trend is observed in technologically advanced sectors and services. Leading companies from developed countries with high wages and significant development of advanced technologies are relocating labour-intensive production tasks abroad, while retaining in their home countries activities that require high qualifications and have a high share in value creation domestically [Baldwin, Ito, 2023; UNCTAD, 2024]. This may lead to deepening inequalities in the distribution of value added between developed and developing countries, in favour of the former, consequently posing a threat to developing countries of being trapped in low value-added production. The key to mitigating these disparities is to understand the sources of competitiveness in global value chains, so that by formulating policies for participation in GVCs, countries can successfully leverage these sources.

1.4. Sources of competitiveness in global value chains

The ability of enterprises and countries to leverage global value chains (GVCs) to build a competitive advantage lies in effectively engaging in international production and supply networks to enhance value added, strengthen market position, and achieve sustainable economic benefits. To effectively build a competitive advantage, companies and countries must skilfully integrate into the structures of global value chains, leveraging their resources, technologies and adaptive capabilities to maximise the benefits of participating in global production networks. The ability of enterprises and economies to utilise global value chains to gain a competitive advantage is a complex process that requires the combination of several key factors, such as access to innovation and knowledge, including digital technologies, integration within global value chains, cost efficiency, as well as possessing the appropriate resources.

A key driver of competitiveness in global value chains is access to advanced technologies and knowledge, which facilitates greater production efficiency and fosters innovation. Research on global value chains indicates that innovativeness is a key factor enabling enterprises to move to higher levels of global value chains, known as 'upgrading' [Humphrey, Schmitz, 2002]. Enterprises that are able to develop new products, introduce unique technical solutions and adapt to changing consumer preferences gain an advantage in international markets.

According to [Opazo-Basáez, Vendrell-Herrero, Bustinza, Marić, 2022], competitiveness in global value chains and the benefits of participating in these chains are enhanced by the adoption of Industry 4.0 technologies, as these technologies enable companies to not only manage production and logistics more efficiently but also better adapt to dynamic market conditions and increase operational flexibility. Automation and advanced production systems improve process efficiency, allowing for reduced production costs and quicker responses to changing demand. Digitalisation allows companies to gain more precise control over product quality and reduce the risk of downtime and production errors, which is an important competitive factor. Industry 4.0 technologies also support decision-making processes through big data analysis, enabling companies to better forecast market changes and make data-driven strategic decisions. Digitalisation supports the development of innovative business models within global value chains, such as on-demand production or product personalisation. Thanks to digital technologies, companies can tailor products to customer needs in real-time, increasing their value added and allowing for better alignment with the demands of global market customers. In particular, digital technologies accelerate the benefits of participating in global value chains in countries with lower levels of economic development and high trade openness [Li, Lai, He, 2024].

Integration into global value chains means participating in international production networks, where different stages of production processes are geographically distributed across the globe. The literature highlights that companies can build competitiveness by specialising in specific segments of the value chain [Gereffi, Fernandez-Stark, 2011], while participation in highly advanced segments, such as research and development (R&D), design, or brand management, often generates higher added value compared to involvement in segments focused solely on assembly or large-scale production [Baldwin, Venables, 2013]. The literature emphasises that companies capable of developing their specialisation and identifying high-value-added niches gain a competitive advantage in global markets [Gereffi, 2018].

Among the most important sources of competitiveness within global value chains is cost efficiency, which enables companies and countries to reduce production costs and gain a price advantage in international markets. By optimising costs and locating

production in regions with lower costs, companies can enhance their competitiveness, attract customers, and strengthen their position in the global supply network [Buckley, 2009]. Companies that can effectively scale production gain a cost advantage through lower variable costs per unit, allowing them to increase margins or lower prices for customers [Buckley, Casson, 2009]. Economies of scale resulting from large-scale production, combined with specialisation in specific segments of the value chain, enable companies to reduce unit costs, which is particularly crucial for the manufacturing sector. The literature notes that companies operating in global value chains can focus their activities on selected stages of production where they achieve the greatest efficiency, allowing them to further optimise costs and increase competitiveness [Hitt, Ireland, Hoskisson, 2012]. Specialisation and efficiency in selected segments of the chain allow enterprises to maximise value added while minimising costs. Cost efficiency is also the result of effective supply chain management, which enables companies to optimise logistics processes, reduce transport time, and minimise inventory and the risk of production downtime [Christopher, 2023]. The literature indicates that companies operating within global value chains can enhance cost efficiency through effective supplier management, outsourcing of certain processes, and strategic partnerships that facilitate cost and resource sharing [Gereffi, Fernandez-Stark, 2011].

Another crucial aspect of building a competitive advantage within global value chains is resources. From the perspective of the resource-based view (RBV) of companies, a company's competitiveness stems from possessing rare, hard-to-imitate, and unique resources and capabilities that allow businesses to stand out from the competition [Barney, 1991]. The literature on global value chains highlights that resources – including human, technological and financial resources, as well as organisational knowledge – can be leveraged to create value added and build a sustainable competitive advantage in global markets [Gereffi, Humphrey, Sturgeon, 2005].

1.5. The role of global value chains in shaping international competitiveness

Global value chains play a pivotal role in the modern international economy, shaping how countries and businesses can build and strengthen their competitiveness, with one of the most significant effects of global value chains being their impact on economic growth [Jangam, Rath, 2021]. Baldwin [2016] emphasises that participation in global value chains allows companies to expand their exports, even if they do not produce the entire final product. Companies can export components or services that

are part of the international production chain, increasing revenue and strengthening their position in global markets.

Participation in global value chains facilitates technology transfer, as companies involved in international value chains often collaborate with global technology leaders, allowing them to acquire modern technologies and know-how [UNCTAD, 2013]. In many cases, multinational corporations share technology with local partners to ensure appropriate quality and standardisation of products, resulting in countries participating in global value chains having the opportunity to enhance their technological capabilities and develop higher value-added sectors, contributing to long-term productivity growth [Gereffi, 2018]. In particular, this presents a significant opportunity for less developed countries to catch up technologically [Kowalski, Rybacki, 2021].

Thanks to global value chains, economic entities can quickly and effectively reach global markets, as participation in value chains allows for risk sharing and cost reduction associated with international expansion [Buckley, 2009]. Enterprises can tailor their production to the specific requirements of different markets without the need for a physical presence in each one. Global value chains allow companies to increase their production scale, helping them achieve greater economies of scale and reduce unit production costs.

International competitiveness processes occur primarily at the industry level, as explained by Michael Porter's [2009] concept of the so-called diamond. Porter's diamond, which emphasizes the importance of four main attributes, which are factor conditions, demand conditions, related and supporting sectors, and firms' strategy, structure and rivalry, while taking into account the influence of random factors and government action. This offers a multidisciplinary explanation of the international competitive advantage of individual industries in different economies [Gorynia, Jankowska, 2017].

Participation in global value chains also involves various challenges and risks. One of the key challenges associated with participating in global value chains is the risk of excessive dependence on foreign suppliers, with enterprises that heavily rely on international supply networks more vulnerable to fluctuations in raw material costs and potential disruptions in supply chains, such as those arising from geopolitical tensions or trade barriers [Christopher, 2023]. This issue became especially apparent during the COVID-19 pandemic, as numerous supply chains were disrupted, leading to widespread shortages of components and raw materials [Rahman, Paul, Agarwal, Shukla, Taghikhah, 2024].

A key challenge of participating in global value chains lies in the unequal distribution of value added. Developing countries are typically involved in lower value-added activities, such as manufacturing or assembly, while stages generating higher value

added, such as design, marketing and distribution, are dominated by developed countries, which leads to an asymmetrical distribution of economic benefits and deepens inequalities between countries participating in value chains [Aguiar de Medeiros, Trebat, 2017]. At the same time, economies with lower positions in global value chains have limited opportunities to upgrade due to barriers to accessing advanced technologies, know-how and capital.

Global value chains are characterised by high sensitivity to global economic crises that can disrupt their functioning. The risks associated with globalisation were already highlighted by the financial crisis that began in 2008, with disruptions in one link of the chain causing cascading effects throughout the network [Buckley, 2009]. An example of a crisis that caused widespread supply disruptions, increased transportation costs, and led to a shortage of goods in many industries was the COVID-19 pandemic [Rahman et al., 2024]. The collapse of global value chains [Yagi, Managi, 2021] caused disruptions in the functioning of companies and a reduction in the level of production and supply of goods. The effects of this shock were transmitted down the supply chains to companies worldwide, with businesses heavily reliant on supply chains unable to obtain the necessary parts and components. This was particularly true for cooperation with China, which is an important supplier of intermediate goods to the rest of the world, especially in the electronics, automotive and machinery industries. The resulting disruptions began to have a significant impact on companies further down the supply chain, and collectively contribute to the rising costs of doing business and "constitute a negative productivity shock, resulting in reduced economic activity" [Gopinath, 2020]. In this situation, resilience to crises has become one of the key features enabling reaching a highly competitive position, with an increased emphasis on the sustainable dimension of competitiveness.

1.6. Conclusions

In the context of GVC development, the traditional approach to international competitiveness is becoming less suitable for analysing economic processes due to the increasing interdependencies between countries, with the tightening of connections within GVCs meaning that trade competitiveness can no longer be viewed solely through the lens of a country's exports, as it is closely tied to the import of semi-finished products supplied by trade partners. This shift may result in two emerging trends. Firstly, developing countries may fall into the 'low value-added production trap'. Secondly, the R&D paradox may arise in countries that conduct intensive research and development but relocate manufacturing processes abroad, with

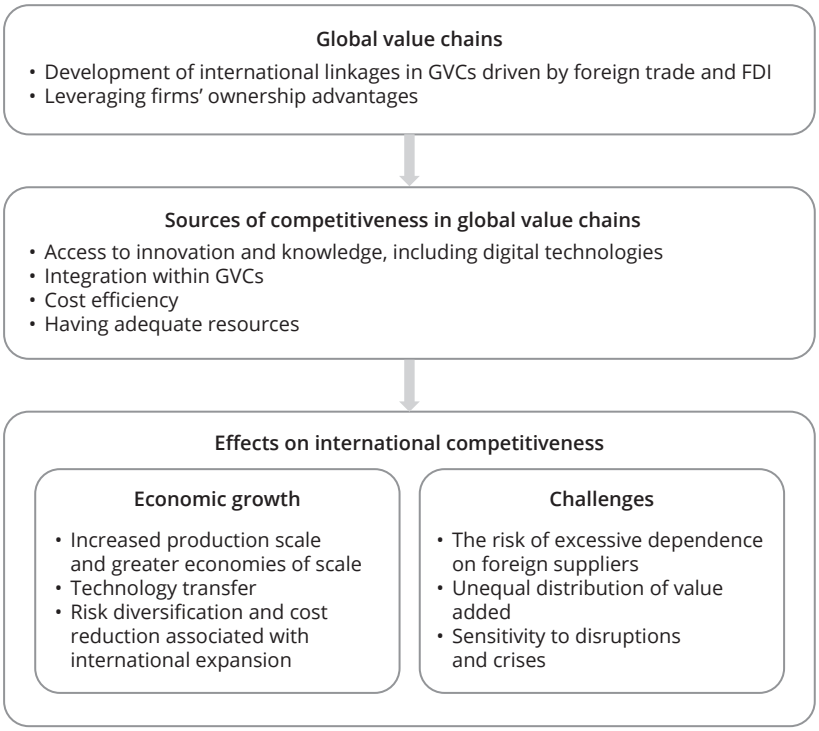
a significant portion of high-value-added production occurring domestically, while assembly and production take place in foreign locations. Consequently, these countries demonstrate strong competitiveness in innovation but may not excel in mass production, with services, particularly IT, consulting and logistics, becoming a key component of global value chains. The associated increase in demand for highly skilled, high-value-added labour drives the concentration of service activities in regions with dense populations and high levels of human capital. These trends imply a relatively diminished effectiveness of national industrial policies. Tools aimed at stimulating local production may inadvertently benefit foreign economies due to the substantial import content in domestic export goods, with strategies focusing on the development of infrastructure, innovation and education potentially proving more effective in enhancing competitiveness.

The competitiveness of businesses and economies within GVCs is built on several key pillars, with particular emphasis on advanced technologies, innovation, cost efficiency, specialisation, and access to resources and knowledge. Industry 4.0 technologies, such as automation and big data analytics, enable companies to manage production with greater precision and enhance operational flexibility, allowing for better adaptation to changing market conditions. Additionally, specialisation in highly advanced segments of the value chain, such as research and development, or brand management, enables businesses to gain a competitive edge by generating higher value added. In contrast, specialisation in the assembly or mass production stages tends to benefit economies with lower cost structures.

At the same time, cost efficiency enables companies to not only optimise production costs but also enhance price competitiveness in international markets by locating production in countries with lower labour costs. The ability to effectively scale production processes and leverage economies of scale is another critical factor in building competitiveness. From the perspective of resource-based theory, businesses can achieve an advantage through rare, inimitable and valuable resources, such as human capital, technology and unique organisational knowledge. Knowledge exchange and technology transfer within global value chains contribute to long-term economic growth, particularly benefiting developing countries by enabling their participation in higher value-added production processes. However, participation in GVCs also presents significant challenges, such as the risk of overdependence on foreign suppliers and an unequal distribution of value added. Crises like the COVID-19 pandemic have exposed the vulnerability of global supply chains to disruptions, which can severely impact production and the delivery of goods. Moreover, the asymmetric distribution of value added often exacerbates inequalities between countries at different stages of development.

The discussions in this chapter lead to the proposal of a conceptual framework illustrating the relationship between GVCs and international competitiveness, as presented in the figure below.

Figure 1.2. A conceptual framework showing the relationship between GVCs and international competitiveness



Source: own elaboration.

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Chapter 2

Evolution of Poland's Position in Global Value Chains

Andżelika Kuźnar

2.1. Introduction

The aim of this chapter is to present the evolution of Poland's position in global value chains (GVCs). The analysis covers the main aspects of Poland's participation in GVCs, particularly through backward and forward linkages in value chains, and the structure of the chapter reflects the key issues discussed in the subsequent sections. First one is dedicated to input-output tables, which present the structures of production and trade between countries, highlighting the key elements in the process of creating value added in Polish foreign trade. Next section discusses the integration of the Polish economy into GVCs through the trade of intermediate goods, and another one presents various perspectives in the studies of global flows of goods and services, which then allows for a more precise assessment of Poland's position in trade of goods and services. The following section contains an analysis of domestic and foreign value added in Polish exports. Finally Poland's linkages with GVCs, both forward (to GVCs) and backward (from GVCs), are discussed in detail.

The main research questions concern the following issues:

- What are the levels of Poland's involvement in global value chains, particularly in backward and forward linkages?
- How can intermediate goods in Poland's trade indicate changes to Poland's position in GVCs?
- How significant for the Polish economy is the increasing share of foreign value added in exports?

The timeframe of the analysis mostly covers the years 1995–2020, which is determined by the availability of data in the TiVA database, ending in 2020. In the case of Eurostat data, the analysis covers the period 2004–2023. The year 2004 has been highlighted due to its particular significance for Poland in the context of accession to the European Union and the long-term effects of economic integration. Such an extended

time horizon allows for the observation of long-term trends and key changes in relation to Poland's position in global value chains.

The methodology of the study is based on an analysis of statistical data from international databases, particularly trade in value-added (TiVA), which enables the tracking of value-added flows and complex linkages in global value chains.

2.2. Input-output tables

In recent decades, global production processes have undergone a fundamental change, resulting in the rapid development of international outsourcing and an increase in trade. Traditionally, production for the purposes of foreign trade had a horizontal nature, with companies or economies specialising in producing specific final goods, which were then exported. The contemporary production model, on the other hand, resembles a complex network structure, where components are manufactured at various stages by multiple companies/economies, linked by horizontal, vertical and diagonal relationships. Companies or economies no longer specialise in the entire production process, but only in its selected stages [Jones, Wang, Fei, Chen, Bethmann, 2022, p. 15].

This new type of production linkage means that traditional measures of international trade (by gross value) are insufficient to represent the actual connections between countries and industries involved in international production. Integrating the input-output tables (IOTs) of individual countries provides insights into the processes of value added creation in international trade, as well as the involvement of countries and specific industries in global value chains (GVCs).

The input-output table provides a statistical representation of the production activities of individual sectors within a given framework (usually within a national economy) over a specified period (most commonly annually). Initially, these tables were designed as models of the entire national economy, but as early as in the 1950s, they began to be used for analysing regional interdependencies. In the 1960s, Rondal J. Wonnacott developed the first international input-output model, encompassing two economies and the trade between them. In subsequent years, these tables became a tool for constructing large econometric models, and in the 1970s, they were used to analyse global issues. In the face of globalisation, when intersectoral linkages crossed national borders, the input-output tables began to be constructed taking into account relations between multiple countries and regions [Ambroziak, Marczewski, 2014].

The process of constructing international input-output tables is difficult and time-consuming, as it requires the 'alignment/harmonisation' of national tables with bilateral trade data of individual countries.

Table 2.1. The scheme of the international input-output table

	Intermediate consumption			Final demand			Global production
	Country 1	Country 2	Country 3	Country 1	Country 2	Country 3	
Country 1	**intermediate consumption of domestic goods in Country 1**	intermediate exports from Country 1 to Country 2	intermediate exports from Country 1 to Country 3	**final demand for domestic goods in Country 1**	final exports from Country 1 to Country 2	final exports from Country 1 to Country 3	X_1
Country 2	intermediate exports from Country 2 to Country 1	**intermediate consumption of domestic goods in Country 2**	intermediate exports from Country 2 to Country 3	final exports from Country 2 to Country 1	**final demand for domestic goods in country 2**	final exports from Country 2 to Country 3	X_2
Country 3	intermediate exports from Country 3 to Country 1	intermediate exports from Country 3 to Country 2	**intermediate consumption of domestic goods in Country 3**	final exports from Country 3 to Country 1	final exports from Country 3 to Country 2	**final demand for domestic goods in Country 3**	X_3
Value added	V_1	V_2	V_3				
Global production	X_1	X_2	X_3				

Source: Ambroziak, Marczewski [2014].

A major challenge is the appropriate attribution of foreign value added to the original countries of origin, which is complicated due to the high degree of fragmentation of production networks.

The example scheme of an international input-output table for single-sector economies of three countries (Table 2.1) enables tracing these complex processes. The rows of the table detail the allocation of goods and services produced in a country, while the columns specify the origins of goods and services used domestically for production (intermediate consumption) and consumption (final demand). For instance, the row corresponding to Country 1 indicates the share of intermediate goods produced allocated to domestic consumption and their share exported to Countries 2 and 3. The table provides information about the domestic and foreign allocation of final goods. It is also possible to trace, for instance, the intermediate and final goods imported from Countries 2 and 3 for production and consumption in Country 1 [Ambroziak, Marczewski, 2014].

2.3. Intermediate goods in Poland's trade

The importance of IOTs in GVC analyses has increased due to the growing role of intermediate goods (materials used for the production of final goods) in international trade, which now constitute its majority. These can include, for example, grains used in food production, textiles used for clothing production, or metals essential for manufacturing various products [WTO, 2024], with these products passing through multiple stages of the production process for goods and services, frequently crossing borders numerous times before becoming a final product and being sold to the consumer in the target market. Thus, the trade in these goods not only demonstrates the fragmentation of production but also indirectly reflects the size of GVCs. A high share of intermediate goods in a country's trade indicates a deep integration of its economy with global and regional value chains. It is assumed that the more intensively a country trades in intermediate goods, the greater its contribution to value-added creation in the international value chain [Folfas, 2016, p. 27].

The analysis of the share of intermediate goods in Poland's international trade can be conducted using the Broad Economic Categories (BECs) classification. It includes capital goods, consumption goods, and intermediate goods[1].

[1] The following categories are included in intermediate goods: primary food and beverages for industry, processed food and beverages for industry, primary industrial supplies not elsewhere classified, processed fuels and lubricants, capital goods (except transport equipment and their parts) and accessories thereof, as well as parts of transport equipment and accessories thereof.

Eurostat data, presented in Table 2.2, indicates Poland's significant role in the GVCs, measured by the share of trade in intermediate goods. In imports to Poland, the share of intermediate goods in 2023 was 55.8%, which was 5.8 p.p. lower compared to 2004, and is particularly noticeable in imports from EU members, where the share decreased from 60.3% to 52.5%. In imports from non-EU countries, the rate in 2023 was 62.6%, suggesting that Poland imports relatively more intermediate goods from non-EU markets. The higher share of intermediate goods in imports from non-EU countries may result from investments by non-EU companies, which view Poland as a base for further processing of products and a gateway to enter other EU markets. The lower share of intermediate goods in imports from the EU, on the other hand, may indicate improving living standards and growing consumption of final goods originating from EU member countries.

The share of intermediate goods in Polish exports is lower than in imports, amounting to 48.9% in 2023, 6.2 p.p. lower than in 2004. It is slightly higher in exports to EU members (49.8%) than non-EU countries (46.1%). The export of intermediate goods from Poland to the EU is accompanied by lower transport costs and faster delivery times than outside the EU, which may translate into relatively higher shares of intermediate goods with EU member countries. The decreasing share of intermediate goods in exports may indicate an increase in Poland's specialisation in the production of final goods. However, nothing is known about the origin of these goods, i.e., whether only domestic value added was used in their production or whether they also contain a foreign component.

Table 2.2. The share of intermediate goods in Poland's exports and imports in selected years of 2004–2023 (%)

	2004	2010	2015	2020	2023
Import					
Intra-EU-27	60.3	59.1	55.0	52.0	52.5
Extra-EU-27	65.1	60.7	60.2	57.7	62.6
Global	61.6	59.6	56.7	53.8	55.8
Export					
Intra-EU-27	57.4	51.4	49.9	46.6	49.8
Extra-EU-27	48.3	45.4	43.9	43.8	46.1
Global	55.1	49.7	48.3	45.9	48.9

Source: own elaboration based on Eurostat [2024].

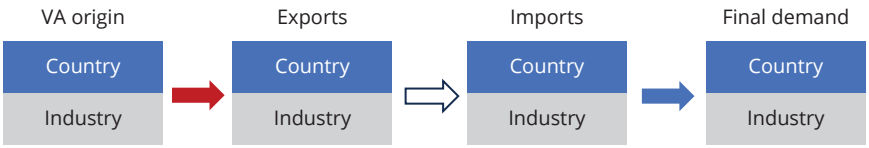
In summary, a higher share of intermediate goods in imports than in exports may indicate Poland's specific role in global value chains. Poland imports components that are processed locally and later exported as final or intermediate goods or consumed in the domestic market. At the same time, Poland's position in GVCs is more pronounced in the regional context – Poland is more integrated with the EU value chain than with global chains.

2.4. The role of the origin of value-added in the studies of global flows of goods and services

Conventional international trade statistics only partially capture the dynamics of global flows of goods and services. Among the four perspectives that can be adopted in international trade studies, presented in Figure 2.1, they only encompass direct flows of intermediate and final goods and services (exports). The remaining perspectives include the origin of value added, importers and final consumers, and in each case, analysis can be conducted at the level of countries or industries (or product groups).

The study of international trade from the perspective of the origin of added value is particularly important in an era where intermediate goods play a significant role in international trade, leading to the need to distinguish between domestic and foreign value added in trade, as well as trade in value added. The primary tool for tracking the origin of value added at various stages of production processes on a global scale, thereby enabling a detailed analysis of the complex structures of modern global value chains, is international input-output tables [Ambroziak, Marczewski, 2014].

Figure 2.1. Perspectives in the studies of the global flows of goods and services



Legend:

From the country and industry of the value added origin, intermediate goods and services may be processed by many firms in many countries before being processed by the exporting country, which is often the main origin of value added.

Direct flows of intermediate and final goods and services. Note: exports of final products meet final demand in the importing country.

Intermediate goods and services processed by the importing country may pass through many countries and industries before the final products reach the ultimate destination of demand. Note: the importing country may be the country of final demand.

Notes: re-exports of untransformed goods are not included in the system.

Source: OECD [2023, p. 14].

There are numerous databases enabling research in this area. One of them is the joint OECD and WTO Trade in Value Added (TiVA) database, available since January 2013. The latest available edition from 2023 contains trade data for 77 economies (including all OECD, EU, ASEAN and G-20 countries, as well as selected regional groupings) across 45 industries from 1995 to 2020[2] according to ISIC Rev. 4. A major advantage of this database is the calculated indicators concerning various aspects of global value chains, trade in value added, and value added in trade.

The indicators in the TiVA database allow for a comprehensive study of Poland's foreign trade and participation in global value chains to be conducted. These indicators can, for example, represent the value added:

a) from one of the 45 industry and service sectors;
b) embedded in the export of components from Industry A in Country X;
c) imported by Industry B in Country Y;
d) ultimately satisfying the final demand for products from Industry C in Country Z.

Some of these possibilities are presented in the later sections of this chapter.

2.5. Domestic and foreign value added in Poland's exports

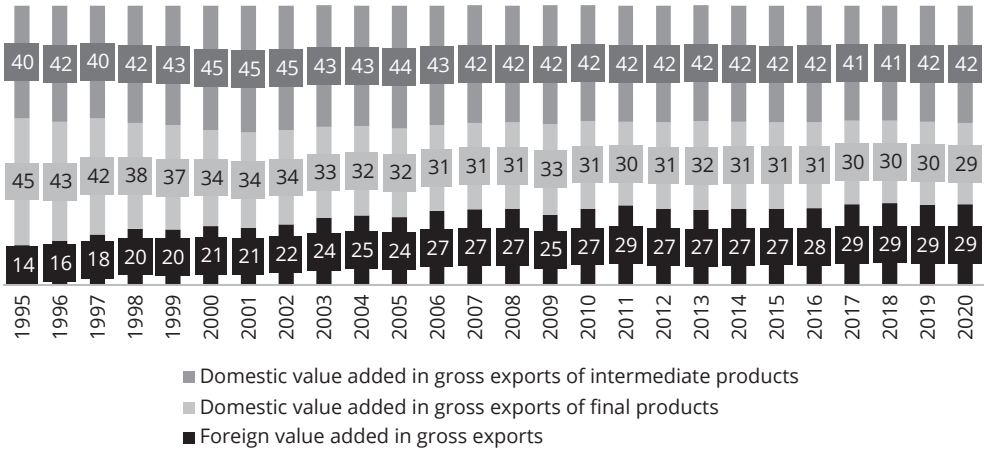
The TiVA database allows for the calculation of a country's value added in trade, including the ability to trace the origins of value added in total exports or in individual sectors. The value added in a country's gross exports can originate domestically – if it was produced in the exporting country – or from abroad – if it was produced in another country and entered the exporting country in the form of intermediate goods. Exported domestic value added can also be used for further production abroad (intermediate consumption) or for final consumption (final demand) [Ambroziak, 2018, p. 11].

The data presented in Figure 2.2 indicates that since 1995, the share of domestic value added in Polish exports has decreased from 86% in 1995 to 71% in 2020, which is almost entirely due to the decreasing share of domestic value added in the export of final products from Poland. In 1995, the share of this component in gross exports was 45%, while in 2020 it was only 29%. In contrast, the share of domestic value added in the export of intermediate products has remained relatively stable throughout the analysed period, fluctuating around 40–42%. The data indicates that in the structure

[2] Official input-output statistics are published with a significant time lag (reaching, at best, two to three years). The construction of international input-output tables also requires the harmonisation of national tables with bilateral trade data of individual countries. Therefore, the data in the TiVA database is published with a similarly significant time lag.

of domestic value added exported from Poland, components or semi-finished products intended for the target market of foreign partners or used by them in further stages of production abroad play an increasingly significant role.

Figure 2.2. Domestic and foreign value added in Poland's gross exports in 1995–2020 (%)



Source: OECD [2024].

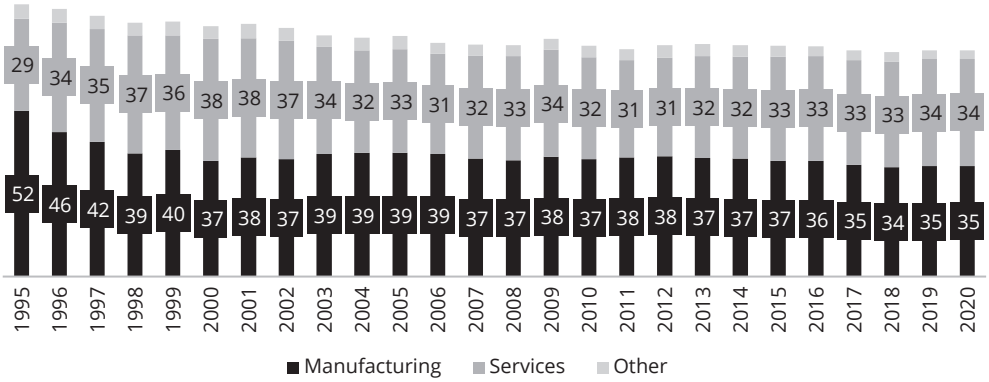
It is worth noting that this data does not provide the full picture of Poland's trade in intermediate and final goods, as the data on the share of foreign value added in exports does not distinguish between final and intermediate goods. In light of the previously presented data, which indeed demonstrates a high but declining share of intermediate goods in Poland's total exports, it can be assumed that there is a significant share of final goods in the foreign value added in Polish exports. In other words, Poland uses foreign components and materials for production, and then exports final products.

The declining share of domestic value added in Poland's exports is accompanied by a decreasing role of manufacturing in Poland's exports, and simultaneously an increasing specialisation of Poland's exports in services. In 1995, as much as 52% of Poland's gross exports came from domestic value added in manufacturing, whereas by 2020 this share had fallen to 35%. At the same time, the share of services in exports increased from 29% to 34% (Figure 2.3).

These changes indicate a structural transformation of the Polish economy, where services, including those supporting global production processes, play an increasingly significant role in exports. In the analysed period, the share of services in Polish value-added exports increased the most in the following sectors: information and communication, primarily activities related to programming, consultancy and information services; as well as professional, scientific and technical activities. The noted decline

in the share of manufacturing in Poland's exports was primarily driven by sectors such as the production of textiles, wearing apparel, leather goods and related products; the manufacturing of other transport equipment; the production of wood and cork products (excluding furniture), straw and plaiting materials; the production of paper and paper products, printing and reproduction of recorded media; the manufacturing of computers, electronic and optical products; and the production of machinery and equipment not elsewhere classified. The shift towards the service sector, especially in the indicated areas, suggests that Poland is increasingly involved in servicing and supporting global production processes, rather than exporting final, finished products.

Figure 2.3. Domestic value added in Poland's gross exports by sector in 1995–2020 (%)



Source: own elaboration based on OECD [2024].

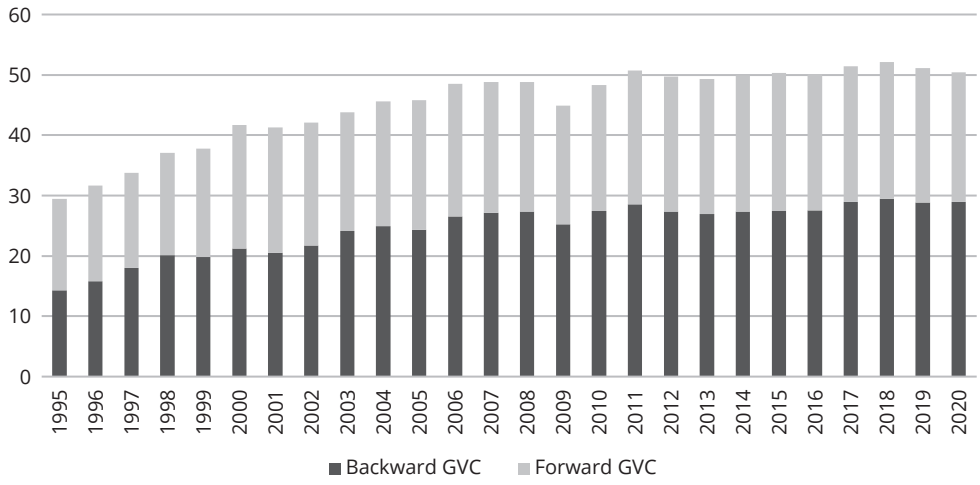
At the same time, a gradual increase in the share of foreign value added in Polish exports can be observed – from 14% in 1995 to 29% in 2020, which means that Poland is increasingly integrating with global value chains, and exports are becoming more dependent on foreign components. This trend indicates that over the past decades, Poland has strengthened cooperation with international partners, which may be linked to the growing presence of foreign investors and the intensive import of intermediate goods. The situation has stabilised since 2010 – there is no longer an increase in the share of foreign value added in Poland's gross exports.

2.6. The nature of Poland's integration into GVCs

The share of foreign value added in a country's exports is on the components useful for determining the country's integration into global value chains. Such integration may stem from the necessity to import intermediate goods used in manufacturing,

which are then re-exported as either intermediate or final goods. These are referred to as backward linkages in the value chain, which are illustrated by foreign value added in a country's gross exports. Additionally, countries can participate in GVCs through forward linkages, where domestic value added is embedded in components exported to other countries and subsequently re-exported to third countries (domestic value added in foreign gross exports). Backward linkages are sometimes referred to as linkages 'towards suppliers of intermediate goods and services for production,' while forward linkages are 'towards foreign recipients of goods and services used by them in production' [Ambroziak, 2018, p. 41]. By adding the foreign value embodied used in a country's exports to domestic value added used in other countries' exports, and then relating this sum to the country's gross exports, we obtain the country's GVC participation in index. It shows how much of the country's exports are part of a multi-stage international trade process. As a result, this index enables the assessment of a country's export integration with international production networks [Kuźnar, 2017; Nacewska-Twardowska, 2017].

Figure 2.4. Poland's GVC participation index in 1995–2020



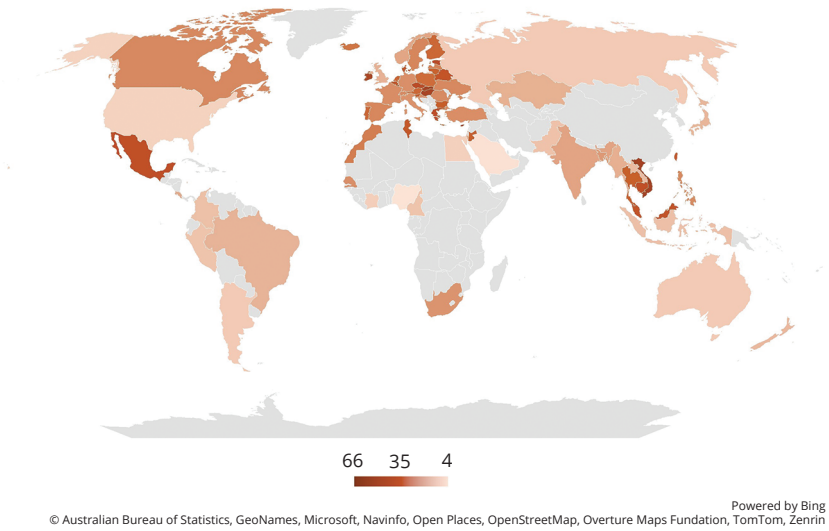
Source: own elaboration based on OECD [2024].

As shown in Figure 2.4, Poland's GVC participation in gross export was 29.5% in 1995, remaining at slightly over 50% since 2015. The increase in Poland's involvement in GVCs was more significantly influenced by the growth in backward linkages (which doubled) than forward linkages (which increased 1.5 times).

Backward linkages in GVCs

Figure 2.5 shows the share of foreign value added in Poland's gross exports compared to the global context. In 2020, this indicator for Poland was 29%, which was above the OECD average of around 7% and the EU-27 average of nearly 16%, placing Poland in 30th place out of 77 economies in the TiVA database. Countries with the highest levels of backward GVC linkages (values above 30%) include small open Western European economies (such as Luxembourg, Malta, Ireland), whose small size limits their ability to produce/source inputs domestically. High values of the index are also observed in some Central and Eastern European economies (including Slovakia, Hungary, Czechia, Estonia), as well as many countries in East and Southeast Asia (including Singapore, Vietnam, Malaysia, Taiwan, Thailand, South Korea). These are countries located near major production centres (Germany in Europe, China in Asia), where GVC-related activities are common and which rely heavily on the import of intermediate goods and services.

Figure 2.5. Foreign value added in Poland's gross exports (backward GVC) compared to the world in 2020 (% of a country's gross exports)



Source: own elaboration based on OECD [2024].

The foreign value added in Poland's gross exports consists of roughly equal proportions of value originating from other EU-27 members (14.3% in 2020) and from outside the EU-27 (14.6%), with Germany providing the most inputs used in Poland's exports of all countries. In 2020, Germany's share of inputs originating from the EU-27 was 5.1%, while Poland's export dependency on the import of inputs from outside the EU has been systematically increasing (see Table 2.3).

Table 2.3. Origin of foreign value added in Poland's exports (backward GVCs) in selected years of 1995–2020 (% of Poland's gross exports)

	1995	2004	2020
Value added from the EU-27 in Poland's exports, including from:	**8.5**	**15.1**	**14.3**
▪ Germany	3.3	5.4	5.1
▪ Italy	1.2	1.9	1.5
▪ France	0.7	1.7	1.2
▪ Netherlands	0.5	0.8	0.9
Value added from outside the EU-27 in Poland's exports, including from:	**5.8**	**9.8**	**14.6**
▪ Russia	1.0	2.3	2.7
▪ United States	0.8	1.1	1.6
▪ United Kingdom	0.7	1.1	0.9
▪ China	0.1	0.7	2.9

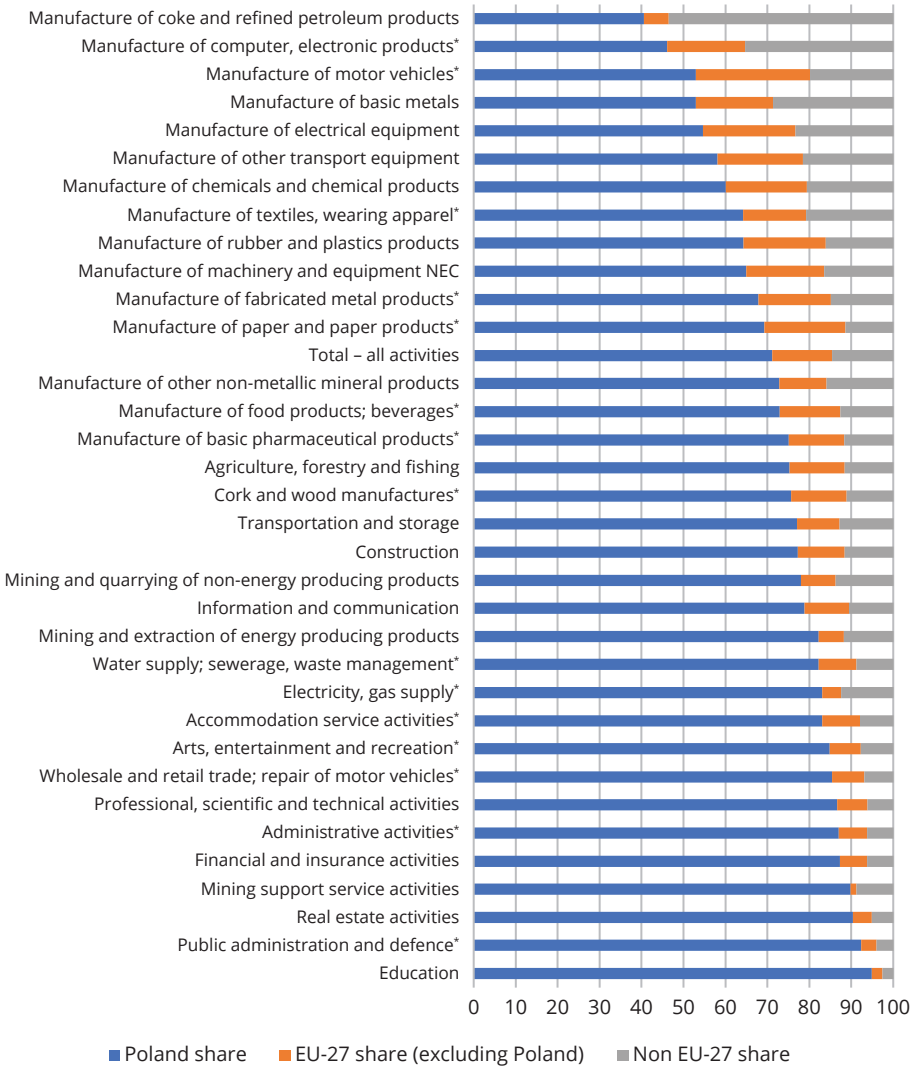
Source: own elaboration based on OECD [2024].

Notably, China has gained prominence as a supplier of components for Poland's export production, rising from eleventh to fourth place among Poland's trade partners. Russia is also of significant importance (due to the import of energy resources)[3].

Poland's export sector most dependent on imported inputs is the production of coke and refined petroleum products – in 2020, almost 60% of the gross exports in this sector were previous imports, almost entirely from outside the EU-27 (see Figure 2.6). Other sectors heavily dependent on imported inputs include the manufacture of other transport equipment (41.8%), electrical equipment (45.4%), basic metals (47.1%), motor vehicles, trailers and semi-trailers (47.1%), and computers, electronic and optical products (53.9%), with the manufacture of motor vehicles showing the greatest dependence on imported inputs from the EU-27 (27.3%).

[3] Following Russia's aggression against Ukraine in February 2022 and the related EU sanctions, Poland gradually reduced and eventually ceased the import of energy resources from Russia.

Figure 2.6. Origin of value added in Poland's export sectors in 2020 (% of Poland's gross exports)



* Full names of sectors: Manufacture of computer, electronic and optical products, Manufacture of motor vehicles, trailers and semi-trailers, Manufacture of textiles, wearing apparel, leather and related products, Manufacture of fabricated metal products, excluding machinery and equipment, Manufacture of paper and paper products; printing and reproduction of recorded media, Manufacture of food products; beverages and tobacco products, Manufacture of basic pharmaceutical products and preparations, Cork and wood manufactures (excluding furniture); manufacture of straw and plaiting materials, Water supply; sewerage, waste management and remediation activities, Electricity, gas, steam and air conditioning supply, Accommodation and food service activities, Arts, entertainment and recreation; other service activities, Wholesale and retail trade; repair of motor vehicles and motorcycles, Administrative and support service activities, Public administration and defence; compulsory social security.

Source: own elaboration based on OECD [2024].

In 2020, the import content of Poland's gross exports generally ranged from 5% to 23% for service sectors, 10% to 25% in agriculture and mining, and from 25% to 60% in manufacturing. This confirms the generally observed global trends: a higher level of backward linkages in global value chains is seen in the manufacturing sector due to advanced vertical specialisation and international outsourcing (offshoring), while lower levels of these linkages are typically found in the agricultural, mining and service sectors, which use imported intermediate products less frequently. The products of these latter sectors, in turn, are often used as inputs in the production of other goods, which justifies the expectation of relatively high forward linkages of these sectors in the value chain.

Forward linkages in GVCs

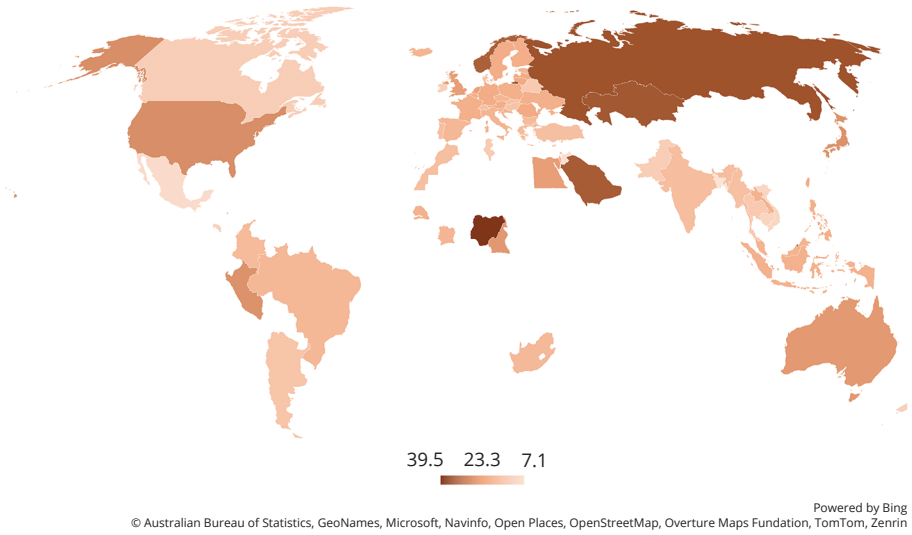
Poland's forward GVC linkages can be expressed as the domestic value added originating in Poland and embodied in other countries' exports, relative to Poland's gross exports. It is assumed that the higher this indicator, the more integrated the country is into global value chains. Accordingly to the stronger these types of linkages are, the more significant the prospects for the development of foreign export markets become for the Polish economy. In 2020, Poland ranked 28th out of 77 economies in the TiVA database in terms of GVC forward linkages. At that time, 21.5% of Poland's total gross exports consisted of Polish value added, that was subsequently re-exported by third countries. This figure exceeded the averages for the EU-27 (13.8%) and the OECD (18.8%). Leading the rankings are countries whose value added is embedded in the exports of other nations, often crossing multiple borders before reaching their final destination. These are specifically countries that have rich mineral resource deposits and hold an important position in their global export, such as Nigeria, Russia, Brunei Darussalam, Kazakhstan, Saudi Arabia and Norway. In each of these cases, the share of forward linkages in GVCs in 2020 exceeded 30% (see Figure 2.7).

Relatively high rates are also achieved by economies largely based on the service sector, which often provides essential contributions to the production of all other industries (e.g., the United Kingdom). Small open economies (such as Luxembourg or Malta) rank at the bottom of the list.

Poland has a higher level of forward linkages in GVCs than the Visegrad Group countries (see Figure 2.8). In 2020, the share of domestic value added from Hungary and Slovakia embodied in third countries' exports, relative to their own gross exports, amounted to around 16–17%, while in the case of the Czechia, it reached 20%. Although all of these countries have experienced an increase in this type of GVC participation,

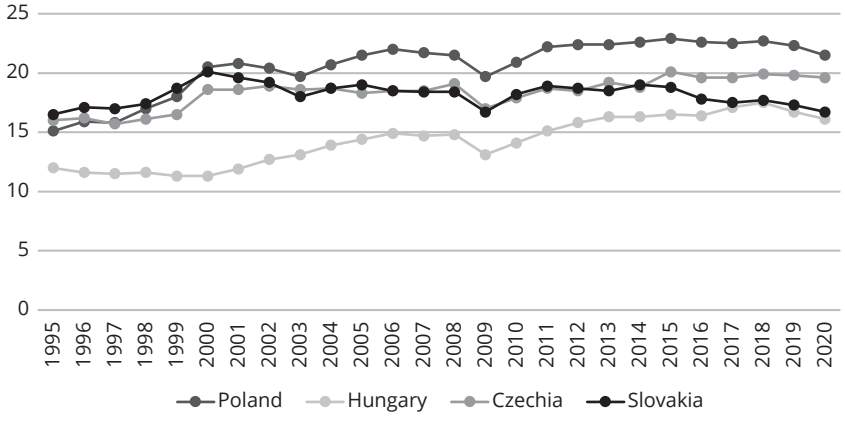
only in Poland were both the growth and the final level of domestic value added in foreign exports relative to gross exports (21.5%) more significant.

Figure 2.7. Domestic value added in foreign exports (Poland's forward GVC linkages) compared to the world in 2020 (% of a country's gross exports)



Source: own elaboration based on OECD [2024].

Figure 2.8. Poland's domestic value added in foreign exports (forward GVCs) compared to the Visegrad Group countries in 1995–2020 (% of a country's gross exports)



Source: own elaboration based on OECD [2024].

The data in Table 2.4 presents the main directions (both within the EU-27 and outside the EU) through which Polish value added is exported abroad, indicating that Poland has stronger forward GVC linkages with partners from the EU-27. In 2020, EU-27 countries accounted for over 16% of the Polish value added that was embodied in other countries' exports. The corresponding figure for non-EU countries was 5.2%. The most important exporter of Polish value added to third countries is Germany, followed by Czechia, France and the Netherlands. Among non-EU countries, Polish value added is exported abroad to the greatest extent (although relatively small compared to EU countries) through exports from Switzerland, the United Kingdom and China.

Table 2.4. Polish value added embedded in the exports of EU-27 and non-EU-27 countries (forward GVCs) in selected years of 1995–2020 (% of Poland's gross exports)

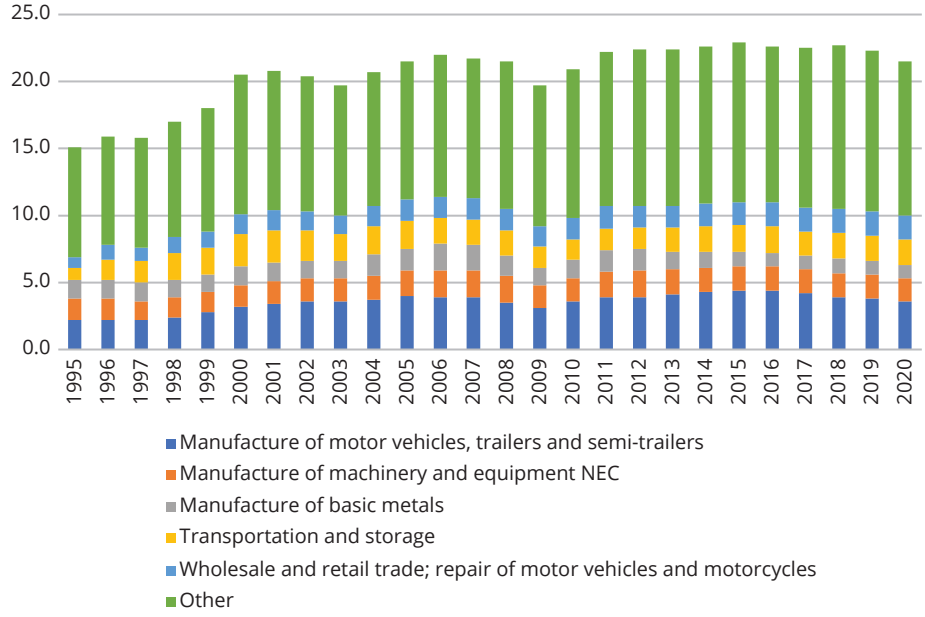
	1995	2004	2020
Polish value added in the exports of EU-27 countries, including:	11.1	15.7	16.3
▪ Germany	4.2	5.2	4.2
▪ Czechia	0.5	1.2	1.5
▪ France	0.9	1.2	1.1
▪ Netherlands	0.7	0.5	1.0
Polish value added in the exports of non-EU-27 countries, including:	4.0	5.0	5.2
▪ Switzerland	0.2	0.3	0.6
▪ United Kingdom	0.7	0.7	0.6
▪ China	0.1	0.3	0.5

Source: own elaboration based on OECD [2024].

Export industries most involved in forward linkages of global value chains and their changing shares in Poland's gross exports are presented in Figure 2.9 and include manufacturing sectors such as the manufacture of motor vehicles, trailers and semi-trailers; the production of machinery and equipment; and the production of basic metals, as well as service sectors such as transportation and storage; wholesale and retail trade and repair of vehicles. The fastest-growing service sectors, on the other hand, include information and communication, as well as professional, scientific and technical activities. The previously observed trend of the increasing importance of services in the export of Polish value added is clearly reflected here: the share of services in forward linkages in GVCs rose from 2.5% in 1995 to 6.3% in 2020. During the same period, the share of the manufacturing industry as a whole increased less significantly, from 12% to 14.3%.

The dominant share of Germany in the export of Polish value added may pose a burden for Polish exporters in the event of a downturn in German export performance, and in particular, those sectors that currently exhibit the highest level of forward linkages in relations with Germany may be most affected. These are primarily commercial services, which accounted for 54% of Poland's value added re-exported by this country in 2020 (including wholesale and retail trade, transportation and storage, professional, scientific and technical activities, information and communication) as well as manufacturing sectors such as the manufacture of metal products, motor vehicles, trailers and semi-trailers, and the production of rubber and plastic products.

Figure 2.9. Poland's export sectors with the highest GVC forward linkages in 1995–2020 (% of Poland's gross exports)



Source: own elaboration based on OECD [2024].

2.7. Conclusions

This chapter presents an analysis of key aspects of Poland's participation in global value chains (GVCs), based on trade in value-added data from 1995–2020, supplemented by data on trade in intermediate goods from 2004–2023. The findings highlight the critical role of intermediate goods in Poland's trade. The analysis of value added in Poland's trade shows that since 1995, the share of foreign value added in Polish

exports has gradually increased at the expense of domestic value added, reflecting Poland's growing integration into GVCs.

Poland's GVC structure is dominated by backward linkages, where the country imports components necessary for further production intented for export. The primary partners in this regard are EU countries, particularly Germany.

Over the period under study, Poland's participation in forward GVC linkages has deepened, especially in service sectors, which may facilitate further specialisation in high-value-added areas such as IT and consulting. The growing level of forward GVC linkages underscores the increasing importance of Polish suppliers in international markets. Nevertheless, the dominant role of Germany as an intermediary re-exporting Polish value-added could be a risk factor, as the performance of Polish exports is partly dependent on the condition of the German economy.

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Chapter 3

The Impact of Foreign Direct Investment on Poland's Participation in Global Value Chains

Tomasz Marcin Napiórkowski

3.1. Introduction

With the rise of globalisation and transnational corporations, the importance of global value chains (GVCs) has grown exponentially. GVCs can be defined as 'the fragmentation of production processes into several stages carried out in different countries and linked together through service connections, leading to the creation of borderless production systems of varying complexity' [Martínez-Galán, Fontoura, 2019, p. 175]. Similar to hosting foreign direct investment (FDI) [e.g., Napiórkowski, 2017], the participation of entities from a given economy in global value chains can bring tangible benefits (e.g., new production processes) [Martínez-Galán, Fontoura, 2019]. Foreign direct investment is understood as "an investment reflecting lasting interests and control of a foreign direct investor resident in one economy which invests in an enterprise in another economy (foreign affiliate)" [UNCTAD, 2023].

The purpose of this chapter is to explore whether hosting foreign direct investment exerts a statistically significant and positive influence on the host economy's participation in global value chains, exemplified by the Visegrad Group countries. The primary reason for choosing the Visegrad Group was the limited period for which data is available for Poland alone, making it impossible to construct an econometric model solely for this economy, while the second reason for choosing this group is to provide a background and points of comparison in the data analysis for Poland.

First, trends in foreign direct investment in Poland are outlined, followed by an analysis of Poland's share in global value chains based on a chosen metric, in recent years. Subsequently, the literature addressing the factors determining the participation of economies in GVCs is analysed, with the literature review resulting in a research hypothesis and a proposed econometric model equation designed to test it. The next section of the chapter focuses on econometric modelling, with its findings addressed in the last subsection.

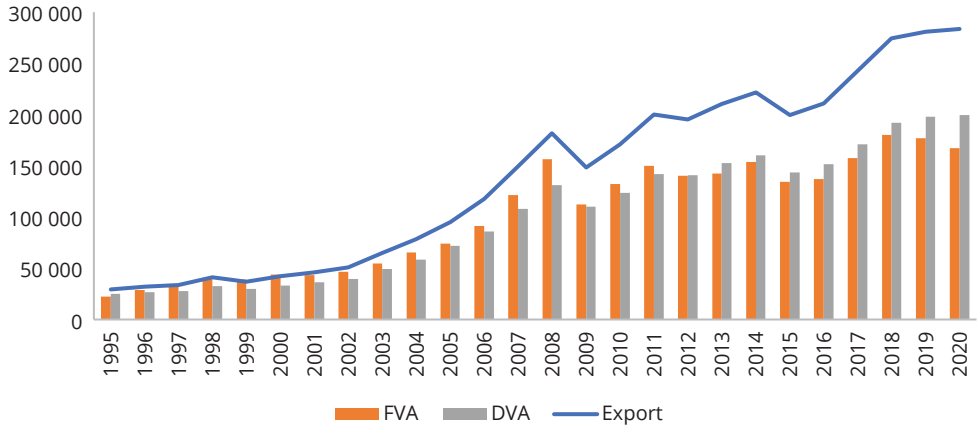
3.2. The dynamics of participation in global value chains and hosting foreign direct investment

Literature offers multiple approaches to measuring an economy's level of participation in global value chains. For example, Martínez-Galán and Fontoura [2019] sum the domestic value added in exports with the foreign value added in imports relative to total exports. Kersan-Škabić [2019] measures the involvement by summing the share of domestic value added in foreign exports with the share of foreign value added in domestic exports in relation to total exports. In turn, in an article by Efogo, Wonyra and Osabuohien [2021], participation in GVCs is expressed as the sum of foreign and domestic value added in exports.

Considering the availability of data for the studied economies, the level of a country's participation in global value chains was expressed as the sum of domestic (DVA) and foreign (FVA) value added in exports, where the share of foreign value added embedded in exports 'reflects how much of a country's gross exports contains value added that is produced outside the domestic economy (and imported) ' [OECD, 2016].

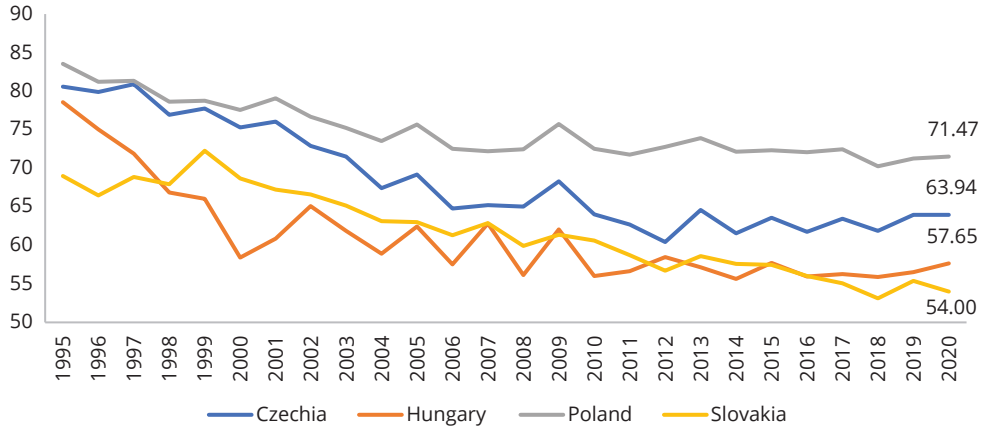
An analysis of each component of the above-mentioned indicator for Poland shows that until around 2003, the growth rates of exports, DVA and FVA were very similar to each other. However, in the years following the 2008 crisis, the trends in the analysed processes shifted markedly in favour of exports (Figure 3.1), which is shown in the decreasing values of Poland's global value chain participation index.

Figure 3.1. Trends in exports, domestic (DVA) and foreign (FVA) value added in exports in Poland in 1995–2020 (USD millions)



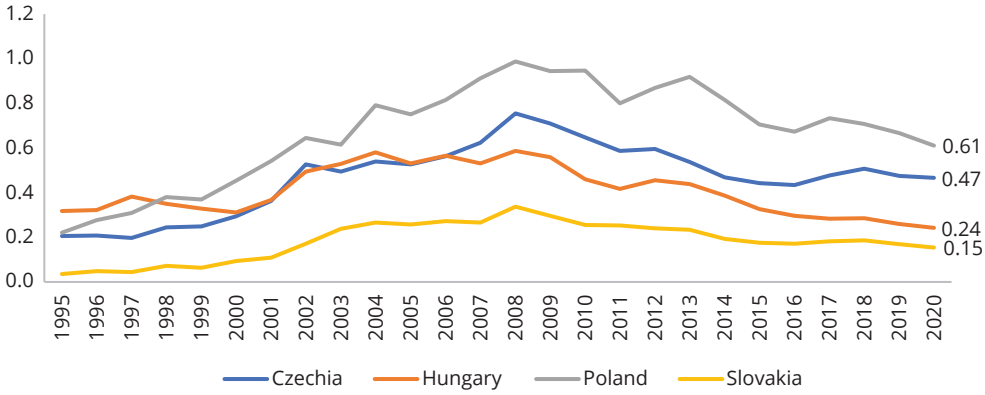
Source: own elaboration based on OCED [2024].

Figure 3.2. Participation of the Visegrad Group economies in global value chains in 1995–2020 (GVC index)



Source: own elaboration based on OCED [2024].

Figure 3.3. Foreign direct investment stocks in the Visegrad Group economies in 1995–2020 (% of the world)



Source: own elaboration based on UNCTAD [2024].

The share of each analysed country (Czechia, Hungary, Poland and Slovakia; Figure 3.2) in global value chains declined over the analysed period (1995–2020). Hungary's involvement decreased the most (by 20.92 p.p.), followed by the Czechia (by 16.63 p.p.), Slovakia (by 14.97 p.p.), and finally Poland (down by 12.05 p.p.). In 1997, Poland and Czechia had comparable shares (approximately 80%), but by 2020, Poland had firmly established itself as the leader among the Visegrad Group in global value chain participation. Early in the study period, Hungary ranked a close third to second

place in terms of GVC participation, but its involvement dropped markedly over time, reaching just slightly above that of Slovakia (57.65% vs. 54%) by 2020.

The Visegrad Group countries' relative attractiveness as a foreign direct investment destination, compared to other countries in the world, rose consistently from 1995 until the late 2000s, at which point a pronounced reversal of the trend took place (Figure 3.3). In the first half of the studied period, Poland experienced the most significant growth in relative attractiveness, establishing itself as the clear leader of the group. Czechia ranked second, followed by Hungary and then Slovakia. If the late-2010s trends prevail, Poland ceded its leadership position to Czechia, while Hungary and Slovakia will see their relative attractiveness weaken further at comparable rates.

3.3. Determinants of an economy's participation in global value chains in the literature

Kersan-Škabić [2019] used a dynamic econometric model to analyse the determinants of global value chain participation in EU countries, highlighting factors such as GDP growth, the lagged value of GVC participation, foreign direct investment, financial sector development, the share of services in GDP, high-tech exports as a percentage of total exports, and wage levels. It is noteworthy that although the importance of specific determinants is largely comparable between the EU-15 ('old Union') and the new member states, the magnitude of their influence varies significantly between the two groups.

In their analysis of the probability and extent of firms' and countries' participation in global value chains on a global scale, Urata and Baek [2020] used econometric modelling to demonstrate that, at the company level, the key determinants are labour productivity, firm size, the share of foreign capital in ownership, and advanced technological capabilities. At the level of the whole economy, the most important factors turned out to be openness to foreign trade, inflows of foreign direct investment, availability of highly educated individuals, well-developed infrastructure (including efficient logistics), and good governance. The study and its outcomes should be considered exploratory, as the authors analysed a broad array of potential factors influencing GVC participation, further expanded by numerous potential interactions among them.

Efago et al. [2021], through econometric modelling, explored the effects of foreign direct investment on national participation in global value chains, including additional explanatory variables such as trade openness and costs, logistics quality, manufacturing value added, demand, agricultural and service value added, government efficiency,

physical and human capital, financial sector loans to enterprises, and lagged foreign value added. Interestingly, both openness to foreign trade and demand (measured as GDP per capita) were found to negatively affect the explained variable under study, whereas, for example, the GDP growth rate had a positive sign.

The potential for production and openness to economic exchange were also noted as factors influencing an economy's participation in global value chains based on econometric modelling results by Fernandes, Kee, Winkler [2022]. The authors considered processes such as the abundance of production factors, geographical structure, political stability, liberal trade policy, foreign direct investment and domestic industry capacity (representing the size of the economy) as important determinants of an economy's participation in global value chains.

An interesting observation regarding the determinants of an economy's participation in global value chains was made by Banerjee and Zeman [2022], who identified the size of the economy as a key factor, noting that the actual impact of other potential determinants is highly dependent on the sample and whether the participation is upstream, downstream or overall. Other determinants considered noteworthy by the authors include the share (separately) of low- and (together) medium- and high-technology manufacturing and services in exports, the percentage of employees with higher education, the capital-to-output ratio, foreign direct investment, the real effective exchange rate (REER) and the level of corruption control.

Eegunjobi and Ngepah [2022] employed a comparable set of explanatory variables, tackling the issue at the meso level and focusing on a specific industry – in this case, the seafood export sector. The authors (using the Hausman–Taylor estimator and a series of econometric models) demonstrated that processes such as GDP per capita (representing economic potential), R&D investment, financial market advancement, government quality, profit tax levels (representing attractiveness for FDI), openness to foreign trade, and net inflows of foreign direct investment determine participation in global value chains. Interestingly, the GDP per capita coefficient turned out to be negative. More surprising was the negative impact of government quality on the modelled explained variable.

Although additional investigation into the literature on factors influencing participation in global value chains could be undertaken, the presented sample adequately highlights the consistency in the choice of determinants among various studies, including economic potential (measured by GDP or abundance in production factors), openness to trade (traditionally the sum of exports and imports expressed in relation to GDP), and foreign direct investment. The remaining factors seem to be tailored to the analysed economies or result from the choice of literature referenced in the review.

Based on the literature presented above, it can also be inferred that foreign direct investment positively translates into an economy's participation in the global value chain. This conclusion forms a research hypothesis, which is tested in the next step using econometric modelling.

3.4. Econometric modelling of the impact of foreign direct investment on the host economy's participation in global value chains

Based on the literature review findings, global value chain (GVC) [OECD, 2024] participation is modelled as a function of GDP per capita (to circumvent the 'large country problem', *Y*) [World Bank, 2024], trade openness (calculated as the sum of exports and imports as a percentage of GDP, *T* [World Bank, 2024], and foreign direct investment stock (expressed as a percentage of global FDI stock, *FDI* [UNCTAD, 2024]. This relationship is illustrated in Equation 3.1. The measure of foreign direct investment as stock allows for the identification of the relative attractiveness of the analysed economy compared to the rest of the world. The choice of FDI stock, rather than their flows, was dictated by the very high volatility of foreign direct investment flows, making it difficult to establish a trend and, consequently, the econometric modelling process. Additionally, since the logarithmic form of the model was chosen, the use of FDI flows was impossible due to their negative values. The data for modelling covers the period 1995–2020, which is the longest period for which a balanced panel could be collected. The database used thus has the following parameters: $i = 4$, $t = 26$.

$$\ln\left(GVC_{it}\right) = \beta_0 + \beta_Y \ln\left(Y_{it}\right) + \beta_T \ln\left(T_{it}\right) + \beta_{FDI} \ln\left(FDI_{it}\right) + \gamma_i + \delta_t + \varepsilon_{it}, \qquad (3.1)$$

where:
Y – function of GDP per capita,
T – sum of exports and imports as a percentage of GDP,
FDI – percentage of global FDI stock.

The model parameters were estimated using the Ordinary Least Squares (OLS) estimator with cross-sectional (γ_i) and period (δ_t) effects. The results of the Hausman test (Prob > $chi^2 = 0.000$) indicated the necessity to apply fixed effects that capture processes specific to a given cross-section (economy) and year that are not accounted for in the model by the included explanatory variables. The model's residuals are characterised by the absence of heteroskedasticity (Prob > chi^2 of the Wald test = 0.337), absence of autocorrelation (Prob > *F* of the Wooldridge test = 0.550), a normal distribution

(*p*-value of the Jarque–Bera test = 0.561, Prob > *Z* of the Shapiro–Wilk test = 0.511), and the absence of a unit root (*p*-value of the Levin–Lin–Chu test = 0.093, *p*-value of the Harris–Tzavalis test = 0.000). Presented results suggest a correct structural form of the model and confirm a low probability of the omitted variable bias (which also results from the application of fixed cross-sectional and time effects). Due to the presence of cross-sectional correlations (*p*-value of the Breusch–Pagan LM test = 0.000), the OLS estimator was substituted by the panel-corrected standard errors (PCSE) estimator. The applied procedure is consistent with the literature presented and detailed, e.g., by Napiórkowski [2022].

The estimated model, as shown in Table 3.1, is highly aligned with data (*R*-squared = 89.57%), and every estimated coefficient is statistically significant (Prob > chi^2 = 0.000).

Table 3.1. The results of the econometric modelling

Explanatory variable	Coefficient	*p*-value
Y	0.108	0.000
T	−0.390	0.000
FDI	−0.021	0.001
β_0	5.010	0.000

Source: own elaboration based on OECD [2024], World Bank [2024], and UNCTAD [2024].

Table 3.2. Verification of econometric modelling results – alternative measure of FDI stock

Explanatory variable	Coefficient	*p*-value
Y	0.092	0.000
T	−0.340	0.000
FDI/GDP	−0.024	0.021
β_0	5.030	0.000

Source: own elaboration based on OECD [2024], World Bank [2024], and UNCTAD [2024].

To verify whether the obtained results could depend, for example, on a different measure of FDI stock (e.g., stock expressed as a percentage of the host country's GDP) or the inclusion of a lagged value of the explained variable, a series of robustness checks were conducted. A change in the measure of foreign direct investment stock did not affect the signs, values or statistical significance of the estimated coefficients (Table 3.2, *R*-squared = 89.03%, Prob > chi^2 = 0.000). Similarly, the addition of a lagged value of GVC participation [e.g., according to Efago et al., 2021] to the original

model (Table 3.3, *R*-squared = 91.92%, Prob > chi^2 = 0.000), as well as to the one with an alternative FDI measure, did not introduce significant changes (Table 3.4, *R*-squared = 91.56%, Prob > chi^2 = 0.000).

Table 3.3. Verification of econometric modelling results – addition of a lagged explained variable

Explanatory variable	Coefficient	*p*-value
Y	0.080	0.000
T	−0.291	0.000
FDI	−0.016	0.002
Y_{t-1}	0.281	0.000
β_0	3.626	0.000

Source: own elaboration based on OECD [2024], World Bank [2024], and UNCTAD [2024].

Table 3.4. Verification of econometric modelling results – alternative measure of FDI stock and addition of a lagged explained variable

Explanatory variable	Coefficient	*p*-value
Y	0.066	0.000
T	−0.248	0.000
FDI/GDP	−0.019	0.035
Y_{t-1}	0.292	0.000
β_0	3.590	0.000

Source: own elaboration based on OECD [2024], World Bank [2024], and UNCTAD [2024].

The permutations of the original model presented above indicate its robustness, which minimises the likelihood that the obtained results are a coincidence related to the author's subjectivity.

The coefficient assigned to GDP per capita, in line with a significant portion of the literature [e.g., Kersan-Škabić, 2019], is statistically significant (*p*-value = 0.000) and positive. One unexpected outcome, based on the reviewed literature, is the negative sign of the statistically significant coefficient (*p*-value = 0.000) representing the influence of economic openness to trade on participation in global value chains, as illustrated in Figures 3.2 and 3.4[1]. The obtained results from econometric modelling

[1] This observation is confirmed by the fact that the economy with the highest involvement in global value chains, i.e., Poland, is the country with the lowest openness to foreign trade in the studied group of countries. A similar conclusion can be drawn by analysing the two processes for Slovakia, i.e., the lowest participation in GVCs and the highest openness to trade.

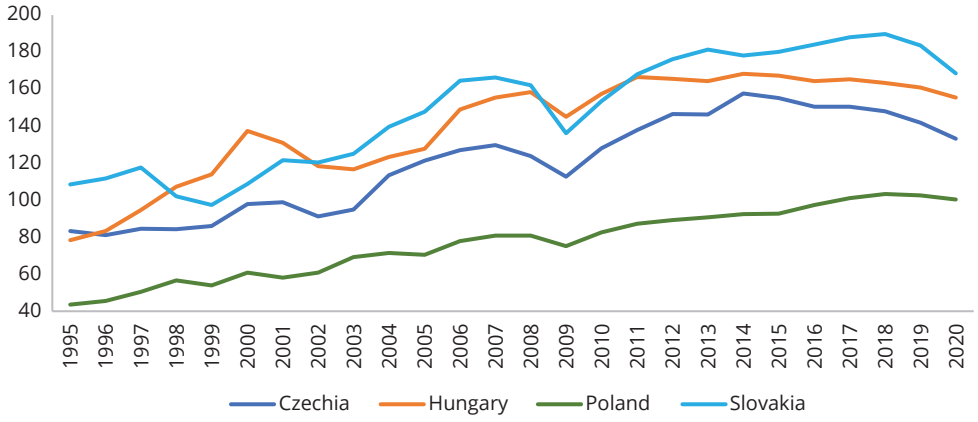
are consistent with a study by Efago et al. [2021], which also indicated a negative relationship between trade openness and GVC participation – echoing the conclusions of Johnson and Noguera [2017] and Koopman, Wang and Shang-Jin [2014], who suggest that this may be due to inaccuracies in data reporting or calculation methods.

The negative sign of the coefficient describing the impact of foreign direct investment on the host country's participation in GVCs (p-value = 0.001) contradicts the expectations developed during the literature review [e.g., Efago et al., 2021; Urata, Baek, 2020; as well as Androv, Stehrer, 2019; Su, Fu, 2021], thus not allowing for the confirmation of the research hypothesis based on the literature analysis.

The observed results suggest that the examined economies are increasing the role of foreign trade in their economic mix while simultaneously focusing on production within domestic value chains. Similar conclusions can be drawn regarding the impact of foreign direct investment.

Mathematically, the relatively very low value and negative sign of the FDI coefficient can be attributed to the mismatch in trends between the participation of the studied economies in global value chains and their FDI hosting (Figures 3.2 and 3.3), while differences compared to other studies may also arise from the method of measuring the level of participation in GVCs and the use of FDI stocks versus flows. When comparing the results to the analysed literature, it is important to consider the relationship between the influence of specific determinants and the type of economies studied (e.g., a broad set of heterogeneous economies versus a small homogeneous group), and whether the analysis addresses the whole value chain or specifically upstream or downstream participation [Banerjee, Zeman, 2022].

Figure 3.4. Openness to foreign trade of the Visegrad Group economies in 1995–2020 (% of GDP)



Source: own elaboration based on OCED [2024].

3.5. Conclusions

This chapter aimed to investigate the effect of hosting foreign direct investment on Poland's participation in global value chains. Given the limited period of data for Poland, the analysis was extended to include, alongside Poland, the other Visegrad Group members. Based on the literature review a research hypothesis was presented suggesting a statistically significant and positive impact of FDI on the dependent variable. Based on the literature review, it was established that the primary factors determining an economy's participation in GVCs are its size, openness to foreign trade, and foreign direct investment hosting, which enables the development of an econometric model. The model's outcomes underwent a validation process, which entailed using various measures of used variables and incorporating the lagged explained variable on the equation's right-hand side. The model itself was subjected to a series of tests, the results of which ensured its econometric correctness.

The hypothesis was not confirmed, which suggests that although FDI stock do influence the involvement of the examined economies in global value chains in a statistically significant manner, the effect is both negative and minimal. Interestingly, trade openness also turned out to have a negative impact on the examined and explained process.

In terms of economic policy, the findings outlined in this chapter may be viewed as a basis for debate on the use of available foreign direct investment stock for participation in global value chains. From a scientific perspective, future research in this area should verify the validity of the results obtained here, for instance by applying alternative measures of participation in global value chains, and attempt to explain, for example through the analysis of economic policy, the signs of the coefficients assigned to trade openness and foreign direct investment.

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Chapter 4

Poland's Competitiveness in Foreign Trade

Artur Franciszek Tomeczek

4.1. Introduction

The Polish economy currently presents a unique dichotomy. On the one hand, Poland is classified by the World Bank as a high-income country [World Bank, 2024b] with a high rate of economic growth [Eurostat, 2024c], with modern technologies playing an increasingly significant role [Kowalski, Weresa, 2019; Ministry of Development, 2017; Dutta, Lanvin, Rivera León, Wunsch-Vincent, 2024]. On the other hand, however, Poland is still classified as an emerging economy [IMF, 2024; World Bank, 2024a], relying significantly on relatively low production costs (by European standards) [Eurostat, 2024g] and a large number of working hours coupled with relatively low labour productivity [Tomeczek, 2023]. Like many other European countries, Poland is facing macroeconomic challenges, such as a rapidly ageing society [Eurostat, 2020, 2024f] and energy sector self-sufficiency [Eurostat, 2024a, 2024b].

A similar contrast can be observed in the role played by large cities and their surrounding municipalities, with the dominant role of Warsaw in the Mazowieckie Voivodeship serving as a well-documented example [Napiórkowski, Radło, 2022; Radło, Szczech-Pietkiewicz, 2022; Szczech-Pietkiewicz, Radło, Tomeczek, 2022]. The diverse challenges faced by large and small cities are reflected in the differences in competitiveness across the country's regions, with specific voivodeships implementing the principles of their assigned regional smart specialisations [Ministry of Economic Development and Technology, 2024]. Servitisation processes play a significant role in major cities and industrial districts [Szczech-Pietkiewicz et al., 2022, p. 27], and Poland also has well-developed clusters [Kowalski, 2020; Kowalski, Marcinkowski, 2014].

The aim of this study is to describe the characteristics of Poland's competitiveness from the perspective of foreign trade, with four research questions formulated in order to achieve this goal:

1) Who are Poland's most important trading partners?
2) What goods are most significant in Poland's foreign trade?
3) For which goods does Poland have the greatest comparative advantage?

4) Is Poland currently among the leading European countries in terms of labour productivity?

The structure of this chapter is as follows. First section presents the research methodology and data sources. The study then covered: Poland's trading partners, the structure of Poland's foreign trade, the comparative advantages of products exported by Poland, and the Polish labour market. The whole is crowned with a synthetic summary, containing the most important conclusions from the research conducted.

4.2. Methodology and data sources

The analysis presented in this chapter adopts a statistical-descriptive approach. Data regarding Poland's trading partners and the structure of its international trade was sourced from the TradeMap database [ITC, 2024], which is based on quantitative data from UN Comtrade [United Nations Statistics Division, 2024]. Polish names of the Harmonized Commodity Description and Coding System (HS4 codes) were retrieved from the ISZTAR4 system [Ministry of Finance, 2024], data on comparative advantage was obtained from the UNCTAD [2024] database, while labour market data was sourced from Eurostat [Eurostat, 2024d].

The Revealed Comparative Advantage (RCA) index is defined as the ratio of the share of product J in the total exports of country A to the global share of product J in total global exports [UNCTAD, 2024], with an RCA index above 1 indicating an above-average advantage in the export of the given product by that country.

4.3. Poland's trading partners

In the context of foreign trade, historically Poland's economy has relied significantly on trade flows with Germany. Table 4.1 lists Poland's most important trading partners in 2023, showing that Germany (USD 98.7 billion) remains the largest recipient of Polish exports, followed by Czechia (USD 22.3 billion) and France (USD 21.9 billion). This specific economic cooperation between Poland and Germany is largely a result of geographical proximity (neighbouring countries allow for swift logistical connections), the absence of significant barriers (EU membership facilitates and encourages collaboration), and numerous similarities between their economic systems, while the post-COVID-19 trend of shortening and relocating value chains has also given Poland an opportunity to replace Chinese suppliers of industrial semi-products for the German market. Poland exports predominantly to European countries, with the United

States being the only non-European country on the discussed list. Conversely, the list of Poland's top import partners includes more non-European economies, with Germany again ranking first (USD 70.2 billion), followed by China (USD 42 billion) and Italy (USD 16.9 billion).

Table 4.1. Poland's key trading partners in 2023 (USD thousands)

Partner economy	Exports value	Partner economy	Imports value
Total	**354 667 456**	**Total**	**341 407 274**
Germany	98 737 031	Germany	70 194 728
Czechia	22 267 841	China	41 955 682
France	21 859 760	Italy	16 912 142
United Kingdom	17 532 697	United States	15 414 559
Italy	16 264 271	Netherlands	13 284 988
Netherlands	16 212 190	France	11 576 133
Ukraine	11 558 206	Czechia	11 304 963
United States	10 886 393	South Korea	10 024 530
Spain	9 751 924	Norway	8 847 394
Slovakia	9 687 258	Saudi Arabia	7 643 619
Sweden	8 856 696	Spain	7 376 940
Belgium	8 568 979	Belgium	7 314 272
Hungary	8 475 892	Türkiye	7 170 949
Romania	7 511 950	Denmark	6 757 356
Austria	7 331 976	Sweden	6 594 029
Lithuania	5 760 879	United Kingdom	6 337 245
Denmark	5 760 787	Japan	5 687 694
Türkiye	4 521 621	Hungary	5 500 516
Switzerland	4 008 803	Slovakia	5 397 688
Russia	3 705 519	Austria	4 947 715

Source: ITC [2024].

Table 4.2 shows the partner economies with which Poland recorded the largest bilateral trade balance surplus in 2023, which include economies such as Germany (USD 28.5 billion), the United Kingdom (USD 11.2 billion), Czechia (USD 11 billion), France (USD 10.3 billion) and Ukraine (USD 7 billion). Cooperation between Poland and Germany, characterised by Poland's significant trade surplus, remains mutually beneficial, although the current complex international situation necessitates consideration of potential risks stemming from a deteriorating trade balance. Poland's economy cannot easily decouple from its dependency on Germany as a primary export market,

and any economic difficulties faced by Germany directly affect Poland's economic performance. The German economy is heavily reliant on industry, particularly energy-intensive sectors such as automotive and machinery manufacturing, and in the context of significant energy price increases, these sectors face serious challenges in maintaining competitiveness in global markets. The necessity of imposing an embargo on Russian gas imports has caused substantial burdens for industry, with the significant dependence of the German economy on Russian gas becoming very evident. While energy prices for individual consumers are always somewhat subject to regulation by state authorities, energy prices for industry are determined by the free market. Another factor that has impacted the competitiveness of Germany's energy-intensive industries is the introduction of new regulations aimed at reducing carbon dioxide emissions. The current governing so-called traffic light coalition (*Ampelkoalition*), which includes the Green Party, considers this an important element of its electoral agenda. An additional burden for the entire German economy was the decision to shut down nuclear power plants back in 2011 in response to the Fukushima disaster.

Table 4.2. Poland's largest trade balance surplus in 2020–2023 (USD thousands)

Partner economy	2020	2021	2022	2023
Total	**–491 401**	**–17 619 197**	**–15 747 939**	**13 260 182**
Germany	17 713 039	20 416 548	20 199 165	28 542 303
United Kingdom	9 188 960	10 736 531	9 935 455	11 195 452
Czechia	6 959 020	8 304 509	11 519 498	10 962 878
France	5 403 181	6 868 572	8 890 948	10 283 627
Ukraine	2 721 626	2 012 803	3 480 146	6 958 028
Romania	2 839 909	3 176 803	4 292 952	4 642 852
Slovakia	1 643 504	1 742 980	4 155 220	4 289 570
Hungary	2 329 333	2 895 451	3 653 041	2 975 376
Netherlands	755 235	87 040	2 555 871	2 927 202
Lithuania	2 128 822	2 959 264	2 060 343	2 497 559
Belarus	544 126	262 487	836 149	2 400 774
Austria	876 680	1 874 166	2 521 496	2 384 261
Spain	799 822	518 471	1 934 575	2 374 984
Sweden	3 203 063	3 216 402	2 960 111	2 262 667
Latvia	1 013 711	1 391 103	1 821 703	1 914 672
Switzerland	312 986	891 735	1 258 699	1 426 640
Mexico	105 811	1 022 186	1 298 850	1 348 673
Croatia	761 017	1 024 886	1 128 301	1 268 685

Partner economy	2020	2021	2022	2023
Belgium	317 994	978 589	1 643 025	1 254 707
Estonia	1 032 077	1 192 852	1 356 882	1 144 675

Source: ITC [2024].

Table 4.3. Poland's largest trade balance deficits in 2020–2023 (USD thousands)

Partner economy	2020	2021	2022	2023
Total	**–491 401**	**–17 619 197**	**–15 747 939**	**13 260 182**
China	–33 730 247	–46 342 875	–44 130 450	–39 001 988
South Korea	–5 426 904	–6 787 617	–7 944 777	–9 109 467
Saudi Arabia	–216 049	–1 641 746	–5 152 741	–6 775 759
Norway	223 393	–41 304	–1 693 683	–5 746 156
Japan	–3 939 448	–4 246 761	–4 335 454	–4 922 153
United States	–585 831	–1 688 871	–5 798 927	–4 528 166
Vietnam	–2 904 736	–3 593 338	–3 108 420	–3 111 084
Bangladesh	–2 228 725	–2 872 846	–3 400 394	–2 959 621
Türkiye	–2 136 536	–3 227 787	–2 539 230	–2 649 328
Taiwan	–1 481 803	–2 237 553	–2 605 992	–2 385 225
Brazil	–982 758	–1 041 944	–1 419 049	–2 318 573
India	–1 483 072	–2 087 104	–2 419 936	–1 879 018
Indonesia	–681 689	–1 075 318	–1 726 273	–1 339 204
Colombia	–153 998	–96 756	–939 889	–1 138 633
Qatar	–448 109	–987 122	–2 164 844	–1 118 084
Thailand	–759 723	–881 723	–919 897	–1 028 500
Malaysia	–1 182 450	–1 396 743	–1 221 962	–1 005 424
Denmark	1 293 472	1 883 355	1 605 627	–996 569
Pakistan	–423 067	–563 340	–641 339	–659 046
Italy	–2 010 502	–2 624 637	–879 909	–647 871

Source: ITC [2024].

Table 4.3 presents the partner economies with which Poland recorded the largest bilateral trade deficits in 2023, with the greatest deficit noted with China (–USD 39 billion), followed by South Korea (–USD 9.1 billion), Saudi Arabia (–USD 6.8 billion), Norway (–USD 5.7 billion) and Japan (–USD 4.9 billion). Trade deficits with East Asian countries are common in many nations worldwide due to the dominant role of exports from this region, while economies such as Saudi Arabia and Norway are characterised by strong global positions in energy sector exports.

4.4. Structure of Poland's foreign trade

Table 4.4 presents the structure of Polish exports at the HS4 level of the Harmonized Commodity Description and Coding System for 2023, with the most significant export items related to the automotive industry, including parts and accessories for motor vehicles (USD 18 billion), electric batteries (USD 13 billion), passenger cars and other motor vehicles for the transport of persons (USD 7.6 billion), and motor vehicles for the transport of goods (USD 6.8 billion). Also noteworthy are categories in which Poland demonstrated a high comparative advantage, such as cigars, cigarillos and cigarettes made of tobacco (USD 4.9 billion), and meat and edible poultry offal (USD 4.4 billion).

Table 4.4. Structure of Polish exports at HS4 level in 2023 (USD thousands)

HS4	Category	Exports value
8708	Parts and accessories of the motor vehicles of headings 8701–8705	18 010 775
8507	Electric accumulators, including separators therefor, whether or not rectangular (including square)	12 980 465
8703	Motor cars and other motor vehicles principally designed for the transport of persons (other than those of heading 8702), including station wagons and racing cars	7 648 280
8704	Motor vehicles for the transport of goods	6 805 605
8471	Automatic data-processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewhere specified or included	6 683 325
9403	Other furniture and parts thereof	5 892 869
8528	Monitors and projectors, not incorporating television reception apparatus; reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus	5 582 158
2402	Cigars, cheroots, cigarillos and cigarettes, of tobacco or of tobacco substitutes	4 871 764
8411	Turbojets, turbopropellers and other gas turbines	4 800 454
0207	Meat and edible offal, of the poultry of heading 0105, fresh, chilled or frozen	4 429 704
8544	Insulated (including enamelled or anodised) wire, cable (including coaxial cable) and other insulated electric conductors, whether or not fitted with connectors; optical fibre cables, made up of individually sheathed fibres, whether or not assembled with electric conductors or fitted with connectors	4 154 668
7308	Structures (excluding prefabricated buildings of heading 9406) and parts of structures (for example, bridges and bridge-sections, lock-gates, towers, lattice masts, roofs, roofing frameworks, doors and windows and their frames and thresholds for doors, shutters, balustrades, pillars and columns), of iron or steel; plates, rods, angles, shapes, sections, tubes and the like, prepared for use in structures, of iron or steel	3 954 991
9401	Seats (other than those of heading 9402), whether or not convertible into beds, and parts thereof	3 941 572

HS4	Category	Exports value
3926	Other articles of plastics and articles of other materials of headings 3901–3914	3 315 446
1905	Bread, pastry, cakes, biscuits and other bakers' wares, whether or not containing cocoa; communion wafers, empty cachets of a kind suitable for pharmaceutical use, sealing wafers, rice paper and similar products	3 284 010
3004	Medicaments (excluding goods of heading 3002, 3005 or 3006) consisting of mixed or unmixed products for therapeutic or prophylactic uses, put up in measured doses (including those in the form of transdermal administration systems) or in forms or packings for retail sale	3 234 711
4011	New pneumatic tyres, of rubber	2 921 628
3925	Builders' ware of plastics, not elsewhere specified or included	2 897 812
2716	Electrical energy	2 841 812
2710	Petroleum oils and oils obtained from bituminous minerals, other than crude; preparations not elsewhere specified or included, containing by weight 70% or more of petroleum oils or of oils obtained from bituminous minerals, these oils being the basic constituents of the preparations; waste oils	2 835 326

Source: ITC [2024].

Table 4.5 presents the structure of Polish imports at HS4 level of the Harmonized Commodity Description and Coding System in 2023, showing that Polish imports in 2023 were primarily concentrated in the energy sector and intra-industry trade within the automotive industry. Prominent examples from the energy sector include crude petroleum oils (USD 15.3 billion) and other than crude petroleum oils (USD 9.3 billion). Meanwhile, the automotive industry was represented by categories such as passenger cars and other motor vehicles for the transport of persons (USD 15 billion), and parts and accessories for motor vehicles (USD 11.5 billion). Another significant component of Polish imports was pharmaceuticals, specifically medicines (USD 6.8 billion).

Table 4.5. Structure of Polish imports at HS4 level in 2023 (USD thousands)

HS4	Category	Imports value
2709	Petroleum oils and oils obtained from bituminous minerals, crude	15 346 807
8703	Motor cars and other motor vehicles principally designed for the transport of persons (other than those of heading 8702), including station wagons and racing cars	15 039 631
8708	Parts and accessories of the motor vehicles of headings 8701–8705	11 453 766
2710	Petroleum oils and oils obtained from bituminous minerals, other than crude; preparations not elsewhere specified or included, containing by weight 70% or more of petroleum oils or of oils obtained from bituminous minerals, these oils being the basic constituents of the preparations; waste oils	9 306 114

cont. table 4.5

HS4	Category	Imports value
3004	Medicaments (excluding goods of heading 3002, 3005 or 3006) consisting of mixed or unmixed products for therapeutic or prophylactic uses, put up in measured doses (including those in the form of transdermal administration systems) or in forms or packings for retail sale	6 829 578
9999	Commodities not elsewhere specified	6 810 397
8471	Automatic data-processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewhere specified or included	4 931 208
8542	Electronic integrated circuits	3 907 874
8411	Turbojets, turbopropellers and other gas turbines	3 881 159
2841	Salts of oxometallic or peroxometallic acids	3 729 737
2701	Coal; briquettes, ovoids and similar solid fuels manufactured from coal	3 581 043
8507	Electric accumulators, including separators therefor, whether or not rectangular (including square)	3 460 822
8409	Parts suitable for use solely or principally with the engines of heading 8407 or 8408	3 072 586
7210	Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, clad, plated or coated	2 855 509
8517	Telephone sets, including smartphones and other telephones for cellular networks or for other wireless networks; other apparatus for the transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network), other than transmission or reception apparatus of heading 8443, 8525, 8527 or 8528	2 843 082
8544	Insulated (including enamelled or anodised) wire, cable (including coaxial cable) and other insulated electric conductors, whether or not fitted with connectors; optical fibre cables, made up of individually sheathed fibres, whether or not assembled with electric conductors or fitted with connectors	2 828 635
3926	Other articles of plastics and articles of other materials of headings 3901–3914	2 583 237
2716	Electrical energy	2 511 264
3002	Human blood; animal blood prepared for therapeutic, prophylactic or diagnostic uses; antisera, other blood fractions and immunological products, whether or not modified or obtained by means of biotechnological processes; vaccines, toxins, cultures of micro-organisms (excluding yeasts) and similar products; cell cultures, whether or not modified	2 470 716
7208	Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, hot-rolled, not clad, plated or coated	2 442 381

Source: ITC [2024].

In the context of the significant importance of the automotive sector for Poland's exports and imports, a regulation that could significantly impact foreign trade is the plan to limit the production and sale of combustion engine vehicles, as transitioning the automotive industry to the production of electric vehicles is not a simple task. Recent actions by the German government seem to be aimed at enhancing the European Union's

economic cooperation with a new, potentially powerful partner-India, with Chancellor Olaf Scholz undertaking an official visit to that country in October 2024 [Euronews, 2024]. The challenges facing the German automotive industry are particularly tied to consumers' purchasing power and the situation in the Chinese market, as a marked deterioration in the financial condition of Chinese consumers would lead to a significant global decline in demand for German cars.

4.5. Poland's comparative advantages

Table 4.6 presents the value of the RCA indicator for products exported by Poland for which the greatest comparative advantage has been recorded, with the product categories corresponding to the divisions of the Standard International Trade Classification (Revision 3) at the 3-digit SITC code level. The greatest comparative advantage in Polish exports was noted in the category of coke and semi-coke of coal, of lignite or of peat; retort carbon (SITC – 325, RCA – 16.6), fish, dried, salted or in brine; smoked fish (SITC – 035, RCA – 10.1), tobacco products (SITC – 122, RCA – 9.2), rails and railway track construction materials (SITC – 677, RCA – 5.6), and meat and edible meat offal (SITC – 017, RCA – 5.5). Poland also achieved a relatively strong result in the category of arms and ammunition (SITC – 891, RCA – 3.1), which is significant from the perspective of national security. Conversely, relatively weak results were recorded for products in strategically important categories such as aircraft and associated equipment (SITC – 792, RCA – 0.3), medicinal and pharmaceutical products (SITC – 541, RCA – 0.3), and medicaments (SITC – 542, RCA – 0.5).

Table 4.6. Products with the highest RCA index value for Polish exports in 2023

SITC	Category	RCA
325	Coke and semi-coke of coal, of lignite or of peat; retort carbon	16.6
035	Fish, dried, salted or in brine; smoked fish	10.1
122	Tobacco, manufactured	9.2
677	Rails and railway track construction mat., iron, steel	5.6
017	Meat, edible meat offal, prepared, preserved, NES	5.5
025	Birds' eggs, and eggs' yolks; egg albumin	5.1
045	Cereals, unmilled (excluding wheat, rice, barley, maize)	4.9
696	Cutlery	4.9
073	Chocolate, food preparations with cocoa, NES	4.7
642	Paper and paperboard, cut to shape or size, articles	4.5
583	Monofilaments, of plastics, cross-section > 1 mm	4.3

cd. tabeli 4.6

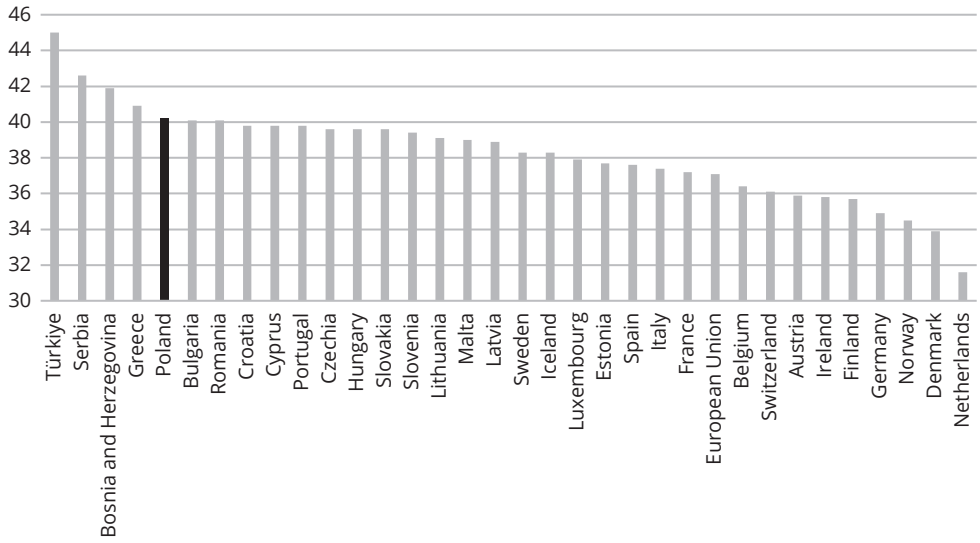
SITC	Category	RCA
761	Television receivers, whether or not combined	4.1
012	Other meat and edible meat offal	3.9
691	Structures and parts, NES, of iron, steel, aluminium	3.9
212	Furskins, raw, other than hides and skins of group 211	3.8
791	Railway vehicles and associated equipment	3.7
775	Household type equipment, electrical or not, NES	3.6
635	Wood manufacture, NES	3.5
245	Fuel wood (excluding wood waste) and wood charcoal	3.4
629	Articles of rubber, NES	3.4
821	Furniture and parts	3.4

Notes: NES – not elsewhere specified.
Source: UNCTAD [2024].

4.6. Labour market in Poland

Figure 4.1 shows the average number of usual weekly hours worked in one's main job in European economies, based on available data.

Figure 4.1. Average number of usual weekly hours worked in one's main job in European economies in 2023

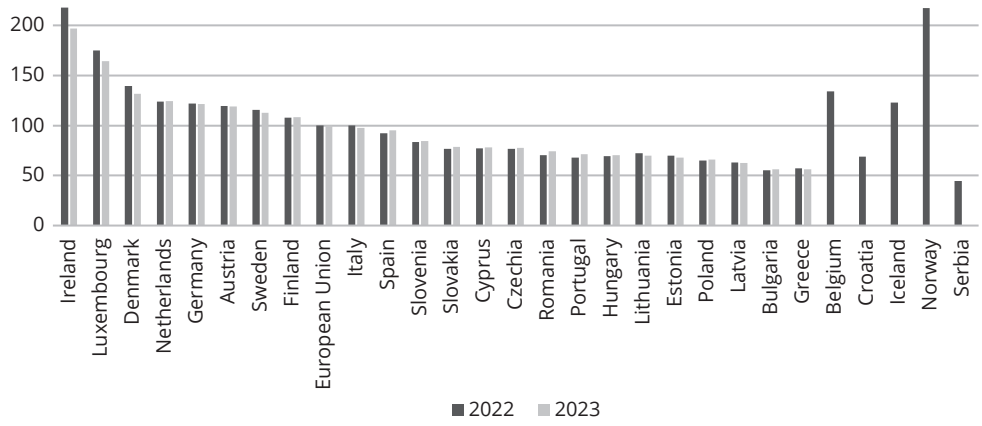


Source: Eurostat [2024d].

Poland (40.2) ranked fifth in terms of average weekly hours worked, behind Türkiye (45), Serbia (42.6), Bosnia and Herzegovina (41.9), and Greece (40.9), with the lowest values of this indicator among European countries noted for the Netherlands (31.6), Denmark (33.9), Norway (34.5), Germany (34.9) and Finland (35.7). Consequently, employees in Poland work significantly more hours per week than the EU average (37.1).

Figure 4.2 presents nominal labour productivity per hour worked in European economies, based on available data. Nominal labour productivity per hour worked is defined as the ratio of real output in a given economy (expressed in purchasing power parity) to the total number of hours worked in that economy (real output per unit of labour input, measured by the total number of hours worked) [Eurostat, 2024e]. In 2023, the highest labour productivity was recorded in Ireland (196.8), Luxembourg (164.4), Denmark (131.6), the Netherlands (124.2) and Germany (121.5), with Poland (65.7) ranking near the bottom of the analysed economies, well below the EU average (100).

Figure 4.2. Nominal labour productivity per hour worked in European economies in 2022–2023 (100 = EU-27 in 2020)

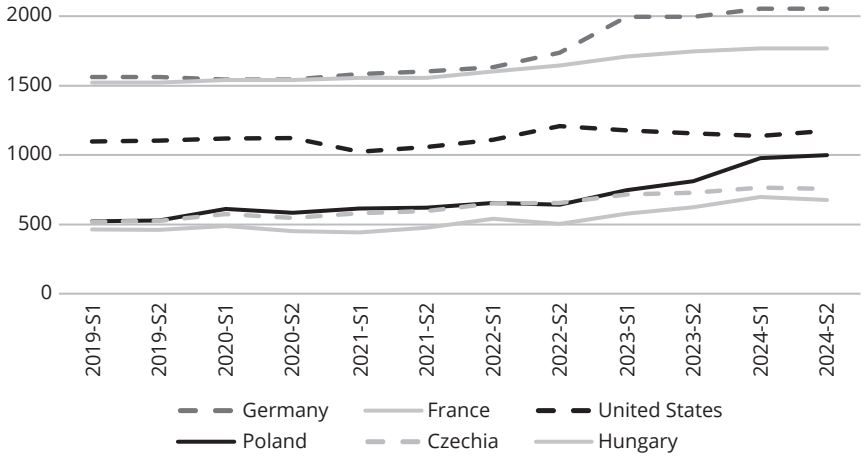


Source: Eurostat [2024e].

Since 2019, the minimum wage in Poland has been consistently increasing, sparking numerous political and economic discussions. Figure 4.3 illustrates the monthly national minimum wages in selected economies from 2019 to 2024. The time series is updated semi-annually. In 2019, the nominal value of the minimum wage expressed in euros was similar to that of Czechia and Hungary, but there have been further significant increases since 2023, with the current minimum wage in Poland (998 EUR) rising to a level close to that of the United States (1174 EUR). It should be noted, however,

that the United States has not raised its federal minimum hourly wage (7.25 USD) since 2009 [U.S. Department of Labor, 2024]. Naturally, in 2024, the minimum wage remains considerably higher in economies such as Germany (2054 EUR) and France (1767 EUR).

Figure 4.3. Monthly national minimum wages in selected economies in 2019–2024 (EUR)



Source: Eurostat [2024e].

It is no coincidence that the most productive countries are also those where employees work the fewest hours. Overworked employees with low productivity are unable to utilise their working time effectively, nor can they dedicate sufficient attention to their families and children, and their non-working hours are often spent on unpleasant obligations rather than rest. These adverse conditions have a noticeable impact on productivity levels, particularly in Eastern European countries. Quantitatively, achieving 5% more output at the cost of increasing working hours by 10% results in a decline in productivity, while conversely, a 5% decrease in output resulting from a 10% reduction in working hours leads to higher productivity. Highly developed Western economies are decisively moving towards reducing working hours and increasing automation.

Introducing a more flexible working time arrangement could encourage employees to organise their work more effectively and improve efficiency without relying on wage increases as incentives, as excessively long working hours lead to both employee fatigue and the necessity to address personal life matters during work hours (e.g., scheduling medical appointments by phone). Shortening working hours could positively impact employees' physical and mental health, significantly reduce burnout, and improve motivation.

4.7. Conclusions

Despite ongoing dichotomies, Poland's economy is steadily advancing towards economic development and increasing its significance on the international stage, although the current state of international trade is heavily burdened by tense geopolitical circumstances. Armed conflicts, political instability in key global economies, disruptions to supply chains, climate change, and large-scale environmental pollution have all brought about significant changes to the economy in the 21st century.

Germany remains Poland's most important trading partner, and from Poland's perspective, the trade turnover with Germany, encompassing both exports and imports, reached the highest levels, showing a favourable, substantial surplus. Polish exports were primarily directed to European countries, with Czechia and France ranking second and third, respectively, among export destinations. The only non-European country in the top ten recipients of Polish exports was the United States. Notably, Ukraine ranked seventh, despite not being a member of the European Union. In terms of Poland's largest trading partners by import value, the top three were Germany, China and Italy, with the United States ranking fourth, South Korea eighth, and energy giants Norway and Saudi Arabia completing the top ten.

In the structure of Polish exports in 2023, first, third and fourth place were occupied by parts and vehicles related to the automotive industry. In contrast, the leading position in Poland's import structure was held by petroleum oils and oils obtained from bituminous minerals. Poland's imports were dominated by the energy sector and intra-industry trade within the automotive sector, while the goods in which Poland holds the highest comparative advantage are primarily products of the coking industry (coke and semi-coke of coal), animal products (including fish products such as canned and smoked fish), and tobacco processing products.

Highly developed economies in Western Europe are moving towards reducing working hours and increasing automation, and if Poland intends to further enhance its level of economic development, decisive measures must be taken to follow this direction. Currently, Poland does not rank among the leading European countries in terms of labour productivity, but rather among the economies with the highest number of hours worked. One significant reason for Poland's low labour productivity is the excessive exploitation of human capital. On average, people in Poland work much longer hours per week than, for example, in Germany or Denmark, where productivity is correspondingly much higher. Moreover, despite noticeable increases, the minimum wage in Poland remains more than twice as low as in Germany.

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Chapter 5

Income Convergence: Poland in the European Union – The Pentagon of Competitiveness

Mariusz Próchniak

5.1. Introduction

The aim of this chapter is to present the historical paths and current macroeconomic outcomes of 11 Central and Eastern European (CEE) countries that joined the European Union (EU) in 2004, 2007 and 2013, i.e., Poland, Bulgaria, Croatia, Czechia, Estonia, Lithuania, Latvia, Romania, Slovakia, Slovenia and Hungary (EU-11). In our analysis of past development patterns, we used the study of income convergence of these countries in relation to 14 Western European countries that are current EU members (EU-14)[1]. For the analysis of current macroeconomic performance, we used so-called competitiveness pentagons, which allow for the assessment of individual countries based on five criteria: economic growth, inflation, unemployment, the balance of the public finance sector, and the balance of foreign trade. These variables represent important areas from the perspective of state economic policy, while simultaneously shaping the competitiveness of economies to a large extent. The last of these areas – foreign trade – is also crucial considering the main theme of this year's Report. As part of the analysis of competitiveness pentagons, we compared seven CEE countries (four Visegrad Group countries and three Baltic states) with five Western European countries, representing three Western European models of capitalism: the continental model (Germany and France), the Mediterranean model (Spain and Italy), and the Nordic model (Sweden).

The report builds upon prior research on this subject, featured in earlier versions of the study. Previous analyses of income convergence include, among others, the following works: Matkowski, Rapacki and Próchniak [2016a]; Próchniak [2017, 2022,

[1] The analysis takes into account the following Western European countries: Austria, Belgium, Denmark, Finland, France, Greece, Spain, the Netherlands, Ireland, Luxembourg, Germany, Portugal, Sweden and Italy. The United Kingdom is excluded from the analysis, as it is no longer a member of the European Union.

2023, 2024]; while the competitiveness pentagons were discussed in studies such as Matkowski, Rapacki and Próchniak [2016b]; Próchniak [2023, 2024]; Rapacki and Próchniak [2017, 2018, 2019a, 2020]. The 2013 edition of the report also includes an analysis of regional convergence covering the regions of all EU countries [Matkowski, Próchniak, 2013].

5.2. Theoretical basis for the analysis of income level convergence

The analysis of income level convergence is theoretically grounded in models of economic growth, with neoclassical economic growth models [e.g., Solow, 1956; Mankiw, Romer, Weil, 1992] confirming the existence of conditional β-convergence, which occurs when less developed countries (with a lower GDP per capita) exhibit a faster economic growth rate than more developed countries. Convergence is conditional because it only occurs when all countries are converging towards the same long-term equilibrium state (steady state). The β-convergence hypothesis can be explained using the Solow model [see, e.g., Rapacki, Próchniak, 2012; Próchniak, Witkowski, 2012].

The Solow model defines the core equation for the dynamics of an economy converging to its steady state as:

$$\dot{k} = sf\left(k\right) - \left(n + a + \delta\right)k, \tag{5.1}$$

where: k – capital per unit of effective labour in year t, $\dot{k}$ – change in k over time (from a mathematical perspective, this is the derivative of k with respect to time), s – savings rate, $f(k)$ – production function (expressed per unit of effective labour), n – population growth rate, a – rate of exogenous technological progress, δ – capital depreciation rate. In the analysis of the Solow model with technological progress, the symbols k and $f(k)$ denote capital and output per unit of effective labour, respectively, where effective labour is a product of the level of technology and the workforce.

If we assume the Cobb–Douglas production function $f(k) = = k^{\alpha}(0 < \alpha < 1)$, equation (5.1) transforms into:

$$\dot{k} = sk^{\alpha} - \left(n + a + \delta\right)k. \tag{5.2}$$

By dividing equation (5.2) by k, we obtain the formula for the growth rate of capital per unit of effective labour during the transitional period towards the steady state:

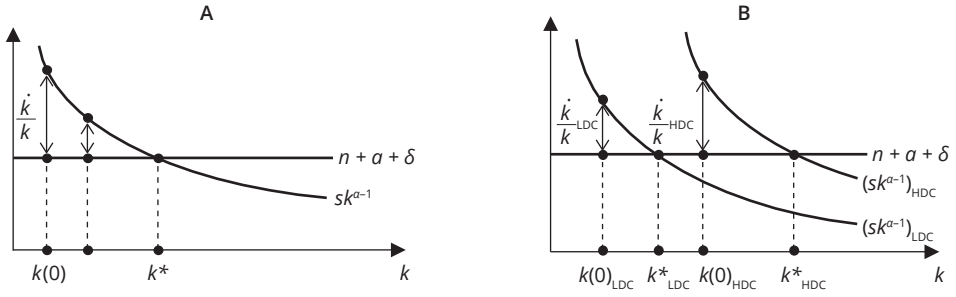
$$\frac{\dot{k}}{k} = sk^{\alpha-1} - \left(n + a + \delta\right). \tag{5.3}$$

Since output is directly proportional to capital, a similar equation characterises the dynamics of GDP per unit of effective labour.

The best way to illustrate the convergence hypothesis is through a graphical analysis of equation (5.3), which is illustrated by Figure 5.1. The growth rate is equal to the vertical distance between the $sk^{\alpha-1}$ curve and the $n + a + \delta$ line. As shown, an economy starting from an initial capital level $k(0)$ and reaching the long-term equilibrium capital stock k^* exhibits a declining rate of economic growth. Convergence is conditional because it occurs only when both economies aim for the same long-term equilibrium state.

To illustrate the conditional nature of the convergence phenomenon, let's consider two countries: one highly developed and one less developed, with a different savings rate. Since the savings rate in the highly developed country is higher, its capital stock in the long-term equilibrium state is also greater, which is illustrated in part B of Figure 5.1. Although the highly developed country starts from a higher level of capital, it shows faster economic growth because it is aiming for a different long-term equilibrium state. In such a situation, convergence will not occur.

Figure 5.1. Economic growth according to the Solow model



Notes: HDC – highly developed country, LDC – less developed country.
Source: own elaboration.

An important aim of empirical research is to estimate the value of the parameter β, which measures the speed of the convergence process to the steady state, according to the following equation:

$$\frac{\dot{y}}{y} = \beta\left(\ln y^* - \ln y\right), \tag{5.4}$$

where: y – output per unit of effective labour in year t, $\dot{y}$ – change in y per unit of time (derivative with respect to time), y^* – output per unit of effective labour in the steady state.

The parameter β indicates the distance the economy has to cover towards the steady state within one period (year). For example, when $\beta = 0.02$, the economy covers 2% of the relevant distance annually.

Another type of convergence is σ-convergence, which occurs when the income disparity between countries decreases over time. Income disparity can be measured by the standard deviation, variance or coefficient of variation of GDP per capita levels between countries or regions.

From a theoretical standpoint, σ-convergence is a necessary but insufficient condition for β-convergence, and it is therefore possible (though unlikely) that income level differences between economies will increase over time while a less developed country exhibits a faster rate of economic growth. This occurs when the less developed country achieves such a rapid rate of economic growth that it surpasses the more developed country in terms of income level, and the differences in development levels at the end period are greater than at the beginning.

To verify the occurrence of absolute β-convergence, we estimated the following regression equation:

$$\frac{1}{T}\ln\frac{y_T}{y_0} = \alpha_0 + \alpha_1 \ln y_0 + \varepsilon_t, \tag{5.5}$$

where y_T and y_0 are the per capita income in the final and initial year, respectively, and ε_t is the random component. The explained variable is thus the average annual growth rate of real GDP per capita according to purchasing power parity (PPP) between period T and 0, while the explanatory variable is the natural logarithm of the level of GDP per capita in the initial period. If the parameter α_1 is negative and statistically significant (in the empirical analysis, we adopted a significance level of 5%), β-convergence occurs. In such a situation, we can calculate the value of the coefficient β measuring the speed of convergence.

$$\beta = \frac{1}{T}\ln\left(1+\alpha_1 T\right). \tag{5.6}$$

To verify the occurrence of σ-convergence, we estimated the trend line for the variation in income levels between countries.

$$sd\left(\ln y_t\right) = \alpha_0 + \alpha_1 t + \varepsilon_t, \tag{5.7}$$

where *sd* denotes standard deviation, and *t* represents time ($t = 1,\ldots,32$ for the period 1993–2024). Thus, the explained variable is the standard deviation of the natural logarithms of GDP per capita levels between countries, while the explanatory variable is time. If the parameter α_1 is negative and statistically significant, σ-convergence occurs.

5.3. Income convergence of the EU-11 countries to the EU-14 – results of an empirical study

The study covers the period 1993–2024, and all calculations were also performed for three sub-periods: 1993–2000, 2000–2010 and 2010–2024, which allows for analysis of the temporal stability of the studied phenomenon and also enables an approximate determination of the influence of many other, deeper factors, including foreign trade, on the rate of income level reduction.

Table 5.1. Results of regression equation estimations describing β-convergence

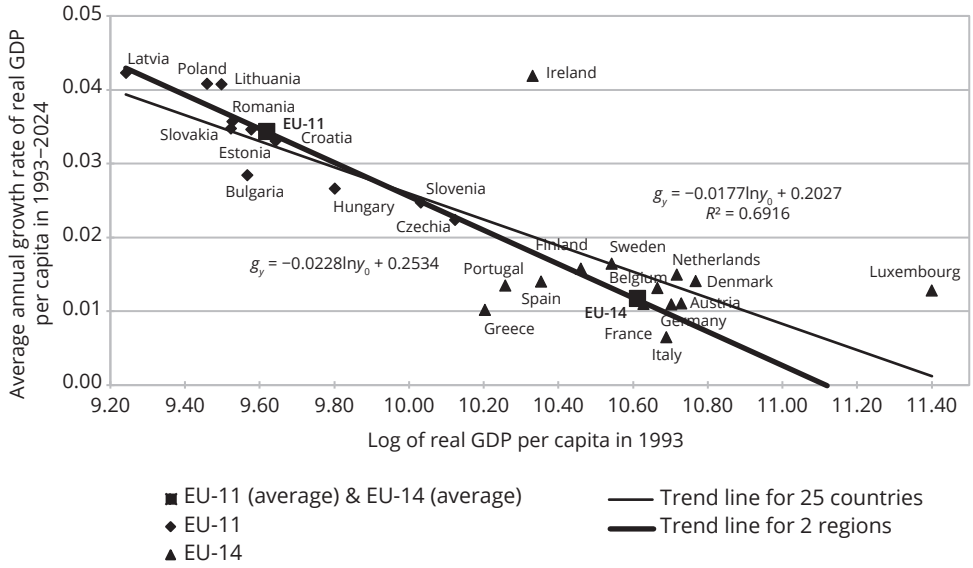
Period	α_0	α_1	stat. t (α_0)	stat. t (α_1)	p-value (α_0)	p-value (α_1)	R^2	β-convergence	β (%)
25 countries of the enlarged EU									
1993–2024	0.2027	−0.0177	8.08	−7.18	0.000	0.000	0.6916	yes	0.0178
1993–2000	0.0671	−0.0033	1.01	−0.51	0.322	0.618	0.0110	no	–
2000–2010	0.3057	−0.0272	8.88	−8.24	0.000	0.000	0.7469	yes	0.0276
2010–2024	0.2446	−0.0213	4.53	−4.21	0.000	0.000	0.4347	yes	0.0216
2 regions (EU-11 and EU-14)									
1993–2024	0.2534	−0.0228	–	–	–	–	1.0000	yes	0.0230
1993–2000	0.1267	−0.0096	–	–	–	–	1.0000	yes	0.0096
2000–2010	0.3830	−0.0349	–	–	–	–	1.0000	yes	0.0355
2010–2024	0.4089	−0.0369	–	–	–	–	1.0000	yes	0.0376

Source: own elaboration.

The calculations use time series of real GDP per capita based on purchasing power parity (in USD) obtained from International Monetary Fund [IMF, 2024] data.

The results of the β-convergence analysis of the EU-11 countries to the EU-14 are presented in Table 5.1 and Figure 5.2, with convergence analysed both within the entire group of 25 EU countries and between the two regions comprising the EU-11 and EU-14 areas. Aggregated data for the two areas: the EU-11 and EU-14 are weighted averages with variable weights reflecting the population size of each country within the specific group in a given year.

Figure 5.2. Relationship between the per capita GDP growth rate in 1993–2024 and the per capita GDP at the beginning of the period



Source: own elaboration.

The results confirm the occurrence of clear income convergence of the EU-11 countries to the EU-14 throughout the period 1993–2024, with convergence occurring both among the 25 countries of the studied group and between the two areas, EU-11 and EU-14. Countries with a lower income level in 1993 generally exhibited a faster rate of economic growth from 1993 to 2024 than the initially more developed countries. As the less developed countries in 1993 were those from Central and Eastern Europe, these results confirm a clear convergence of the EU-11 countries towards the average income level of Western Europe.

An analysis of Figure 5.2 shows that the dispersion of points representing individual countries is not large relative to the negatively sloped trend line, resulting in a relatively high coefficient of determination at 69%. Thus, differences in the initial income level account for over two-thirds of the variation in economic growth rates from 1993 to 2024.

The points representing individual countries allow for a comparison of their situations and an assessment of changes in their competitive positions over the full timeframe. Among the countries in the studied group from Central and Eastern Europe, Lithuania, Latvia and Poland exhibited the fastest economic growth rates, demonstrating an average annual economic growth of over 4% between 1993 and

2024, with a relatively low initial income level. Romania, Slovakia, Estonia and Croatia also recorded relatively rapid economic growth rates of around 3.5%. The results achieved by these countries strengthened the trend towards convergence across the entire group. Poland's situation appears advantageous compared to other countries. It ranked second among the 11 CEE countries in terms of the average economic growth rate in 1993–2024 (with a result of 4.1%), which was one of the factors strengthening the competitive position of the Polish economy.

The improvement in the competitive position of CEE countries and faster economic growth compared to Western Europe was the result of a combination of various factors, including the opening of economies to foreign trade, acquiring new supply chains, and consequently, the increased role of foreign trade in the economy. Indeed, if we look at the data for 1995, the share of exports in GDP for the EU-11 countries was relatively low, ranging from 23% of GDP in Poland to 66% of GDP in Estonia, with as many as eight countries (Czechia, Hungary, Lithuania, Latvia, Bulgaria, Croatia, Romania and Poland) not exceeding 40%. Structural reforms, the integration anchor and accession to the EU significantly increased the role of exports in the economies of the EU-11 countries. Thus, in 2004, Hungary, Estonia and Slovakia recorded an export share in GDP of 60–69%, while in the case of only 4 countries, this share did not exceed 40% of GDP (Latvia, Croatia, Poland and Romania). In the following years, the economies continued to open up, and by 2023, only in one country (Romania) did exports account for less than half of GDP (exactly 39%), while in the countries leading in terms of goods sold abroad, the export share in GDP was 91% (Slovakia), 84% (Slovenia), 81% (Hungary) and 78% (Lithuania and Estonia).

Aggregated data for two areas: The EU-11 and EU-14 also confirms the occurrence of convergence between 1993 and 2024, with the points representing these two areas marked with squares in Figure 5.2. The EU-11 group as a whole demonstrated a faster rate of economic growth than the EU-14 area, despite having a significantly lower initial income level.

Coefficient β, measuring the speed of the convergence process, are 1.78% for the 25 countries and 2.30% for the two areas, allowing for an estimation of the time needed to reduce the development gap between the studied countries, namely that if they maintain the average economic growth trend from 1993–2024, the expanded EU countries will need approximately 30–40 years to halve the distance separating them from a common hypothetical long-term equilibrium state (this result was calculated as follows: $-\ln(0.5)/0.0178 = 38.9$ years and $-\ln(0.5)/0.0230 = 30.1$ years), with the above results indicating a slow convergence of the EU-11 countries to Western Europe. Based on these estimates, it is difficult to expect a rapid equalisation of income levels between Poland and other CEE countries and Western Europe in the medium term.

This result should be treated with some caution, as it is based on model assumptions that may not be met in reality. Namely, it is assumed here that there is diminishing marginal productivity of capital (in line with the neoclassical production function), and also that economies are heading towards a steady state with a declining rate of economic growth, which they will reach in infinity. Therefore, when interpreting these results, it makes sense to provide the half-life rather than the period required to completely close the income gap. It is worth comparing these results with other forecasts, such as those presented in the *Report of the SGH Warsaw School of Economics and the Economic Forum*, which suggest that Poland will catch up with Western Europe in a dozen or so years, although in light of the events that have occurred in recent years, namely the COVID-19 pandemic, the war in Ukraine, and the energy crisis, these forecasts are unrealistic [Próchniak, Lissowska, Maszczyk, Rapacki, Sulejewicz, 2019].

It is also worth looking at how the stability of convergence processes has evolved over time, as it turns out that in the identified sub-periods, the speed of convergence varied greatly. The high instability of the convergence rate in the studied countries was caused by factors such as the global crisis, the COVID-19 pandemic, as well as the varied impact of institutional factors on economic growth, related, for example, to membership in the European Union. For the 25 EU countries in the years 1993–2000, there was no statistically significant reduction in the income gap by the EU-11 countries compared to the EU-14 (on average for the entire group). For the years 1993–2000, there is a negative slope of the trend line, although not statistically significant. Such model estimation results effectively indicate a lack of convergence, despite the negative slope of the trend line. A very strong acceleration in the rate of convergence occurred in the years 2000–2010, which undoubtedly had its roots in the EU enlargement[2], while the clear trend toward convergence observed during the 2000s weakened in the 2010s and the early 2020s, largely due to the crises related to the COVID-19 pandemic and the war in Ukraine, which disrupted the previously stable economic growth paths of the studied countries.

The β-convergence results presented here are averaged values for the entire region, and as shown in Figure 5.2, individual CEE countries exhibited varying dynamics of economic growth and different degrees of convergence with Western Europe. It is worth analysing how the convergence of individual EU-11 countries towards the EU-14 looked in the identified sub-periods.

Figure 5.3 shows the income gap decrease in percentage points of a given EU-11 country relative to the EU-14 area in the years 1993–2000, 2000–2010 and 2010–2024.

[2] The positive impact of EU membership on the economic growth of 11 CEE countries is also confirmed in an article by Rapacki and Próchniak [2019b].

The data presented in the figure partially confirms the conclusions from the convergence analysis, namely that in all countries, the slowest closing of the income gap occurred in the first identified sub-period, i.e., 1993–2000, and also that in those years, two countries (Bulgaria and Romania) even increased their development gap with Western Europe. The atypical behaviour of Bulgaria and Romania was partly due to the fact that the integration anchor associated with EU enlargement started to take effect in these countries later than in other CEE countries (except for Croatia, which joined the EU the latest). Between 1993 and 2000, Poland reduced its gap with the 14 Western European countries by 7 p.p. and was among the leading countries in this regard (Estonia reduced the gap by 8 p.p., and Slovenia and Croatia by 7 p.p.).

After 2000, the convergence rate gained momentum within the entire EU-11 group, with most CEE countries reducing the income gap with the EU-14 by 10 p.p. or more in both the 2000s and the period from 2010 to 2024. Lithuania was the leader, narrowing the development gap with Western Europe by 21 p.p. between 2000 and 2010, and by 26 p.p. between 2010 and 2024. Latvia, Poland and Romania were also leaders in this regard, reducing the development gap with the EU-14 in the two consecutive sub-periods by 16 and 19 p.p. (Latvia), 14 and 25 p.p. (Poland), and 17 and 23 p.p. (Romania), respectively.

In the case of Poland, European funds played a significant role in accelerating the pace of convergence after EU enlargement, enhancing the competitiveness of the Polish economy. Poland was the largest beneficiary of EU funds under the 2007–2013 budget, with the flow of money provided by the European Union through various aid programmes positively impacting the growth dynamics of the Polish economy from both the demand and supply sides, enabling Poland to achieve relatively good results in terms of the economic growth rate in recent years (for instance, it was the only EU country to avoid a recession during the global financial crisis). The EU budget for 2014–2020 and the continued substantial inflow of structural funds to new member states were also factors conducive to maintaining Poland's faster pace of convergence with Western Europe in the most recent analysed sub-period.

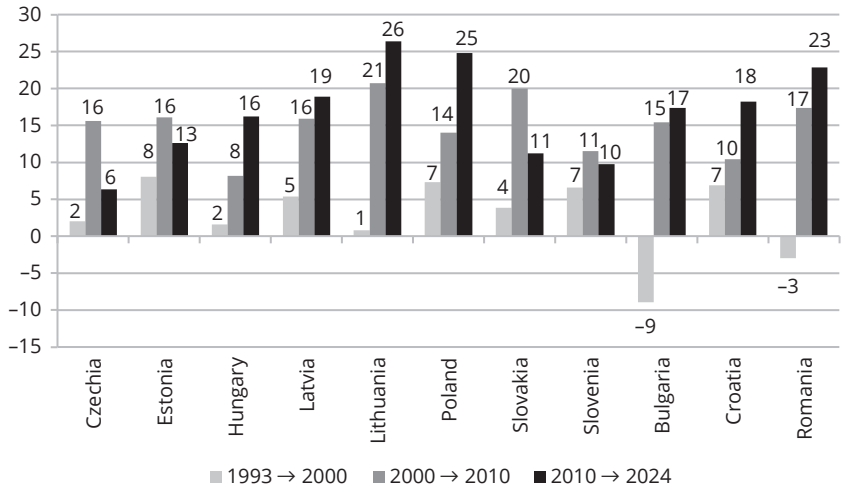
An important source of Poland's convergence with Western Europe was also the accumulation of human capital, which is a very important factor of production. The rapid growth of human capital stock was the result of many factors, including an improvement in the health of the population. The improvement in public health was due, for example, to better access to doctors and hospitals through the development of private healthcare, increased prevention, and greater attention to environmental protection issues.

The expansionary fiscal and monetary policy pursued in Poland in recent years by the government and the central bank also contributed to maintaining good economic

growth dynamics despite the COVID-19 pandemic. Major infrastructure investments, including the continuation of motorway and expressway construction (such as Via Baltica and Via Carpatia), railway line modernisations and the purchase of new rolling stock, the Vistula Spit canal, and the construction of the tunnel under the Świna River in Świnoujście, as well as large social programmes increasing households' available income, are just some examples of actions that positively impacted the Polish economy.

The role of international trade in Poland's economic development must not be overlooked. The economic openness index (measured as the share of the sum of exports and imports in GDP) stood at 44% in Poland in 1995, which indicated a relatively high level of Poland's closure to international exchange. In the subsequent years of transformation and EU membership, the role of foreign trade significantly increased, and the economic openness index in Poland rose to 71% and 110% of GDP in 2004 and 2023, respectively.

Figure 5.3. The scale of income gap reduction by the EU-11 countries compared to the EU-14 in three consecutive sub-periods (p.p.)



Notes: variations are measured by taking the GDP per capita by PPP in the EU-14 as 100 annually.
Source: own elaboration based on IMF [2024].

As a result, Poland ranks fourth among the EU-11 group in terms of relative income per capita (calculated according to PPP). According to IMF data from October 2024, in 2024, Poland's GDP per capita was 78% of the average income per capita of Western Europe (EU-14). Only Czechia (85%), Slovenia (84%) and Lithuania (81%) have better results than Poland, which represents a notable advancement compared to the statistics from several years ago, when Poland was at the bottom of the group. Hopefully, despite

the war in Ukraine, Poland will continue its positive development trends and, further reducing its developmental gap with Western Europe in the coming years.

The σ-convergence of CEE countries to Western Europe is measured by changes in the standard deviation of the natural logarithms of GDP per capita among the 25 EU states, as well as between the two areas, the EU-11 and EU-14. The results of the trend line estimation for the standard deviations are presented in Table 5.2, and Figure 5.4 contains a graphical representation of the results.

The data in Table 5.2 shows that throughout the entire period from 1993 to 2024, there was σ-convergence both among the 25 EU countries and between the EU-11 and EU-14 areas, while the slopes of both estimated trend lines are negative and statistically significant at very high levels of significance (*p*-values of 0.000 indicate that the parameter *p*-value is less than 0.0005). High values of the coefficients of determination (over 90%) indicate a very good fit of the empirical points to the trend line.

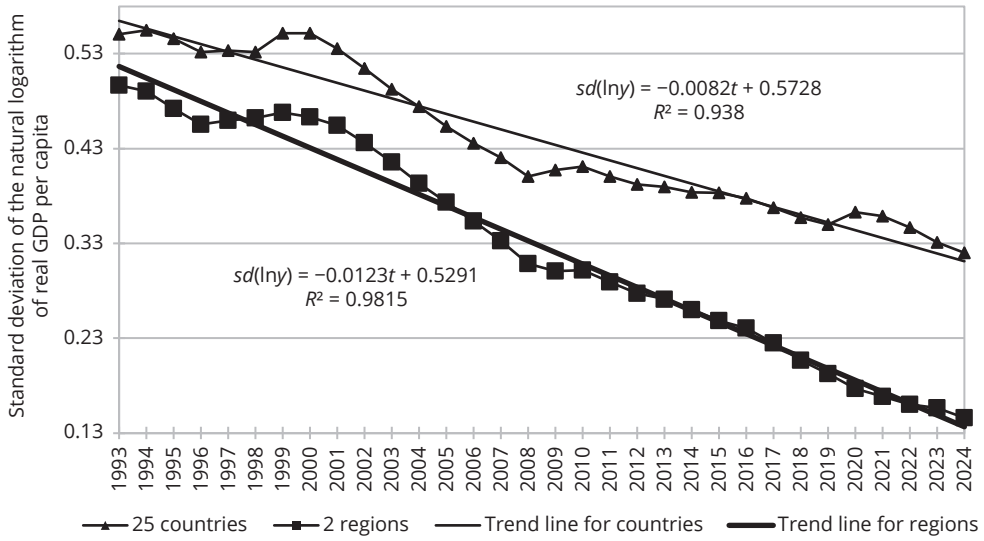
Table 5.2. Results of regression equation estimations describing σ-convergence

Period	a_0	a_1	stat. *t* (a_0)	stat. *t* (a_1)	*p*-value (a_0)	*p*-value (a_1)	R^2	σ-convergence
25 countries of the enlarged EU								
1993–2024	0.5728	−0.0082	79.03	−21.31	0.000	0.000	0.9380	yes
1993–2000	0.5467	−0.0006	66.09	−0.38	0.000	0.716	0.0237	no
2000–2010	0.5582	−0.0158	65.66	−12.62	0.000	0.000	0.9465	yes
2010–2024	0.4131	−0.0055	115.10	−14.04	0.000	0.000	0.9382	yes
2 regions (EU-11 and EU-14)								
1993–2024	0.5291	−0.0123	91.02	−39.89	0.000	0.000	0.9815	yes
1993–2000	0.4910	−0.0044	56.99	−2.60	0.000	0.041	0.5303	yes
2000–2010	0.4854	−0.0183	90.87	−23.21	0.000	0.000	0.9836	yes
2010–2024	0.3150	−0.0117	110.70	−37.42	0.000	0.000	0.9908	yes

Source: own elaboration.

Figure 5.4 shows the trend of the standard deviation of GDP per capita logarithms, with a visible general downward trend in the income disparity between new and existing EU countries. The most noticeable and systematic reduction in income disparities occurred in the second part of the analysed period, starting from 2000. In 2009 and 2010, due to the global financial crisis and the slowdown in GDP growth in many previously rapidly developing countries, income disparities among the 25 countries in the studied group increased. Divergence within the EU-25 group also occurred in 2020 due to the coronavirus pandemic, although the averaged data for the two areas does not confirm this.

Figure 5.4. The standard deviation of GDP per capita in 1993–2024



Source: own elaboration.

When comparing our findings with the results of other analyses, it must be noted that there is a vast number of empirical studies on the phenomenon of convergence, making it impossible to list them all here. For a detailed review of empirical studies, see, for example, an article by Matkowski, Rapacki and Próchniak [2016c]. Books by Malaga [2004], Michałek, Siwiński and Socha [2007], Liberda [2009], Batóg [2010], Próchniak and Witkowski [2016], Jóźwik [2017], as well as Kotliński and Warżała [2020], are entirely or largely devoted to the phenomenon of convergence in EU or OECD countries. In turn, books by Wójcik [2018] and Bernardelli, Próchniak and Witkowski [2021] contain some innovative approaches to measuring the convergence process, along with an extensive empirical analysis.

Comparing the results obtained here with the literature, it should be added that studies often suggest the possibility of divergence emerging in Europe (both at the national and regional levels). For example, Mucha [2012] argues that, for certain eurozone nations, a shared currency could become a cause of significant challenges and contribute to economic divergence relative to other members of the Economic and Monetary Union. Monfort, Cuestas and Ordóñez [2013] analysed the real convergence of GDP per worker levels in 23 EU countries from 1980–2009 (Western European countries) and 1990–2009 (CEE countries), showing that by applying club convergence techniques, there is strong evidence to suggest the occurrence of income per capita divergence across the entire EU. However, for example, CEE countries (except Czechia,

but including Greece) form a group demonstrating convergence. Borsi and Metiu [2013] analyse the real convergence of 27 EU countries from 1970–2010, concluding that there is no convergence of income per capita levels across the entire group, but that there is convergence within subgroups of countries that are converging towards different steady states. Staňisić [2012] analyses β-convergence in the EU-25 countries and within two groups of countries: the EU-15 and EU-10, confirming the presence of β-convergence in the EU-25 countries (indicating the convergence of new EU member states towards Western Europe) and denying the existence of convergence within the EU-15 and EU-10 groups. The author of the cited work further asserts that during the global financial crisis, income disparities among the EU-25 countries increased, although the scale and duration of this increase were limited and did not affect the long-term convergence path, which is a conclusion very similar to the results of our study.

Convergence is clearly not a phenomenon that happens automatically. Despite the strong decreasing tendency of income disparities between Central and Eastern Europe and Western Europe in recent years, there is no guarantee that this situation will persist in the future (as evidenced by the temporal instability of our results and the increasingly frequent mentions in the literature of the possibility of divergent trends emerging in Europe). An extremely important task for economic policymakers is therefore to conduct actions in such a way as to maintain the existing long-term economic growth trends in Europe, characterised by the reduction of income disparities between the eastern and western parts of our continent.

5.4. The pentagon of competitiveness

To assess the current state of the economy, we used so-called competitiveness pentagons[3], which enable a comparative analysis of countries based on five commonly used variables illustrating the state of the economy:

a) the economic growth rate,
b) the unemployment rate,
c) the inflation rate,
d) public finance balance,
e) foreign trade balance.

[3] The originator of the concept of such pentagons is Zbigniew Matkowski, PhD. A detailed description of the idea of pentagons and their interpretation can be found in earlier editions of the report [see, e.g., Matkowski, Rapacki, Próchniak, 2016b]. In this edition of the Report, in line with the main theme, we use the foreign trade balance to assess the external balance instead of the current account balance of the balance of payments.

The overall condition of the Polish economy was compared with the situation in six other CEE countries: three Visegrad Group countries (Czechia, Slovakia, Hungary) and three Baltic countries (Lithuania, Latvia, Estonia), as well as with the situation in five Western European countries: Germany, France, Italy, Spain and Sweden. The selected Western European countries represent three models of Western European capitalism, according to Amable's [2003] classification. Germany and France represent the continental model, Spain and Italy represent the Mediterranean model, while Sweden reflects the Nordic (or Scandinavian) model. We excluded the Anglo-Saxon (liberal) model from the analysis, as its flagship representative (the United Kingdom) is no longer a member of the European Union.

Table 5.3 contains data on five indicators describing the overall economic condition of Poland and the compared countries in 2024[4]. All the statistics are preliminary estimates. At the time of writing this chapter (October 2024), we did not yet have complete data for 2024, only estimates. In the analysis, we used data from the International Monetary Fund (excluding the foreign trade balance), which were the most up-to-date as of October 2024, so at the time of writing this report.

Table 5.3. Main macroeconomic indicators in Poland and selected EU countries in 2024

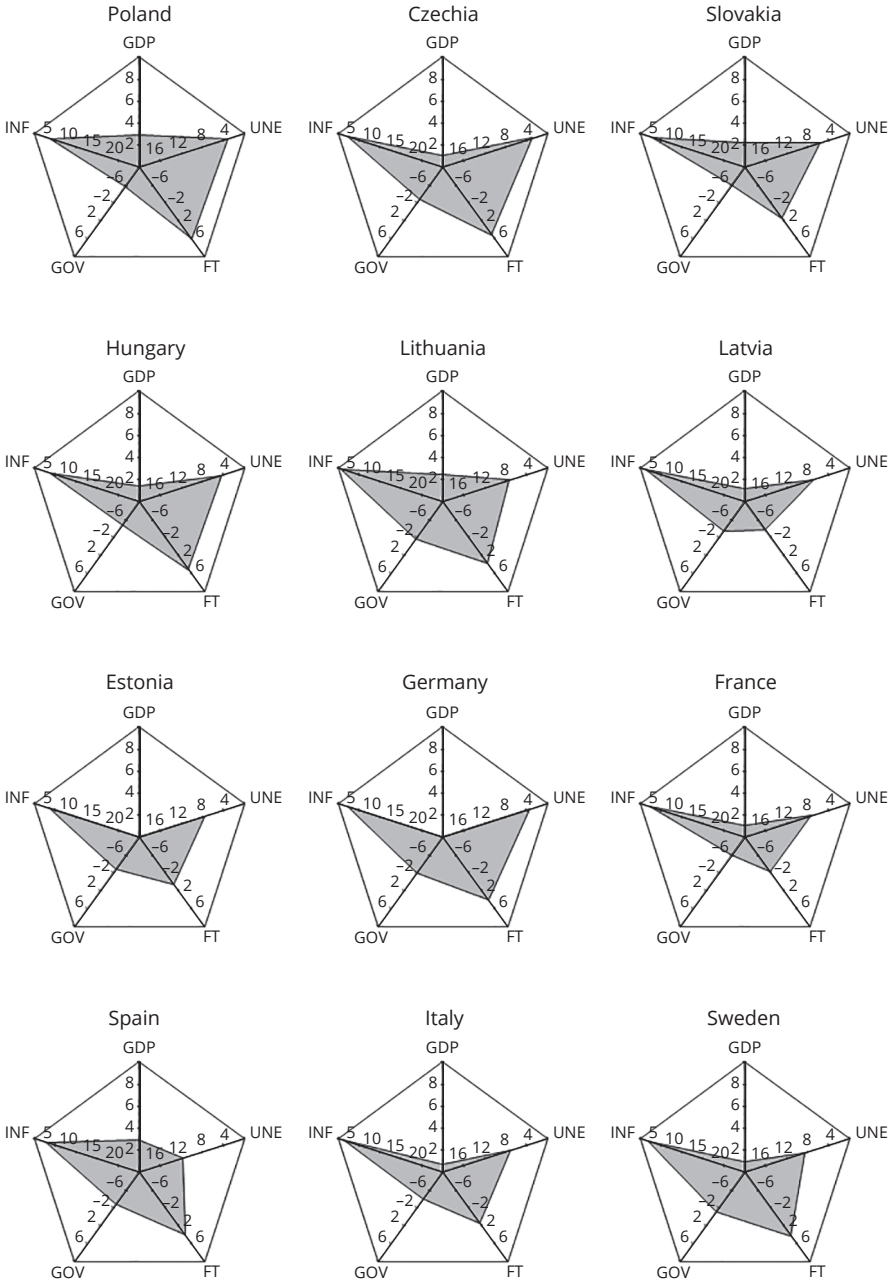
Country	GDP growth (%)	Inflation (%)	Unemployment (%)	Public finance balance (% of GDP)	Foreign trade balance (% of GDP)
	2024	2024	2024	2024	2023
CEE countries					
Poland	**3.0**	**3.9**	**3.2**	**−5.7**	**6.1**
Czechia	1.1	2.3	2.8	−2.9	5.1
Slovakia	2.2	2.8	5.6	−5.9	1.3
Hungary	1.5	3.8	4.4	−5.0	5.1
Lithuania	2.4	0.9	7.3	−1.6	3.8
Latvia	1.2	1.4	6.7	−3.4	−3.9
Estonia	−0.9	3.4	7.5	−3.0	0.6
Western European countries					
Germany	0.0	2.4	3.4	−2.0	4.2
France	1.1	2.3	7.4	−6.0	−2.2
Spain	2.9	2.8	11.6	−3.0	4.1
Italy	0.7	1.3	7.0	−4.0	1.4
Sweden	0.9	2.1	8.5	−1.2	4.4

Note: all data concerning 2024 is of an estimated nature; data on foreign trade balance are from 2023; inflation data presents the rate of increase in consumer goods and services prices on an annual average basis.

Source: IMF [2024], World Bank [2024].

[4] The data on the foreign trade balance pertains to 2023.

Figure 5.5. The economic condition of Poland and other selected EU countries in 2024



Notes: GDP – GDP growth rate (%), INF – inflation rate (%), UNE – unemployment rate (%), GOV – general government balance (% of GDP), FT – foreign trade balance (% of GDP); the data concerning the foreign trade balance (FT) pertains to the year 2023.

Source: own elaboration based on the data from Table 5.3.

Figure 5.5 presents the competitiveness pentagons, which illustrate the degree of achievement of five fundamental macroeconomic objectives:

a) economic growth,
b) full employment,
c) internal balance (absence of inflation),
d) public finance balance,
e) external balance.

The degree of achievement of the above objectives is expressed by variables positioned on the numerical axes of the pentagons.

The apexes of the pentagons, reflecting the extreme values (maximum or minimum) of each variable, are regarded as favourable (positive) goals, although this can sometimes be debatable. A substantial government budget surplus, for example, does not have to be an optimal solution, nor do zero inflation or zero unemployment. Another issue are the interdependencies, particularly the conflicts between individual macroeconomic goals, such as the fact that low unemployment (according to the Phillips curve) is often accompanied by high inflation, and vice versa. The relative significance of specific criteria is a distinct matter (such as whether low inflation is equally critical as low unemployment). All of these concerns should be considered when interpreting the diagrammes.

When comparing pentagons illustrating the economic situation of different countries in a given year, both the area enclosed by the pentagon and its shape should be considered. A larger area of the pentagon indicates a better overall economic condition, while a more harmonious shape suggests more balanced development. Such an assessment is, of course, based solely on the five aforementioned macroeconomic criteria describing the current economic condition, and offers no insight into the size of the economy, its economic strength, or its developmental outlook. It does not even say much about the possible economic situation of a given country in the next year, although a good current economic condition increases the chances of maintaining it on a sustainable development path in the near future. Nevertheless, the results of analyses based on this method should be interpreted with great caution.

In 2024, the overall macroeconomic condition of CEE countries was moderate. In the CEE group as a whole, a relatively low rate of economic growth was recorded, and Estonia fell into recession. Of particular concern is the large public sector deficit, exceeding 3% of GDP in numerous instances. The largest public finance sector deficit occurred in countries bordering Ukraine (Slovakia 5.9% of GDP, Poland 5.7% of GDP, and Hungary 5.0% of GDP), which is related to the fact that in the aforementioned countries, military spending is particularly important due to the potential threat of a Russian invasion. At the same time, these countries are experiencing

a relatively large influx of refugees from Ukraine (especially Poland), which necessitates increased social spending.

The CEE countries handled the inflation threat fairly effectively. As recently as 2023, inflation in many CEE countries approached 10% or even reached double digits. In 2024, it was reduced, partly due to the restrictive monetary policy implemented by central banks and interest rate hikes. On the other hand, low GDP growth was associated with a reduction in global demand, which was also a factor in curbing inflation. The relatively good situation among the new EU member states also applied to the unemployment rate (with a small exception for the Baltic states), with the labour market situation being the most favourable in Czechia and Poland, where the unemployment rate in 2024 was (according to preliminary estimates) 2.8% and 3.2%, respectively. In Hungary and Slovakia it was 4.4% and 5.6%, while in the Baltic states it was around 7%.

As for the exchange of goods and services with foreign countries, the situation of the CEE countries was good. All the CEE countries presented in Table 5.3, except Latvia, recorded a trade surplus, and apart from Estonia and Slovakia, which recorded trade surpluses of 0.6% of GDP and 1.3% of GDP, respectively, the surplus in the other countries was above 3% of GDP (notably, Poland reached a very high level of 6.1% of GDP). These results show that the CEE countries are highly competitive in the international market, offering high-quality products that are in strong demand abroad.

When comparing the overall condition of the economies of the CEE countries to those of Western Europe, clear differences are not easily visible. The rate of economic growth in Western Europe was low in 2024, similar to that in the CEE group, with Western European countries recording – similarly to the CEE cluster – low inflation and moderate, internally varied unemployment (the highest unemployment rate was in Spain, at 11.6%). All the Western European countries listed in Table 5.3 showed a public finance sector deficit, and the vast majority of them (excluding France) had a surplus in foreign trade.

Compared to the entire group in the pentagons, Poland's situation is moderate. In 2024, Poland achieved good results in terms of the economic growth rate (3.0%, leading the group), unemployment rate (3.2%), and foreign trade balance (a surplus of 6.1% of GDP – data for 2023). It achieved worse results in terms of the inflation rate (3.9% – the fastest price increase among the countries analysed in the pentagons), and decidedly poor results regarding the public finance sector balance (a deficit of 5.7% of GDP).

5.5. Conclusions

In the group of 25 countries of the enlarged European Union, there exists the income-level β-convergence over the entire 1993–2024 period. The convergence occurred both among the 25 countries of the analysed sample and between the two areas of the EU-11 and EU-14. The 1993–2024 economic growth rate was negatively related to the initial GDP per capita level. The new EU member states from Central and Eastern Europe achieved faster economic growth rates than Western European countries, even though the initial level of GDP per capita in the former group was much lower.

The β-coefficients, which measure the speed of convergence, are 1.78% for the 25 countries and 2.30% for the two areas. This means that if the average economic growth tendencies observed throughout the 1993–2024 period are maintained, the countries of the enlarged EU will need about 30–40 years to halve the distance toward a common hypothetical steady-state.

In the distinguished sub-periods, the rate of convergence was differentiated. The 1993–2000 period did not confirm a statistically significant β-convergence. A strong acceleration of the catching-up process occurred in 2000–2010, which had its roots in the EU enlargement. The clear trend toward convergence observed in the first decade of the 21st century weakened in the second and early third decades. This was largely due to the occurrence of crises related to the COVID-19 pandemic and the war in Ukraine.

There was also a σ-convergence both among the 25 EU countries and between the EU-11 and EU-14 areas throughout the 1993–2024 period. The most clear and systematic decrease in income disparities occurred in the second part of the analysed period, i.e., from 2000. During 2009–2010 – as a result of the global financial crisis and the weakening of GDP growth rates of many previously fast-growing economies – income disparities among the 25 countries in the study group increased. Divergence in the EU-25 cluster also occurred in 2020 as a result of the coronavirus pandemic.

Hence, an unconditional narrowing of competitiveness gaps, reflected in the living standards of societies in the old and new EU countries, cannot be expected in the short term. Speeding up the convergence process will depend, in part, on effective economic policies focused on narrowing the development gaps between Central and Eastern Europe and Western Europe. Future economic growth will be significantly influenced also by the war in Ukraine and the ongoing energy crisis, which bring the threat of a marked deterioration in convergence, with the potential for divergence trends arising in the future. Hopefully, this pessimistic outlook will not materialise, allowing CEE countries to maintain their trajectory of fast economic growth and narrowing the development gap with Western Europe.

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Chapter 6

Changes of Total Factor Productivity

Mariusz Próchniak

6.1. Introduction

We conducted an analysis of total factor productivity (TFP) using growth accounting, which is an empirical approach aimed at determining the extent to which economic growth results from changes in the inputs of measurable production factors and the extent to which it stems from technological progress, measured by the rate of growth in TFP.

The study covers 11 Central and Eastern European (CEE) countries, collectively referred to as the EU-11 (Poland, Bulgaria, Croatia, Czechia, Estonia, Lithuania, Latvia, Romania, Slovakia, Slovenia and Hungary) during the period 2014–2023. To evaluate the dynamics of TFP changes over the examined years, the study also presents average TFP growth rates for two sub-periods: 2014–2019 (i.e., before the outbreak of the COVID-19 pandemic) and 2020–2022 (the pandemic period), with the year 2023 analysed separately.

This study builds upon previous research in the area, presented in earlier editions of the report [see, e.g., Próchniak, 2022, 2023, 2024]. In the 2020 edition of the study [Próchniak, 2020], growth accounting was additionally conducted at the sectoral level.

6.2. Changes in total factor productivity – theoretical foundations

The origins of growth accounting can be traced back to the first half of the 20th century, with the concept of total productivity and the notion that labour is not the sole factor of production – requiring the inclusion of other factors such as capital and land when measuring national wealth and productivity – discussed in economic literature as early as in the 1930s [Griliches, 1996]. The first reference to an input-output type indicator appeared in Copeland's 1937 work [Griliches, 1996]. During the 1940s and 1950s, a number of studies were published – largely independently – presenting empirical

findings on measuring TFP. The first such study, conducted by the Dutch economist Jan Tinbergen, was published in 1942. Over the following years, additional works examined the relationship between output levels and input expenditures [see, e.g., Tintner, 1944; Barton, Cooper, 1948; Johnson, 1950; Schmookler, 1952; Abramovitz, 1956; Kendrick, 1956; Ruttan, 1956].

Robert Solow was the first economist to formalise growth accounting [Solow, 1957]. Using a macroeconomic production function and differential calculus, he demonstrated how economic growth rates could be decomposed into parts attributable to increased inputs of production factors and the remaining component, known as the Solow residual. This residual represents the portion of economic growth that cannot be attributed to specific inputs and is, therefore, a measure of technological progress or TFP growth.

In subsequent years, additional works on growth accounting emerged, introducing new approaches, extensions of earlier research, and novel elements of empirical analysis [see, e.g., Solow, 1962; Griliches, 1964; Jorgenson, Griliches, 1967].

The decomposition of economic growth initiated by Solow forms the foundation of modern growth accounting. The starting point for such an analysis is the macroeconomic production function. Its general form is as follows:

$$Y(t) = F\left(A(t), Z_1(t), \ldots, Z_n(t)\right), \tag{6.1}$$

where Y represents output (GDP), A denotes the level of technology, and Z_1, …, Z_n are measurable production factors. Empirical studies typically consider two or three measurable production factors: labour, physical (tangible) capital, and, optionally, human capital.

In this edition of the report, the analysis will focus on two measurable production factors: labour and physical capital[1]. The production function (6.1) therefore takes the following form:

$$Y(t) = F\left(A(t), L(t), K(t)\right). \tag{6.2}$$

To decompose the rate of economic growth into its individual components, equation (6.2) should be transformed into a form that expresses the growth rate of Y, which is achieved by differentiating equation (6.2) with respect to time and then dividing through by Y. As a result, we obtain:

[1] In the 2012 and 2014 editions of the study, in addition to the basic growth accounting model, an extended model incorporating human capital was also estimated [Próchniak, 2012, 2014].

$$\frac{\dot{Y}}{Y}=\frac{\frac{\partial F(A,L,K)}{\partial A}\dot{A}}{Y}+\frac{\frac{\partial F(A,L,K)}{\partial L}\dot{L}}{Y}+\frac{\frac{\partial F(A,L,K)}{\partial K}\dot{K}}{Y}. \tag{6.3}$$

By multiplying each component on the right-hand side of equation (6.3) by A/A, L/L, and K/K, respectively, we obtain:

$$\frac{\dot{Y}}{Y}=\frac{\frac{\partial F(A,L,K)}{\partial A}A}{Y}\frac{\dot{A}}{A}+\frac{\frac{\partial F(A,L,K)}{\partial L}L}{Y}\frac{\dot{L}}{L}+\frac{\frac{\partial F(A,L,K)}{\partial K}K}{Y}\frac{\dot{K}}{K}. \tag{6.4}$$

Equation (6.4) demonstrates that the GDP growth rate is a weighted average of the growth rates of three factors: technology, labour and physical capital. The weights are the shares of each factor in GDP, measured as the marginal product of the factor (at the macroeconomic level), multiplied by the quantity of that factor and divided by the total output.

6.3. Method

The research method used in this chapter is growth accounting. To calculate the growth rate of TFP in the empirical study, additional assumptions should be introduced into equation (6.4), which represents the essence of growth accounting.

Firstly, it is assumed that the production function exhibits Hicks-neutral technological progress. Consequently, the production function can be expressed as follows:

$$F(A,L,K)=A\cdot f(L,K). \tag{6.5}$$

As observed, Hicks-neutral technological progress implies that variable A, representing the level of technology, appears as a multiplicative factor in the production function f, which determines output based on the inputs of measurable factors. Such technological progress benefits both production factors equally, without altering the marginal rate of technical substitution between them. For the production function in equation (6.5), the share of technology's contribution to income, represented by the term $(\partial F/\partial A)\ A/Y$ in equation (6.4), equals 1. Consequently, equation (6.4) can be rewritten as:

$$\frac{\dot{Y}}{Y}=\frac{\dot{A}}{A}+\frac{\frac{\partial F(A,L,K)}{\partial L}L}{Y}\frac{\dot{L}}{L}+\frac{\frac{\partial F(A,L,K)}{\partial K}K}{Y}\frac{\dot{K}}{K}. \tag{6.6}$$

The above equation shows that the rate of economic growth is the sum of technological progress (TFP growth) and the average growth rate of labour and physical capital inputs, weighted by the income shares of both factors.

It is also necessary to introduce an additional assumption concerning the marginal products of the two factors. The marginal products of labour and capital at the macroeconomic level are inherently unmeasurable, and therefore it is assumed that all markets are perfectly competitive and no externalities exist. Under these conditions, the marginal product of capital ($\partial F/\partial K$) equals the return on capital r, while the marginal product of labour ($\partial F/\partial L$) equals the wage rate w. Denoting the share of capital income in total output as $s_K = rK/Y$ and the share of labour income as $s_L = wL/Y$, equation (6.6) can be rewritten as:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + s_K \frac{\dot{K}}{K} + s_L \frac{\dot{L}}{L}. \tag{6.7}$$

Let us make an additional assumption that the entire income can be attributed to one of the two production factors: labour or physical capital, i.e., $Y = wL + rK$. In this case, the income shares of labour and physical capital sum to one: $s_K + s_L = 1$. Thus, formula (6.7) takes the following form:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + s_K \frac{\dot{K}}{K} + \left(1 - s_K\right)\frac{\dot{L}}{L}. \tag{6.8}$$

Equation (6.8) forms the basis of standard growth accounting. From this equation, the growth rate of TFP can be calculated as the difference between the GDP growth rate and the weighted average growth rate of the two production factors:

$$\text{TFP growth} = \frac{\dot{A}}{A} = \frac{\dot{Y}}{Y} - \left[s_K \frac{\dot{K}}{K} + \left(1 - s_K\right)\frac{\dot{L}}{L} \right]. \tag{6.9}$$

6.4. Empirical study results

For the purposes of this analysis, we compiled data forming the following time series:

a) economic growth rates,
b) labour input growth rates,
c) physical capital input growth rates.

The economic growth rate is the annual growth rate of total real GDP sourced from the IMF [2024] database, labour input growth is measured using employment dynamics provided by the International Labour Organisation [ILO, 2024], while

the physical capital stock time series was calculated using the perpetual inventory method (PIM), based on data from the World Bank [2024]. This method requires several assumptions. We assumed a depreciation rate of 5% and an initial capital-to-output ratio of 3. According to the perpetual inventory method, the starting year should precede the period for which TFP is calculated. In our study, the calculations begin in 2000, with the assumption that the capital-to-output ratio equals 3 for that year. Gross fixed capital formation (GFCF) was used as the investment variable, and the income shares of labour and physical capital were set at a half.

In this edition of the study, we updated all the time series for the analysed variables, with all the calculations performed anew. Consequently, the documentation of results is fully presented in this text and does not duplicate information from previous editions of the report.

Table 6.1 presents the detailed results of the decomposition of economic growth rates, while Tables 6.2 and 6.3 summarise the data from Table 6.1.

Between 2014 and 2023, TFP growth rates in the EU-11 countries were moderate. In three countries of the studied group, the average annual productivity growth exceeded 2% per year (Romania: 2.5%, and Croatia and Slovenia: 2.1%). Poland ranked fourth, with TFP growth of 1.8%, a result similar to that of Bulgaria (1.7%). Latvia recorded annual productivity growth of 1.2%, with TFP growth below 1% in the remaining EU-11 countries. An exception was Estonia, where TFP growth over the entire 2014–2023 period was negative.

Although Poland's results could have been better, they should be seen as a modest success for the country compared to other new EU members. If we consider changes in TFP as an approximate measure of technological progress, Poland ranked among the top EU-11 countries in terms of creating new technologies.

Overall, for the EU-11 group as a whole, TFP growth dynamics were weak during the 2014–2023 period. This poor performance can be attributed, firstly, to a significant drop in TFP in the studied countries in 2020 during the COVID-19 pandemic. The recession observed in nearly all countries in 2020 led to negative TFP growth rates that year. The second factor negatively affecting TFP levels was the war in Ukraine, which triggered economic slowdowns (and in some cases, recessions), resulting in negative TFP dynamics in many EU-11 countries in 2023.

In this chapter, we assume that TFP growth serves as an approximate measure of technological progress. The residual-based TFP calculated using growth accounting has its limitations as an indicator of technological progress, which should be borne in mind when interpreting the results. Firstly, the economic recession in 2020, driven by external factors and with relatively limited reflection in the accumulation of labour and especially capital – stemming from investments made in previous years – results

in negative estimates of TFP dynamics for that year. Secondly, the portion of TFP derived from increased labour productivity should, to some extent, be attributed to the contribution of human capital to economic growth. Due to difficulties in calculating the stock of human capital for the analysed group of countries, our TFP measure also incorporates the impact of human capital on growth.

Over time, the countries leading in TFP dynamics have changed, due to the fact that growth accounting is a method with results that are highly sensitive to fluctuations in individual variables (labour inputs, capital inputs, and output levels). These variables – particularly output – are subject to significant year-on-year fluctuations due to business cycles and irregular variations caused by various demand- and supply-side shocks, both internal and external. Consequently, the ranking of countries based on TFP dynamics can shift considerably from one year to the next. In analyses conducted many years ago, the Baltic States led in terms of TFP dynamics. Before the global financial crisis of 2008–2009, they experienced rapid economic growth that could not be fully explained by changes in labour and physical capital, and thus was attributed to TFP. Poland's position in those analyses was moderate – not as strong as the Baltic States, but also not among the laggards of the group. Extending and shifting the time horizon has significantly improved Poland's standing compared to other countries.

The most significant fluctuations in TFP growth rates during the study period were observed in Croatia, Romania and Slovenia. The variation in productivity change dynamics in these countries was primarily due to a sharp decline in TFP in 2020 as a result of the deep recession caused by the coronavirus pandemic. For instance, Croatia's real GDP fell by 8.5% in 2020, making it the EU-11 country with the deepest recession that year. In the aforementioned three countries, the difference between the highest and lowest TFP growth rates from 2014 to 2023 exceeded 12 p.p. (in Croatia, even over 20 p.p.). In other CEE countries, the range of TFP growth rates was also considerable, ranging from 7.0 p.p. in Lithuania to nearly 11 p.p, in Latvia, Bulgaria and Estonia. These large variations in TFP fluctuations stem from the significant declines in productivity observed in all countries in 2020 as a result of the COVID-19 pandemic. In Poland, the lowest TFP growth rate during the study period occurred in 2020 (−3.0%), with the highest in 2018 (4.5%).

Data from the sub-periods indicates differing behaviour among countries in terms of TFP dynamics. Overall, TFP growth rates in the identified sub-periods were not particularly high.

Table 6.1. Contribution of labour, physical capital and TFP to economic growth in 2014–2023

		2014			2015			2016			2017			2018			2019			2020			2021			2022			2023		
		Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p)	Contribution (%)
Bulgaria	L	1.6	0.8	83	1.7	0.8	25	−0.5	−0.2	−8	4.4	2.2	81	0.1	0.0	1	2.5	1.3	32	−3.4	−1.7	43	−1.4	−0.7	−9	2.4	1.2	31	−6.9	−3.5	−188
	K	2.1	1.0	110	2.2	1.1	32	2.2	1.1	37	1.6	0.8	29	1.7	0.8	32	1.9	1.0	24	2.1	1.1	−27	2.0	1.0	13	1.3	0.7	17	1.6	0.8	44
	TFP	−0.9	−0.9	−93	1.5	1.5	43	2.2	2.2	72	−0.3	−0.3	−10	1.8	1.8	67	1.8	1.8	44	−3.3	−3.3	83	7.4	7.4	96	2.1	2.1	53	4.5	4.5	244
	GDP	0.9	0.9	100	3.4	3.4	100	3.0	3.0	100	2.7	2.7	100	2.7	2.7	100	4.0	4.0	100	−4.0	−4.0	100	7.7	7.7	100	3.9	3.9	100	1.8	1.8	100
Croatia	L	2.7	1.4	−396	1.3	0.6	25	0.3	0.1	4	2.2	1.1	33	1.8	0.9	31	1.5	0.7	21	−1.3	−0.7	8	1.3	0.6	5	1.7	0.9	12	−6.1	−3.1	−100
	K	0.7	0.4	−103	0.5	0.3	11	1.0	0.5	13	1.2	0.6	18	1.2	0.6	21	1.4	0.7	20	1.9	0.9	−11	1.4	0.7	5	1.7	0.9	12	1.6	0.8	27
	TFP	−2.1	−2.1	599	1.7	1.7	65	3.0	3.0	83	1.7	1.7	49	1.4	1.4	49	2.0	2.0	58	−8.8	−8.8	103	11.7	11.7	90	5.3	5.3	75	5.3	5.3	173
	GDP	−0.3	−0.3	100	2.6	2.6	100	3.6	3.6	100	3.4	3.4	100	3.0	3.0	100	3.4	3.4	100	−8.5	−8.5	100	13.0	13.0	100	7.0	7.0	100	3.1	3.1	100
Czechia	L	0.8	0.4	17	1.4	0.7	14	1.9	1.0	37	1.6	0.8	16	1.4	0.7	24	0.2	0.1	2	−1.3	−0.6	12	−0.3	−0.2	−4	−1.0	−0.5	−17	−2.1	−1.0	1234
	K	2.2	1.1	48	2.2	1.1	22	2.8	1.4	53	2.3	1.2	22	2.5	1.3	44	3.1	1.5	43	3.3	1.6	−31	2.5	1.3	31	2.4	1.2	42	2.5	1.2	−1446
	TFP	0.8	0.8	35	3.2	3.2	64	0.2	0.2	9	3.2	3.2	62	0.9	0.9	31	1.9	1.9	55	−6.3	−6.3	119	2.9	2.9	72	2.1	2.1	74	−0.3	−0.3	312
	GDP	2.2	2.2	100	5.0	5.0	100	2.6	2.6	100	5.2	5.2	100	2.8	2.8	100	3.6	3.6	100	−5.3	−5.3	100	4.0	4.0	100	2.8	2.8	100	−0.1	−0.1	100
Estonia	L	0.6	0.3	8	1.3	0.6	35	0.9	0.5	15	1.8	0.9	16	1.0	0.5	13	0.9	0.4	12	−2.3	−1.2	40	1.1	0.6	8	4.1	2.0	3228	2.8	1.4	−47
	K	3.5	1.8	53	3.0	1.5	82	2.5	1.3	41	2.7	1.4	24	3.6	1.8	48	4.1	2.1	56	4.3	2.2	−75	4.9	2.5	34	5.1	2.6	4074	4.3	2.1	−71
	TFP	1.3	1.3	38	−0.3	−0.3	−17	1.4	1.4	44	3.4	3.4	60	1.4	1.4	39	1.2	1.2	33	−3.9	−3.9	135	4.1	4.1	58	−4.5	−4.5	−7202	−6.6	−6.6	217
	GDP	3.3	3.3	100	1.8	1.8	100	3.1	3.1	100	5.6	5.6	100	3.7	3.7	100	3.7	3.7	100	−2.9	−2.9	100	7.1	7.1	100	0.1	0.1	100	−3.0	−3.0	100
Hungary	L	5.3	2.7	63	2.7	1.3	36	3.4	1.7	76	1.6	0.8	19	1.1	0.5	10	1.0	0.5	10	−1.1	−0.6	13	4.1	2.0	29	1.4	0.7	16	0.6	0.3	−34
	K	1.3	0.7	16	2.0	1.0	27	2.2	1.1	50	1.3	0.7	15	2.5	1.2	23	3.5	1.7	36	4.2	2.1	−47	3.2	1.6	23	3.4	1.7	37	3.3	1.6	−179
	TFP	0.9	0.9	21	1.4	1.4	37	−0.6	−0.6	−26	2.8	2.8	66	3.6	3.6	67	2.7	2.7	55	−6.0	−6.0	134	3.4	3.4	48	2.2	2.2	47	−2.8	−2.8	313
	GDP	4.2	4.2	100	3.7	3.7	100	2.2	2.2	100	4.3	4.3	100	5.4	5.4	100	4.9	4.9	100	−4.5	−4.5	100	7.1	7.1	100	4.6	4.6	100	−0.9	−0.9	100

cont. table 6.1

		2014			2015			2016			2017			2018			2019			2020			2021			2022			2023		
		Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p)	Contribution (%)
Latvia	L	−1.0	−0.5	−27	1.3	0.6	17	−0.3	−0.2	−7	0.2	0.1	3	1.6	0.8	20	0.1	0.0	6	−1.9	−0.9	27	−2.6	−1.3	−20	2.5	1.2	42	−0.1	−0.1	26
	K	2.6	1.3	69	2.1	1.1	28	1.9	0.9	39	1.2	0.6	18	1.8	0.9	23	2.5	1.2	209	2.4	1.2	−34	2.1	1.0	15	2.4	1.2	41	2.3	1.1	−404
	TFP	1.1	1.1	58	2.2	2.2	56	1.6	1.6	68	2.6	2.6	80	2.3	2.3	57	−0.7	−0.7	−115	−3.8	−3.8	107	7.0	7.0	104	0.5	0.5	17	−1.4	−1.4	478
	GDP	1.9	1.9	100	3.9	3.9	100	2.4	2.4	100	3.3	3.3	100	4.0	4.0	100	0.6	0.6	100	−3.5	−3.5	100	6.7	6.7	100	3.0	3.0	100	−0.3	−0.3	100
Lithuania	L	2.0	1.0	29	1.2	0.6	30	2.0	1.0	38	−0.5	−0.2	−6	1.5	0.7	18	0.3	0.1	3	−1.5	−0.7	−799	0.8	0.4	6	3.8	1.9	78	1.4	0.7	−253
	K	2.5	1.3	36	2.8	1.4	69	2.9	1.5	57	3.0	1.5	35	3.4	1.7	43	4.0	2.0	43	4.2	2.1	2296	3.8	1.9	31	4.3	2.2	88	4.2	2.1	−752
	TFP	1.2	1.2	34	0.0	0.0	1	0.1	0.1	5	3.0	3.0	71	1.5	1.5	39	2.5	2.5	54	−1.3	−1.3	−1396	3.9	3.9	63	−1.6	−1.6	−66	−3.1	−3.1	1105
	GDP	3.5	3.5	100	2.0	2.0	100	2.6	2.6	100	4.3	4.3	100	4.0	4.0	100	4.6	4.6	100	0.1	0.1	100	6.2	6.2	100	2.4	2.4	100	−0.3	−0.3	100
Poland	L	1.7	0.9	23	1.6	0.8	19	0.8	0.4	13	1.4	0.7	13	0.3	0.2	3	−0.1	−0.1	−1	−1.7	−0.8	41	3.2	1.6	23	0.5	0.2	4	1.4	0.7	430
	K	2.6	1.3	33	3.2	1.6	37	3.5	1.8	60	2.6	1.3	25	2.5	1.3	21	3.3	1.6	37	3.5	1.8	−87	3.0	1.5	22	2.9	1.5	26	2.9	1.4	896
	TFP	1.7	1.7	44	2.0	2.0	45	0.8	0.8	27	3.1	3.1	61	4.5	4.5	76	2.9	2.9	65	−3.0	−3.0	146	3.8	3.8	55	3.9	3.9	70	−2.0	−2.0	−1227
	GDP	3.8	3.8	100	4.4	4.4	100	3.0	3.0	100	5.1	5.1	100	5.9	5.9	100	4.5	4.5	100	−2.0	−2.0	100	6.9	6.9	100	5.6	5.6	100	0.2	0.2	100
Romania	L	0.8	0.4	9	−0.9	−0.5	−14	−1.0	−0.5	−18	2.6	1.3	16	0.2	0.1	2	−0.1	0.0	−1	−1.8	−0.9	25	−9.0	−4.5	−79	0.7	0.3	8	−1.4	−0.7	−33
	K	3.0	1.5	37	3.2	1.6	51	3.6	1.8	62	3.1	1.5	19	3.3	1.6	27	3.0	1.5	39	3.8	1.9	−51	3.5	1.8	31	3.5	1.7	42	3.7	1.8	86
	TFP	2.2	2.2	54	2.0	2.0	64	1.6	1.6	56	5.3	5.3	65	4.3	4.3	71	2.4	2.4	62	−4.6	−4.6	126	8.4	8.4	148	2.0	2.0	50	1.0	1.0	47
	GDP	4.1	4.1	100	3.2	3.2	100	2.9	2.9	100	8.2	8.2	100	6.0	6.0	100	3.9	3.9	100	−3.7	−3.7	100	5.7	5.7	100	4.1	4.1	100	2.1	2.1	100
Slovakia	L	4.1	2.0	75	0.0	0.0	0	2.8	1.4	72	1.5	0.8	26	1.4	0.7	18	0.6	0.3	12	−2.1	−1.0	31	1.0	0.5	10	1.9	1.0	51	0.3	0.1	8
	K	2.5	1.2	46	2.5	1.3	24	3.9	2.0	101	2.8	1.4	47	2.8	1.4	35	2.8	1.4	56	3.1	1.5	−46	2.0	1.0	21	2.1	1.1	56	2.3	1.2	74
	TFP	−0.6	−0.6	−21	3.9	3.9	75	−1.4	−1.4	−73	0.8	0.8	26	1.9	1.9	47	0.8	0.8	32	−3.8	−3.8	115	3.3	3.3	69	−0.1	−0.1	−7	0.3	0.3	19
	GDP	2.7	2.7	100	5.2	5.2	100	1.9	1.9	100	2.9	2.9	100	4.0	4.0	100	2.5	2.5	100	−3.3	−3.3	100	4.8	4.8	100	1.9	1.9	100	1.6	1.6	100
Slovenia	L	1.2	0.6	22	0.1	0.0	2	−0.3	−0.1	−4	4.8	2.4	47	2.2	1.1	26	0.2	0.1	3	−0.5	−0.2	6	−0.7	−0.3	−4	1.5	0.7	28	0.3	0.2	8
	K	0.6	0.3	10	0.5	0.3	11	0.4	0.2	7	0.2	0.1	2	0.7	0.4	8	1.3	0.6	18	1.5	0.8	−18	1.0	0.5	6	1.6	0.8	30	1.8	0.9	42
	TFP	1.9	1.9	68	2.1	2.1	87	2.9	2.9	97	2.7	2.7	51	2.9	2.9	66	2.8	2.8	79	−4.6	−4.6	113	8.2	8.2	98	1.1	1.1	42	1.1	1.1	50
	GDP	2.8	2.8	100	2.4	2.4	100	3.0	3.0	100	5.2	5.2	100	4.4	4.4	100	3.5	3.5	100	−4.1	−4.1	100	8.4	8.4	100	2.7	2.7	100	2.1	2.1	100

Source: own elaboration.

Table 6.2. TFP growth rates (%)

Country	Entire period 2014–2023			2014–2019	2020–2022	2023
	Average	Min	Max	Average	Average	
Bulgaria	1.7	−3.3	7.4	1.0	2.0	4.5
Croatia	2.1	−8.8	11.7	1.3	2.7	5.3
Czechia	0.9	−6.3	3.2	1.7	−0.4	−0.3
Estonia	−0.3	−6.6	4.1	1.4	−1.4	−6.6
Lithuania	0.6	−3.1	3.9	1.4	0.3	−3.1
Latvia	1.2	−3.8	7.0	1.5	1.2	−1.4
Poland	**1.8**	**−3.0**	**4.5**	**2.5**	**1.6**	**−2.0**
Romania	2.5	−4.6	8.4	3.0	1.9	1.0
Slovakia	0.5	−3.8	3.9	0.9	−0.2	0.3
Slovenia	2.1	−4.6	8.2	2.5	1.6	1.1
Hungary	0.7	−6.0	3.6	1.8	−0.2	−2.8

Source: own elaboration.

Table 6.3. Contribution of TFP to economic growth (%)

Country	Entire period 2014–2023		
	Average	Min	Max
Bulgaria	60	−93	244
Croatia	134	49	599
Czechia	83	9	312
Estonia	−660	−7202	217
Lithuania	−9	−1396	1105
Latvia	91	−115	478
Poland	−64	−1227	146
Romania	74	47	148
Slovakia	28	−73	115
Slovenia	75	42	113
Hungary	76	−26	313

Source: own elaboration.

Among the analysed sub-periods, the years 2014–2019 saw the EU-11 countries achieve relatively strong productivity growth. Before the outbreak of the COVID-19 pandemic, at the end of the second decade of the 21st century, Central and Eastern Europe experienced favourable economic conditions. The countries recorded relatively rapid economic growth, with positive prospects translating into relatively strong dynamics

in total factor productivity (TFP). The leaders during this period were Romania, Slovenia and Poland, which recorded annual TFP growth rates of 2.5–3%. The lowest productivity growth was observed in Slovakia and Bulgaria, with rates not exceeding 1%.

From 2020 onward, the EU-11 group as a whole experienced a decline in TFP growth dynamics. During the 2020–2022 period, encompassing the COVID-19 pandemic and the onset of the war in Ukraine, TFP growth rates significantly decreased. Four countries (Hungary, Slovakia, Czechia and Estonia) recorded negative TFP growth. Although a decline in TFP should not necessarily be interpreted as technological regression – given the residual method used to calculate TFP – negative values nonetheless reflect economic challenges. The leader during this period, Croatia, recorded TFP growth of 2.7%. Between 2020 and 2022, Poland ranked in the middle of the group, with an average annual productivity growth rate of 1.6%, matching that of Slovenia.

In 2023, the EU-11 countries demonstrated varied TFP growth dynamics. Croatia and Bulgaria showed significant TFP increases, at 5.3% and 4.5%, respectively. In three CEE countries (Slovenia, Romania, and Slovakia), TFP growth was moderate, at 1.1%, 1.0%, and 0.3%, respectively. However, the remaining EU-11 countries recorded negative TFP changes, with Estonia, Lithuania, and Hungary experiencing particularly adverse results. Estonia's TFP declined by 6.6%, Lithuania's by 3.1%, and Hungary's by 2.8%. Poland also reported a negative outcome, with a TFP decline of 2.0% in 2023. The poor performance observed in some CEE countries can be attributed to stagnation (Poland) or economic recession (Estonia, Lithuania, and Hungary).

In terms of TFP contributions to economic growth, the numerical values for the analysed period are partially distorted, which is partly due to instances where GDP growth rates are close to 0%, causing percentage changes in TFP to result in disproportionately high contributions to economic growth, often amounting to several thousandths (e.g., Lithuania in 2020 and Estonia in 2022), and the COVID-19 pandemic additionally disrupted statistics related to TFP's share in economic growth. Nevertheless, certain trends and patterns can be identified based on aggregated results for the entire period.

As shown in Table 6.3, the percentage contributions of TFP to economic growth ranged from 60% to 80% in many countries (excluding those with extremely atypical values) during the 2014–2023 period, which underscores the significant role of TFP in driving economic growth in the analysed countries over the past decade.

It is worth noting that other Polish researchers also conducted studies on the decomposition of economic growth and TFP estimates for Poland, in addition to the cited studies in this report[2]. For example, Florczak and Welfe [2000] and Welfe

[2] Due to space constraints, we did not provide a detailed description of the results presented in these studies.

[2001] calculated TFP for Poland in 1982–2000 using the standard growth accounting framework, considering two production factors: labour and physical capital (machinery and equipment or total fixed assets). In their research, the elasticity of production with respect to fixed assets (i.e., the share of capital income in total income) was calibrated at 0.5 or estimated based on the production function. In another study, Welfe [2003] estimated TFP for Poland for 1986–2000 using various alternative values for the share of capital income in total income (ranging from 0.25 to 0.7). Similarly, Florczak [2011] used the Wharton method to estimate TFP values adjusted for short-term demand fluctuations for Poland during 1970–2008, subsequently analysing the determinants of total factor productivity.

TFP estimates for Poland were also conducted by Zienkowski [2001], Rapacki [2002], Piątkowski [2004] and Ptaszyńska [2006]. Roszkowska [2005] and Tokarski, Roszkowska and Gajewski [2005] carried out growth accounting for Poland's voivodeships, while Bolińska [2018], Dykas and Misiak [2018], and Dańska-Borsiak [2020] focused on selected Polish poviats. Zielińska-Głębocka [2004] estimated TFP for 100 industrial sectors in Poland, Ciołek and Umiński [2007] calculated the TFP growth rate in domestic and foreign Polish enterprises, while Doebeli and Kolasa [2005] used the index number decomposition method in growth accounting for Poland, Czechia and Hungary. Ulrichs and Gosińska [2020] estimated the parameters of sectoral production functions describing the impact of variables representing physical capital and labour on gross value added in Poland. Młynarzewska-Borowiec [2018] estimated the level and dynamics of TFP in EU countries, including Poland, for the period 2000–2014.

It is also worth mentioning research in this field conducted for Poland by Statistics Poland (Główny Urząd Statystyczny, GUS), including studies by Kotlewski and Błażej [2016, 2018, 2020], which use the KLEMS productivity framework and estimate, among other factors, the contribution of multifactor productivity (MFP) to production growth. The empirical research is conducted both at the national level (for Poland and selected other EU members) and at the level of Polish voivodeships and individual economic sectors.

6.5. Conclusions

The results indicate that changes in productivity have played a significant role in the economic growth of Poland and other EU-11 countries. In Poland, the average annual TFP growth rate was 1.8% during 2014–2023, ranking fourth in the EU-11 group (Romania led with a productivity growth rate of 2.5%). The increase in TFP in Poland should be interpreted as an improvement in the competitiveness of the Polish

economy, with higher productivity of production factors signifying greater efficiency in resource allocation and a stronger competitive position in the international arena. The COVID-19 pandemic and the war in Ukraine negatively impacted TFP dynamics, seeing many EU-11 countries experience declines in total factor productivity in 2020 and 2023. Geopolitical forecasts for the world, including Eastern Europe, do not suggest a quick return for the EU-11 countries to the stable trajectory of consistent TFP growth observed before the pandemic.

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Part II

Competitive Ability in Foreign Market

Chapter 7

The Labour Market in Poland and Global Production Networks Participation

Anna Maria Dzienis

7.1. Introduction

The global production networks (GPNs) approach provides theoretical and analytical frameworks for understanding the complexities of global economic activities. Coe and Yeung [2015, pp. 2–3] define a global production network as 'an organizational arrangement, comprising interconnected economic and non-economic actors, coordinated by a global lead firm, and producing goods or services across multiple geographical locations for worldwide markets. GPNs thus emphasise the interconnections and spatial dispersion of production processes, illustrating how global economic activities are organised, controlled and shaped by diverse actors (e.g., firms, states and institutions) across different regions.

The analysis of global production networks aims to develop a 'dynamic conceptual apparatus' that considers multiple scales and power relations, with its theoretical framework being the way in which value is created, enhanced and captured in various spatial configurations [Hess, Yeung, 2006, pp. 1193, 1197], with different actors within the network contributing to value creation and benefitting from it, even though these benefits are often unevenly distributed. The GPN framework analyses how regions and local economies can integrate with global production activities, 'strategic coupling', which impacts their economic development.

Researchers of global production networks distinguish the following analytical frameworks of the approach [e.g., Hess, Yeung, 2006; Coe, Yeung, 2015]:

1) Network structure and the concept of 'embeddedness': GPNs are characterised by complex relationships between actors, involving multiple levels of coordination and control between different firms and geographical regions. To exploit regional advantages such as labour costs, knowledge and other resources, different stages of production are carried out in various locations around the world, resulting in a spatial division of labour. The concept of embeddedness, central to the GPN

approach and derived from economic sociology, highlights how economic actions are influenced by the social, institutional and cultural environments in which they occur.

2) 'Value chain' analysis embedded in development studies, which addresses issues related to economic development, such as industrial 'upgrading', technological changes, or shifts in employment. The GPN goes beyond the framework of the 'core' and 'periphery' of the value chain and enriches this analysis with insights into how actors in various production networks are anchored in diverse locations and at multiple levels.
3) Analysis of 'power relations' between actors in production networks, understood as 'the ability of one actor to affect the behaviour of another actor' [Coe, Yeung, 2015, p. 17].

Global Production Networks are dynamic and constantly evolving due to technological changes, market conditions and company strategies, and state and supranational policies can also significantly influence their (re)configuration [Dzienis, McCaleb, 2024]. The GPN approach considers how networks adapt to changes, and therefore includes research on shifts in production location, technological advancement, and the emergence of new economic regions.

The development of regions and global production networks interact through the aforementioned strategic coupling, since the development takes place when the resources of regions 'interact positively with the strategic needs of actors in these global production networks' [Coe, Yeung, 2015, p. 20]. Thanks to strategic coupling, local actors can benefit from participating in global value chains (GVCs), including in terms of job creation, technology transfer or economic growth. Examples include special economic zones, investments in infrastructure, and human resources in specific industries that attract international companies.

Thus, global production networks serve as a broad framework for interpreting the economic and social effects of globalisation. This approach goes beyond traditional theories by emphasising the multi-scalar and multi-actor dimensions of the internationalisation of production, representing a forward-looking approach to studying multidimensional economic processes.

The aim of this chapter is to present the labour market in Poland from the perspective of linkages in production networks, and to identify key dynamics in this area in the context of the future model of the country's integration with global value chains. The study, which was conducted using the example of two sectors, automotive and ICT, whose development is strongly linked to foreign capital and the country's export activities, is based on a combination of literature review, case studies and data analysis. Poland ranks among the top three countries in the European Union regarding

employment in automotive industry factories. Domestic employment in this sector and related industries is estimated at over 1.1 million people [PIM, 2022]. Therefore, the automotive industry plays a crucial role in the Polish economy and its position in global and regional production networks [Dzienis, 2021]. At the same time, contemporary challenges related to the green and digital transformation mean that the rapidly growing ICT sector is becoming increasingly important for this traditional industry. Poland prides itself on ranking 3rd in the global ranking of world-class programmers and 1st in terms of the number of developers in the Central and Eastern European region [PAIH, 2025]. The increase in investment in research and development in the ICT sector – by approximately 30% in 2023 compared to the previous year [Trade.gov.pl, 2024] – demonstrates its dynamic growth and significance for the competitiveness of the Polish economy. Firstly, the concept of work in the GPN framework is presented. Next, the general position of Poland in production networks is outlined to provide context for the case studies of the automotive industry and the ICT sector. The chapter concludes with an overview of the research findings and a summary.

7.2. Work in the context of global production networks

Global production networks present a refined perspective on work and labour markets, recognising them as integral components of the global economic system. The GPN perspective highlights how global firms strategically locate production activities in areas where they can access workers who meet their cost or skill requirements, leading to the creation of a global division of labour based on regional advantages.

Within production networks, local firms and workers can benefit from the transfer of technology and know-how, which can lead to the upgrading of production functions and processes, as well as the development of skills and the upskilling of workers, allowing some regions to gradually move into more advanced production sectors and offer better-paid jobs. The internationalisation of work and the strong interdependencies between actors associated with this phenomenon also carry certain risks, such as vulnerability to disruptions in production and employment, as was the case during the COVID-19 pandemic [Yeung, 2024].

The GPN perspective also highlights the segmentation of labour, both within and between countries, resulting from factors such as the history of a given place, culture, social stratification, gender relations, or education systems [Coe, Dicken, Hess, 2008, p. 284]. It is noteworthy that the inter-firm linkages bring together societies characterised by considerable institutional diversity. Henderson, Dicken, Hess, Coe and Yeung [2002, p. 436] argue that comprehending the development dynamics of a location involves

understanding both how places are reshaped by flows of capital, labour, knowledge, power and other factors, and how these flows, in turn, are influenced by the places, their institutions, and their social relations.

For these reasons, work within the GPN framework can be analysed through the concepts of strategic coupling and embeddedness, where the social, cultural and institutional contexts of different regions shape the nature of relationships between actors. Both concepts are dynamic and context-dependent, evolving with changes in global production networks and regional policies. This perspective facilitates the examination of how local employment practices, social norms, and regulations are shaped by integration with global or regional networks, and how these, in turn, affect the efficiency and competitiveness of regions in the global economy.

7.3. Poland's economy within production networks

In recent decades, Poland's role within global production networks has increased, with Polish plants becoming key links in the supply chains of major international companies, producing parts and products for both European and global markets, which is confirmed by data on trade in semi-finished products. According to Eurostat [2024b], Polish imports of semi-finished products from EU-27 countries reached a value of EUR 10 072.2 million in June 2024, while exports amounted to EUR 10 382.4 million. Compared to June 2015, this represented an increase of nearly 74% in imports and 81% in exports, and during the same period, the value of imports and exports of consumer goods increased by 114% and 104%, respectively, reaching EUR 4597 million and EUR 7202 million. For Polish foreign trade with countries outside the EU-27, imports of semi-finished products totalled EUR 5487 million, with exports standing at EUR 3445 million in June 2024, which represented an increase compared to June 2015 of 76% for imports and 82% for exports. Imports of consumer goods from non-EU-27 countries amounted to EUR 1416 million and exports to EUR 2251 million, up by 145% and 95%, respectively, compared to 2015.

The statistics that detail the extent of individual economies' involvement in global value chains are found in the OECD TiVA (trade in value added) database, which aims to analyse a country's value added in the production of goods or services that are subsequently exported [OECD, 2024]. The published data facilitate estimating the share of a given economy in global value chains by providing information on the import of intermediate goods included in exports (backward linkages) and the domestic value added in exports and the final demand of partners (forward linkages) [OECD, 2024b]. The domestic value added in exports can then become part of a partner country's

exports or be re-imported, whereas the domestic value added supported by foreign final demand is consumed in the partner country [Lee, Zagdanski, Spencer, Hay, 2020]. According to the OECD [2023a], despite the slowdown in global integration within GVCs as a result of the financial crisis in 2008–2009, the share of foreign value added (FVA) in Polish exports increased from 27.3% to 28.9% between 2008 and 2020, remaining above the OECD average of 26.7%, which means that Poland has strengthened backward linkages in global or regional value chains. At the same time, the share of domestic value added (DVA) supported by foreign demand also increased during this period from 26.4% to 36.3%, above the OECD average of 29.8% [OECD, 2023a], indicating Poland's increasing involvement in forward linkages in GVCs.

Poland has relatively attractive labour resources, with a progressive process of upskilling the workforce in the last decade. Between 2015 and 2023, the percentage of the population aged 15–64 with higher education increased by nearly 9 p.p. to 33% [Local Data Bank, 2024], with the share of graduates from STEM (Science, Technology, Engineering and Mathematics) programmes in higher education in Poland in 2018 reaching 22%, according to World Bank data [2024]. For comparison, in Germany it was 35%, in France 26%, and in Italy 24%. In the 2024 IMD World Talent Ranking, Poland ranked 36th among 67 surveyed economies, i.e., eight positions higher than the previous year [IMD, 2024], showing a significant improvement in factors comprising the index, such as 'appeal', the extent to which the country utilises the foreign talent pool, and 'readiness', perceived as the availability of skills and competencies in the talent pool. The final factor acknowledged the growth in labour resources and the outcomes of the PISA (Programme for International Student Assessment) survey.

7.4. Case studies – the automotive sector and the ICT sector

7.4.1. Automotive sector

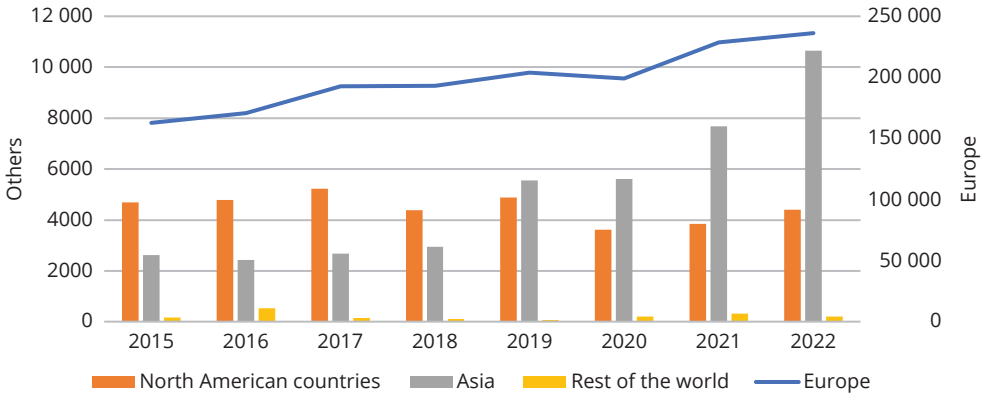
Over the past decades, the Polish automotive sector has become a significant player in the global car industry, with its integration into global production networks driven by foreign direct investment (FDI), cost advantages, and proximity to Western European markets. This case study analyses the Polish automotive sector from a GPN perspective, with a particular focus on the workforce and labour market dynamics. In this chapter, the automotive sector is understood as Division 29 of Section C of the European NACE Rev. classification of economic activities.

7.4.2. Growth of the automotive industry in Poland

According to the Polish Investment and Trade Agency [PAIH, 2023], the Polish automotive sector generates approximately 8% of GDP and about 13.5% of export value, with the export value of the automotive industry amounting to nearly EUR 40 billion in 2022, representing a 21% increase compared to the previous year [PAIH, 2023]. The Polish automotive sector has been developing dynamically since the 1990s, and as a result of FDI inflows, integration with European and global markets and the development of the supply chain, it has transformed from a relatively small domestic industry into a key hub in the European automotive production network. Poland's accession to the European Union in 2004 further integrated its automotive sector with the European market, facilitating trade and the flow of goods within the EU.

In terms of value, foreign direct investments in Poland are predominantly from European countries (94% of the total), and their value has been steadily increasing in recent years, despite a temporary slowdown during the COVID-19 pandemic (Figure 7.1). Since 2019, there has also been an increase in FDI from Asia, which accounted for 1.5% of the total in 2015 and 4.2% in 2022.

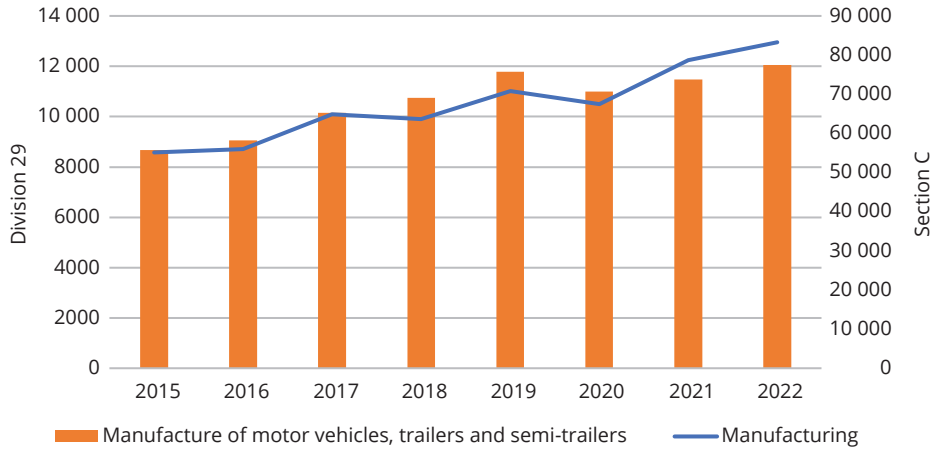
Figure 7.1. Foreign direct investments in Poland by regions of origin (EUR millions)



Source: own elaboration based on NBP [2024].

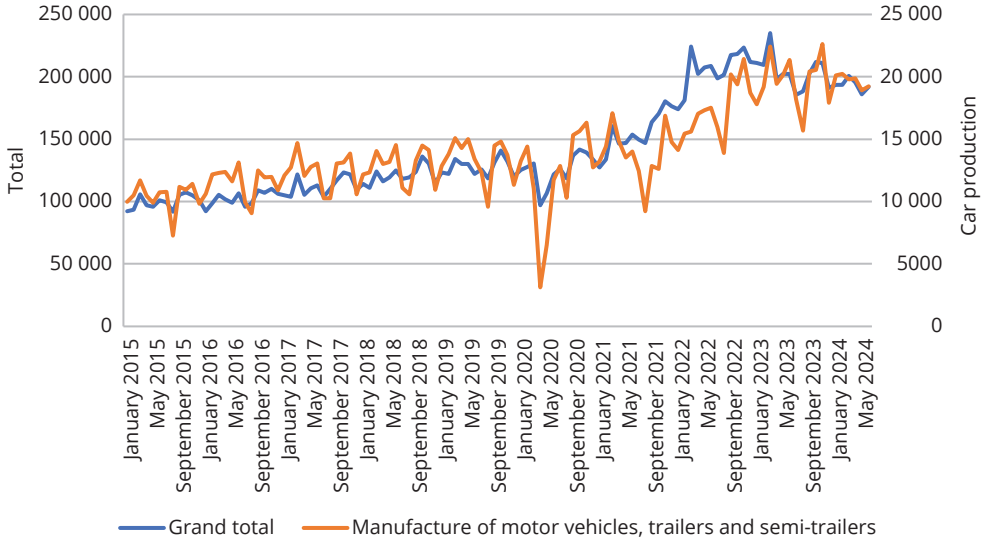
The value of FDI in Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers (according to NACE Rev. 2) increased by 39% from 2015 to 2022, reaching EUR 12 055.6 million (Figure 7.2). FDI has contributed to the development of numerous manufacturing sites, including factories for cars, engines and automotive components.

Figure 7.2. Overall FDI in Section C – Manufacturing, and Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers (EUR millions)



Source: own elaboration based on NBP [2024].

Figure 7.3. Sold production of the industry overall and the manufacture of motor vehicles, trailers and semi-trailers 2015–2024 (PLN millions)



Source: own elaboration based on Statistics Poland [2024a].

At the same time, the sold production of motor vehicles, trailers and semi-trailers increased by 88% between October 2015 and October 2023, despite significant declines during the COVID-19 pandemic (Figure 7.3), with the sold production in

Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers, in 2022 amounting to PLN 194 238.4 million [Statistics Poland, 2024c, p. 36]. In terms of the vehicle production structure, the decreasing number of passenger cars produced (a 52% decline in 2022 compared to 2015) was offset by an 85% increase in the production of lorries and road tractors for semi-trailers in 2022 compared to 2015 [Statistics Poland, 2024c].

As reported by Orbis, 2061 firms were active in Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers, in Poland in 2023, while out of the 1124 companies for which ownership data was available, 291 were under foreign ownership [Orbis, 2023], most of them based in Germany, the Netherlands, Sweden, Japan, the United States and the United Kingdom. Table 7.1 presents the leading automotive companies in Poland in terms of revenue and employment.

Table 7.1. Major companies in Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers in Poland in terms of revenue (USD) and employment in 2023

	Company	Revenue	Company	Employment
1	Volkswagen Poznan sp. z o.o.	6 373 371	Volkswagen Poznan sp. z o.o.	9289
2	Inter Cars SA	4 601 667	Lear Corporation Poland II sp. z o.o.	8637
3	FCA Poland sp. z o.o.	3 930 956	Aptiv Services Poland SA	5782
4	Man Trucks sp. z o.o.	3 766 605	ZF Automotive Systems Poland sp. z o.o.	4598
5	Mercedes-Benz Manufacturing Poland sp. z o.o.	2 916 621	Inter Cars SA	4374
6	Volkswagen Motor Polska sp. z o.o.	2 080 434	Volvo Polska sp. z o.o.	3315
7	Brose Sitech sp. z o.o.	1 846 965	Man Bus sp. z o.o.	3041
8	Volvo Polska sp. z o.o.	1 699 343	ZF CV Systems Poland sp. z o.o.	2838
9	Stellantis Gliwice sp. z o.o.	1 534 280	Toyota Motor Manufacturing Poland sp. z o.o.	2825
10	Toyota Motor Manufacturing Poland sp. z o.o.	1 327 403	Superior Industries Production Poland sp. z o.o.	2681

Source: own elaboration based on Orbis [2023].

As OECD TiVa data shows, the share of foreign value added in the export of the Polish motor vehicle manufacturing sector in 2020 was 47.1%, the third highest result among sectors of the Polish economy, indicating significant integration of foreign components in vehicle production. Additionally, car manufacturing accounted for the highest share of foreign value added in total exports, at 4.3%. At the same time, almost 80% of the domestic value added in car manufacturing was generated by

foreign demand, which was the second highest result among industries. In 2020, the share of imported intermediate goods and services in Poland's total exports reached 51.8% (up from 38.9% in 2008), over 7 p.p. higher than the OECD average of 44.5%, while the manufacture of motor vehicles, trailers and semi-trailers recorded the highest value of this indicator at 67.5%. EU-27 countries are the key contributors to domestic value added in gross exports of intermediate products, with vehicle production displaying the strongest regional links to Germany and countries outside the EU-15.

7.4.3. Workforce in the Polish automotive sector

By the end of 2022, 3.243 million people were employed in industry, an increase of 8% compared to 2015. According to PAIH [2023], in 2022 the Polish automotive industry and related sectors employed about 7.6% of all people working in industry, which puts Poland in third place in the EU for this category [PAIH, 2023, p. 7].

Labour costs in Poland are lower than in Western Europe, which remains a key factor in attracting foreign investment. However, wages in the automotive sector are typically higher than the national average, reflecting the level of qualifications required for many positions. On average, the monthly gross salary in Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers, in 2022 reached PLN 6989.42, marking a 57% increase compared to 2015, while in the same year, the average monthly gross salary in the overall manufacturing industry was PLN 6028.43.

The sector benefits from a relatively skilled workforce, with engineering education programmes and vocational training contributing to the availability of qualified workers. The PAIH report [2023] emphasises that Poland ranks first in the region for the number of workers with technical education, and the talent pool includes nearly 1.5 million students, of whom over 300 thousand are engineering students [PAIH, 2023, p. 5]. However, the labour market still experiences a shortage of workers. Statistics Poland [2024b] data indicates that in 2023, industrial workers, craftsmen and machine and equipment operators and fitters were the most in-demand professionals, resulting in growing concern about a skills shortage in advanced production processes and areas such as automation and robotics, which are gaining significance in the automotive industry.

Poland's integration into global production networks has led to a segmentation of the labour market, where higher-skilled workers employed in advanced production processes enjoy better pay and greater job security, while lower-skilled workers face more precarious working conditions. This segmentation is also reflected in the differences between workers employed by large multinational corporations and those in smaller, local supply firms, where pay and working conditions can differ substantially.

7.4.4. Labour market dynamics and global production networks

According to OECD TiM (trade in employment) statistics [2023b], which describe employment in terms of the economy's participation in global value chains, from 2000 to 2020, with the progression of Poland's integration into global value chains, domestic employment embodied in foreign final demand increased. In 2020, 34% (5.6 million individuals) of total employment was engaged in production for foreign demand, exceeding the OECD average of 27.4%. with Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers, ranking second. In this context, employment embodied in foreign final demand accounted for 80.5% of the sector's total employment (Table 7.2). Similarly, the domestic compensation of employees embodied in foreign final demand, expressed as a percentage of the total compensation of employees in the industry, reached 80.5% in Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers, in 2020.

Table 7.2. Trade in employment (TiM) in 2020 (% of employment)

	Domestic employment embodied in foreign final demand		Domestic employment embodied in gross exports of final products		Domestic employment embodied in gross exports of semi-finished product	
	2015	2020	2015	2020	2015	2020
Overall economic activities	30.78	34.05	13.81	14.71	17.21	19.62
Manufacture of motor vehicles, trailers and semi-trailers	71.25	80.45	70.92	76.61	65.55	62.31

Source: own elaboration based on OECD [2023b].

OECD [2023b] data also allows for analysing the impact of export activity of a given industry on domestic employment. Domestic employment embodied in gross exports includes both employment in the exporting industry itself and employment in other related (upstream) domestic industries that supply intermediate goods used by the exporting industry [Horvát, Webb, Yamano, 2020, p. 21]. This is particularly true in the manufacturing industry.

Within domestic employment embodied in gross exports, OECD [2023b] identifies three components that account for the direct, indirect and 're-importing' effects of domestic employment in relation to exports. In 2020, domestic employment embodied in export activities in Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers, was significantly higher than the actual employment in this division, amounting to 288.2 thousand people, with an employment ratio of 138.92%

(Figure 7.4) in vehicle manufacturing, corresponding to 400.4 thousand individuals, which highlights considerable participation in the manufacturing of motor vehicles, trailers and semi-trailers by employees from other sectors of the economy, illustrating a high degree of supply chain fragmentation within the industry.

Figure 7.4. Domestic employment embodied in the industry's export activity, accounting for direct domestic, indirect domestic and re-imported employment effects in 2020 (% of employment in the exporting sector)

Source: own elaboration based on OECD [2023b].

OECD [2023b] data also allows for analysing the domestic compensation of employees embodied in gross exports. The OECD also publishes data on the components of this indicator. These are:

1) direct domestic compensation of employees embodied in gross exports, which measures the domestic wages directly paid by an industry to produce goods or services exported by that industry,
2) indirect domestic compensation of employees embodied in gross exports, referring to wages paid by other related domestic industries included in the exports of the given industry,
3) re-imported domestic compensation of employees embodied in gross exports, which measures domestic wages paid by any industry in the country to produce exports of intermediate goods or services that are subsequently included in imports used for export production by the same industry in the country [Horvát et al., 2020, p. 26].

In general terms, the domestic compensation of employees in division embodied in export activities amounted to 25% of the industry's gross exports, with the domestic

compensation of employees embodied in gross exports of Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers, representing 140% of the total compensation in the industry in 2020. The 'direct' component of the indicator amounted to almost 77%, and the 'indirect' component to 61.6% of the total compensation of employees in the industry, which means that a considerable share of wages in this sector was driven by its export operations, with domestic employee compensation largely being directly paid by Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers, for its production of export goods or services. The sector's export operations further supported employee compensation in other interconnected domestic industries included in its exports, while the export of final goods from the sector had a stronger impact on domestic employee compensation compared to the export of intermediate goods (Table 7.2). From 2015 to 2020, the contribution of the sector's final product exports to domestic employee compensation grew, whereas the role of intermediate product exports diminished.

In conclusion, participation in value chains has played a significant role in fostering job creation and wage growth within the Polish automotive industry in recent years. On the other hand, dependence on functioning within global, or rather regional, production networks makes the Polish labour market, particularly in Division 29 of Section C – Manufacture of motor vehicles, trailers and semi-trailers, susceptible to regional and global economic fluctuations.

7.4.5. Summary

The integration of the Polish automotive sector, especially within regional production networks, has led to substantial job creation, skill enhancement and economic development, with the industry demonstrating a high ratio of imported intermediate goods and services embedded in its exports. The share of FVA in the industry's exports is the third highest among economic activity divisions, and over 80% of the domestic value added generated in the sector was embedded in foreign final demand, specifically through consumption within the importing country.

Employment and wages in the Polish automotive sector are heavily dependent on its export activities and foreign final demand, and the supply chain fragmentation in this industry leads to a significant share of employment in related sectors being engaged in the export operations of the automotive sector. Moving forward, the sector's prosperity will rely on its adaptability to shifting global and regional dynamics, particularly those concerning Germany and other significant partners, along with its ability to retain a skilled and competitive workforce.

7.5. ICT sector

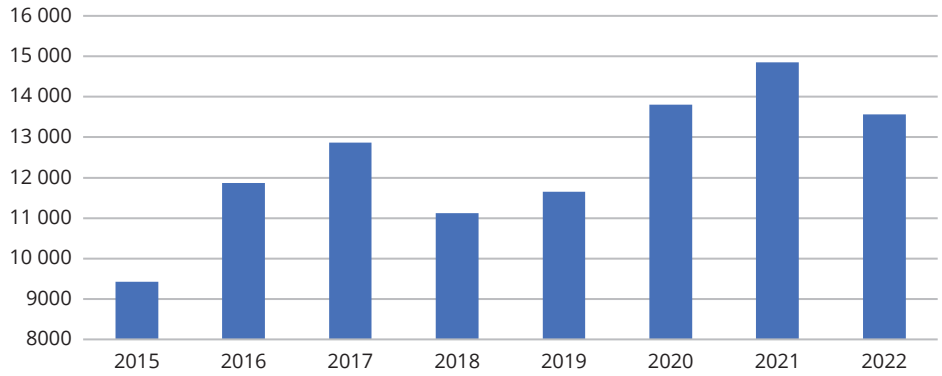
The Polish information and communication technology (ICT) sector has emerged as a dynamic and rapidly growing industry, playing a key role in the country's integration into Global Production Networks. This case study looked at the development of the Polish ICT sector from a GPN perspective, focusing on the characteristics of the workforce and the dynamics of the labour market. In this study, the ICT sector is understood as Section J of NACE Rev. 2.

7.5.1. Growth of the ICT Industry in Poland

Over the last two decades, Poland's information and communication technology (ICT) sector has grown substantially, emerging as a vital driver of economic growth. According to OECD data, in 2020, the ICT industry in Poland employed 456.3 thousand people [OECD, 2023b], with the share of value added by ICT sector enterprises in GDP standing at 3.8%, compared to the EU average of 7.1% [Statistics Poland, 2023b, pp. 33–34]. Poland has attracted investments from major global tech firms, including Visa, Google, Amazon and Microsoft. According to the *Emerging Europe Future of IT* report, in 2023, Poland was one of the three most competitive IT markets in Central and Eastern Europe. The value of the ICT sector increased by 14% year-on-year, exceeding PLN 107 billion [Trade.gov.pl, 2024].In terms of attracting investments in science, technology, engineering and maths (STEM), Poland ranks fifth in Europe and within the top ten worldwide. Such investments reinforce Poland's position as a key player in the global ICT industry, particularly in software development, IT services and business process outsourcing. Foreign direct investment in Poland's ICT sector in 2022 represented 5.4% of total FDI, amounting to EUR 13 568.1 million, up by nearly 44% since 2015 (Figure 7.5) [NBP, 2024].

According to data from Statistics Poland [2023b, p. 23], in 2022, there were 2712 companies in Poland employing 10 or more people, of which 91.9% provided ICT services. Data from Orbis database reveal that the top ten among these companies, both by revenue and employment, include two from Poland. In the first case these are Asseco Poland SA and Polkomtel sp. z o.o., while in the second case they are Asseco Poland SA and Comarch SA (Table 7.3) [Orbis, 2023]. Companies specialising in the Computer programming, consultancy and related activities, Telecommunications, and Programming and broadcasting activities divisions dominate the Section J – Information and Communication.

Figure 7.5. Total FDI in the ICT sector in 2015–2022 by economic activity (EUR millions)



Source: own elaboration based on NBP [2024].

Table 7.3. Top 10 ICT companies in Poland by revenue (USD) and workforce in 2023

	Company	Revenue	Company	Employment
1	Asseco Poland SA	4 305 667	Asseco Poland SA	33 062
2	Orange Polska SA	3 455 909	Capgemini Polska sp. z o.o.	11 568
3	P4 sp. z o.o.	2 817 672	Orange Polska SA	9063
4	Allegro sp. z o.o.	1 940 688	Sii sp. z o.o.	7700
5	Polkomtel sp. z o.o.	1 842 618	Nokia Solutions And Networks sp. z o.o.	6821
6	T-Mobile Polska SA	1 747 478	Comarch SA	6479
7	Nokia Solutions And Networks sp. z o.o.	699 153	UBS Business Solutions Poland sp. z o.o.	5270
8	Canal+ Polska SA	646 615	Epam Systems (Poland) sp. z o.o.	4771
9	Capgemini Polska sp. z o.o.	632 901	HSBC Service Delivery (Polska) sp. z o.o.	4496
10	TVN SA	596 209	Atos Poland Global Services sp. z o.o.	3930

Source: own elaboration based on Orbis [2023].

According to OECD data, in 2020, the share of foreign value added (FVA) in the exports of Poland's ICT and electronics sector reached 53.9%, marking the second-highest result among Polish economic sectors [OECD, 2023], while in the same year, the share of foreign value added in the exports of Poland's ICT industry, as reported by OECD TiVA statistics, stood at 21% (up from 19.4% in 2015). Within the Section

J – Information and communication, the highest FVA share of 23% (18.8% in 2015) was recorded in Divisions 58–60 – Publishing, video and television programme production, sound recording, programming and broadcasting activities. The ICT sector's contribution to the total foreign value added in exports amounted to 1.1% (up from 0.7% in 2015), with Divisions 62–63 – Computer programming, consultancy, and related information services, playing the largest role. Simultaneously, 51% of domestic value added in the ICT sector was driven by foreign demand (compared to 38.4% in 2015). The highest share within this section (63.8%) was attributed to Divisions 62–63 – Computer programming, consultancy and related information services. In 2020, the share of imported intermediate goods and services in ICT sector exports reached 46.2% (up from 38.2% in 2015), exceeding the OECD average of 44.5%, and once again, the highest value for this indicator (47.2%) was observed in Divisions 62–63 – Computer programming, consultancy and related information service. The domestic services content in gross exports for the ICT sector in 2020 was nearly 76%, with the highest share (77%) recorded in Divisions 62–63 – Computer programming, consultancy and related information services. The presented data concludes that between 2015 and 2022, the Polish ICT sector deepened its connections within value chains, both backward and forward, which in the case of backward linkages is evidenced by an increase in the share of foreign value added (FVA) in sector exports. As for forward linkages, it is reflected in the rise in the share of domestic value added in the total value added generated by the sector, supported by foreign final demand. The industry also exhibited a significant reliance on imported intermediate goods and services in its exports. The most important contributors to Poland's domestic value added in gross exports of intermediate products are the EU-27 countries, with particularly strong regional ties observed between the ICT sector and Germany, as well as other EU-15 countries.

It is worth noting that ICT companies in Poland demonstrated a higher level of innovation compared to businesses in other sectors of the economy, with nearly half of the companies in this sector (46.8%) introducing innovations between 2020 and 2022, compared to a general innovation rate of 32.2% among all companies in Poland [Statistics Poland, 2023b, p. 23]. In 2022, expenditure on R&D activities in the ICT sector increased by 40.5% compared to the previous year, accounting for 18.6% of the country's total research and development spending [Statistics Poland, 2023a, p. 1, 2023b, p. 34; Dzienis, Kapturkiewicz, 2025]. Poland has developed a robust R&D infrastructure, supported by both public and private investments, and the presence of technology parks and innovation hubs, as well as collaboration between universities and industry, fosters innovation in the ICT sector.

7.5.2. Workforce in the Polish IT sector

The Polish ICT sector employs a highly skilled workforce, with a strong focus on engineering, computer science and mathematics, and the availability of well-educated professionals is a critical factor in Poland's integration into Global ICT Production Networks. Salaries in the ICT sector are above the national average, reflecting the demand for qualified specialists. Between 2015 and 2022, average gross monthly wages in Section J increased by 64% [Statistics Poland, 2024c], and in March 2024, the ICT sector reported the highest median salary across the entire economy, amounting to PLN 10 558.90. Similarly, the highest average salary was also recorded in this sector, reaching nearly PLN 15 thousand [Statistics Poland, 2024d, pp. 2–3]. Despite these figures, wages remain competitive compared to those in Western Europe and North America, making Poland an attractive location for ICT operations.

The Polish education system, particularly technical universities, plays a crucial role in supplying the ICT sector with highly qualified graduates, with Poland boasting a relatively high number of STEM graduates, contributing to its competitive standing in the ICT industry. According to Eurostat data, in 2023, ICT specialists accounted for 4.3% of total employment in Poland, compared to an EU average of 4.8%. Additionally, 78% of ICT specialists employed in Poland in 2023 held a higher education degree, which is significantly above the EU average of 67%, ranking Poland sixth among EU member states [Eurostat, 2024a].

Professional development and certification programmes are widely available, enabling employees to adapt to the rapidly evolving technological landscape. Nevertheless, there is a growing demand for more specialised skills in emerging fields such as artificial intelligence, machine learning and advanced cybersecurity.

The Polish ICT sector is characterised by a flexible labour market, with a significant portion of the workforce engaged in freelancing or contractual work, which is appealing to global companies, allowing them to scale operations quickly in response to shifting market demands. The popularity of remote work has also surged, particularly following the COVID-19 pandemic, further integrating Polish ICT professionals into global labour markets, a shift enabling them to provide services to companies worldwide without geographical limitations.

7.5.3. Labour market dynamics and global production networks

The Polish ICT sector is deeply integrated into Global Production Networks, with many local companies and employees participating in international projects and

collaborations, which provides Polish companies with access to global markets and innovation networks, simultaneously exposing them to international competition.

According to OECD TiM statistics, in 2020, 53.2% of employees in Poland's ICT sector were engaged in work to meet foreign demand [OECD, 2023b]. The highest share of employment supported by foreign final demand, at 64%, was recorded in Divisions 62–63 – Computer programming, consultancy and related information services, which underscores how participation in production networks contributes to employment growth while also highlighting the increasing dependency of sectoral labour markets on value chain linkages (Table 7.4).

Table 7.4. Trade in employment (TiM) in 2022 (% of employment)

	Domestic employment embodied in foreign final demand		Domestic employment embodied in gross exports of final products		Domestic employment embodied in gross exports of semi-finished product	
	2015	2020	2015	2020	2015	2020
Overall economic activities	30.78	34.05	13.81	14.71	17.21	19.62
Section J – Information and Communication	39.31	53.20	16.54	21.43	21.64	30.84
Divisions 58–60 – Publishing, video and television programme production, sound recording, programming and broadcasting activities	33.90	39.87	16.01	19.22	19.03	24.81
Division 61 – Telecommunications	20.39	26.92	12.06	16.80	9.95	17.02
Division 62–63 – Computer programming, consultancy and related information services	51.66	63.81	19.08	23.25	28.90	30.09

Source: own elaboration based on OECD [2023b].

Direct domestic employment supported by export activity measures employment in a given sector utilised in the production of goods and services exported by that sector within a country. This component dominates employment in Poland's ICT sector, accounting for nearly 38% of the sector's total employment in 2020, with indirect domestic employment embedded in the gross exports of the ICT sector equalling 14% of the sector's employment. Indirect employment supported by the export activity of a given sector, in this case ICT, refers to employment in other related domestic industries sustained by the ICT sector's exports. It can be observed that the export activity of Poland's ICT sector does not involve employment in related domestic industries supplying it with intermediate goods used for export to the same extent as, for example, in vehicle production. Re-imported domestic employment supported by

gross exports, which measures domestic employment in any sector within a country used to produce exports of intermediate goods and services that are later included in imports utilised for the production of exports by a given sector in that country [Horvát et al., 2020, p. 22], remains minimal in both Poland's ICT sector and the vehicle production sector.

In the context of wages analysed through the lens of participation in GVCs, the OECD [2023b] provides data on the share of domestic employee wages in relation to the gross exports of a given domestic industry, measuring domestic employee wages embodied in export activity as a percentage of gross exports [Horvát et al., 2020, p. 27]. For the ICT sector, the overall wage indicator embodied in export activity amounted to 34%.

In 2020, the 'direct' component of domestic compensation of employees embodied in gross exports within the ICT sector accounted for nearly 40%, with the 'indirect' component equalling 10.5% of domestic employee wages embodied in export activities, which means that the export activities of the ICT sector supported 40% of wages within the domestic sector and 10.5% of wages in related domestic sectors. Similarly, for wages, the re-imported domestic value of employee wages embodied in the export activity of both the ICT sector and vehicle production was minimal, suggesting that only a small share of wages was generated by re-imported exports from the sector for further export purposes (as part of the production chain for other goods or services within the country). Additionally, the domestic value of employee wages embodied in the export of final and semi-finished products in Section J – Information and Communication amounted to 13.62% and 20.18%, respectively, with the domestic value of wages embodied in foreign final demand, expressed as a percentage of total wages, at 54.23% for the ICT sector in 2020.

7.5.4. Summary

Alongside foreign direct investment, Polish ICT companies have also expanded their operations, becoming significant employers and generating relatively high revenue. Companies such as Asseco, CD Projekt and Comarch have emerged as key players in both European and global markets, offering specialised services, software products and IT solutions.

The Polish ICT labour market is characterised by a substantial talent pool, highly skilled professionals, and still-competitive wages, with the attractiveness of Poland's ICT workforce evidenced by the steadily increasing foreign direct investment in the industry.

From the perspective of participation in global value chains (GVCs), the ICT sector shows a growing share in the total foreign value added (FVA) in exports, while

simultaneously, over 50% of the domestic value added in the sector is embedded in foreign demand. Nearly 53% of employees in the industry were engaged in activities catering to foreign demand, while foreign final demand supported 54% of the sector's wages. Export activity in the ICT sector accounted for 38% of employment and 34% of wages in the industry. Between 2015 and 2020, the ICT sector deepened both forward and backward linkages within global value chains.

7.6. Discussion

The impact of a country's level of engagement in GVCs on its labour market is not straightforward [Wojtas, Pasierbiak, 2024] and depends on various factors. Szymczyk and Wolszczak-Derlacz [2022] highlight the differentiated effects of a country's relative position within GVCs on employment and wages, depending on the nature of the linkages (forward or backward), the income level of the economy, and the specific sectors involved, whether services or manufacturing. The objective of this chapter, however, was not to evaluate the effects of local labour market integration into GVCs but to present Poland's labour resources, exemplified by the automotive and ICT sectors, from the perspective of their linkages with production networks in the context of potential future integration models with GVCs.

Labour is a critical resource for both national economies and multinational companies, creating a dynamic interplay referred to as strategic coupling, and strategic thinking about this process from the perspective of a country's resources is therefore pivotal to shaping its future profile of integration within GVCs. The mutual interactions between local labour markets and investing firms, stemming from the social, networked and territorial embeddedness of resources [Coe, Yeung, 2015], underscore the importance of local social, cultural and institutional characteristics in aligning regional assets with Global Production Networks. The balance of power among actors within strategic coupling offers opportunities for economies to secure more advantageous positions in Global Production Networks (GPNs), which is achievable when domestic actors capture stages of production that generate higher value added, often located at the initial and final phases of the value chain [Kuźnar, 2017]. In the long term, this involves fostering an economy centred on innovative production and service activities [Jankowiak, 2024], and understanding which companies and locations successfully capture value added contributes to strengthening a country's role in GPNs. Moreover, the negotiating position of regional institutions improves as local resources align more closely with the needs of lead companies [Coe, Yeung, 2015]. Looking ahead, reinforcing institutional frameworks for GVC integration is particularly important,

which is crucial for developing domestic resources in a manner that ensures long-term, sustainable growth and benefits future generations.

Both the automotive industry and the ICT sector in Europe face challenges stemming from technological transitions towards electric vehicles, autonomous driving, automation, robotics and digitalisation, with both the green and digital transitions set to impact production networks in many dimensions, affecting economies at the core, semi-periphery and periphery of global value chains. Pavlínek [2022] suggests that better developed core and semi-peripheral countries will adapt more swiftly to these changes due to their innovative capacities and institutional support.

In the long term, ICT sector products and semi-finished products will become increasingly important components of automotive industry development, and cross-sector collaboration in building production capabilities for the emerging sector of alternative and autonomous vehicles is becoming an urgent necessity. Pavlínek [2022] highlights the importance of specialised regional resources, particularly in research and development (R&D) and innovation, not only in improving but also in maintaining a country's position within the GVC hierarchy. Talent pools, employee qualifications, education and progressive upgrading – shifting economic activities towards R&D and innovation – form the foundation for new opportunities and greater benefits from participation in value chains.

It is essential to acknowledge that relying on low labour costs as a competitive advantage is a risky development strategy, not least because surplus labour in many Eastern European countries is shrinking [Pavlinek, 2023]. This approach also affects the education of future generations of workers, potentially resulting in a talent drain abroad or discouraging younger generations from pursuing skill development. Pavlinek [2023] offers a somewhat pessimistic perspective, suggesting that Eastern Europe's dependence on foreign capital for growth – and consequently its position within European value chains and Global Production Networks, particularly in the automotive industry – is unlikely to improve, which makes it even more crucial to recognise the potential of local labour resources and the role of institutional support, particularly in growth-oriented industries and those more deeply integrated into GVCs, to foster domestic technological advantages and talent development.

Pietrobelli [2021, p. 448] defines "GVC-oriented policies" as "multidimensional and cross-cutting", which "affect various aspects and require a systemic vision and coordinated action by multiple stakeholders", further explaining that "investment attraction should favour projects with greater potential for creating local linkages. Innovation systems must align with GVCs and leverage mutual interdependencies. Policies on education, training and migration must also consider GVC dynamics, consistently attracting and nurturing talent" [Pietrobelli, 2021, p. 448].

By mobilising their unique resources, national or regional institutions can avoid one-sided power relations favouring lead companies [Coe, Yeung, 2015], and labour, particularly highly skilled workers, can serve as such a critical resource.

7.7. Conclusions

The ongoing reconfiguration of global production networks driven by digitalisation and the green transition has introduced new players to the international arena, shifted the balance of power within global production networks, implemented new regulatory constraints, and seen the competitiveness of economies increasingly supported by substantial state and institutional funding for new technologies. As the global automotive industry undergoes transformation, Poland will need to focus on enhancing workforce skills, investing in innovation, and improving working conditions to maintain its competitiveness within GVCs. To this extent, the challenges posed by digitalisation and the electrification of the automotive industry require urgent attention, with the extensive supply chains supporting the production of traditional vehicles presenting potential risks to Poland's automotive sector and its labour market. At the same time, this situation should galvanise institutions into formulating and implementing policies aimed at fostering integration with GVCs in a way that capitalises on Poland's resources and strengths.

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Chapter 8

Global Value Chains and Poland's Innovativeness – The Macro-, Meso- And Microeconomic Perspective

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8.1. Introduction

The aim of this chapter is to identify the channels through which global value chains (GVCs) influence the innovativeness of the Polish economy on three levels: macroeconomic, mesoeconomic and microeconomic. From a macroeconomic perspective, the analysis focuses on the interdependence between GVCs and the national innovation system, which encompasses entities engaged in research and development (R&D), institutional factors, and the knowledge resources accumulated within the economy. A key role in this system is played by the interactions among these elements, which lead to the creation of new solutions, their introduction to the market, and the subsequent dissemination of innovations [Weresa, 2012, 2022]. In light of this definition, this chapter specifically aims to explore how GVCs affect three key components of Poland's national innovation system: R&D funding, human resources in R&D, and the creation of knowledge resources.

On the mesoeconomic and microeconomic levels, the chapter aims to identify the factors shaping the international competitiveness of Polish enterprises in comparison to other EU countries. This analysis is based on data from the Community Innovation Survey 2018–2020, which highlights the diversification of exports by innovation-active enterprises and their innovation potential, measured by internal R&D expenditure and the level of collaboration in innovation. The analysis serves as a basis for identifying sectors of the Polish economy that are most engaged in GVCs, with a high degree of internationalisation measured by the share of a sector's exports in Poland's total exports and its enterprises' innovation activity.

Additionally, at the mesoeconomic level, the chapter examines the inclusion of industrial clusters in GVCs and evaluates the significance of this phenomenon for

economic competitiveness, as well as assessing the internationalisation of cluster initiatives in Poland.

The chapter concludes with a detailed analysis of the innovation behaviour of enterprises in selected sectors: D20 – Manufacture of chemicals and chemical products, D27 – Manufacture of electrical equipment, and D29 – Manufacture of motor vehicles, trailers and semi-trailers, excluding motorcycles. The analysis evaluates their potential and highlights potential areas for increased activity.

8.2. Global value chains and innovativeness – a macroeconomic perspective

The emergence and development of global value chains (GVCs) and their impact on national innovation systems is a complex process, characterised by two complementary directions:

- consolidation and deepening of economic specialisation based on existing traditional technological advantages,
- intensification of international cooperation aimed at accessing and transferring foreign scientific achievements.

While continuing and strengthening traditionally established technological specialisation enables countries to reinforce their competitive advantages in areas based on existing knowledge and experience existing knowledge and experience, thereby enhancing their position within GVCs. At the same time, international cooperation allows them to benefit more fully from knowledge and innovations developed in other parts of the world. This applies both to research and development (R&D) activities conducted in foreign research centres and the overseas expansion of domestic enterprises that operate within global value-added chains, with these transformations leading to the development of new research and technological linkages within GVCs, integrating national innovation systems with the global scientific and technological ecosystem. As a result, enterprises and research institutions can not only adapt foreign innovations but also enrich their knowledge base through collaboration with international partners, which contributes to diversifying national innovation systems and deepening technological specialisation. These processes can foster the creation of new technological niches where domestic entities may gain competitive advantages in international markets.

In the context of the evolution of innovation studies, two aspects are particularly noteworthy. The first is the shift in the way innovation is analysed, which is increasingly viewed from a systemic perspective. Innovations are no longer seen merely as individual achievements of research units or companies but as outcomes of interactions among

entities within innovation systems and the gradually emerging international innovation ecosystem. A systemic approach reveals how various actors involved in the creation and transfer of knowledge – such as research and development institutions, businesses, public administration, innovation users, and institutional arrangements, including science and innovation policies – contribute to the development and transfer of new knowledge [for more see Weresa, 2012, 2022].

The second aspect is the growing connections between entities from different countries in both research activities and innovation processes, which allows for more efficient utilisation of global resources and intellectual capital. Strengthening ties within GVCs can accelerate innovation processes and improve the adaptation and application of new technologies in global markets.

In this way, traditional models of national innovation systems can transform into more complex structures integrated with international R&D networks, allowing local firms – and consequently, countries – to specialise in niche technologies and better utilise resources available within GVCs [Lema, Pietrobelli, Rabellotti, 2021]. Participation of domestic entities in GVCs fosters innovation through the research and innovation activities of foreign-owned firms operating in local markets, knowledge transfer, learning from foreign practices, and spillover effects [Zhang, 2014; Narula, Pineli, 2017; Crescenzi, Gagliardi, Iammarino, 2015; Weresa, Napiórkowski, 2018]. Companies benefit from advanced technologies and specialised knowledge embedded in imported intermediate goods, which can enhance productivity and innovation, particularly in developing countries where indigenous technological capabilities may be limited [Crescenzi et al., 2015; Eissa, Zaki, 2023], although the realisation of these opportunities resulting from R&D and innovation linkages within GVCs does not occur automatically. The relationship between GVCs and the innovation ecosystem is non-linear and depends on several factors, including the level of economic development and the national innovation system [Pietrobelli, Rabellotti, 2010; Lee, Szapiro, Mao, 2018], institutional factors [Pietrobelli, Rabellotti, 2011], including national innovation policies [Eissa, Zaki, 2023; Elshaarawy, Ezzat, 2023], and numerous microeconomic variables. Empirical studies demonstrate that among the microeconomic factors shaping the impact of GVCs on innovation, the direction, strength and scope of collaboration between domestic and foreign firms within GVCs are significant [Javorcik, Lo Turco, Maggioni, 2018; Lema et al., 2021]. Additionally, the position of firms within GVCs [Ito, Ikeuchi, Criscuolo, Timmis, Bergeaud, 2023], the financial health of firms involved in GVCs [Elshaarawy, Ezzat, 2023], and the specific structure of the GVC in which a firm operates [Bucioun, Pisano, 2021] play critical roles.

As highlighted in Chapter 1 of this monograph, there are risks associated with the unequal contribution of different elements within a value chain to the creation of

added value, and a related danger of becoming trapped in low-value-added activities. Such a situation may arise if domestic entities fail to expand their involvement in R&D within GVCs or if firms focus solely on incremental improvements required by GVCs rather than pursuing broader, breakthrough innovations. This risk is particularly pronounced in vertical, hierarchically structured GVCs, where leading firms dictate standards and processes, limiting the ability of local firms to experiment and innovate. Consequently, firms may become confined to specific roles, restricting their potential for innovation beyond the immediate requirements of their GVC partners [Elshaarawy, Ezzat, 2023]. Dependence on GVCs dominated by foreign entities may hinder the capacity of local firms to develop innovative capabilities, especially if they lack the resources or institutional support necessary for modernisation [Lee et al., 2018; Ito et al., 2023].

Synthesising the findings of the relevant literature, the impact of foreign-owned firms and their links within GVCs on the innovativeness of the host country can occur across at least several dimensions:

- direct impact on innovation through the creation of innovations in the local market,
- transfer of achievements from the firm's country of origin or other markets,
- indirect influence on innovation by affecting local enterprises through competition, imitation and cooperation,
- external (spillover) effects – technological, economic and environmental.

In the long term, institutional and systemic effects may also emerge, influencing institutions, technological policy, education policy and other areas.

In light of theoretical considerations regarding the relationship between GVCs and the development of national innovation systems, a key question arises: how does Poland's participation in GVCs shape its national innovation system? This analysis focuses on only one of the aspects mentioned above, namely the direct impact of firms with foreign participation operating in Poland on the Polish innovation system, which is reflected in the participation of foreign entities in funding R&D, employing local scientific personnel, and their contribution to the creation of new knowledge, measured by patent applications submitted to the Polish Patent Office for intellectual property protection by foreign entities operating in Poland. Other aspects, such as interactions with local enterprises or influence on national institutions, fall outside the scope of this chapter, with the interpretation of macroeconomic analysis results consequently pertaining exclusively to the direct impact of GVCs on the national innovation system.

Foreign-owned enterprises operating in Poland and linked to GVCs with firms abroad play a significant role in business sector expenditures on R&D in Poland. Their share in the total R&D expenditure of the business sector in Poland reached 53% in 2022, marking an increase of 10 p.p. since 2011, which underscores the growing importance

of these entities within Poland's innovation system. Most European countries report a lower share of foreign-owned enterprises in R&D funding compared to Poland, for example 31% in Germany and 25% in Italy. Firms with foreign participation play a relatively larger role in the national innovation systems of Czechia, Hungary and Ireland (Table 8.1).

Table 8.1. Expenditures on R&D by enterprises with foreign participation as a percentage of total enterprise expenditure – Poland compared to selected EU countries in 2011–2022 (%)

Country	2011	2013	2015	2021*
Poland	**44.8**	**47.0**	**44.7**	**53.5**
Czechia	NA	62.8	61.4	NA
Hungary	62.6	60.1	66.1	NA
Slovenia	29.1	NA	42.1	NA
Netherlands	32.5	31.3	32.4	NA
Germany	26.1	22.4	21.5	31.1
Italy	24.2	23.3	25.1	25.5
France	27.5	21.1	20.6	NA
Ireland	65.6	65.2	63.7	59.6

* Data for 2021, or the latest available data.

Source: own elaboration based on OECD [2019, Table 61] and Statistics Poland [2024, Table 2].

The significance of foreign-owned companies in Poland's innovation system is also demonstrated by the fact that in 2022, 1128 private enterprises with foreign participation conducted R&D activities in Poland, representing 17% of all private enterprises engaged in R&D (Table 8.2), allocating the majority of their R&D expenditure in Poland (86%) to evelopment work, with only 6% directed towards basic research (Figure 8.1).

According to Statistics Poland, in terms of R&D fields, engineering and technical sciences dominated the research activities of foreign-owned firms in Poland, accounting for 63% of total R&D expenditures by this group. The next most attractive field for R&D activities of firms with foreign participation is natural sciences, absorbing 28% of R&D expenditures, followed by health sciences (9%), ranked third (Figure 8.2), which aligns with the proportions of R&D personnel employment (Table 8.2). Expressed in full-time equivalents (FTE), it is evident that in each of the three scientific fields attractive to foreign enterprises operating in Poland, the share of research personnel employed by these firms exceeds half of the total researchers engaged in R&D activities within private enterprises in Poland, even though this group of firms held relatively less research equipment. According to Statistics Poland, in 2022, the value of

research apparatus owned by foreign-capital enterprises conducting R&D in Poland constituted 35.6% of the total research equipment in private enterprises (Table 8.2).

Table 8.2. R&D activities of private sector enterprises with foreign participation compared to all private sector companies in Poland in 2022

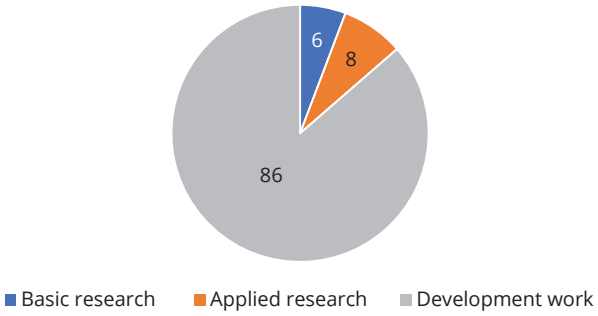
	Private enterprises by ownership				
	Total	Domestic or predominantly domestic ownership	**Foreign or predominantly foreign ownership**	Mixed ownership	Share of foreign- or predominantly foreign-ownership (%)
Number of entities conducting R&D activities	6606	5377	**1128**	101	17.1
Internal R&D expenditures (thousands of PLN), including:	26 605 689.1	12 088 736.6	**14 244 616.6**	272 335.9	53.5
▪ basic research	1 424 196.2	594 077.1	**819 700.9**	10 418.2	57.6
▪ applied research	2 925 304.2	1 710 263.7	**1 119 196.9**	95 843.6	38.3
▪ development work	22 256 188.7	9 784 395.8	**12 305 718.8**	166 074.1	55.3
Research apparatus (gross value, thousands of PLN)	8 368 167.3	5 354 118.7	**2 976 549.0**	37 499.6	35.6
R&D personnel (individuals)	153 344.0	79 097.0	**72 591.0**	1656.0	47.3
R&D personnel (FTE) by executive sector and domain	65 363.2	27 450.8	**37 410.3**	502.1	57.2
▪ life sciences	18 731.7	8587.9	**10 014.0**	129.9	53.5
▪ engineering and technology sciences	40 408.3	15 877.9	**24 201.9**	328.6	59.9
▪ medical and health sciences	4479.8	2093.8	**2351.4**	34.6	52.5
▪ agricultural and veterinary sciences	720.5	440.1	**0.0**	0.0	0.0
▪ social sciences	929.8	378.4	**0.0**	0.0	0.0
▪ humanities and arts	93.1	72.8	**0.0**	0.0	0.0

Source: own elaboration based on Statistics Poland [2024, Tables 1–5, 10, 17].

What are the effects of the research activities of enterprises with foreign participation operating in Poland and linked within value chains with entities in other countries? The scope of innovative solutions developed by enterprises with foreign capital participation is illustrated by the number of patents, industrial designs and utility models submitted by these entities for intellectual property protection in Poland (Figure 8.3). Based on the analysis of Statistics Poland [2024] data, synthetically illustrated in Figure 8.3, several conclusions can be drawn regarding changes in these indicators in the period 2015–2022:

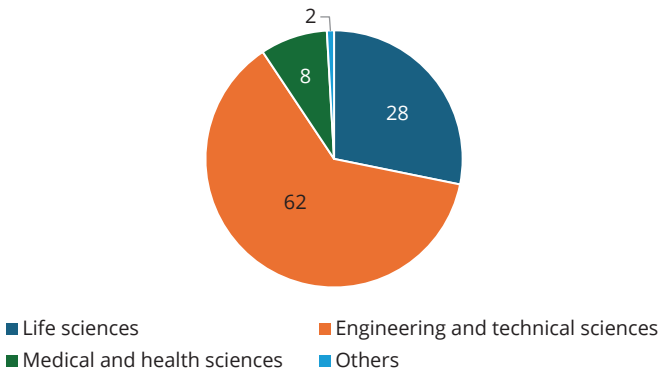
- the number of patent applications showed a declining trend, decreasing by more than half, from 139 applications in 2015 to 83 in 2022,
- the share of foreign-capital enterprises in the total number of patent applications filed by enterprises in Poland is small, and even decreased slightly from 2.9% in 2015 to 2.5% in 2022,
- industrial design and utility model applications submitted for protection in Poland fluctuated at a stable level of several dozen applications annually, accounting for 5.4% and 9.4% of the total number of applications of these types in 2022, respectively; the share of industrial design applications remained relatively stable during the analysed period, while the importance of utility model applications submitted by foreign entities for protection in the total number of such applications increased.

Figure 8.1. Expenditures on R&D by enterprises with foreign participation in Poland by type of research in 2022 (%)



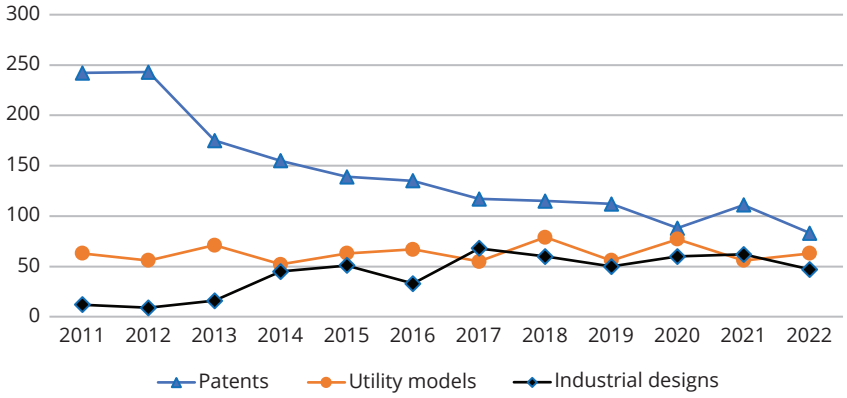
Source: own elaboration based on Statistics Poland [2024, Table 4].

Figure 8.2. Expenditures on R&D by enterprises with foreign participation in Poland by R&D fields in 2022 (%)



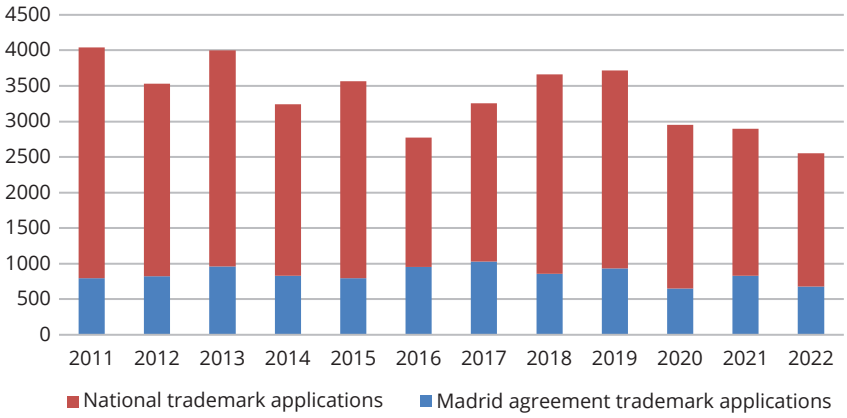
Source: own elaboration based on Statistics Poland [2024, Table 5].

Figure 8.3. Patent applications by entities with foreign participation in Poland in 2011–2022



Source: own elaboration based on Statistics Poland [2024, Table 1(66)].

Figure 8.4. Trademark applications by foreign entities in Poland in 2011–2022



Source: own elaboration based on Statistics Poland [2024, Table 1(66)].

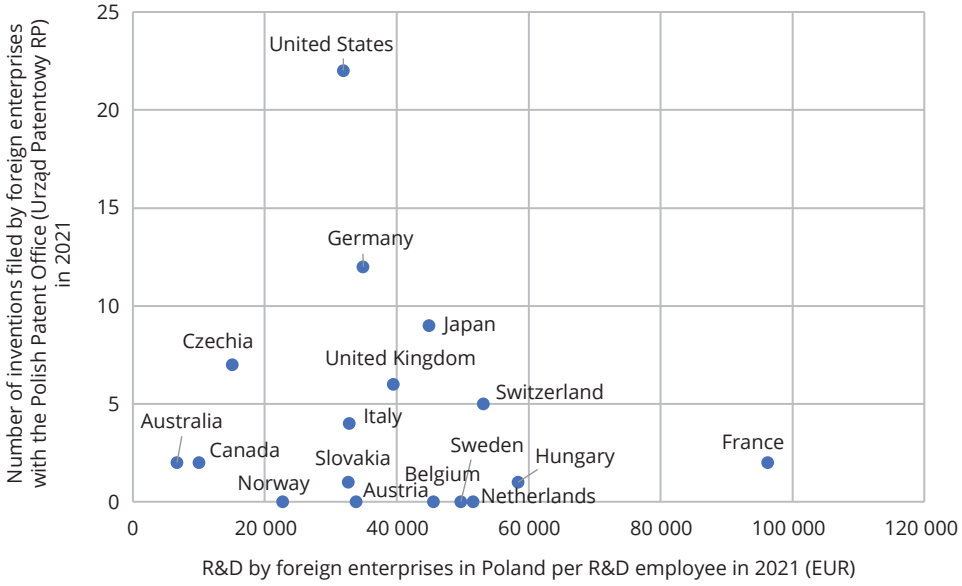
Trademarks and their protection represent another outcome of GVC connections. Some fluctuations in the number of trademark applications can be observed in the period from 2011 to 2022; however, a generally declining trend is noticeable, both for domestic applications and those made under the Madrid Agreement, with the latter predominating, since trademarks of international companies operating in global markets are registered in Poland primarily through this procedure (Figure 8.4). Compared to other types of intellectual property (patents, utility models, and industrial designs) submitted for protection in Poland by foreign-capital enterprises, the number

of trademarks is relatively high (1876 in 2022), and their share in the total number of trademark applications is higher than for other types of intellectual property, despite a decrease from 22% in 2015 to 17.6% in 2022.

In the context of the impact of GVCs on Poland's innovation system, it is worth complementing the above analysis with the geographical directions of GVC linkages and their connection to Poland's innovation system.

According to Eurostat [2024] data, in 2022, enterprises in Poland controlled by foreign entities spent EUR 1029 million on R&D in the country, of which 77.4% was spent by firms located in the EU, while 22.6% came from firms outside the EU. Among these, the largest investors in R&D were entities with shareholders from Germany, France, Ireland, the United States and Sweden, and these same countries, albeit in a slightly different order, also lead in terms of R&D personnel employed in Poland by firms with foreign participation. Subsidiaries of German firms rank first in this group, followed by those from the United States, Ireland, Sweden and France.

Figure 8.5. R&D expenditure by foreign enterprises in Poland per R&D employee compared to patents filed by these enterprises, geographical distribution in 2021



Source: own elaboration based on Statistics Poland [2024, Table 2(67)] and Eurostat [2024].

The question arises as to what extent R&D expenditures incurred in Poland by foreign-owned firms translate into innovative outcomes. Figure 8.5 illustrates the relationship between R&D expenditures per employee in the analysed enterprises

and the number of patent applications filed by these firms in Poland, presented geographically. The first conclusion from the data analysis pertains to the unequal patent activity of foreign-owned firms in Poland, with the most active in patenting in Poland being firms from the United States and Germany, even though these firms are not leaders in R&D expenditure per researcher employed in Poland. In this regard, firms from France, Hungary, Switzerland and the Netherlands lead the group. The second conclusion from the analysis of Figure 8.5 concerns the relationship between R&D expenditures per employee and patent activity. Statistical data does not indicate the existence of such a relationship for firms with foreign participation operating in the Polish market, and the R&D expenditure incurred in Poland by firms with foreign participation per R&D employee is not clearly correlated with the patent activity of these enterprises in Poland. It is also worth noting that the number of patents obtained by foreign-owned firms conducting R&D in Poland is small and exhibits a declining trend (as shown in Figure 8.3), and over the entire analysed period (2015–2022), more than half of patent applications by these firms were domestic in nature. For example, in 2022, of the 83 inventions submitted for patenting, 52 applications (62%) were made under the domestic procedure [Statistics Poland, 2024, Table 2(67)].

Based on the analysis of Figure 8.5 and the patent activity of firms with foreign participation in Poland, it can be observed that the contribution of this group of enterprises to Poland's innovation system primarily involves the implementation of incremental innovations or solutions previously applied in other countries, rather than the introduction of breakthrough innovations that would be reflected in obtaining patents in Poland. This conclusion pertains solely to one aspect of their impact – namely, the direct contribution of creating new, globally unique solutions in Poland that could be patented, and a future direction for research on this issue could involve identifying their impact on domestic enterprises and spillover effects.

8.3. Participation in global value chains (GVCs) and the international competitiveness and innovation potential of enterprises

The international competitiveness of an enterprise refers to its ability to effectively compete in international markets and achieve a sustainable competitive advantage over its foreign rivals [Gorynia, Łaźniewska, 2009, pp. 61–63; Dorożyńska, Kłysik-Uryszek, Kuna-Marszałek, 2020].

Enterprise internationalisation, being both a cause and a result of participation in global value chains (GVCs), leads to numerous challenges, including the necessity

to adapt to foreign regulations, quality standards and technical requirements. At the same time, it enhances competitiveness by enabling the acquisition of new experiences and the introduction of innovative solutions [Jaklič, Trąpczyński, Puślecki, 2023].

Participation in GVCs allows enterprises to not only diversify their revenue sources but also scale up their operations, which can contribute to long-term development and help stabilise export levels [Díaz-Mora, Gandoy, Gonzalez-Diaz, 2018], fluctuations of which were acutely felt during the pandemic crisis [Gorynia, Trąpczyński, 2022].

However, the key element in building an enterprise's competitiveness over the long term lies in the introduction of product innovations, which, through offer differentiation, are a more crucial factor in creating an advantage in many industries than process innovations, which primarily support cost advantages [Chen, 2018].

The degree of innovativeness of an enterprise can be assessed based on its capacity and willingness to implement innovations. Innovative capacity refers to an organisation's ability to generate, develop, effectively implement, and commercialise new ideas or innovative solutions [Stawasz, 2013], with this resource- and input-oriented approach placing particular emphasis on the level of investment in research and development (R&D) activities [Solarin, Lopez, Gil-Alana, 2022]. However, innovative capacity is not solely a financial matter; it also encompasses organisational skills related to the effective management of innovation projects, the ability to adapt technologies, and the integration of internal and external knowledge.

Willingness to innovate, the second pillar of innovativeness, pertains to an enterprise's readiness to take risks associated with implementing new solutions, even when there is uncertainty about their market success [Daronco, Silva, Seibel, Cortimiglia, 2023].

Research indicates that a high level of both innovative capacity and willingness to innovate is a key factor in gaining a competitive advantage, particularly in highly technological industries. Organisations that effectively invest in R&D and promote an innovative culture [Strychalska-Rudzewicz, Sobol, 2023] are more likely to maintain leadership positions in their sectors and adapt to changing market conditions [Büschgens, Bausch, Balkin, 2013; Pedraza-Rodríguez, Ruiz-Vélez, Sánchez-Rodríguez, Fernández-Esquinas, 2023].

A critical factor in fostering innovativeness is collaboration in innovation, which involves integrating external sources of knowledge and technology with an enterprise's internal innovation processes [Lewandowska, 2018]. Cooperation with business partners, scientific institutions or competitors enables faster and more effective market introduction of innovations, with knowledge management playing a pivotal role in this process and open innovation regarded as a driving force for economic development and business success [Bigliardi, Ferraro, Filippelli, Galati, 2020]. Firms

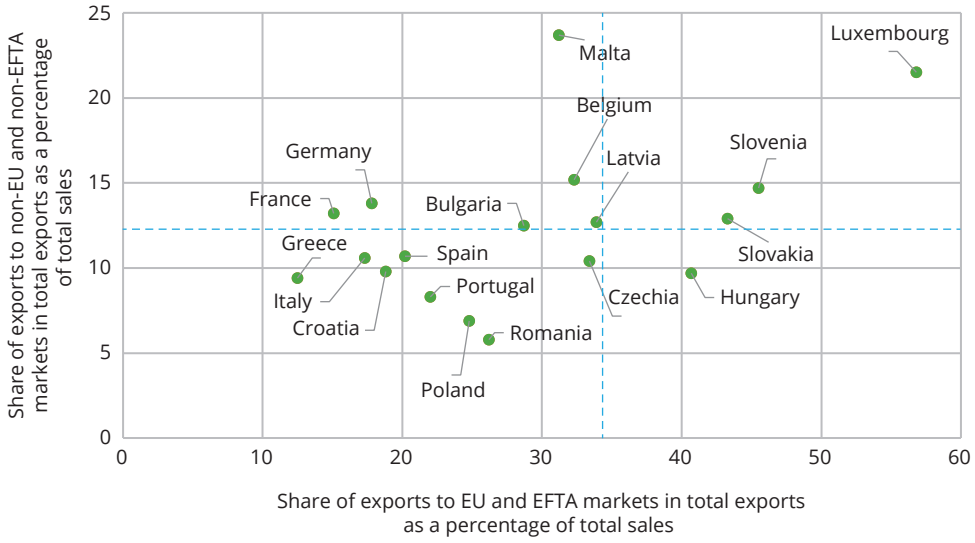
that collaborate with a broad range of partners expand their R&D horizons, facilitating the implementation of more radical innovations [Amara, Landry, 2005; Aničić, 2024].

The level of technological advancement in an industry significantly influences the willingness of enterprises to engage in collaboration, while the complexity of technological processes and their dynamic changes [Malerba, Orsenigo, 1993] lead companies in high-tech industries to collaborate more frequently than those in lower-tech sectors [Wang, Hsu, 2014].

The empirical section begins with an analysis of the international competitiveness of Polish enterprises compared to those in the European Union, measured by declarations regarding export intensity and its geographical diversification. The next step is an analysis of the innovation potential of Polish enterprises, assessed through investments in in-house R&D and their willingness to collaborate.

The data used in this analysis comes from the Community Innovation Survey (CIS) for 2018–2020, a cyclical survey conducted in the EU and associated countries, aimed at collecting data on the innovation activities of enterprises. The CIS is one of the primary tools for monitoring and analysing innovation in Europe, and its methodology is based on the recommendations of the *Oslo Manual*, which defines concepts and indicators related to innovation [OECD, Eurostat, 2018].

Figure 8.6. Share of innovative enterprises exporting to EU and EFTA markets and other markets in 2018–2020 (%)



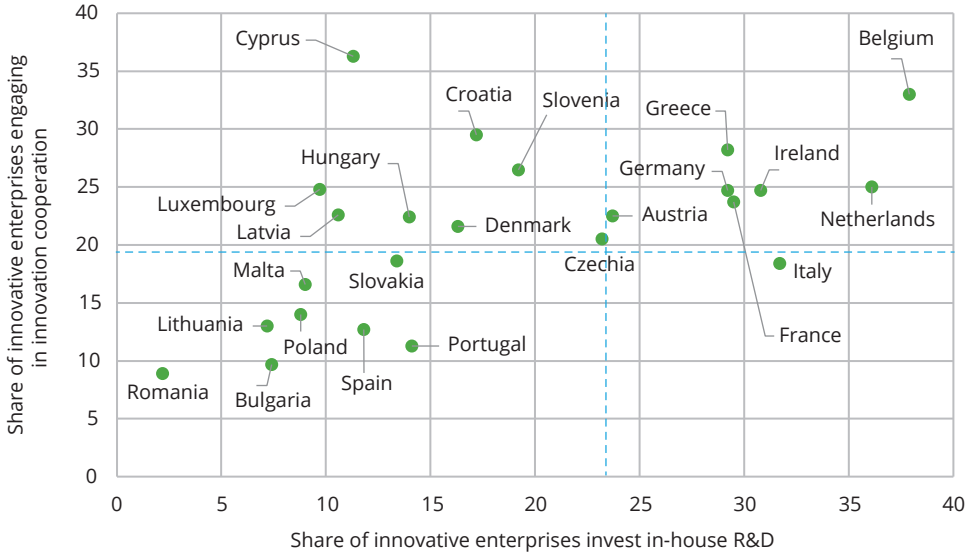
Source: own study elaboration on the CIS data (2018–2020) [Eurostat, 2020].

Figure 8.6 presents the share of innovative enterprises in the surveyed EU countries, based on CIS 2018–2020 data, using two variables partially illustrating connections within GVCs: the declared share of exports to EU markets in total sales and the share of exports to markets outside the EU as a percentage of total sales.

The size of the circles in the chart represents the share of innovative enterprises from a given country in the entire sample, with the highest percentage of innovative enterprises in the sample recorded in Greece (73%), Belgium (71%) and Germany (69%), and the lowest percentages observed in Hungary and Spain (33%), Lithuania (32%) and Romania (11%). In Poland, the percentage of innovative enterprises in the total sample was 36%, compared to an average of 47% for the 18 surveyed economies.

The presented data shows that the majority of innovative enterprises direct their sales to EU markets, and a higher share of exports in total sales is characteristic of smaller countries with less absorptive domestic markets. For example, more than 78% of innovative enterprises in Luxembourg direct their sales to foreign markets (including 57% to EU markets), with only 21.7% of sales aimed at the domestic market. Similarly high shares of foreign sales are observed for innovative enterprises in Slovenia (60.2%), Slovakia (56.2%) and Estonia (47.8%).

Figure 8.7. Share of innovative enterprises with in-house R&D departments and engaging in innovation cooperation in 2018–2020



Source: own elaboration based on the CIS data (2018–2020) [Eurostat, 2020].

For Poland and Germany, the proportions are significantly different, with 31.7% of innovative enterprises in both countries reporting sales to foreign markets (24.8% to EU markets for Poland and 17.8% for Germany). Meanwhile, 68.3% of sales for innovative enterprises in both Poland and Germany are directed to the domestic market.

Innovativeness is influenced by numerous variables, among which investments in R&D and the intensity of innovation cooperation play a crucial role. Figure 8.7 illustrates the performance of innovation-active enterprises in these two areas, and data clearly shows that countries from the so-called old EU lead in terms of both declared investments in-house R&D and cooperation in innovation. Enterprises from Poland, similar those from other countries in the region, exhibit significantly lower levels of innovation cooperation and investments in in-house R&D.

Despite identified limitations, Polish enterprises play a significant role in global value chains (GVCs), participating both as component suppliers and as manufacturers of final products. The dynamic growth of the economy, increasing competitiveness and integration with the EU market allow Polish companies to gradually increase their value-added within global production structures.

Analysing the position of specific sectors of the Polish economy within GVCs enables a better understanding of their contribution to the global economy and the identification of challenges and opportunities associated with further internationalisation of business activities, as well as the significance of GVC involvement for enterprises.

Table 8.3 provides a summary of Polish industrial manufacturing sectors[1], considering their share in Poland's gross exports and the share of foreign value-added (FVA) in the gross exports of a given sector in 2018, while the third variable considered is the declared innovation activity of enterprises in these sectors for the period from 2020 to 2022.

[1] Section B – Mining and quarrying: Division 05 – Mining of coal and lignite; Division 06 – Extraction of crude petroleum and natural gas; Division 07 – Mining of metal ores; Division 08 – Other mining and quarrying; Division 09 – Mining support service activities; Section C Manufacturing: Division 10 – Manufacture of food products; Division 11 – Manufacture of beverages; Division 12 – Manufacture of tobacco products; Division 13 – Manufacture of textiles; Division 14 – Manufacture of clothing; Division 15 – Manufacture of leather and related products; Division 16 – Manufacture of wood and cork products, except furniture; manufacture of straw and plaiting materials; Division 17 – Manufacture of paper and paper products; Division 18 – Printing and reproduction of recorded media; Division 19 – Manufacture and processing of coke and refined petroleum products; Division 20 – Manufacture of chemicals and chemical products; Division 21 – Manufacture of basic pharmaceutical substances and pharmaceutical preparations and other pharmaceutical products; Division 22 – Manufacture of rubber and plastic products; Division 23 – Manufacture of other non-metallic mineral products; Division 24 – Manufacture of basic metals; Division 25 – Manufacture of fabricated metal products, except machinery and equipment; Division 26 – Manufacture of computer, electronic and optical products; Division 27 – Manufacture of electrical equipment; Division 28 – Manufacture of machinery and equipment NES; Division 29 – Manufacture of motor vehicles, trailers and semi-trailers, excluding motorcycles; Division 30 – Manufacture of other transport equipment; Division 31 – Manufacture of furniture; Division 32 – Other manufacturing; Division 33 – Repair, maintenance and installation of machinery and equipment [Statistics Poland, 2024].

From the analysis, the sectors where the share in Poland's gross exports exceeded 5% in 2018 and where the FVA in gross exports was above 40% include: D20 – Manufacture of chemicals and chemical products (exports in 2018 accounted for 5.8% of Poland's total exports); D27 – Manufacture of electrical equipment (6.85% of exports); and D29 – Manufacture of motor vehicles, trailers and semi-trailers, excluding motorcycles (16.9% of exports).

Table 8.3. Polish industrial sectors classified by FVA share in gross exports, sector share in Poland's gross exports in 2018, including the percentage of innovative enterprises in the sector 2020–2022 (%)

Variables		The sector's share in Poland's gross exports		
		< 2.0	2.1–4.9	> 5
FVA share in the gross exports of the sector	40		D19***** D24*** D26***** D30****	D20**** D27**** D29****
	30–40	D07 (NA) D08*	D13** D14* D15* D17** D18**	D22** D25** D28**** D31* D32*** D33*
	< 30	D05***** D06 (NA) D09** D21*****	D16* D23**	D10* D11*** D12*

* Share of innovation-active enterprises in the total population of the sector at 30–20% (2020–2022). ** Share of innovation-active enterprises in the total population of the sector at 40–30% (2020–2022). *** Share of innovation-active enterprises in the total population of the sector at 50–40% (2020–2022). **** Share of innovation-active enterprises in the total population of the sector at 60–50% (2020–2022). ***** Share of innovation-active enterprises in the total population of the sector at 75–60% (2020–2022).

Source: study elaboration on Białowąs, Błaszczuk-Zawiła, Pasierbiak [2024] and Statistics Poland [2024].

Considering the innovation activity of enterprises in the three mentioned sectors, measured by the share of innovation-active enterprises in the sector's population, the values were 55.9%, 51.3% and 50.3%, respectively. These figures place the sectors within the 60–50% range, marked with four stars in the table, and significantly above the average for the entire Polish economy. However, as Białowąs, Błaszczuk-Zawiła, and Pasierbiak [2024] rightly point out, due to their significant participation in GVCs, these sectors are also the most exposed to potential global disruptions.

At this point, it is worth identifying the factors contributing to the strong position of entities in these three selected sectors, which is addressed through the analysis presented in Table 8.4.

Table 8.4. Overview of innovation activity in enterprises from the three Polish industrial sectors (D20, D27, D29) with the highest foreign value added (FVA) share in gross exports and the highest contribution to Poland's gross exports in 2020–2022 (%)

Variables	Result for Poland	D20 – Manufacture of chemicals and chemical products	D27 – Manufacture of electrical equipment	D29 – Manufacture of motor vehicles, trailers and semi-trailers, excluding motorcycles
Share of innovation-active enterprises	36.1	55.9	51.3	50.3
Strategies for ensuring the economic efficiency of enterprises (assessed as very important)				
Improvement of existing products or services	21.6	26.6	28.8	20.7
Introduction of new products or services	17.0	24.0	24.4	24.3
Offering low prices for products or services	19.3	24.3	16.3	19.9
Offering high-quality products or services	45.4	49.0	54.9	54.3
Offering a wide range of products or services	20.0	21.6	20.6	18.3
Reaching new customers	37.6	45.9	40.8	38.4
Offering standard products or services	19.4	19.5	19.3	18.8
Offering products or services tailored to individual customer needs	33.1	31.3	41.6	42.7
Innovation and intellectual property protection in enterprises				
Product innovations were implemented	32.2	49.5	48.3	43.3
Business processes were implemented	28.1	41.9	41.3	37.5
They sold or licensed their own intellectual property rights to other entities	0.9	2.5	2.8	0.3
They sold (or transferred) their own intellectual property rights to other entities	0.5	1.2	1.0	0.6
They participated in cross-licensing agreements of intellectual property rights	1.1	1.5	2.8	3.1
They filed patent applications with the Polish Patent Office	6.9	15.8	11.4	7.3
They registered inventions with foreign or regional patent offices	1.0	3.8	3.0	3.1
The share of enterprises that introduced new or improved products				
Products	14.2	33.9	29.2	27.1
Services	4.9	7.5	6.7	6.0
New to the market	6.6	14.6	14.9	10.7
New to the enterprise	10.8	28.4	19.7	19.0
Net revenues from the sales of new or improved products (goods and services) introduced to the market in 2020–2022 generated in 2022				
Total	14.8	33.2	28.0	26.9

Variables	Result for Poland	D20 – Manufacture of chemicals and chemical products	D27 – Manufacture of electrical equipment	D29 – Manufacture of motor vehicles, trailers and semi-trailers, excluding motorcycles
Export	7.9	16.1	17.8	19.9
Expenditure on innovative activities and expenditure financing sources*				
R&D work carried out in the entity (internal)	11.7	29.4	27.3	19.6
R&D work commissioned to other entities (outsourced)	2.5	9.3	5.5	6.1
Collaboration with other enterprises or institutions				
Total	13.2	25.3	27.2	22.5
Belonging to a group of enterprises	7.4	16.9	15.4	21.6
Consulting firms	11.3	21.0	18.1	15.1
Suppliers of equipment, materials, components	11.5	16.5	14.4	16.3
Competition	3.1	5.6	3.7	3.3
Customers	6.9	11.8	11.4	7.4
Other enterprises	7.6	9.9	8.9	10.7
Universities	9.7	18.6	16.6	10.4
Public research institutes	6.7	14.0	9.7	6.8
As part of a cluster initiative	2.7	5.8	5.5	1.2
Public support for innovative activities				
From local government units	12.0	9.9	10.5	15.2
From central government units	18.9	15.1	23.0	24.0
From the EU	8.0	10.3	11.1	4.8
From the EU *Horizon 2020* programme	1.1	0.9	3.3	1.2
The significance of factors related to climate change in business activities				
Government policies or instruments	6.2	8.2	7.1	6.5
Growing customer demand for products that help mitigate or adapt to climate change (e.g., low-emission products)	5.7	11.5	9.3	10.1
Increasing costs or expenditure resulting from climate change	17.0	24.0	16.6	16.4
Effects of extreme weather conditions	5.7	6.2	5.1	3.6

* Data for 2022.

Source: own elaboration based on the CIS for 2018–2020 data [Eurostat, 2020] oraz GUS [2024].

The data shows that entities in all three sectors exhibit above-average declared innovation activity compared to the average for entities in the entire Polish economy (2018–2020), translating into higher or significantly higher levels of activities such as: introducing product innovations and business process innovations, filing patent

applications, submitting inventions, conducting R&D activities independently, as well as outsourcing these activities. Above-average activity is also evident in the share of sales from innovative products in total sales, high declarations of R&D investments, and above-average intensity of innovation cooperation, including within clusters (details in Table 8.4).

8.4. Clusters and their internationalisation within global value chains

The advancement of globalisation, characterised by the elimination of trade barriers and improvements in transport and communication infrastructure, has led to increased global cooperation and resource flows, which is also evident in the activities of clusters, as they can serve as mechanisms for coordinating the actions of multiple entities, thereby enabling international expansion for both individual companies and groups of participants. Traditionally, clusters were perceived as spatially constrained and self-sufficient industrial systems that could interact with corporate entities only at the beginning and end of the production process, but growing interconnections in the global economy compel enterprises operating within clusters to expand their collaboration beyond the local level and engage with foreign partners. The conventional methodology assumes that the potential for business development in foreign markets depends mainly on internal factors, although the use of a network approach in the context of firm internationalisation is gaining importance. From this perspective, an enterprise is part of a broader network of entities that maintain diverse connections [Johanson, Mattsson, 2015].

Internationalisation is also gaining importance in the context of clusters, and is analysed in two fundamental dimensions [Jankowska, Götz, 2018]:

1) active internationalisation directed outward, which involves supporting the internationalisation of cluster members either indirectly, through a naturally conducive environment developed bottom-up, or through top-down designed activities aimed at stimulating foreign expansion via exports or foreign direct investment (FDI),
2) passive internationalisation directed inward, which focuses on increasing the attractiveness of FDI through economies of agglomeration, the dissemination of knowledge, and lower levels of uncertainty.

[Zeng, Liu, Wang, Zhan, 2019] notes that European clusters and cluster policies focus on supporting the international expansion of firms participating in cluster initiatives, whereas Asian clusters are primarily driven by FDI, and cluster policies in this region share many characteristics with special economic zones (SEZs).

The modern global economic system is characterised by a strong international fragmentation of production, leading to the integration of regional industrial clusters into global value chains. In this particular context, Michael Porter [Porter, 2008, pp. 252–253] observed the paradox of location, which refers to the lasting competitive advantage of firms in international markets, often tied to the local environment and various aspects of proximity, despite the ongoing trend of globalisation. The focus of this research is the concept of glocalisation, which encompasses the mutual integration of global economic elements and regional economic and social frameworks that participate in international networks. This phenomenon also applies to clusters, which often generate intermediate products serving as the foundation for the functioning of global value chains [Kowalski, 2022].

The integration of clusters into global value chains is linked to the fact that transnational corporations develop their chains by sourcing region-specific resources, including local knowledge, a strategy leading to the phenomenon of multiple embeddedness, where firms establish lasting and deep connections with multiple industry clusters [Riviere, Romero-Martínez, 2021]. Simultaneously, the value chains within clusters become dispersed, creating cooperative and competitive dependencies among individual industrial agglomerations, which occupy different or identical positions within the value chain. The improvement of competitiveness and the upgrading of a cluster integrated into global value chains can occur through [Gereffi, 2019]:

- process upgrading – increasing process efficiency through the reorganisation of production systems or the implementation of advanced technologies,
- product upgrading – diversifying the product range and producing higher-value-added products,
- functional upgrading – adopting new functions or altering the combination of existing tasks to increase the level of activity specialisation,
- inter-sectoral upgrading – engaging in new types of economic activity and entering new value chains by leveraging competencies gained through prior participation in other value chains.

Looking at clusters and global value chains in terms of governance, it can be said that clusters operate under a horizontal governance system, primarily coordinating local cooperation among firms and other organisations within and outside the cluster structure. Conversely, the governance of global value chains relies on a vertical governance system, which involves linking various buyers and suppliers across different countries, and although the coexistence of both systems in a given territory may lead to conflicts, such as asymmetry, proper coordination of these systems results in a favourable synergy effect, fostering industrial advancement, upgrading the region's economy, and improving its international competitiveness. Consequently,

the integration of clusters into global value chains provides a holistic perspective on economic processes, both top-down and bottom-up, the overlap of which is part of the analysis of the multi-polar governance system for global value chains [Dagar, 2021]. Even though the coexistence of both systems in a given territory may lead to conflict situations, such as those arising from asymmetry, their proper coordination contributes to a beneficial synergy effect, fostering industrial advancement and regional economic upgrading, thereby improving the region's competitive position on the international stage. The integration of clusters into global value chains provides a holistic perspective on economic processes, encompassing both top-down and bottom-up approaches, while the same time, the overlap of these approaches falls within the scope of the analysis of the multi-polar governance system for global value chains [Dagar, 2021].

Previous experiences of cluster initiatives in developing local and national cooperation positively impact the establishment of international connections for clusters within global value chains. These experiences enable potential foreign partners to connect with various entities in the domestic market and provide the necessary skills for implementing joint projects and ventures, resulting in the internationalisation of clusters positively influencing their organisational diversity. These clusters include groups of entities such as business service providers, financial institutions, supplier companies or associations of specialists from various fields. The presence of prominent research and scientific institutions in a cluster initiative is particularly important, as it increases the project's credibility and demonstrates to potential international partners the vast potential of knowledge and skills available. The added value in the form of technological development, knowledge acquisition, relationship building and innovation resulting from the internationalisation of clusters within global value chains enhances the competitiveness of cluster structures.

The adoption of Industry 4.0 solutions influences global value chains and relationships within them, and these solutions modify awareness of partners' progress in digital transformation, affect integration among partners, and lead to changes in diversification, geographic scope, and value chain management. According to [Osarenkhoe, Fjellström, 2024], the cluster organisation platform helps its member firms reach global markets, making them more competitive by granting access to global value chains and encouraging greater creativity. External linkages impact a cluster's ability to acquire external information and integrate it into production processes, with firms drawing knowledge from both their own activities and those of their partners [Bathelt, Li, 2020]. Conversely, clusters that rely solely on regional expertise may trap firms in outdated technology [Ito et al., 2023].

Data for the empirical analysis of the internationalisation of cluster initiatives in Poland is provided by a study commissioned by the Polish Agency for Enterprise

Development (PARP), titled *Benchmarking of Clusters in Poland – 2022 Edition*. In the area of internationalisation, the following subareas were assessed:

- internationalisation potential – 32 out of 41 analysed cluster initiatives provided services supporting the internationalisation of their members' activities, while among the 642 surveyed cluster members, 34% utilised such services directly or through the cluster, and 27% were offered internationalisation services but chose not to use them; the most frequently mentioned services included the organisation of trade fair visits and business missions, promotion of brands and products abroad, as well as soft support areas such as consultancy and training,
- international activity – 29 out of the 41 analysed cluster initiatives engaged in organising international events, 28 had signed cooperation agreements with foreign entities, 27 implemented international projects, and 20 (especially clusters from the ICT and automotive sectors) declared that their members included entities subject to direct foreign investments,
- exports and pro-export activities – 35 out of the 41 analysed cluster initiatives declared that cluster enterprises generated revenue from foreign sales, with the key export markets including: Germany (17 clusters), the United States (16), France (15), Canada (14), Ukraine (12), Belgium (11), Denmark, Italy, China, Sweden, Lithuania, Spain and Czechia (10 clusters each). At the same time, 27 out of the 41 analysed cluster initiatives declared participation in international trade fairs and exhibitions.

Annual editions of the benchmarking of clusters in Poland also document best practices in the area of cluster impact on the internationalisation of their participants' activities. The 2023 report [PARP, 2023] featured a case study on supporting the internationalisation of members of the Polish Automotive Group cluster, which during the COVID-19 pandemic faced the risk of supply chain disruptions involving production facilities located in Asia. Cluster members recognised the limitations of globalisation and the associated challenges in procurement and logistics chains, which inspired the cluster to launch a project called the Polish Automotive Production Hub (PAPH), aimed at foreign enterprises, particularly those in the automotive industry, interested in relocating their industrial production to Poland. The primary goals of the project are: providing technological and production support for new investments in Poland, promoting the Polish automotive industry, enhancing the competitiveness of Polish producers of automotive parts and components, integrating Polish automotive part manufacturers into new supply chains, and facilitating cooperation between foreign investors and Polish automotive manufacturers, such as through joint ventures or other forms of collaboration.

Poland's operational factories and their production capacity encourage foreign investors to consider relocating production without the need to build new facilities,

with the cluster assisting investors in developing supply chains, supporting investments, providing legal assistance and sharing expertise. The cluster coordinator promotes the cluster and attracts contractors, directing them to the appropriate cluster members. Meanwhile, cluster members are prepared to collaborate with investors, which may include hosting the investor's production line within their facility, leveraging their business partnerships, and proprietary technologies.

As part of the cluster, a decision was made to establish an export consortium PGM Automotive, which as a comprehensive and broad joint offering is more effective for serving investors and potential clients, as such an offering more easily attracts contractors and increases interest from entities outside the cluster. Under the common PGM Automotive brand, automotive parts are supplied to challenging markets in Africa and the Middle East. Collaboration and cooperation in such difficult markets yield positive results, such as securing clients for the diverse product offerings of various cluster members in Algeria, Saudi Arabia, Morocco and Guinea.

Additionally, the Polish Automotive Group organises seminars for potential suppliers, prepared in collaboration with automotive corporations, including client visits and member trips, such as the COSME project, under which four PGM members travelled to Japan, Singapore and the United States. The cluster also collaborates with major enterprises in the industry, such as Hyundai Motor Manufacturing Czech and Kia Motors Slovakia, to identify new suppliers in Poland [PARP, 2023].

8.5. Conclusions

The analysis of the significance of internationally connected companies conducting R&D activities in the Polish market for the Polish innovation system in this chapter focused on their direct impact on creating new solutions, although without considering the indirect impact related to the modernisation and innovation of domestic enterprises or spillover effects, which should be noted as a limitation of this study. Based on the macroeconomic analysis conducted in this chapter, the following conclusions can be drawn:

- Theoretical and conceptual considerations indicate that the relationship between GVCs and the innovation ecosystem is non-linear and depends, among other factors, on the level of development of the national innovation system and the overall economy. The functioning of GVCs fosters innovation through knowledge transfer and the associated learning processes of domestic entities based on foreign models, including spillover effects. However, there is a risk that foreign entities might dominate GVCs linkages, potentially limiting the innovativeness of local

innovative firms, especially in the absence of resources or institutional support from innovation policies.

- Companies with foreign capital account for a significant share of R&D expenditures by private enterprises operating in Poland, with the group's R&D investments constituting approximately half of the total expenditures of the private sector in Poland. The majority (86%) of R&D spending by internationally connected companies operating in Poland is allocated to development, with a focus on engineering and technical sciences.
- The patent activity of foreign-owned firms operating in Poland and integrated into GVCs shows a declining trend, which suggests that the innovations of these companies are more about transferring innovations new to the Polish market rather than creating novel solutions unknown globally. This conclusion is further supported by the lack of a clear relationship between the level of R&D expenditure per researcher incurred by companies with foreign participation in Poland and their patent activity.

Meanwhile, based on the sectoral and microeconomic perspective analysis conducted in the chapter, it can be concluded that:

- The literature indicates that company participation in global value chains (GVCs) contributes to international competitiveness by enabling revenue source diversification and enhancing the effects of their activities.
- Integration into GVCs can support the stabilisation of export levels, which is particularly important during economic crises such as the recent COVID-19 pandemic or the current geopolitical situation.
- The disruption of global value chains can lead to severe disturbances and a loss of competitiveness for companies, especially in industries heavily reliant on international suppliers. In response, companies should invest in supplier diversification, local value chains and risk management strategies to enhance their resilience in the face of such crises.
- Data collected through the CIS 2018–2020 questionnaire shows that innovation-active enterprises in countries with smaller and less absorptive internal markets, such as Luxembourg, Slovenia or Estonia, report a significantly higher share of innovative product exports in their total sales, predominantly targeting EU markets. Conversely, in countries with larger internal markets, such as Poland or Germany, the dominant share of sales by innovation-active enterprises is directed at the domestic market, with a significantly lower share of exports in total sales. It should also be noted that the level of innovation activity among Polish enterprises is significantly below the EU average.
- Entities from industries such as the manufacture of chemicals (D20), electrical equipment (D27) and motor vehicles (D29) play a key role in Poland's gross exports,

with a share of over 5% in 2018, and are also characterised by a significant level of foreign value added (FVA), exceeding 40%. Additionally, these sectors exhibit high innovation activity (50 to 55%), significantly above the average for the Polish economy, underscoring their strong position and importance in the context of international competitiveness.

- At the same time, these enterprises demonstrate above-average innovation activity compared to the average for Polish entities, particularly in key variables examined in the CIS questionnaire, such as R&D investments, collaboration (including within clusters), and the implementation of innovations.
- The analysis of empirical data clearly indicates that a high level of innovativeness, supported by investments in research and development (R&D) and collaboration with business and institutional partners, is a key element of the long-term competitiveness of Polish high-tech enterprises engaged in GVCs.

Mesoeconomic-level analysis reveals that:

- Clusters play a significant role in global value chains, enabling the coordination of activities and enhancing the flow of resources and knowledge. Their integration into GVCs involves the phenomenon of multiple embeddedness, which refers to firms building stable and deep connections with multiple industry clusters.
- In the context of improving competitiveness, clusters within global value chains can develop through process, product, functional and inter-industry upgrading.
- Cluster management is horizontal, focusing on local collaboration, whereas global value chains use vertical management models. Despite potential conflicts arising from these differing systems, proper coordination can lead to synergies and the improved economic positioning of regions.
- Empirical analysis of data from cluster benchmarking in Poland, conducted for the Polish Agency for Enterprise Development, found that companies from 35 out of 41 surveyed cluster initiatives generated revenue from foreign sales, 29 were involved in organising international events, 28 had signed cooperation agreements with foreign entities, 27 implemented international projects, and 20 reported having members that are subjects of direct foreign investment.
- Analysis of the experiences of the Polish Automotive Group cluster highlights the positive impact of clusters on relocating production to Poland and developing local supply chains, as well as increasing their organisational diversity and fostering knowledge and innovation development, which enhances their international competitiveness.

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Chapter 9

Towards a Change in Poland's Place in Global Value Chains

Eliza Przeździecka

9.1. Introduction

In the era of evolving conditions in foreign markets, every open economy, including Poland, faces the challenge of enhancing its competitiveness on the global stage. Over three decades of activity in foreign markets have defined Poland's position in global value chains (GVCs), which has predominantly been characterised by low and medium-low value-added processes. Improving the country's position within GVCs involves capturing activities with higher value addition, leading to greater benefits from participation in the international division of labour and contributing to GDP growth.

Elevating a country's standing in global value chains necessitates increasing its involvement in processes with higher value-added components, with such transformations driven by investments in advanced technologies and fostering innovation in both industry and services. For enterprises, this requires allocating additional resources to investments, such as in fixed assets. However, Poland's investment-to-GDP ratio currently stands at 17.7%, significantly below the EU average of 22.2%, and has remained at this lower level for years [World Bank, 2024]. Companies often lack the financial resources needed for such investments, and uncertainty continues to deter entrepreneurs from committing resources to activities whose outcomes will materialise only in the long term – precisely the type of developmental and innovation-enhancing investments needed within businesses. Factors such as sluggish recovery from the pandemic-induced crisis, geopolitical tensions and weakened economic conditions among Poland's key trading partners exacerbate this reluctance.

When investment opportunities within enterprises are limited, economic policy decisions can play a pivotal role in altering a country's position in global value chains (GVCs), with policies aimed at reconfiguring Poland's participation in these networks becoming a cornerstone of the nation's development strategy. In the face of intensifying global market competition and the growing need to enhance economic

resilience, gaining competitive advantages and balancing various forms of international cooperation have emerged as priorities for economic policy. Trade policy is particularly significant in this context, as it governs external economic relations. As a member of the European Union, Poland does not independently conduct trade policy but adheres to the regulations and frameworks established within the economic union.

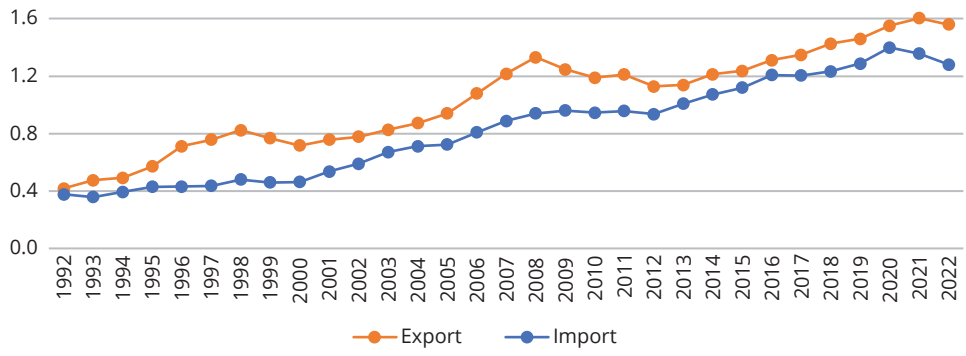
This chapter aims to analyze selected trade policy tools and identify their potential effects on Poland's place in the GVC, highlighting the importance of appropriate actions in shaping Poland's competitiveness in foreign markets.

9.2. Poland in the European Union

Poland has experienced rapid economic growth since the early 1990s, becoming a significant part of the European market, with membership in the European Union as a key driver of this economic transformation.

In 1992, Poland's GDP per capita, measured by purchasing power parity (PPP), amounted to only one-third of the average for the EU-15 countries. By the time Poland joined the EU in 2004, this figure had risen to 41%, and by 2023 it had exceeded 77% of the EU average. While Poland's share in global exports increased from 0.47% in 1992 to 0.94% in 2004, and its share in global imports grew from 0.35% to 0.72%, the openness of the Polish economy truly expanded following EU accession, particularly in terms of exports. In 2022, Poland's share of global exports reached 1.56%, nearly four times higher than at the beginning of the economic transition period. Similarly, Poland's share of global imports stood at 1.28%.

Figure 9.1. Poland's exports and imports as a percentage of global exports and imports in 1992–2022 (%)



Source: WITS [2024].

Polish enterprises have capitalised on the opportunities offered by participation in the free trade area of the Single European Market, benefiting from unrestricted access to a large consumer base and cooperation with EU partners [Przeździecka, Wilczopolski, 2024]. The European principle of free trade has enabled Polish companies to enjoy access to nearly 410 million consumers, a figure that was close to 480 million prior to Brexit.

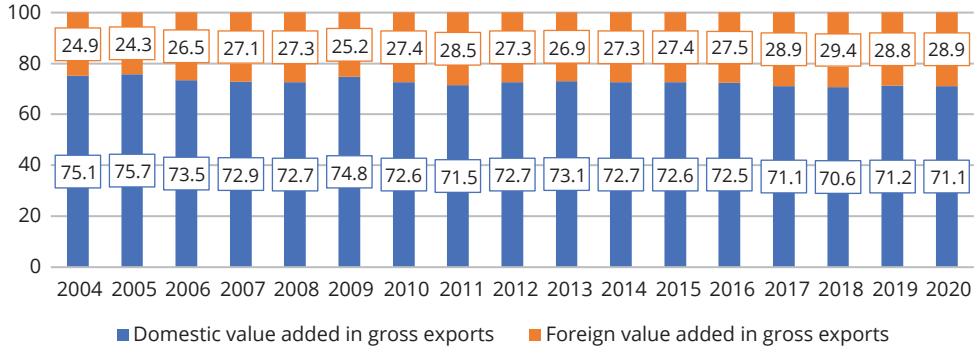
At the time of Poland's accession to the European Union, exports accounted for just over one-third of the country's GDP. After two decades of Polish enterprises operating within the European Single Market, the value of exports as a share of GDP has doubled.

Table 9.1. Exports of goods and services as a percentage of GDP in Poland (%)

1992	1996	2000	2004	2008	2012	2016	2020	2022
20.04	22.07	27.19	34.24	37.81	44.28	50.27	52.99	62.69

Source: own elaboration based on the World Bank data.

Figure 9.2. Value added in Polish gross exports in 2004–2020



Source: own elaboration based on the OECD (TiVA) data.

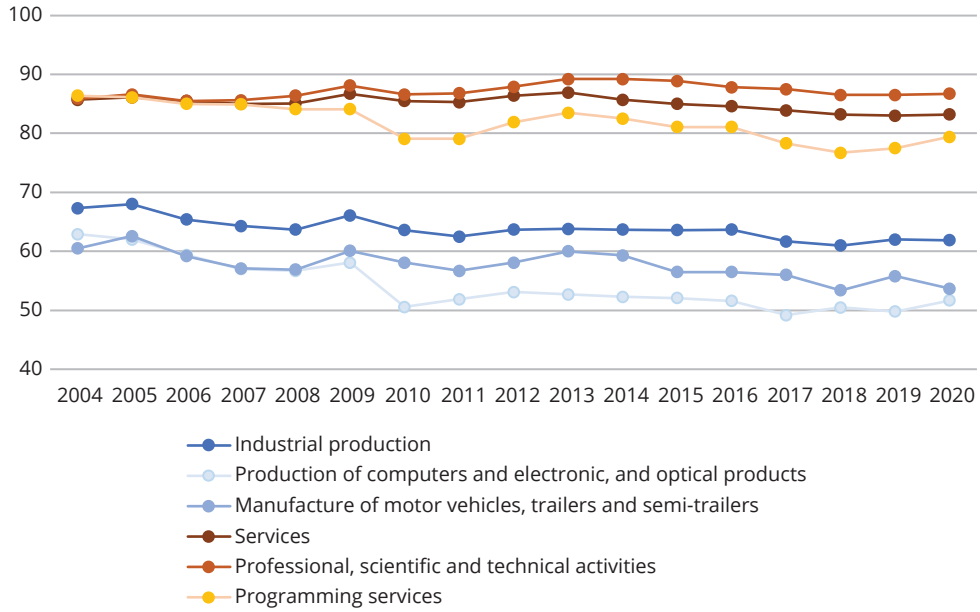
The EU market is the most important sales destination for Polish exporters of both final goods and components supplied to European customers, and European companies also play a crucial role as suppliers for Polish manufacturers [Pasierbiak, Bobowski, 2023].

Data on the sources of value added[1] in Polish exports indicates an increasing significance of the contribution of foreign entities, which suggests that Polish exports are increasingly dependent on foreign suppliers. Multinational corporations play a key

[1] The TiVA (trade in value added) data published by the OECD is released with a delay. Currently, the most up-to-date data pertains to the year 2020.

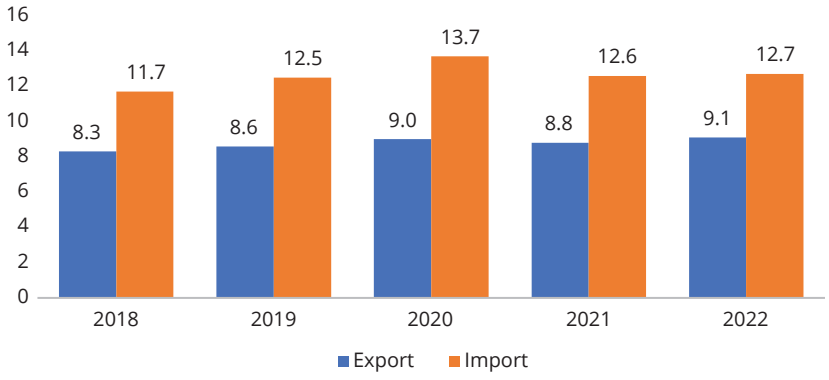
role in this process, incorporating foreign semi-finished products, raw materials, or intellectual property solutions into their production processes. Consequently, the share of domestic value added in exports is declining.

Figure 9.3. Share of domestic value added in Polish gross exports in selected economic sectors in 2004–2020 (%)



Source: own elaboration based on the OECD (TiVA) data.

Figure 9.4. Share of high-tech products in total exports and imports (%)



Source: Statistics Poland [2022].

This trend has been evident since 2013. The changes observed between 2004 and 2020 were the most pronounced in high-tech manufacturing sectors, such as the production of computers, and electronic and optical products. In the case of services, there has been a slight decline in the share of domestic value added in Polish gross exports since 2004, although this indicator remains higher than in the industrial sector.

The share of high-tech goods in exports is, first of all, significantly lower than in imports. Furthermore, in recent years, there has been no notable increase in this indicator, particularly concerning exports, which is not an encouraging sign for building long-term competitive advantages in the economy.

9.3. A new era in the global economic order

Shifts in global trade, geopolitical tensions and technological disruptions are prompting economies participating in GVCs, including Poland, to strengthen their resilience and foster the development of high-value-added industries.

On the other hand, there is a global trend of increasing opposition to free trade, which reflects widespread concerns about the consequences of open economies. One of the earliest manifestations of rising protectionism and a departure from trade liberalisation was the British vote on Brexit, which ultimately led to a breach in the Single European Market [Garcia, 2023; Stack, Bliss, 2020; Zimmermann, 2019].

Additionally, in 2019, the European Union embarked on a new development strategy under the framework of the European Green Deal. By 2050, the EU aims to become a carbon-neutral economy. Alongside the European Green Deal, the EU adopted a Digital Strategy (in 2020 and 2021) to maximise the benefits of technological progress, while laying the groundwork for a new industrial policy within the framework of a revised political agenda [Ambroziak, Przeździecka, 2024].

In shaping trade policy, the European Commission has prioritised encouraging businesses to invest in research and development, digitalisation and automation, with the aim to advance high-tech industries (knowledge-based sectors) such as renewable energy, electronics, information technology and pharmaceuticals. Beyond ensuring energy security and fostering a digital economy, market protection measures are designed to build the resilience of supply chains and reduce EU member states' vulnerability to risks within global supply chains by developing local production capacities and critical infrastructure.

9.4. EU trade regulations reform

The European Union aims to ensure that products sold within its market are offered at fair and equitable prices, regardless of their origin. This involves eliminating unfair trade practices, such as dumping (selling products below production costs) and subsidies (government financial support for domestic producers), which can distort market conditions for companies operating in Europe. The EU seeks to balance the playing field between domestic and imported goods, thereby protecting the European market from an influx of cheap products manufactured without adherence to environmental and social standards.

In line with ESG standards, the EU expects that product prices reflect environmental and social costs. Under its new regulations, the EU also considers environmental protection standards and workers' rights in the countries of origin of imported products, and importers failing to meet these standards may be subject to higher tariffs. The goal is to enable European businesses to compete on equal terms with entities from third countries.

The EU's approach is aimed at protecting both European producers and consumers, as unfair competition can lead to the collapse of businesses, rising unemployment, and a weakened European economy. On the other hand, consumers could be exposed to low-quality products that fail to meet European safety and environmental standards.

For these reasons, the EU has recently embarked on a comprehensive reform of its key trade regulations.

In 2017, regulations were introduced to protect the EU market from unfair trading practices, with their primary aim being to reform trade defence instruments (TDIs), specifically targeting dumping and subsidies applied by non-EU trade partners. This reform responded to the evolving dynamics of global trade and growing concerns within the EU about cheap imports, particularly from non-market economies characterised by state intervention, posing potential risks to EU industries and jobs. Among the key measures to protect the EU market, the 2017 legislation established a new method for calculating the 'market value of goods' in anti-dumping investigations. Rather than relying solely on export prices of goods from countries suspected of dumping, the EU now employs an approach that considers the production costs and market price effects in the country of export. This change was particularly significant for imports from China and Vietnam.

Additionally, the new regulations enhanced the EU's ability to identify subsidies, including indirect subsidies, which encompass not only direct export subsidies but also any form of public financial support provided to businesses. A groundbreaking

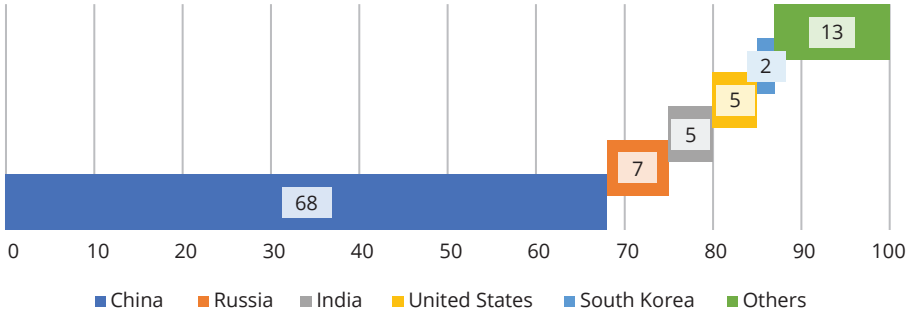
aspect of the reform was the inclusion of social and environmental standards in tariff calculations, which meant that imports from countries with lower environmental and labour standards were subject to higher tariffs, a measure aimed at protecting European industries from competition that failed to meet EU-equivalent regulatory standards regarding social and environmental effects. However, it appears that the regulations implemented six years ago have not significantly influenced the domestic value added in exports, nor have they contributed to altering Poland's position in GVCs.

In addition to anti-dumping and anti-subsidy measures, safeguards have been introduced to address exceptionally rapid increases in the import of specific products. Excessive imports can ultimately lead to significant losses for EU producers and, in some cases, even bankruptcy. In the event of a sharp rise in import volumes, short-term market protection measures can be applied, including import quotas that limit the allowed volume of imports, and tariff quotas, where imports exceeding the limit are subject to additional duties. These safeguards provide EU enterprises with time to adapt to competitive imports. Import safeguards are applied exclusively to imports from outside the EU. Initially, such measures can be implemented for a maximum of 200 days, and following an additional impact assessment can be extended to a total of up to 8 years.

The trade defence instruments (TDIs) that can be imposed include *ad valorem* duties, specific duties, and variable duties/minimum import prices. Another option is a price undertaking, where an individual foreign exporter voluntarily commits to selling their goods at or above a minimum import price, which remains confidential.

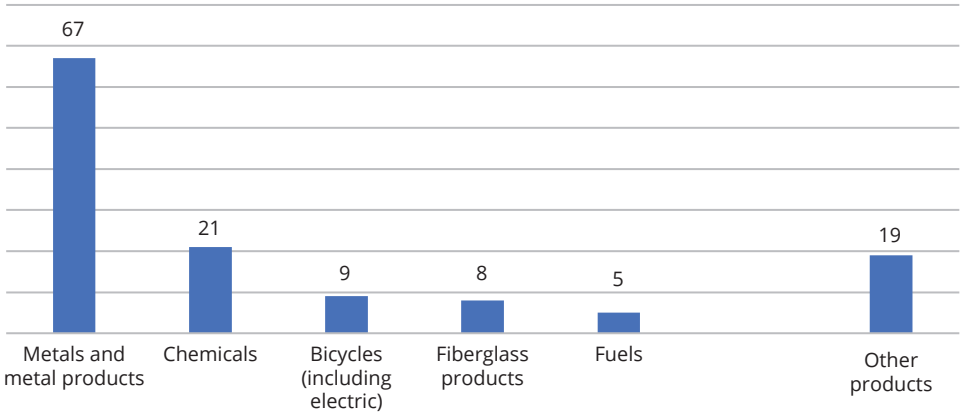
In the first year of the regulations' operation, most anti-dumping and anti-subsidy investigations concerned producers from China (68% of all cases), with Russian producers ranking second (7%), followed by Indian and American companies (5% each).

Figure 9.5. Anti-dumping and anti-subsidy investigations by country at the end of 2018 (%)



Source: own elaboration based on European Court of Auditors [2020].

Figure 9.6. Anti-dumping and anti-subsidy investigations by product groups at the end of 2018



Source: own elaboration based on European Court of Auditors [2020].

The described investigations, however, did not pertain to high-tech products, with most applications of EU market protection measures initially targeting low-value-added goods, such as metals and metal products. Chemicals ranked second, a category listed by Statistics Poland as high-tech products based on the Standard International Trade Classification (SITC Rev. 4) [Statistics Poland, 2022], although this was the only group of goods within the high-tech category. It cannot therefore be said that the described trade policy tools (protective measures) have had a significant impact on changing the position of EU countries, including Poland, within GVCs.

In recent years, export restrictions for reasons of national security have gained particular importance in the European Union's trade policy, with these restrictions applying to goods and services that can be used for both military and civilian purposes, referred to as dual-use items. Depending on the type of goods and their intended use, an exporter may require a special licence to export them outside the EU, or their trade may be entirely prohibited.

A system for controlling the export, brokerage, technical assistance, transit and transfer of dual-use items was introduced in 2021, making it a relatively new trade regulation tool, and applies not only to goods but also to software and technology intended for both civilian and military purposes. Such items may be used in the design, development, production or application of nuclear, chemical or biological weapons, as well as their delivery systems. The regulations identify key sectors, including chemicals, telecommunications, machinery, mining, fuel production and telecommunications services, and also include a control list specifying dual-use items, technologies and services. The categories are outlined in Table 9.2.

Table 9.2. Categories of dual-use items

Category number	Group name
0	Nuclear materials, facilities and equipment
1	Special materials and related equipment
2	Materials processing
3	Electronics
4	Computers
5	Telecommunications and information security
6	Sensors and lasers
7	Navigation and avionics
8	Marine
9	Aerospace and propulsion

Source: Regulation (EU) 2021/821 of the European Parliament and of the Council [OJ L 206, 11.06.2021].

Under the export control system described, in 2022, EU member states reviewed approximately 40 thousand applications for the export of goods with potential military use to third countries, amounting to a total value of EUR 38.4 billion, with only 1.3% of these applications resulting in export denials, which indicates that the application of these export restriction regulations currently remains limited. However, it is important to note that these regulations directly pertain to many high-tech products and advanced technologies, with the impact of these export control measures potentially hindering Poland's ability to increase its share in global value chains in categories of high value-added products.

9.5. Foreign investment control in the EU

A further step toward greater market control was the EU regulation on foreign direct investment screening, which enables the scrutiny of investments in so-called strategic sectors where they might threaten security or public order. The regulation operates on two levels. On the one hand, EU member states establish their own national systems for monitoring foreign investments, while on the other hand, the European Commission retains the right to intervene in a member state's decisions if the matter concerns multiple countries or if the investment could impact projects and programmes implemented by the EU as a whole[2].

[2] These include the Copernicus programme, the preparatory action for the establishment of a new governmental satellite communications programme (EU GOVSATCOM), the Space Programme, Horizon

When scrutinising an investor, particular attention should be paid to whether the investor is controlled by a third country – namely, the country of the parent company's headquarters – as well as risks related to illegal or criminal activities, and the potential impact on critical infrastructure, technologies or media. The scope of this scrutiny is defined to include: disclosure of the ownership structure of the foreign investor, reporting the approximate value of the FDI, a description of the products, services and economic activities of the foreign investor and the target enterprise, identification of UE member states where the beneficiary company operates, source of investment funding, and the timeline for planned or already completed implementation of the FDI.

The final approval for a monitored investment is granted by the state in which the investment is being made, although the opinions of other EU member states and the European Commission should also be sought. Additionally, in April 2022, the Commission issued guidelines for member states on assessing security and public order risks in the EU posed by Russian and Belarusian investments, emphasising the need for a thorough evaluation of the origin of capital, beyond special-purpose entities, and suggesting extending scrutiny to transactions already completed where ownership by entities from Russia or Belarus is suspected. Increasing attention has also been paid to dispersed capital, such as portfolio investments made by private equity funds.

Between 2022 and 2023, the EU Commission and member states collectively reviewed over 1200 transactions, compared to 400 in 2021. The number of member states with monitoring mechanisms rose from 14 to 22. The Commission issued an opinion in fewer than 3% of cases.

The primary sources of foreign direct investments reported under the cooperation mechanism were the United States, the United Kingdom, Switzerland, China, Singapore, the United Arab Emirates, the Cayman Islands and Canada. Investments from Russia accounted for less than 1.5%, while from Belarus only 0.2% [Europe Direct, 2023].

Most cases concerned manufacturing (44%), including the defence, aerospace and space industries, energy, semiconductors and medical sectors. A significant number of reviews also involved data processing and storage, cybersecurity and transportation – together accounting for 32%.

The effectiveness of the FDI monitoring system raises concerns. Firstly, member states interpret notification criteria differently, resulting in some countries reporting all projects involving foreign investors, with others doing so selectively. Among the latter are Germany, Italy and Finland.

2020 (now Horizon Europe), Euratom, trans-European transport, energy, and telecommunications networks (currently the Connecting Europe Facility), the Digital Europe programme, the European Defence Fund, the preparatory action for defence research, Permanent Structured Cooperation (PESCO), the European Joint Undertaking for ITER and the Development of Fusion Energy, and the EU4Health Programme.

Risk assessments also vary between countries, leading to divergent decisions regarding Chinese investors. For instance, in 2021, Croatia revoked a previously granted approval for a Chinese investor to manage the Port of Rijeka, while in 2022, Germany approved the acquisition of shares in the Port of Hamburg by the Chinese company Cosco [Kolarz, 2023]. In this context, it is worth mentioning the case of Chinese investments in Poland at the Gdynia Container Terminal, where container and heavy cargo handling takes place. Following an incident in the summer of 2023, when equipment intended for the United States military was not unloaded, a decision was made in August 2024 to designate the 'Chinese quay', part of the Port of Gdynia, as critical infrastructure, and Hutchison, which operates this section of the port, will be required to report the company's activities related to security. However, this will not affect the port's business operations, and the company retains discretion over decisions such as allowing NATO warships to dock at the quay. Hutchison has leased part of Gdynia's quay since 2007 and, under the terms of the agreement, has rights to the area until 2089.

9.6. Conclusions

The evaluation of the impact of trade policy tools on Poland's position in global value chains (GVCs) remains significantly limited due to the availability of trade data measured in value-added terms. Moreover, as highlighted by the analysed trade policy instruments, many of them are expected to yield results only in the longer term.

There are also substantial changes in business conditions. Rising wages in Poland are becoming a barrier for enterprises whose operations relied on low-cost labour (average wages in the economy have grown annually by 6.5% since 2014). Despite this trend, wage disparities persist: the average salary in Poland remains at half of the EU average and one-third of the average in Germany. However, Poland's attractiveness to investors is upheld by its central location in Europe, with north-south and east-west transportation routes intersecting. Combined with significant improvements in transport infrastructure over the past decade, Poland is emerging as a logistics and transportation hub for the Central and Eastern European region. These conditions offer potential for attracting FDI in strategic sectors to stimulate innovation and technological progress, ultimately increasing the value added in manufacturing as well as services.

Turning attention to the mechanisms supporting the development of the economy in the context of current and future challenges, it should be noted that the results of the presented analysis of the trade policy tools introduced in recent years indicate

that Poland has limited opportunities to strengthen its position in the GVC through the tools of European Union trade policy.

The EU's new trade policy, which supports high-value-added processes and protects the European market from unfair competition and promotes ESG standards, is having a slight impact on strengthening Poland's place. Despite the weakening of the global economic climate, opportunities for Polish companies may arise from, among other things, the substitution of Asian suppliers in knowledge-based industries such as information technology, pharmaceuticals and green technology, as well as in the development of supply chains within the framework of ties between economies in the immediate vicinity. Strengthening Poland's position in the GVC by shifting from low-cost manufacturing to higher-value-added industries will be achieved by diversifying trade partners and building capacity by strengthening internal capabilities, such as through education development.

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Chapter 10

Legal Aspects of Poland's Participation in Global Value Chains

Jerzy Menkes

10.1. Introduction

The subject of this study is the institutional and normative response of the West to the collapse of the global international order and the current state of global disorder, with our research focusing on the economic pillar of the international order. The West's reaction in its relations with strategic rivals (China and Russia) and other actors within the so-called axis of evil/alliance of tyrants[1] is aimed at mitigating risks stemming from actions of these actors, which challenge security, human rights and free, and fair trade. Although the West has not formally announced a unified strategy for addressing these challenges, I shall reconstruct it through inductive reasoning. The study's focus on the economy determines the central importance of decisions concerning:

- de-risking: reducing threats in conjunction with altering the composition of economic relationships (de-coupling),
- economic interventionism: the adoption of interventionist policies by Western states[2].

These actions are embedded within a broader strategy where the goals and measures in the economic sphere are subordinated to interconnected objectives, including the implementation of human rights and freedom, ensuring the security of the West, and promoting sustainable development.

The subsequent stages of the study include:

- the collapse of the (old) institutional and normative order, stemming from both the suspension of obligations (and consequently the freezing of institutional functions) and the long-term process of *desuetude* regarding universal regulations,

1 The terms used by President George W. Bush [2022] and Jens Stoltenberg [2024] to describe the group of states and terrorist organisations. Officially, NATO [2024] identified Russia, China and North Korea as state participants in this group in its Summit Declaration.

2 The United States and the European Union have thus adopted the policy pursued by Indo-Pacific states [Schropp, 2024].

- the construction of an 'internal' order uniting Western states and international integration organisations to expand and deepen the 'security community' they form,
- legal analysis of Poland's role in shaping the West's strategy, as well as the economic opportunities and risks for Poland resulting from this new strategy.

10.2. General issues

The terms 'globalisation' and 'global value chains' are not part of legal discourse (legal language), let alone the language of legal acts. The first originates in the language of economics[3] and international relations, while the second is a term specific to economics. The concepts denoted by these terms refer, in the first case, to interconnected economic, social and political relations, and in the second, to economic linkages whose creation depends on globalisation as a necessary condition. The connection between globalisation and global value chains existed only during the wave of globalisation initiated after the end of the 'First Cold War'[4], which ended with the advent of the 'Second Cold War'[5], and it was this combination of globalisation and global value chains – rather than the level of globalisation[6] – that defined this wave of globalisation. The level of interdependence achieved during this period led the West to abandon globalisation and limit the participants in transnational value chains to Western states, with the linkage between globalisation and global value chains resulting in increased vulnerability for all participants in globalisation, reducing their relative resilience to various risks [Javorcik, 2020, pp. 111–116].

In the case of each political and economic decision – whether to pursue globalisation or to reject it – international law and other normative systems regulating international relations have served merely as tools for implementing the political and economic will of actors seeking to use globalisation and global value chains to achieve their designated goals. In the pursuit of globalisation and the construction of global value chains, the law was intended to serve as a tool for 'civilising' the process, mitigating the risks of

[3] In this context, François Perroux and Theodore Levitt introduced the term into the language of economics [James, Steger, 2014, pp. 417–418, 426–427].

[4] This wave of globalisation is sometimes regarded as the third wave. The first wave is often placed in the period of 1860–1914, with the second in the period of 1944–1971 [e.g., Johnson, 2008, pp. 8–9]. Three waves are also identified in his report Stern [2002, p. 23], although it dates the beginning of the third wave to 1980 [see also Vanham, 2019].

[5] The end of this cycle of globalisation results from multiple events, the most prominent being Russia's aggression against Ukraine (initiated in 2014) and the US–China trade war (ongoing since 2018). The risks associated with it, particularly overdependence, were exposed by the COVID-19 pandemic and Russia's attempt to use energy blackmail to deter Western aid to Ukraine defending itself against aggression.

[6] The highest level of economic globalisation, equated with interdependence, was achieved between the late 19th century and the outbreak of the First World War [see Waltz, 2010, pp. 132–162, 215–229, and Annex].

'wild' globalisation, and addressing the creation of 'unregulated' global value chains outside the control of national and international public institutions. Participants in the decision-making process regarding globalisation and the establishment of global value chains included political and economic decision-makers[7], as well as other social actors. In this context, the role of the law was significant because 'civilising' the process is intrinsically linked to the universalisation of values and norms that give the process its character, as well as to the institutionalisation of oversight mechanisms. Economic globalisation was placed within one of the three equal pillars of the structure envisioned for the liberal order in the world, with the liberal order aimed to simultaneously ensure: security (for states), the protection of human rights (for individuals), and prosperity (for all) as a result of 'free and fair' trade.

Unfortunately, these hopes did not materialise, and global security was weakened by the simultaneous occurrence of acts of armed aggression by participants of the 'Axis of Evil' and a diminished capacity for assertive responses, which reduced the resilience of the West. One factor undermining resilience was economic overdependence, including reliance on supplies (e.g., energy carriers) from counter-system states and the placement of sensitive links in global value chains within those states, as well as vulnerability to disruptions in connections between participants[8]. The counterproductive nature of economic globalisation and the creation of global value chains for the functioning of the liberal order is also a consequence of the failure to universalise liberal values, with the West's political strategy of 'change through trade' and its associated belief that trade barriers provoke aggression both proving ineffective[9]. In economic terms, counter-system states exploited the benefits of free trade while simultaneously violating the principles of fair trade. Interdependence, like a coin, has two sides: one represents the benefits of positive-sum games, while the other reflects the temptation to exploit vulnerability. Counter-system states chose to focus on the latter, engaging in zero-sum games. In the realm of human rights, globalisation also failed to raise universal standards, a stark example of which is the West importing goods from China that were produced, among other means, by Uyghurs subjected to forced labour.

7 The weight of their voices in the decision-making process varied over time. The alignment of interests between economic entities and states was acknowledged, exemplified by the famous statement from 1953 by Charles Wilson, the then-President of GM and President Eisenhower's nominee for Secretary of Defense, during a Congressional hearing: "What's good for GM is good for America".

8 For example, this is connected to the increasing physical distance between participants in global value chains and the transport of goods along international routes where the security of shipments is low (e.g., due to pirate or terrorist attacks, or the threat of blockades imposed by counter-system states).

9 "When goods don't cross borders, soldiers will" – a statement often attributed to Frédéric Bastiat – was elevated to the status of a dogma by thinkers such as Montesquieu, von Mises and Hazlitt. A similar sentiment was previously expressed by Otto T. Mallery: "If soldiers are not to cross international boundaries, goods must do so. Unless the shackles can be dropped from trade, bombs will be dropped from the sky".

In response to the failure of its hopes and the materialisation of risks, the West decided to abandon the pursuit of building a liberal order on a universal scale. The weights assigned to the elements of the triad – security, human rights, sustainable development and economic freedom – were recalibrated. Instead of equal weights as before, priority was given to human rights and security, with economic policy and its instruments subordinated to their realisation. This subordination aims to align economic policy with the protection of human rights and security while eliminating economic activities that could pose risks to these values. This shift in priorities signifies the end of the 'end of history' and, at the very least, the freezing of efforts to build a liberal order on a universal scale [Zissimos, 2022, pp. 372–376].

In the post-globalisation socio-political and economic reality, cooperation among Western economies is replacing the global market regulated by the WTO framework. As a medium-sized state, Poland is primarily a recipient of this policy shift, although as an EU member it has had and continues to have a voice in shaping this policy, exceeding what its size alone would suggest. Assessing whether, from an economic perspective, the transition from a global market to a 'club of Western states' is more or less beneficial for a medium-sized country falls strictly within the domain of economics [see, e.g., Javorcik, Kitzmüller, Schweiger, Yıldırım, 2023]. Nonetheless, it is evident that the socio-political and economic stability of the 'club' is higher than that of the global system.

The current era of international economic relations, compared to the period of globalisation, is referred to as 'slowbalisation' [D'Urbion, 2019; Aiyar, Ilyina, 2023; Gros, 2024]. However, this term obscures the scale of change, as it is actually de-globalisation, when more accurately described [Evenett, 2022, pp. 345–351].

In cases where a state or group of states decides to halt or withdraw from participation in globalisation, or to regulate the participants in global value chains, international law and other normative systems serve as tools to implement political will. Decision-makers influence the behaviour of international market participants through coercive instruments (e.g., embargoes or sanctions) or economic policy tools (e.g., subsidies). Norms function as instruments for dismantling or freezing 'old' ties and creating new, alternative internal ties within a politically defined group of states. Value chains that were previously formed based on economic criteria are being replaced by chains constructed – using the criteria of security and human rights – by allied states (friendshoring). In such scenarios, economic actors are both the targets and implementers of decisions made by political leaders[10].

[10] According to some citizens and the politicians representing them, globalisation, particularly the creation of global value chains, has led to negative social consequences in Western countries. The 'Rust Belt' in the United States has become a symbol of these adverse effects, with Donald Trump serving as an iconic representative of the voices of its residents.

10.3. From the 'Iron Curtain' through the 'End of History' to the End of the 'End of History'

10.3.1. 'Iron Curtain'

Researchers examining social processes attempt to place them on a timeline, marking them with 'milestones', despite being aware of the counterfactual nature of such efforts and the controversy surrounding the outcomes. The persistent, albeit doomed, attempts to define such markers stem from the 'linear' perception of time in Western civilisation. It is impossible to pinpoint the exact dates marking the beginning and end of socio-political and economic structural transformations, which occur within the 'long duration' (*longue durée*). At best, political events occurring during this time can be attributed the role of markers, allowing to focus on the 'short duration' (*courte durée*). In this analysis, the West is treated as the centre (with the rest of the world as the periphery), leading to an examination of how Western strategies influence both the organisation of the West's own space and the broader global order[11].

The establishment of the United Nations and the United Nations System was intended to initiate the construction of a liberal international order, with the Charter of the United Nations closely linking peace and justice with human rights and development[12]. Economic collaboration (free and fair trade) was envisioned both to deter states from aggression[13] and to protect people from deprivation[14]. On the one hand, there was an effort to universalise the UN System by including the USSR, which was

[11] I therefore examine 'events'; the methodological foundation of the study is defined by Braudel's concept [Braudel, 1999, 2013].

[12] Cf. "Preamble: We the peoples of the United Nations determined to save succeeding generations from the scourge of war, (…), to reaffirm faith in fundamental human rights, in the dignity and worth of the human person, in the equal rights of men and women (…), to promote social progress and better standards of life in larger freedom, and for these ends to practice tolerance and live together in peace with one another as good neighbours, (…), to employ international machinery for the promotion of the economic and social advancement of all peoples, have resolved to combine our efforts to accomplish these aims" [Journal of Laws 1947, no. 23, item 90, Preamble]. "The Purposes of the United Nations are: 1. To maintain international peace and security, (…). 2. To develop friendly relations among nations (…) and to take other appropriate measures to strengthen universal peace. 3. To achieve international co-operation in solving international problems of an economic, social, cultural, or humanitarian character, and in promoting and encouraging respect for human rights and for fundamental freedoms for all without distinction as to race, sex, language or religion. 4. To be a centre for harmonising the actions of nations in the attainment of these common ends" [Journal of Laws 1947, no. 23, item 90, Article 1].

[13] According to the McDonald's peace theory.

[14] Freedom from want ("the third is freedom from want – which, translated into world terms, means economic understandings which will secure to every nation a healthy peacetime life for its inhabitants – everywhere in the world) is part of the 'Four Freedoms' proclaimed by President Roosevelt [1941].

perceived as a counter-system state[15], while on the other hand, a *cordon sanitaire* was imposed around the Axis powers of Berlin–Rome–Tokyo, the so-called enemy states[16]. The inclusion of the USSR was aimed at fostering an experience of the benefits of collaboration and persuading it to adopt a 'win-win' strategy, ultimately internalising the values of the UN Charter. Under quarantine conditions, the goal was to 'build societies' and achieve 'change through trade'. However, in the case of the USSR and its vassalised Axis members (Bulgaria, Croatia, Romania, Slovakia and Hungary), these hopes proved unfounded. Conversely, for states that joined the West (Japan, Italy and Germany), civil societies, democratic governance and the rule of law were successfully established. This divergence in outcomes should not obscure the fundamental differences in approaches. While the West pursued universalisation of regimes in relation to security and human rights – two of the three pillars of the liberal international order – in economic relations, the 'Iron Curtain' separated the West from the East, with the global economy becoming fragmented, and with trade exchange significantly restricted due to exceptionally high levels of protectionism, which also curtailed economic linkages. The separation of economies by the 'Iron Curtain' was the result of political decisions enforced through legal and administrative measures. Beginning with the Export Control Act of 1949[17], the United States imposed trade sanctions on the USSR and its satellites [for more see Silverstrone, 1959, pp. 331–362], and although the regime evolved over time, sanctions remained in place until the collapse of the USSR, monitored by CoCom (Coordinating Committee for Multilateral Export Controls). The prevention of the establishment of the International Trade Organisation and the proliferation of GATT slowed the liberalisation of trade within the West, had little impact on trade within the East, and were indifferent to trade between the West and the East. Political decisions to foster Western unity were significant for intra-Western trade, while at the same time, the 'Iron Curtain' in economic relations was not entirely

15 The Western Allies believed that collaboration with the USSR and Stalin reduced the cost of defeating Nazism: "If Hitler invaded hell I would make at least a favourable reference to the devil in the House of Commons", as Prime Minister Winston Churchill explained in 1941 when justifying the agreement with the USSR.

16 "The Security Council shall, where appropriate, utilise regional arrangements or agencies for enforcement action under its authority. But no enforcement action shall be taken under regional arrangements or by regional agencies without the authorisation of the Security Council, with the exception of measures against any enemy state, as defined in paragraph 2 of this Article, provided for pursuant to Article 107 or in regional arrangements directed against renewal of aggressive policy on the part of any such state, until such time as the Organisation may, on request of the Governments concerned, be charged with the responsibility for preventing further aggression by such a state. The term enemy state as used in paragraph 1 of this Article applies to any state which during the Second World War was an enemy of any signatory of the present Charter" [Journal of Laws 1947, no. 23, item 90, Article 35].

17 The economic dimension of the *cordon sanitaire* originated with the Trading with the Enemy Act (TWEA) and Executive Order 2729-A of 1917.

impenetrable. It is difficult to determine whether the East was more eager for collaboration, seeing it – as evidenced by its experiences[18] – as an opportunity to gain access to the technologically advanced goods and technologies it lacked and could not produce, or whether the West viewed trade as a source of economic benefits and a tool of influence[19]. Starting in 1946, (West) Germany supplied the USSR with large-diameter pipes ('40-inch') and compressors necessary for constructing pipelines to transport oil and natural gas. These transactions were barter-based: pipes and compressors in exchange for oil, and this model of collaboration was solidified through contracts signed between 1967 and 1970 with Austria, Germany, Italy and France. Although trade flourished [Lee, Connolly, 2016, p. 105 et seq.], the USSR did not benefit from knowledge absorption (let alone modernisation), and the subsequent 'Orenburg' gas pipeline was constructed entirely using goods from France[20]. This created a state of interdependence in which trade continued 'independently' – a kind of 'business as usual' policy – despite the Cold War confrontations, such as the Cuban Missile Crisis or the invasion of Afghanistan. Western Europe perceived this interdependence as a tool to deter the USSR from military aggression [Stern, 2005, p. 1 et seq.; Schattenberg, 2022, p. 554 et seq.], while the United States saw it as a threat of overdependence[21]. The paradigm of 'free trade' was contested for both economic[22] and political reasons[23]. Nevertheless, the course towards liberalisation was maintained; NAFTA came into force, and the Uruguay Round was concluded.

In summary, it is impossible to definitively answer the following questions:

- Did the USSR (Eastern Bloc) pursue expansionist policies because it did not experience of the benefit of the 'free trade' [Lacourse, 2022] or participation in 'win-win' scenarios?
- Did the West, by restricting trade with the East, truly defend the 'free world'?

What is certain, however, is that the 'McDonald's peace theory' was never tested globally prior to the dissolution of the USSR, as there were no McDonald's restaurants in the Eastern Bloc.

18 From Hitler's rise to power until 1941, the USSR maintained uninterrupted cooperation with Nazi Germany [see Ericson, 1999; Snyder, 2011].

19 The concept of convergence.

20 This was the result of negative experiences during the construction of the 'Soyuz' pipeline.

21 In US analyses, granting the USSR a quasi-monopolistic status as a supplier was seen as equipping it with a tool of influence [National Foreign Assessment Center, 1981].

22 For example, in the 1980s and 1990s, the US Congress advocated protectionism in response to the trade deficit.

23 At the turn of the last decades of the 20th century, the US imposed trade sanctions on states violating human rights, supporting terrorism, engaging in drug trafficking, or attempting to breach the Treaty of the Non-Proliferation of Nuclear Weapons.

10.3.2. The end of history

The 'end of history' is commonly associated in public discourse with the conclusion of the ' (First) Cold War,' the dissolution of the Eastern Bloc, the collapse of the USSR, and the spread of the rule of law, democracy and human rights from 1990 onwards [Fukuyama, 1996, p. 76]. In international economic relations, however, this milestone should be shifted to 1 January 1995, when representatives of 76 countries signed an agreement in Geneva establishing the WTO – thereby filling the final gap in the Bretton Woods institutional system [Checa, Maguire, 2023]. The universalisation of free trade was marked by the dates on which China (11.12.2001) and Russia (22.08.2012) joined the WTO, with these admissions expressing confidence in the new members' willingness to fulfil their obligations in good faith[24]. Trade in the new global order was intended to be both free and fair[25]. However, China and Russia quickly betrayed the trust placed in them, systemically violating their commitments [Menkes, 2022, p. 279 et seq.][26].

Even if the permissiveness towards China's and Russia's unfair trade and investment practices were regarded as a 'bribe' in exchange for their adherence to the principles of the UN Charter regarding peace and justice in international relations, it proved counterproductive. Both states utilised material resources to develop military capabilities enabling expansionist policies [Sullivan, Brands, 2020; Kuzio, 2023; Motyl, 2023].

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24 This trust was partly derived from their cooperation with the US and the broader West following the attacks of 11.09.2001.

25 An important milestone in establishing a fair-trade regime was the 1997 Convention on Combatting Bribery of Foreign Public Officials in International Business Transactions.

26 This is illustrated by the list of disputes brought to the WTO by the EU against China or Russia: WT/DS407 – China – Provisional Anti-Dumping Duties on Certain Iron and Steel Fasteners from the European Union; WT/DS 372 – China – Measures Affecting Financial Information Services and Foreign Financial Information Suppliers; WT/DS611 – China – Enforcement of intellectual property rights; WT/DS549 – China – Certain Measures on the Transfer of Technology; WT/DS460 – China – Measures Imposing Anti-Dumping Duties on High-Performance Stainless Steel Seamless Tubes ("HP-SSST") from the European Union; WT/DS432 – China – Measures Related to the Exportation of Rare Earths, Tungsten and Molybdenum; WT/DS425 – China – Definitive anti-dumping duties on x-ray security inspection equipment from the EU; WT/DS395 – China – Measures Related to the Exportation of Various Raw Materials; WT/DS339 – China – Measures affecting imports of automobile parts; WT/DS462 – Russian Federation – Recycling fee on motor vehicles – Russian Federation; WT/DS475 – Russian Federation – Measures on the importation of live pigs, pork and other pig products from the EU; WT/DS608 – Russian Federation – Measures Concerning the Exportation of Wood Products; WT/DS604 – Russian Federation – Measures on procurements by State-related entities and other entities in charge of investment projects with State support; WT/DS479 – Russian Federation – Anti-Dumping Duties on Light Commercial Vehicles from Germany and Italy. Documentation of US allegations against China [USTR, 2021].

10.3.3. The end of the end of history

There was no singular event that marked the end of the end of history in the West's relations with its strategic rivals (Russia and China) and counter-systemic members of the 'Axis of Evil' (e.g., North Korea and Iran) [Rasmussen, 2024]. Instead, the turning point comprises a series of events, including:

- on Russia's part: the murder of Sergei Magnitsky, the plundering of Hermitage Capital Management's assets, and the aggression against Ukraine,
- on China's part: trade abuses and coercive policies towards its neighbours,
- on the part of other actors: nuclear proliferation, acts of terrorism and support for terrorist organisations, etc. [CRS, 2021].

In response to attempts by China and Russia to exploit interdependence for coercion, the West responded assertively by rising to the challenge. Russia's energy blackmail did not deter the West from providing aid to Ukraine, and, similarly, China's position in the supply chains of medical equipment, semiconductors and rare earth metals did not prevent the West from confronting Chinese expansionism (including through nonmilitary and military measures) in the Asia-Pacific region. A new 'Cold War' in relations between the West, China and Russia is now a reality, which has compelled the West to work toward establishing a new intra-Western order [Dombrovskis, Gentiloni, 2022; Truss, 2022]. This new order is designed to "safeguard the freedom, common heritage and civilisation of their peoples, founded on the principles of democracy, individual liberty and the rule of law. They seek to promote stability and well-being in the (allied – J.M.) area, and are resolved to unite their efforts for collective defence and for the preservation of peace and security" [Journal of Laws 1947, no. 23, item 90, Preamble].

The West's response to the challenges posed by China, Russia and their allies is multifaceted and diverse. In economic relations, it involves reactive measures, such as expanding the scope and effectiveness of sanctions, which aim both to punish the violators of obligations and to weaken their capacity for actions against the West[27]. Beyond the classical toolkit of trade and investment restrictions[28], new measures are being introduced; an example is regulations enabling the exclusion of 'high-risk vendors' from supply chains and Western markets. The criteria for selecting participants in value chains are also being redefined: the goal of cost reduction is being replaced

[27] The assessment of past sanctions is varied [see Dobson, 2005, pp. 531–556; Busch, 1997, pp. 451–466; Hufbauer, Schott, Eliot, 1990, p. 137].

[28] This is exemplified by the extension of export embargoes to additional goods. While the United States sets the direction and pace, Western nations join in; e.g., the Netherlands imposed a ban on exporting 'Advanced Semiconductor Materials Lithography' (ASML) products to China.

by the goal of building supply chains resilient to geopolitical shocks. In security and defence policy, allies are increasing expenditure[29] and enhancing military capabilities.

Western states are granting administrative authorities the power to exclude suppliers deemed as high-risk, particularly concerning the creation and use of critical infrastructure. 'De-risking' allows economic cooperation to continue without compromising resilience. The implementation of 'de-risking' will occur under a governance regime [Bobowski, Menkes, 2024, pp. 3–15; Menkes, 2024, pp. 16–51], with Poland adopting the new standard following the enactment of the amended Cybersecurity Act[30].

However, the West differentiates its approach towards Russia and China. The policy towards Russia is guided by the principle of *ex injuria ius non oritur*, which rejects the recognition of sovereignty over territorial conquests and holds Russia (both individuals and the state) accountable for crimes against peace, war crimes, and crimes against humanity. In the case of China, the doors to cooperation remain open, with the condition of 'de-risking'[31] being a prerequisite for re-engagement. Whether they will take advantage of this opportunity is solely dependent on China, while the positions of the EU [European Commission, 2023] and the United States[32] on this matter are closely aligned. The policy of 'de-risking' has been officially declared as the Western stance: "Acting together to promote economic resilience, and confront non-market policies and practices that undermine the level playing field and our economic security (…). We recognise the importance of China in global trade. We are committed to advancing free and fair trade, a level playing field, and balanced economic relations (…). We are not trying to harm China or thwart its economic development, indeed a growing China that plays by international rules and norms would be of global interest. However, we express our concerns about China's persistent industrial targeting and comprehensive non-market policies and practices that are leading to global spillovers, market distortions and harmful overcapacity in a growing

[29] European NATO members are approaching compliance with their commitments regarding the defence spending-to-GDP ratio.

[30] The draft Act amending the Act on the National Cybersecurity System and certain other acts [Chancellery of the Prime Minister – Republic of Poland, 2024] implements Directive (EU) 2022/2555 of the European Parliament and of the Council as part of EU Toolbox 5 [EU, 2000].

[31] "National and collective resilience are an essential basis for (…) the effective fulfillment of the Alliance's core tasks (…). We will continue to boost our resilience by increasing the Alliance's collective awareness, preparedness and capacity across all hazards and in all domains, to address growing strategic threats, including against our democratic systems, critical infrastructure and **supply chains** (bold – aut.). (…) We will also take concrete steps to deepen our cooperation with our partners engaged in similar efforts, in particular the European Union. (…) The PRC cannot enable the largest war in Europe in recent history without this negatively impacting its interests and reputation. (…) We remain open to constructive engagement with the PRC, including to build reciprocal transparency with the view of safeguarding the Alliance's security interests. At the same time, we are boosting our shared awareness, enhancing our resilience and preparedness, and protecting against the PRC's coercive tactics (…)" [NATO, 2024, points 12, 26, 27].

[32] "We are for de-risking, not decoupling with China" [Biden, 2023].

range of sectors, undermining our workers, industries and economic resilience and security. We are not decoupling or turning inwards. We are de-risking and diversifying supply chains where necessary and appropriate, and fostering resilience to economic coercion" [Apulia G7 Leaders', 2024].

The emerging framework of cooperation has been termed the New Washington Consensus (NWC), the aim of which is to establish a 'more just and enduring order,' with the benefits derived from it intended to reach 'people around the world' [Sullivan, 2023; Colombatto, 2023; Foer, 2023; Delfeld, 2024, pp. 55–67]. The economic policy paradigm is to be reshaped; the new paradigm encourages governments to adopt growth-oriented policies (including interventionism and protectionism), prioritising allied cooperation at the expense of global ties.

10.4. Conclusions

An evaluation of the economic relations between the West and China and Russia through the lens of international law reveals the *desuetude* of existing bilateral, plurilateral and multilateral commitments between the parties. Furthermore, international agreements with these countries have been effectively abandoned. The World Trade Organisation (WTO) is effectively in a state of hibernation due to the non-functioning dispute resolution system and stalled negotiations, and Russia is subject to unprecedented economic and political sanctions. The EU has suspended the ratification of the EU–China Comprehensive Agreement on Investment (CAI).

The West deepens internal cooperation through mechanisms such as friendshoring and its variant, nearshoring, which are forming a new subset of value chain participants. These value chains are designed to enhance resilience primarily against security risks, while their impact on mitigating other risks is expected to be significantly lower or nonexistent[33]. The West's emerging economic, political and social cooperation will largely rely on administrative cooperation tools, simultaneously fortifying the framework against populist attacks and discouraging free-rider behaviour. The benefits of participating in this collaboration are defined as 'club goods', accessible only to those who adhere to the established rules. The purpose of the economy is to meet human and societal needs, aligning with the principles of sustainable development, with economic systems serving the overarching goals of societal well-being and ensuring security.

[33] For example, limiting the set of participants to EU members reduces risks in transport (nearshoring), but it does not have a clear impact on risks related to natural disasters or catastrophes.

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Conclusions and Recommendations

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In the comprehensive analysis of competitiveness within the framework of global value chains (GVCs), it is apparent that evaluating trade competitiveness necessitates a broad perspective that extends beyond simple export metrics. The complexity of GVCs means that competitiveness is intrinsically linked to a country's ability to effectively import semi-finished products and integrate them into the production of final goods. This global interconnectedness allows nations to specialize in distinct phases of the production process, enhancing efficiency and adding significant value to their economic outputs.

The strategy of locating production in lower-cost regions can lead to significant reductions in operational costs, enhancing price competitiveness. However, this approach also exposes economies to increased risks, particularly from supply chain disruptions, which can be triggered by geopolitical conflicts, economic sanctions, or global health crises such as the COVID-19 pandemic. These vulnerabilities are exacerbated in countries heavily dependent on foreign supplies for critical production components.

The dominance of developed countries in high-value-added stages of production can intensify global economic disparities. These nations often engage in more sophisticated, technology-driven production tasks, while developing countries may remain confined to simpler, labour-intensive tasks. This division can hinder the economic progression of less developed nations. For instance, Poland's involvement in GVCs has primarily increased through the enhancement of backward linkages, indicating a greater reliance on imported inputs for its production processes. This is reflected in the growing proportion of foreign value added in Polish exports, signifying a deeper integration into GVCs but also a potential over-reliance on foreign components.

The structure of Poland's economy has seen a notable shift towards services, which now contribute a larger share of domestic value added to exports. This transition is especially prominent in the IT and professional services sectors, which have developed significant forward linkages in GVCs. These services are not merely supporting but actively driving global production processes, indicating a strategic diversification in Poland's economic activities and a move towards higher value-added operations.

The reliance on Germany as Poland's principal trade partner underscores the regional nature of its GVC engagements. This dependency highlights the necessity

for strategic diversification in Poland's trade partnerships to lessen the economic vulnerabilities associated with potential downturns in major partner economies. Expanding trade relations with other EU and non-EU countries can help mitigate these risks and promote economic stability.

The ongoing evolution of GVCs presents both challenges and opportunities. As global economic conditions shift towards more regionally focused economic blocs, Poland's alignment with these changes will be crucial for future trends shaping economic cooperation with foreign countries. The move towards friendshoring and nearshoring, which aims to build secure and resilient supply chains among trusted partners, reflects a broader geopolitical shift towards prioritizing economic security and sustainability.

The analyses conducted in this book lead to the following recommendations for economic policy:

- In view of the significant importance of companies advancing to more sophisticated stages of GVCs (upgrading) for international competitiveness, it is recommended to invest in research and development, education and training, and create programmes promoting the implementation of Industry 4.0 technologies in enterprises to increase their efficiency and operational flexibility.
- To enhance the resilience of supply chains, it is recommended to undertake measures aimed at diversifying supply sources and creating strategic reserves of raw materials and semi-finished products to reduce dependency on a single supplier or region.
- Reducing the excessive dependence on Germany by developing cooperation with other EU and non-EU countries from areas of 'shared values' will lower the risk associated with potential economic difficulties of the main partner.
- It is essential to intensify investments in industries such as IT, professional, scientific and technical activities to strengthen Poland's position in high-growth potential service sectors.
- Policy should encourage the creation of domestic components used in industrial sector exports, reducing the share of foreign value added in Polish trade, and increasing its competitiveness in international markets.
- There is a need to evaluate foreign direct investment from the perspective of effectively integrating businesses into global value chains, and to promote such behaviour among foreign investors (e.g., through tax incentives).
- It is recommended to support domestic companies in their foreign expansion aimed at building Polish-led global value chains. Examples of such support could include special-purpose funds and, in the case of sales, insurance for repayments by foreign clients.

- Highly developed economies in Western Europe are moving towards reducing working hours and increasing automation. If Poland intends to further enhance its level of economic development, decisive measures should be taken to follow this direction.
- A potential opportunity for the development of Polish exports lies in the current actions by the German government that seem to be aimed at enhancing the European Union's economic cooperation with a new, potentially powerful partner – India.
- Further development of renewable energy sources will help mitigate Poland's reliance on energy imports.
- Since it cannot be unconditionally assumed that convergence processes will continue in the future, economic policy should focus on improving the institutional environment in the group of new EU member states to ensure the continuation of income convergence between Central and Eastern Europe and Western Europe.
- The governments of CEE countries should take measures to improve the state of public finances (reducing the deficit to below 3% of GDP).
- The governments of CEE countries should undertake measures, particularly those related to reforms of the institutional environment and improving supply-side economic efficiency, to accelerate the pace of technological progress, which is approximately measured by the growth of total factor productivity (TFP).
- Accelerating the pace of economic growth requires actions aimed at increasing employment (e.g., raising labour force participation) and boosting the accumulation of physical capital in the economy (e.g., reforms improving the investment climate).
- Strengthening institutional frameworks for GVC integration is recommended to upgrade and shift economic activities towards research, development and innovation.
- Efforts should focus on supporting cross-sectoral collaboration to build production capacities in emerging sectors.
- It is recommended to formulate and implement policies aimed at integration with GVCs in a manner advantageous to Poland's resources.
- It is recommended to further strengthen the financing of research and development (R&D) activities, particularly in industries strategic for Polish exports that are also heavily involved in GVCs, through tax incentives, grants and programmes supporting the commercialisation of research outcomes.
- Policy should foster the creation of robust innovation ecosystems by encouraging businesses to collaborate with research institutions and business partners, both domestically and internationally, to increase their participation in GVCs.
- Strategies for supplier diversification and the development of local value chains should be supported. Implementing risk management mechanisms, such as

monitoring global supply chains, can help enhance the resilience of enterprises to potential disruptions.

- Cluster policies should aim to maximise the internationalisation of clusters and their integration into GVCs, contributing to increased competitiveness through, among other means, access to new markets, international technology transfer, and the development of human capital.

In conclusion, the dynamics of GVCs offer a complex array of opportunities and challenges. By deepening its integration into these chains, an economy can leverage global efficiencies and diversify its economic base, thus enhancing its overall economic stability and growth. However, achieving this requires a nuanced approach that includes strengthening internal capabilities, such as technological advancement and human capital development, while also navigating the intricate global trade environment effectively. The policy frameworks should thus aim not only at deeper integration into GVCs but also at fostering an innovation-driven economic model that aligns with both regional and global economic shifts. This balanced approach will be pivotal in ensuring that the economy not only integrates into but also ascends within the global economic hierarchy, enhancing its long-term economic prospects and stability.

The crises that have affected the world in the past five years, such as COVID-19, geopolitical tensions, and the energy crisis, have revealed the threats that arising from increasing integration with global value chains (GVCs). The disruption of supply chains, as well as difficulties in accessing raw materials or markets, highlighted the need to increase resilience to external shocks and diversify the geographical structure of international trade and investment links. This monograph contributes to the ongoing discussion on the competitiveness of an open economy in the context of increasing integration within GVCs. Taking into account the global and European context, the authors of the monograph aim to assess the competitiveness of the Polish economy and its changes during the period 2015–2023 in comparison with other EU member states, in relation to Poland's position in global and European value chains.

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The monograph reviews and develops the current understanding of international competitiveness, applying it to the assessment of the competitiveness of the Polish economy. This encompasses theoretical, conceptual, and modeling investigations, alongside the integration and interpretation of the most recent empirical data. The contribution of this type of research to science is unequivocal. The novelty of the *Report* stems from the concurrent integration of contemporary theoretical trends in global competitiveness and the analysis and interpretation of empirical data, specifically regarding the Polish economy.

From a review by Professor Marian Gorynia

The authors have carried out original research, which is strongly supported by domestic and foreign literature, and demonstrated an excellent knowledge of theoretical issues and empirical methods. They formulated cognitively valuable conclusions and practical recommendations. The interdisciplinarity of the monograph greatly enriches it substantively. The interdisciplinary nature of the publication is particularly noteworthy, significantly enhancing its substantive value. Although the work primarily covers international economics, the authors skillfully included in the analysis important threads from such fields as: international law, political science, history, and management and international business.

From a review by UŁ Professor Tomasz Dorożyński, PhD

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