Entrenched in Western Europe's Backyard or on the Path to Economic Sovereignty: The Evolution of the Dependent Market Economy Model in Poland and Hungary Since the Global Financial Crisis

By

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Submitted to

Central European University - Private University

Department of International Relations

In partial fulfilment of the requirements for the degree of Master of Arts in International Relations

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Vienna, Austria

2025

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For bibliographic and reference purposes, this thesis should be referred to as: Bastin, Maxime. 2025. *Entrenched in Western Europe's Backyard or on the Path to Economic Sovereignty: The Evolution of the Dependent Market Economy Model in Poland and Hungary Since the Global Financial Crisis*. MA thesis, Department of International Relations, Central European University, Vienna.

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Abstract

Theorization of the capitalist economic structures of East Central European (ECE) states has predominantly categorized the region as dependent on foreign-based transnational corporations (TNC), primarily from Western Europe. These countries are argued to have tightly linked their economic development to the profit-driven interests of these corporate entities. In 2009, Nölke and Vliegenthart conceptualized their economic structures as dependent market economies (DME) (Nölke and Vliegenthart 2009). However, Nölke and Vliegenthart's work, along with much of the seminal literature on ECE capitalism, is grounded within a pre-Global Financial Crisis (GFC) perspective, raising questions about the continued relevance of the DME model in the post-GFC ECE landscape (Nölke and Vliegenthart 2009; Bohle and Greskovits 2012; Myant and Drahokoupil 2010). Recent debates in ECE comparative political economy engaged with the concept of domestic economic upgrading to assess potential shifts in the region's economic trajectory, but no consensus has been reached. In this context, this thesis seeks to examine the extent to which domestic economic upgrading has led to their economic transformation away from the path-dependent model in the post-GFC era. It uses a market-led but policy-supported framework structured around three pillars. Each pillar is operationalized through quantitative indicators, whose evolution is examined using descriptive statistical methods. Focusing on the cases of Poland and Hungary, this thesis argues that both countries have shown some incremental progress toward higher domestic value-added, autonomous forms of production, which can be interpreted as a sign of steps toward a transition away from the DME model. However, this progress remains relative and varies considerably between the two countries.

Keywords: *Dependent Market Economy, East Central Europe, Economic Upgrading, Post-Global Financial Crisis*

Author's Declaration

I, the undersigned, **Maxime Bastin**, candidate for the MA degree in International Relations declare herewith that the present thesis titled "Entrenched in Western Europe's Backyard or on the Path to Economic Sovereignty: The Evolution of the Dependent Market Economy Model in Poland and Hungary Since the Global Financial Crisis" is exclusively my own work, based on my research and only such external information as properly credited in notes and bibliography. I declare that no unidentified and illegitimate use was made of the work of others, and no part of the thesis infringes on any person's or institution's copyright.

I also declare that no part of the thesis has been submitted in this form to any other institution of higher education for an academic degree.

Vienna, 23 May 2025

Maxime Bastin

Acknowledgements

I would like to warmly thank my supervisor, Prof. Daniel Izsak, as well as my academic writing instructor, Zsuzsanna Toth, whose knowledge, continuous guidance, and valuable advice enabled me to complete my thesis.

I am also grateful to my friends for their encouragement and our enriching conversations, which have led me to explore perspectives I had not previously considered.

Finally, I would like to thank my family for their unwavering support and belief in my abilities, which motivates me every day to strive for excellence in everything I undertake.

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List of Abbreviations

CME	Coordinated Market Economy
DME	Dependent Market Economy
ECE	East Central Europe
DBES	Domestic Business Enterprise Sector
FBES	Foreign Business Enterprise Sector
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on Research and Development
GFC	Global Financial Crisis
GVC	Global Value Chain
LME	Liberal Market Economy
OECD	Organization for Economic Co-operation and Development
R&D	Research & Development
TEI	Tertiary Education Institution
TNC	Transnational Corporation
UNCTAD	United Nations Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
USD	United States Dollar

Introduction

Recognizing the limitations of Hall and Soskice's seminal Varieties of Capitalism framework, Nölke and Vliegenthart, Bohle and Greskovits, and Myant and Drahokoupil, among other scholars, developed alternative models to account for the dependent and semi-peripheral capitalist nature of East Central European countries (ECE) (Sebők and Simons 2022, 1627; Hall and Soskice 2001; Nölke and Vliegenthart 2009; Bohle and Greskovits 2012; Myant and Drahokoupil 2010). Their models underscored the influence of transnational actors in the region, a dimension that had not been covered in Hall and Soskice's work (Dudziak 2014, 73; Hall and Soskice 2001). However, while seminal within the literature on comparative capitalism, Sebők and Simons importantly point out that much of the comparative political economy scholarship on East Central Europe either draws from a pre-global financial crisis (GFC) framework or does not fully consider the deep effects of the GFC and the resulting sovereign debt crises (Sebők and Simons 2022, 1627). Yet, the latter have had considerable implications for the continued relevance of the model in post-GFC East Central Europe.

The significant decline in exports from East to West and the credit crunch in Poland's foreign-owned banking sector during the global financial crisis has demonstrated the vulnerability of dependent capitalism to economic shocks (Šćepanović and Bohle 2018, 162; Nölke 2018, 275: King 2002, 26). The economic and social costs of the global financial crisis undermined core principles of neoliberal governance and reshaped the political landscape across Europe. In Poland and Hungary, for instance, these pressures played a critical role in the collapse of the liberal ruling parties and paved the way for the rise to power of illiberal political agendas, with Law and Justice, chaired by Jarosław Kaczynski, coming to power in 2015, and Fidesz, led by Viktor Orbán, retuning to power in 2010 (Sebők and Simons 2022, 1627-1628; Johnson & Barnes 2024, 260; Bluhm and Varga 2020, 642-643).

Both illiberal parties have been argued to follow a similar "illiberal counter-movement" aimed at advancing nationalist agendas, including fostering economic development and overcoming their semi-peripheral status within Europe (i.e., defeating the middle-income trap) (Bluhm and Varga 2020, 642-644; Johnson and Barnes 2024, 260-261). For example, Bluhm and Varga contend that, while acknowledging major differences in how this trajectory has unfolded in each country, both states specifically share a common conceptual core of economic nationalism, which they term "conservative developmental statism" (Bluhm and Varga 2020, 643). Johnson and Barnes describe this nationalist strategy "contemporary financial nationalism" (Johnson and Barnes 2024, 260).

These counter-movements to neoliberalism in East Central Europe, where the neoliberal doctrine shaped the transition from communist regimes to market-led economies and encouraged the massive inflows of foreign capital to support modernization (Berend 2001), necessitates further research aimed at reassessing Nölke and Vliegenthart's conceptualization of East Central Europe's capitalist structure, namely the "dependent market economy" (DME) model, which they developed prior to the legacies of the global financial crisis (Nölke and Vliegenthart 2009, 694). This call for research is reinforced by the fact that the literature within the field of comparative political economy that explores domestic economic upgrading as a catalyst for transitioning away from the economic dependency model remains largely inconclusive. Therefore, this research will attempt to provide an answer to the following question: Since Nölke and Vliegenthart's theorization of the dependent market economy model in 2009, which characterized the capitalist structures of East Central European countries from a pre-Global Financial Crisis perspective, to what extent has domestic economic upgrading led to their economic transformation away from this path-dependent model (Nölke and Vliegenthart 2009)?

This thesis adopts Nölke and Vliegenthart's conceptualization of East Central Europe, defined as comprising Poland, Hungary, the Czech Republic, and Slovakia (Nölke and

Vliegenthart 2009, 671). This group is commonly referred to as the Visegrád countries. The study will focus specifically on the two East Central European countries Poland and Hungary for three major reasons. First, as shown above, both countries experienced similar shifts in their domestic political landscapes in the wake of the global financial crisis. Second, from a comparative political economy standpoint, they are regarded as belonging to the same fundamental grouping (Nölke and Vliegenthart 2009, 671). In addition to undergoing similar transitions from communist regimes to market economies, and completing this process around the same period, they share similar institutional and socioeconomic structures (Nölke and Vliegenthart 2009, 671). Nevertheless, and this is the third reason, despite their numerous structural similarities, these countries show contrasting results, allowing this research to draw nuanced conclusions.

This research utilizes the market-led but policy-supported framework developed by Gál and Lux, which offers an analytical lens consistent with this study's understanding of what a transition away from the DME model could entail (Gál and Lux 2022, 81-83). This framework stipulates that in order to achieve some incremental advancement toward higher domestic value-added, autonomous forms of production (i.e., domestic economic upgrading), and thus a transition away from the path-dependency model, Poland and Hungary must demonstrate progress in three fundamental, analytically distinct, pillars, namely "local embeddedness of capital", "anchoring of innovation and R&D activities", and "local ties of FDI" (Gál and Lux 2022, 82), with the last pillar operationalized as the 'entrepreneurial role of universities.' Through the lens of these three pillars, this research uses descriptive statistics and data from intergovernmental statistical sources to draw the following conclusion.

Both Poland and Hungary demonstrate some incremental progress toward higher domestic valued-added, autonomous forms of production (i.e., domestic economic upgrading), which according to Gál and Lux's framework, can be interpreted as a sign of steps toward a transition away from the DME model (Gál and Lux 2022, 81-83). However, this progress

remains relative, particularly when compared to Austria, a neighboring Western country characterized by a coordinated market economy (CME), and varies enormously between the two countries under study. Despite their progress, both countries are still far from aligning economically with the West.

This thesis starts with a chapter dedicated to the theorization of the dependent market economy model, aiming to clarify its core characteristics, and explore the factors that may drive Poland and Hungary to pursue a transition away from the model. The thesis then moves on to a literature review, discussing two main strands of literature that have assessed the evolution of domestic economic upgrading in ECE countries over the past decade while grounding the debate within the DME framework. Following this, the research elaborates on the chosen theoretical framework and methodology, which were mentioned above. It then proceeds with the analysis of the collected data, with the goal of answering three sub-questions outlined in the previous chapter. Finally, this thesis concludes by answering the research question, restating the main argument previously laid out.

1. Theorizing the Dependent Market Economy Model

The integration of East Central European states into the global capitalist economy was accompanied by a massive wave of privatization, with large state-owned enterprises and the banking industry being transferred to the hands of foreign transnational corporations (Gál and Lux, 2022, 72; Nölke and Vliegenthart 2009, 682; Bruszt and Vukov 2017, 680). A large share of the ECE economies has fallen under the control of domestically based foreign affiliates, which implemented a hierarchical structure to address coordination problems within the host economies (Nölke and Vliegenthart 2009, 677; Nölke 2018, 272). Consequently, the financing strategies, industrial alliances, corporate governance, education and training systems, and dominant method for innovation transfers, which are the five defining institutional complementarities of any variety of capitalism and thus key in understanding the interactions between economic institutions, firms, and innovation systems (Nölke and Vliegenthart 2009, 675; Hall and Soskice 2001, 6-7), are all governed in a hierarchical manner, shaped by Western-based parent companies. Based on Nölke and Vliegenthart's work and the five aforementioned defining spheres of any type of capitalism, this research will first lay down the foundations for understanding the dependent market economy model and its drawbacks (Nölke and Vliegenthart 2009).

1.1 Favored Means of Raising Capital: Foreign Direct Investment

First, in a dependent market economy, transnational corporations prefer to raise investment through foreign direct investment (FDI), which is hierarchically transferred from headquarters to local subsidiaries as a mode of financing and control, rather than raising capital through international financial markets or borrowing from domestic banks (Nölke and Vliegenthart 2009, 675). The United Nations Trade and Development (UNCTAD) defines

foreign direct investment as a long-term investment where a direct investor or a parent company from one country establishes a longstanding interest and control in an enterprise located in another country, in which they hold significant influence over the management of the FDI enterprise (UNCTAD 2007, 245).

Foreign direct investment in East Central European states brought the necessary financing to restructure their post-socialist economies into market economies (Nölke and Vliegenthart 2009, 681; Bandelj 2010, 490; King 2002, 4; Magnin and Nenovsky 2022, 46). Resulting from these massive foreign capital inflows, ECE countries have become embedded in European and global production and trade networks, developing sophisticated manufacturing industries and increasing their economic growth. Their production became largely oriented toward exports, with key manufactured products, such as machinery, automobiles, chemicals, and electronics, primarily destined for and dependent on the Western demand (Bruszt and Greskovits 2009, 418; Rugraff 2006; Nölke and Vliegenthart 2009, 681). However, within transnational industries, ECE-based firms typically occupy subordinate roles, characterized by less autonomy, lower complexity and fewer advanced skills compared to their Western counterparts (Bruszt and Greskovits 2009, 418).

1.2 Corporate Governance & Innovation Transfer Systems

Their subordinate role in the networks of transnational corporations is a direct consequence of their lack of modern technology and global entrepreneurial expertise as they transitioned from socialist regimes (Bruszt and Greskovits 2009, 414; Šćepanović and Bohle 2018, 154), as well as the TNCs' hierarchical corporate governance structure and the resulting decision-making process for innovation transfer. Important corporate decisions trickle down from the Western parent company to the board of directors of the ECE subsidiary (Nölke and Vliegenthart 2009, 682-683), who make investment decisions based on the interests of the

transnational corporation and not on the needs of the host country (King and Sznajder 2006, 781; Rapacki et al. 2019, 39; Nölke and Vliegenthart 2009, 687-688; Myant 2018, 301). The TNCs' corporate strategies adopted in a foreign headquarters and imposed on ECE subsidiaries deprive the host state government and the domestically based economic actors of significant control over economic strategies, perpetuating their dependence on the technological know-how and decision-making power of Western TNCs. This is particularly true when 80% of the productive assets of the Visegrád countries are held by transnational corporations (Bruszt and Vukov 2017, 682).

The lack of consideration for the long-term economic development of the ECE host states and the ensuing reinforcement of dependency can be demonstrated using the "smile curve" concept (Rungi and Del Prete 2017, 3). This U-shaped graph, developed in the 90s by Acer CEO Stan Shih, depicts that value is particularly concentrated at the two ends of the curve, where pre-production (i.e., research and development) and post-production (i.e., marketing and retailing) services occur (Rungi and Del Prete 2017, 2-3; Low 2013, 10; Baldwin, Ito, and Sato, 2022).

While research and development (R&D) has been argued to be a key site for value creation and the enhancement of long-term innovation capacities in host economies (Nölke 2018, 277), Western TNCs, primarily driven by profitability concerns, tend to avoid establishing such activities in ECE due to high associated costs (Nölke and Vliegenthart 2009, 687-688). R&D remains consequently concentrated in the home countries, allowing TNCs to maintain control over core competencies (Nölke and Vliegenthart 2009, 687-688; Nölke 2018, 271-272; Rungi and Del Prete 2017, 14).

Moreover, the constant necessity for DME countries to please foreign investors by maintaining comparative advantages in order to remain the recipients of large foreign investments makes it difficult to accumulate the required financial resources (e.g., through higher taxation) for national government R&D spending (Nölke 2018, 277). Consequently,

technological innovations and know-how remain primarily transferred into the production process through transnational corporate networks that link the various branches of the firm (Nölke and Vliegenthart 2009, 687-688). This strategy enables TNC headquarters to retain the highest valued-added segments of production within their home economies, while giving ECE subsidiaries the role of assembly platforms within the global value chain (GVC) (Nölke and Vliegenthart 2009, 678).

1.3 Industrial Relations & Training Systems

These technology transfers from the core to the ECE countries have led the latter to rapidly become competitive producers and exporters of sophisticated industrial products in the world economy, inducing economic growth (Bruszt and Greskovits 2009, 429). With their eyes focused on economic gains, East Central European neoliberal politicians adopted economic measures favorable to transnational corporations, such as low taxes on businesses and high incomes, as well as weak regulation and legal control of corporate activities, including very limited protection for minority shareholders (Myant 2018, 296-297; Bandelj 2010, 486).

Additionally, as part of the semi-periphery, ECE states have an abundant, cheap and skilled workforce operating in an environment with sufficiently adequate institutions and legal frameworks, which constitutes a major competitive asset for their participation in transnational production (Myant 2018, 300; Nölke and Vliegenthart 2009, 686; Rapacki et al. 2019, 39; Medve-Bálint 2014, 43; Domański and Gwosdz 2009, 474). Firstly, their low wages are a major attraction for Western TNCs which, thanks to their structural power, i.e., their threat to gradually reduce investment in the region in favor of the further East, have ensured that wages do not rise and that no strong workers' unions emerge (Nölke and Vliegenthart 2009, 684). To avoid costly employee protests, both the TNCs and the ECE governments seek to maintain the workforce satisfied through welfare programs that are not as favorable as in coordinated market economy

states, such as Austria and Germany, but are more comprehensive than in liberal market economy (LME) countries, including the United States of America and the United Kingdom (Nölke and Vliegenthart 2009, 685; Bohle and Greskovits 2007).

Secondly, in addition to a cheaper workforce, TNCs also seek employees equipped skill sets adapted to their production needs. During a period of public education cutbacks caused by austerity, TNCs increasingly partnered with vocational schools, which they perceived as valuable suppliers of ready-trained labor, to provide specialist equipment and training for teachers (Roberts 2001, 320). In doing so, they actively shaped vocational programs to align with their operational requirements (Roberts 2001, 320; Nölke and Vliegenthart 2009, 686-687; Dudziak 2014, 75).

Furthermore, by limiting the industrial activities of TNCs' subsidiaries to low-value-added activities, especially manufacturing and assembly (Gál and Lux 2022, 82), TNCs discouraged the development of high quality general education that would upgrade the skills of the workforce, as it would jeopardize the competitive cost advantage of the region (Nölke and Vliegenthart 2009, 687). The major retreat of the state from the education sector has facilitated the opportunity for the interests of these foreign companies to dictate the educational landscape, which they have designed to perpetuate the economic model of external dependency through a major emphasis on vocational training schools (Nölke and Vliegenthart 2009, 687).

1.4 Structural Economic Vulnerability to External Shocks & Middle-Income Trap

Through this elaboration of the five institutional complementarities model that frames the dependent market economy, one understands the central and pervasive role of transnational corporations in the structural organization of the ECE states. These corporations drive the economic growth of these post-communist countries, which rapidly adopted neoliberal policies to begin their catch-up with the core Western economies. The high dominance of foreign firms

in strategic sectors has progressively reduced the region to the assembly and export backyard of Western Europe (Berend, 2001, 266), leading the region to be vulnerable to external economic shocks (Šćepanović and Bohle 2018, 162) and entrapping it into the "middle-income trap" (Riedel 2020, 87; Myant 2018, 292).

Workforce wages, education, and broader economic policies are dictated by foreign interests, whose structural power compels the ECE states to maintain their comparative advantages (i.e., skilled and cheap workforce specialized in the export industries [Dudziak 2014, 75; Nölke and Vliegenthart 2009, 692; Domański and Gwosdz 2009, 474]) competitive in order to safeguard their primary source of capital. The overarching importance of TNCs in the ECE states has been eroding their economic sovereignty, with national governments whose hands are tied between their high need for transnational firms' investment for economic growth and the numerous drawbacks associated with this dependency.

This dependency has rendered ECE economies particularly vulnerable to external economic shocks. By allowing Western TNCs to continue to buy up their companies and banks, and exploit their resources, the ECE countries have established an externally driven model of economic development that is inherently fragile. This vulnerability was demonstrated during the Global Financial Crisis, when the contraction of Western European markets generated a severe economic downturn among the ECE states. Exports from East to West plummeted, falling by 20 to 25 percent across the region, significantly impacting the overall gross domestic product (GDP) growth of the ECE countries (Šćepanović and Bohle 2018, 162). Furthermore, this economic decline was further amplified by foreign-dominated banks that temporarily withdrew capital from their ECE subsidiaries during the crisis to stabilize the balance sheets of their Western-based parent companies (Šćepanović and Bohle 2018, 162; Nölke 2018, 275).

Long-term consequences of this externally anchored economic model have also become visible. The combination of structural dependence on foreign capital and a subordinate position within global value chains has contributed to the ECE countries' entrapment into the "middle-

income trap" (Riedel 2020, 87; Myant 2018, 292). This term refers to the economic growth of middle-income countries that, due to a number of factors, including a strong economic dependence on exports, is unable to reach the level of high-income countries (Riedel 2020, 87). TNCs play a significant role in reinforcing this trap, as their investments in the ECE region are primarily driven by market expansion and profit maximization, with little regard for the economic growth and stability goals that the ECE countries would aim to achieve (Berend 2001, 266).

2. Literature Review

As discussed above, ECE countries' dependence on transnational corporations is further reinforced by asymmetrical decision-making power, reliance on imported foreign technologies and know-how for domestic production lines, and the underdevelopment of national structures capable of contributing to domestic innovation and R&D activities. In light of this, ECE economies could achieve greater economic independence from TNCs by implementing vertical industrial policies that shift the production structures of their national firms toward more value-creating economic activities in GVCs (Kowalski et al. 2015, 32; Kalanta 2024, 662-663).

Whereas mere participation in GVCs brings momentum to productivity and employment growth in semi-peripheral countries that have just entered them, they contribute to making industrialization less economically effective because a nation no longer needs to have a well-established industrial foundation to export technologically advanced products (Pahl and Timmer 2020, 1684; Vrh 2018, 645). ECE countries entered GVCs through the production chains of TNCs, which enabled these states to grow economically for a while, but not sufficiently to close up the economic gap with the West (i.e., the "middle-income trap") (Myant 2018, 292). Moreover, it is empirically observed that their economic growth has been steadily slowing down since 2008, suggesting that their participation in GVCs on the terms of high dependence on foreign inputs has created barriers to further growth (Myant 2018, 292). Thus, while engaging in GVCs, domestic firms should strive for economic upgrading, defined as "an increase over time in a country's economic specialization in high-value-added activities" (Kalanta 2024, 662-663).

In the last decade, many scholars have examined the extent to which economic upgrading has occurred in ECE countries, assessing whether such development indicates a potential transition away from the DME model, and thus a loosening of the structural constraints that preclude economic convergence with Western Europe. Many have reported that, to this day,

ECE states remain deeply entrenched in their dependence on transnational corporations and, consequently, exhibit low levels of economic upgrading (Galgóczi and Drahokoupil 2015; Györffy 2022; Myant 2018; Gál and Lux, 2022; Riedel 2020; Artner, 2018).

For example, Myant argues that ECE countries continue to capitalize on their low-cost labor to attract TNCs that seek to exploit this comparative advantage (Myant 2018, 302). In return, the latter bring rapid economic growth, but growth that does not lead to convergence with the West due to the lack of subsequent economic upgrading, as economic activities that could lead to more domestic value-added, i.e., R&D, continue to be carried out in the TNCs' home countries (Myant 2018, 302). The author asserts that as long as the Visegrád countries remain within the spectrum of the dependent market economy model, no substantial economic development is possible, maintaining them in the middle-income trap (Myant 2018, 302).

Empirical evidence supports this argument, as shown by Gál and Lux, who contend that, in thirty years of economic development, FDI has not led the Visegrád countries to successfully catch up economically with the core economies (Gál and Lux 2022, 74). They claim that overall, FDI has made a limited contribution to economic growth in the region and has not led to the internal capital accumulation needed to generate economic upgrading and thus move away from the dependency development model (Gál and Lux 2022, 90).

Similarly, Galgóczi and Drahokoupil argue that although economic growth and FDI inflows have increased again since 2015 following the GFC, the authors could not observe a significant change in the growth model (Galgóczi and Drahokoupil 2015, 23). According to them, the region remains characterized by minimal economic upgrading, resulting from low engagement in R&D activities, and cheap labor as the main asset for competitiveness. The authors conclude that no major shifts of paradigm are in sight (Galgóczi and Drahokoupil 2015, 23). Echoing this argument, Györffy claims that although the Czech Republic, Estonia, and Slovenia have shown some signs of embarking on a "knowledge-intensive, high-quality" economic development model, the remaining ECE countries continue to rely predominantly on

the low cost of their labor force to maintain competitiveness and on continued FDI inflows for growth (Györffy 2022, 110). The author focuses on Hungary, which she uses as an example of a country that she describes as still deeply embedded in the dependency model due to its specialization in low-value-added production in its largest economic sector, the automotive industry, as well as its high reliance on low-cost labor (Györffy 2022, 110).

Riedel, on the other hand, investigates the case of Poland and concludes that the country remains competitive primarily because of its cheap labor (i.e., hourly labor costs in Poland are about 6.65 euros versus 37 euros in Germany), which is one of the main reasons that FDI has not driven economic upgrading in the country (Riedel 2020, 96-97). The author suggests that Poland undertake a transition that includes higher levels of R&D, design, and innovative operations, which will ultimately enable it to converge with high income countries (Riedel 2020, 97).

Despite these authors' conclusions that, at the turn of the 2020s, East Central European states remain structurally embedded in the dependent market economy model, manifested in their limited specialization in high-value-added sectors (i.e., domestic economic upgrading), this research aims to empirically demonstrate that some incremental progress toward higher domestic valued-added, autonomous forms of production has nevertheless been taking place. Based on Gál and Lux's market-led but policy-supported framework for achieving an alternative development model (Gál and Lux 2022, 81-82), this thesis would argue that these are signs of steps toward a transition away from the DME model, which the region needs for its long-term economic and development goals. This argument is based on case studies in East Central Europe, where a country, a region or a specific sector has experienced some kind of economic upgrading, which can arguably be interpreted as signs of a gradual shift toward a new economic and development model (Medve-Bálint 2024; Kalanta 2024; Markaki, Papadakis, and Putnová 2021).

For example, Medve-Bálint argues that semi-peripheral states, which include the ECE countries, are vulnerable to TNCs' interests and lack the necessary tools to pursue an autonomous development path (Medve-Bálint 2024, 759). However, looking at the city level and focusing in particular on Gdańsk, Poland, the author shows that the city's socially embedded culture of cooperation and entrepreneurial drive have enabled it to transform its decaying economy into a knowledge-intensive center that attracts high-value-added FDI (Medve-Bálint 2024, 760).

Similarly but examining at the state level, Kalanta finds that Estonia, whose economic structures are also entrenched in the DME model, has shown the strongest signs of economic upgrading in East and Central Europe both through its increased specialization in information and communication technology-based services and greater shares of professionals occupying higher-skilled positions (Kalanta 2024, 673). This progress in economic upgrading, while still far from complete, has been the result of a vertical industrial policy that exploited the country's pre-existing capacities (Kalanta 2024, 674). Vertical industrial policy aimed at transforming the Czech Republic's manufacturing structures into more technologically sophisticated sectors of production is policy advice that Markaki, Papadakis, and Putnová formulated by noting the potential gains in domestic value-added due to the country's relatively significant number of R&D-intensive, innovation-based industries (Markaki, Papadakis, and Putnová 2021, 17).

In order to contribute to these studies and to show the incremental progress in economic upgrading that ECE countries have made in recent years, this thesis uses market-led but policy-supported framework for achieving an alternative development model (Gál and Lux 2022, 82). The framework rests on three pillars, namely "local embeddedness of capital", "anchoring of innovation and R&D activities," and "local ties of FDI" (Gál and Lux 2022, 82), with the third one being operationalized as the 'entrepreneurial role of universities.' In the following chapter, the thesis will be elaborating on this theoretical framework through which it will conduct the data analysis.

3. Theoretical Framework & Methodology: The Three Pillars of the Market-Led but Policy-Supported Framework

The rationale behind the choice of Gál and Lux's theoretical framework lies in their recognition that foreign direct investment is not the inherent problem in the current development model of the ECE countries (Gál and Lux 2022, 82). Rather, it is this state of extreme dependency that has completely decoupled domestic economic sectors from this dominant source of capital, thereby eliminating most of the endogenous opportunities for regional development (Gál and Lux, 2022, 81). As Bailey, Lenihan, and De Ruyter claim, FDI is not inherently flawed, rather, it is a failure of government management to address the problems associated with growing over-reliance on FDI (Bailey, Lenihan, and De Ruyter 2016, 885). In fact, these foreign financial resources can become the key to breaking out of the dependency trap if domestic and foreign capitalist actors form a reciprocal beneficial alliance (Medve-Bálint 2024, 759).

This logic is anchored in Gál and Lux's framework, who argue that a sustainable form of economic upgrading that would lead to an alternative development model in the ECE countries can be achieved by exploiting the benefits that FDI brings while systematically decreasing its asymmetrical dependencies (Gál and Lux 2022, 82). It places at the heart of the resolution the re-embedding of the FDI-led growth model in order to dismantle the dual economy structures (Gál and Lux, 2022, 81). This approach to economic upgrading shows some crucial nuances compared to the Organization for Economic Co-operation and Development's (OECD) conclusions, which noted that economic upgrading can be increased in middle-income countries by attracting larger FDI inflows, expanding backward GVC participation (i.e., using more imported intermediate goods), and improving the sophistication of both imported inputs and exported products (Kowalski 2015, 34-36). These strategies, while resulting in economic

upgrading, inevitably lead to an increase in economic dependence on Western-based TNCs, which continue to be the only holders of the technologies and knowledge-based capital that are necessary for the ECE states to develop their economies to the same level of the Western core, thereby reinforcing the middle-income trap, and this unsustainable asymmetrical dependency.

In order to achieve some incremental advancement toward higher domestic value-added, autonomous forms of production (i.e., domestic economic upgrading) and to exit the path-dependency model, the ECE countries need to demonstrate progress in three fundamental, analytically distinct, pillars, namely "local embeddedness of capital", "anchoring of innovation and R&D activities", and "local ties of FDI" (Gál and Lux 2022, 82), with the last pillar being operationalized as the 'entrepreneurial role of universities.' For each pillar, this research uses descriptive statistics to analyze the evolution over time of predefined quantitative indicators that make it possible to assess potential progress. All data used in this analysis are obtained from intergovernmental statistical sources, namely the OECD Data Explorer, the Eurostat Database, and the United Nations Educational, Scientific and Cultural Organization (UNESCO) Data Browser (OECD n.d.a; Eurostat n.d.a; UNESCO n.d.a). The data sets that have been modified for the sake of this research are included in the appendix.

3.1 Pillar 1: Local Embeddedness of Capital

The local embedding of foreign capital is fundamental, as FDI industries that remain unconnected to local economic actors create a dual economy model characterized by a knowledge and efficiency divide between foreign capital holders and domestic entrepreneurs (Gál and Lux 2022, 82). A direct cause of this gap is, in particular, the poor structural embedding of foreign companies in the host economies that have precluded the beneficial and desired spillover effects (Gál and Lux 2022, 82). Therefore, their integration into the local economy through the transfer of a variety of functions to their Visegrád subsidiaries, encompassing

production tasks, higher value-added activities such as corporate management, development and testing operations (i.e., vertical deepening), is a central part to make FDI a permanent and integral element of the local economies (Gál and Lux 2022, 82). Re-embedding FDI into a unified economic structure has the potential to incentivize local suppliers to engage in functional upgrading (i.e., the acquisition of new, more sophisticated functions in the production chain of a certain output [Humphrey and Schmitz 2002, 1020]), helping to dismantle this dual economy structure that constrains the domestic sector (Gál and Lux 2022, 82-83).

The objective of the analysis of this first pillar is to assess the extent to which foreign-owned firms have become economically embedded into the economies of two ECE countries, namely Poland and Hungary, since the GFC in 2008. To do so, this research utilizes the method of Domański and Gwosdz, who defined economic embeddedness as a well-entrenched network of production relationships between TNC affiliates and domestic partners leading to spillover effects, and operationalized it through the concept of "localized capabilities" (Domański and Gwosdz 2009, 455).

Localized capabilities represent a key dimension of economic embeddedness by tying the nature of a company's competitive advantage to the tangible (e.g., local raw materials) and intangible assets (e.g., skills of the labor force, quality and dependability of local supplying firms, among others) of a territorial unit (Domański and Gwosdz, 2009, 455-456). These localized capabilities anchor branches of foreign-controlled firms in their new locations and incentivize them to engage in long-term investments, as these capabilities are a central part of a firm's sunk costs (Domański and Gwosdz 2009, 455-457). These costs correspond to the total of the investments that a company has had to make in order to set up its industrial activities, including facilities, equipment, training of the labor force, etc., and which cannot be recovered in the event of exit, thus reducing its structural power (Domański and Gwosdz 2009, 479).

In light of the central role of localized capabilities in the economic embeddedness of foreign affiliates, Domański and Gwosdz notably measured the development of two types of

capabilities over time, which are utilized as indicators, to determine the evolving degree of embeddedness of foreign-owned automotive firms in Poland (Domański and Gwosdz 2009, 458). These, which consider all the automative companies of the country and draw analytical distinctions between domestic and foreign-owned companies, include their export capabilities of manufactured products and emerging abilities to export non-production activities (Domański and Gwosdz 2009, 458). First, the measurement of the export capabilities of manufactured goods lies on the descriptive statistical analysis of the evolution of volumes of both high-value-added products and low-value-added parts exported by TNCs' subsidiaries (1) (Domański and Gwosdz 2009, 466-467). Second, the growing abilities of foreign-owned enterprises to export non-production activities is assessed by specifically examining the evolution of the export values of services carried out by these enterprises (2) (Domański and Gwosdz 2009, 469).

In order to determine the extent to which TNCs' subsidiaries have become economically embedded in the economies of Hungary and Poland since the Global Financial Crisis, I use the two indicators introduced above, which I slightly adjust for the purposes of my analysis. With regard to the first indicator, I assess the value added of exports using data obtained from the OECD Data Explorer platform (OECD n.d.a). In light of the importance of the manufacturing industry in both countries, I collected data exclusively on manufacturing exports, which I classified into low- and high-value-added content (see Appendix: "Modified Data Set 1"). I regard an increase in the high-value-added content of foreign-owned firms' exports as well as a generally larger volume of high-value-added products compared to low-value-added goods, as a mark of their increasing embeddedness in host countries, because the manufacture of these high-value-added products requires deeper local integration linkages, trust in local capabilities, and the transfer of knowledge and skills, building stronger localized capabilities (Domański and Gwosdz 2009).

For the second indicator, I also use data found on the OECD Data Explorer platform (OECD n.d.a). Instead of focusing exclusively on the development of R&D centers with foreign

suppliers, I take the broad definition of non-production functions that the authors used, which consisted of vaguely contrasting them with manufacturing activities altogether (Domański and Gwosdz 2009, 469). While the Visegrád countries used to have no significant non-production activities carried out by foreign-owned firms at the time of the transition to market economies, and were rather regarded by foreign investors as a place for low-cost manufacturing (Domański and Gwosdz 2009, 468), I aim to investigate whether foreign-controlled, non-production export activities with high value added (i.e., scientific & technical activities and transport & storage) have been evolving positively in Hungary and Poland since 2012 (the oldest year for which comprehensive data sets are available). This data set can be found in the appendix: "Modified Data Set 2". Based on the same reasons evoked for the first indicator, a proliferation of high-value-added, non-production export activities among TNCs' subsidiaries is interpreted as a sign of their increasing embeddedness in their host economies.

However, it is crucial to emphasize that an increase in high-value-added products and services by foreign-owned firms constitutes a necessary yet not sufficient condition to confirm the occurrence of deeper, meaningful embeddedness (i.e., embeddedness that leads to domestic economic upgrading). According to Gál and Lux, it is only when such embeddedness contributes to the development of domestic capabilities and stronger local ties that it can generate incremental advancement toward higher domestic value-added, autonomous forms of production (Gál and Lux 2022, 82). These latter two important dimensions are developed in pillars 2 and 3.

3.2 Pillar 2: Establishment of Domestic Innovation and R&D Activities

Through their second pillar, namely the establishment of innovation and R&D activities, Gál and Lux encourage TNCs, domestically owned enterprises, and host governments to seek to locally develop R&D functions as well as product design activities that have been almost

exclusively carried out abroad, as their domestic development would lead to the generation of domestic knowledge (Gál and Lux 2022, 82-83). The development of specialized sticky knowledge could rebalance the asymmetry of the relationship by reducing the structural power of the TNC, leaving the host economies with more agencies to negotiate for more domestic high-value-added activities, making it more mutually beneficial (Gál and Lux 2022, 83).

The aim of the analysis of this second pillar is to obtain an estimate of the extent to which Poland and Hungary have integrated R&D activities into their overall economic activities since the GFC in 2008. To do so, this research utilizes the method that Nölke and Vliegenthart use to characterize the innovation systems of the dependent market economy model (Nölke and Vliegenthart 2009, 687-691). Arguing that the Visegrád countries are poorly engaged in domestic R&D activities, which results in limited innovation in these countries, they aim to demonstrate it notably through the examination of the expenditures on research and development (Nölke and Vliegenthart 2009, 687-689). To assess the level of spending in R&D activities, the authors looked at the gross R&D expenditures as a percentage of GDP (1), as well as at the total percentage of R&D spending done by foreign-controlled firms in the host Visegrád countries (2) (Nölke and Vliegenthart 2009, 687-689).

In order to assess the evolution of the level of R&D activities in Poland and Hungary since 2008, I use these two indicators although slightly modified. All the data used for the descriptive statistical analysis of this second pillar are retrieved from the OECD Data Explorer platform (see Appendix: "Modified Data Set 3" for indicator 2) (OECD n.d.a). With regard to the first indicator, I interpret a rise in the percentage of GDP as a sign of a general motivation (i.e., both domestically and from abroad) to increase the valorization of the domestic production systems in these two Visegrád countries. Regarding the second indicator, I will disaggregate the data further and examine the spending volumes of domestically and foreign-based companies separately. An increase in R&D spending done by domestically based companies will be interpreted as evidence of the strengthening of domestic innovation capabilities, which further

supports the shift from a manufacturing-intensive economy to one focused on higher value-added activities. As for foreign-based companies, their declining, increasing or stagnant evolutions will determine whether the latter have been engaging or disengaging in the functional upgrading of their industrial operations.

Following Gál and Lux's framework, the combination of these two indicators allows for an assessment of the extent to which these countries have developed their national innovation systems, and thus made progress in the process toward reducing their dependence on TNCs' subsidiaries for the import of innovative technologies (Gál and Lux 2022, 82).

3.3 Pillar 3: The Entrepreneurial Role of Universities

Finally, in their third pillar, Gál and Lux emphasize the need of a horizontal expansion of cooperation between domestic actors, including local suppliers (e.g., domestically owned small and medium-sized enterprises) and institutions (i.e., universities, investment agencies, banking institutions, civil societies, among others), and foreign investors to successfully pursue some incremental progress toward higher domestic value-added, autonomous types of industrial activities (Gál and Lux 2022, 83). Gál and Lux's (2022, 83) assertion about the key role of local institutions in the structural rooting of foreign capital aligns with the logic of Etzkowitz's Triple Helix model of innovation, which contends that the growing collaboration between universities, government, and industry as fairly equal parties leads to innovative strategies and processes (Gál and Lux 2022, 83; Etzkowitz 2003, 308). The model places knowledge-producing institutions, in particular universities, as central contributors to industrial economic upgrading, termed as "innovation" by Etzkowitz, which in turn results in economic development (Etzkowitz 2003, 299-300; Etzkowitz and Leydesdorff, 2000, 117). This third pillar thus focuses on universities and their emerging role as entrepreneurs (Etzkowitz, 2003, 319).

As discussed above, universities, and more generally tertiary education institutions (TEI), have a crucial role to play in the domestic economic upgrading of the ECE countries by transferring their knowledge and research output into the creation and diffusion of technical knowledge that can be used in domestic innovation and R&D industrial activities (Santiago et al. 2008, 96). Etzkowitz refers to this as the "entrepreneurial" role of universities (Etzkowitz 2003, 333).

Therefore, the analysis of this third pillar aims to uncover the evolution of the participation of Polish and Hungarian universities in their efforts to fulfill their economic functions through labor force training as well as R&D and knowledge contribution to technological changes over the past decade (Santiago et al. 2008, 73). To do so, this research first employs the quantitative indicator that Nölke and Vliegenthart use to demonstrate the absence of a strong national tertiary education system in the Visegrád countries, in favor of TNC-shaped vocational schools, namely the government spending in education, expressed as a percentage of GDP (Nölke and Vliegenth 2009, 686-687). Additionally, this research disaggregates further this data to focus specifically on state funding of tertiary education (1).

Moreover, because universities must establish close connections with the industrial sector to fulfill their 'entrepreneurial' roles (Etzkowitz 2003, 319-320), as it is through their close partnership with industries that universities are able to transfer their knowledge to upgrade industrial processes and to contribute to the development of new companies (Etzkowitz 2003, 332), it is useful to observe the evolution of the linkages between the two sectors in Poland and Hungary since 2008 (Santiago et al. 2008, 98). In order to quantitatively assess the degree of linkages between the industrial sector and the higher education, the OECD looks at the percentages of innovating firms out of all innovating firms of the country that directly partner with universities or other tertiary education institutions to pursue innovation processes (2) (Santiago et al. 2008, 99), and at the percentages of R&D performed by universities or other

tertiary education institutions that is financed by the industrial sector (3) (Santiago et al. 2008, 98).

In order to assess the evolution of the participation of Polish and Hungarian universities in their efforts to fulfill their 'entrepreneurial' economic functions in both respective countries since the Global Financial Crisis in 2008, I use the three indicators introduced above. To examine the amount of government spending on education, I use data obtained from the UNESCO Data Browser (UNESCO n.d.a). For the two last indicators, data are retrieved from the Eurostat Database (see Appendix: "Modified Data Set 4" for the indicator 3) (Eurostat n.d.a). With regard to the first indicator, I interpret an increase in public spending on tertiary education as a sign of government re-engagement in general-skills training, which used to be underdeveloped due to the dominance of foreign-led production models (Nölke and Vliegenthart 2009, 687).

As for the other two indicators, an increase in the percentage of higher education R&D funded by the domestically based industrial sector, as well as in the percentage of innovative firms collaborating with universities or other tertiary education institutions, is in both cases taken as evidence of a tightening of the linkages between the tertiary education sector and the industrial one. Conversely, a decline in these percentages is regarded as an indication that the linkages between the two sectors are weakening. Innovative firms are defined as enterprises that have engaged in innovation activities during the surveyed period (Eurostat n.d.b). These connections are particularly important to observe as they directly show the contribution of university education to the innovation systems (Santiago et al. 2008, 99).

Praising a market-led but policy-supported framework to pursue incremental improvements toward higher domestic value-added, autonomous forms of production, Gál and Lux provide this three-pillar approach, which this thesis slightly adjusted to its research needs, to assess the extent of a potential structural transition away from the established dependent market economy model in East Central Europe (Gál and Lux 2022, 82). Each quantitative

indicator makes it possible to measure the degree of the progress made by Poland and Hungary in each pillar, which, examined separately in the next section, allows to assess the evolution of these countries along the DME spectrum. Have TNCs' subsidiaries become more economically embedded into their host economies over the past decade (pillar 1)? Have Poland and Hungary experienced increased integration of innovation and R&D activities into their economic operations (pillar 2)? And have Polish and Hungarian tertiary education institutions strengthened their roles in contributing to industrial innovation and thus industrial upgrading (pillar 3)?

Addressing these three questions allows this thesis to answer the research question, as it helps to determine the extent to which incremental progress toward higher domestic valued-added, autonomous forms of production (i.e., domestic economic upgrading) has been occurring, which, following Gál and Lux's framework, allows this thesis to argue that these are signs of steps toward a transition away from the DME model (Gál and Lux 2022, 81-83).

4. Data Analysis

4.1 Analysis of FDI Stock

As discussed earlier, the continuous substantial inflows of foreign direct investment are at the core of the dependent market economy model, providing the Visegrád countries with their main source of capital, but in turn shaping their financing strategies, education and training systems, industrial relations, internal corporate governance, and innovation systems. While looking at the evolution of the FDI stocks in the Visegrád countries alone does not allow to draw conclusions about a possible transition away from the DME model, the accumulated volumes of foreign capital in the region enable to set the structural context and to assess the evolution of the extent to which the five aforementioned sectors of these two countries have been dependent on foreign ownership, and thus on their funds, corporate agendas, and decision-making processes. Figures 1 and 2 combined depict the evolution of the FDI stocks GDP in the Visegrád countries from 2008 to 2024, expressed respectively in United States dollars, (USD) millions, and as a percentage of GDP.

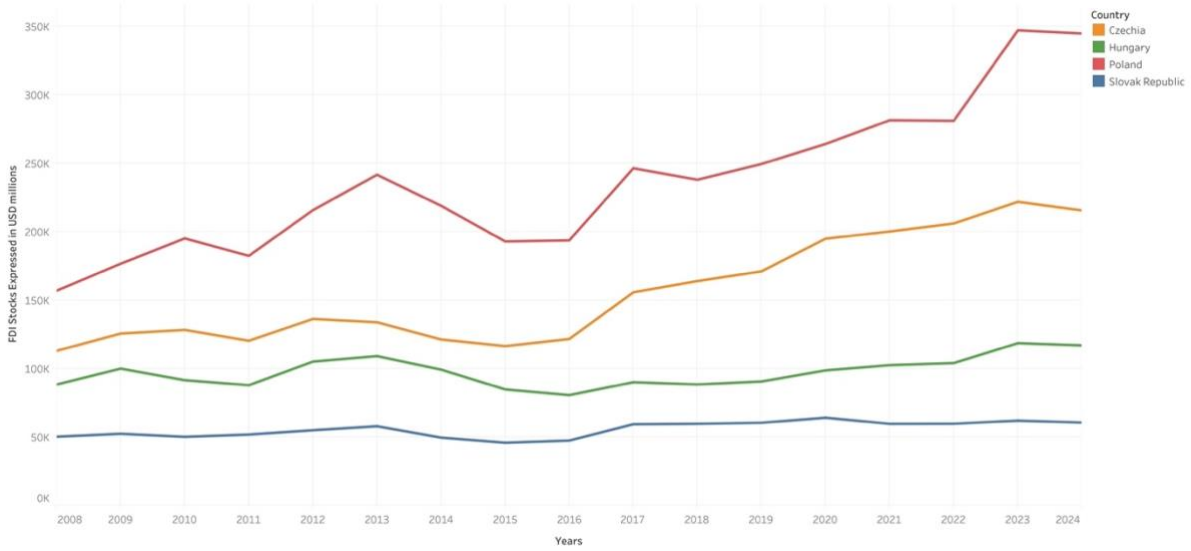

Figure 1. FDI Stocks Expressed in U.S. Dollars, Millions, in the Visegrád Countries from 2008 to 2024
Source: Prepared by the author on the basis of OECD data (OECD, n.d.b).

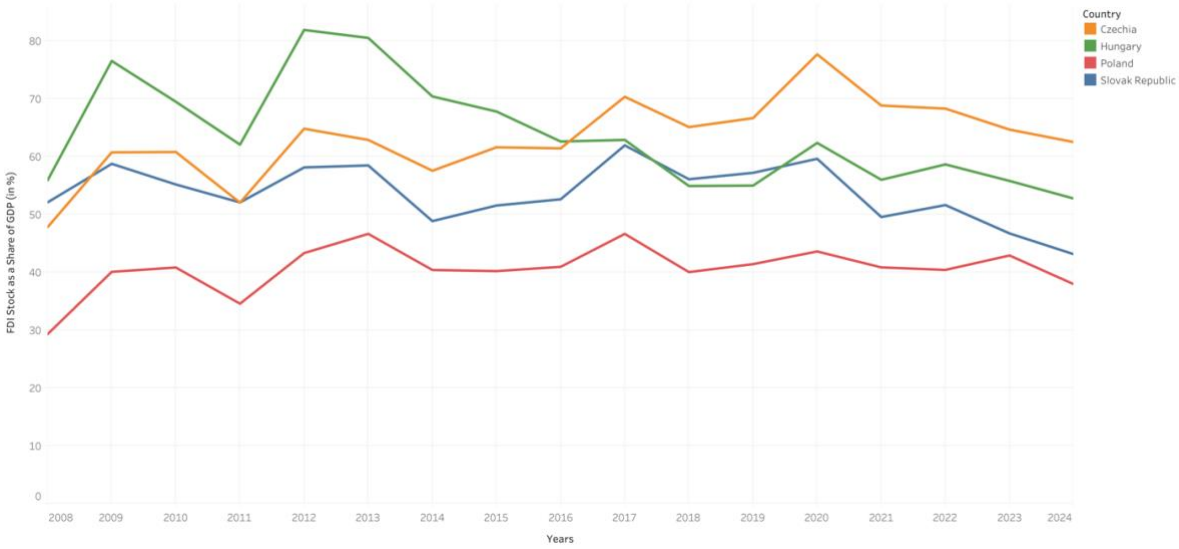

Figure 2. FDI Stocks as a Percentage of GDP in the Visegrád Countries from 2008 to 2024
Source: Prepared by the author on the basis of OECD data (OECD, n.d.c).

Focusing on Figure 2, among the four Visegrád countries on the basis of which Nölke and Vliegenthart theorized the DME model (Nölke and Vliegenthart 2009), Poland had the lowest amount of FDI expressed as a percentage of GDP in 2024, at 38%. Interestingly, its curve expressed as a percentage of GDP has remained relatively flat since 2008, suggesting that its dependence on foreign capital has remained quite unchanged since its economy was characterized as a dependent market economy in 2009. In comparison, Hungary, which used to have the highest percentage in the region, with an FDI stock of over 80% in 2012, has seen its FDI stock steadily decline to reach 53% in 2024, its lowest level in the period measured.

Together, these two figures show that Poland and Hungary are still significantly entrenched in foreign-led production networks, although their FDI stock volume curves have followed different trajectories over the past decade. This observation is also shared by Klimek (Klimek 2024).

This research will now conduct the analysis of each pillar to assess whether these continued high inflows of foreign capital have been redirected in ways that support domestic economic upgrading.

4.2 Analysis of Pillar 1: Local Embeddedness of Capital

4.2.1 Localized Capability 1: Export Ability

In order to address the question of whether TNCs' subsidiaries have become more economically embedded in their host economies since 2012, I first examine the evolution of the volumes of both low- and high-value-added products that foreign-owned firms in Poland and Hungary exported in the last decade. Figures 3 and 4 show the trend of high-value-added exports by foreign-controlled firms respectively in Poland and Hungary. A linear regression line has been computed to show the general trend of the evolution over the years, which has particularly become handy for Hungary, which did not have available data between 2014 and 2019.

The two figures below show that both countries were around the same volume in 2012, i.e., 45.080 billion and 42.319 billion U.S. dollars respectively, and both experienced growth in their exports of high-value-added products. While Poland followed a clear upward trajectory with some fluctuations, Hungary experienced a more moderate and inconsistent increase. The differences in their growth become even more apparent when one looks at the annual variation trend rate, which corresponds to the value by which the linear regression line varies each year. Poland has a regression line that increased yearly by 2.112 billion U.S. dollars, which, if one calculates the percentage of this annual variation trend rate using the volume of high-value-added exports of 2012 as the reference value, represents an annual increase of 4.68%. By contrast, Hungary's regression line grew by a yearly value of 838 million U.S. dollars, representing a growth of 1.98% compared to the actual value of 2012. Thus, one can conclude from these two graphs that both countries saw an increase in their high-value-added exports by foreign-owned firms, with Poland experiencing significantly higher growth than Hungary.

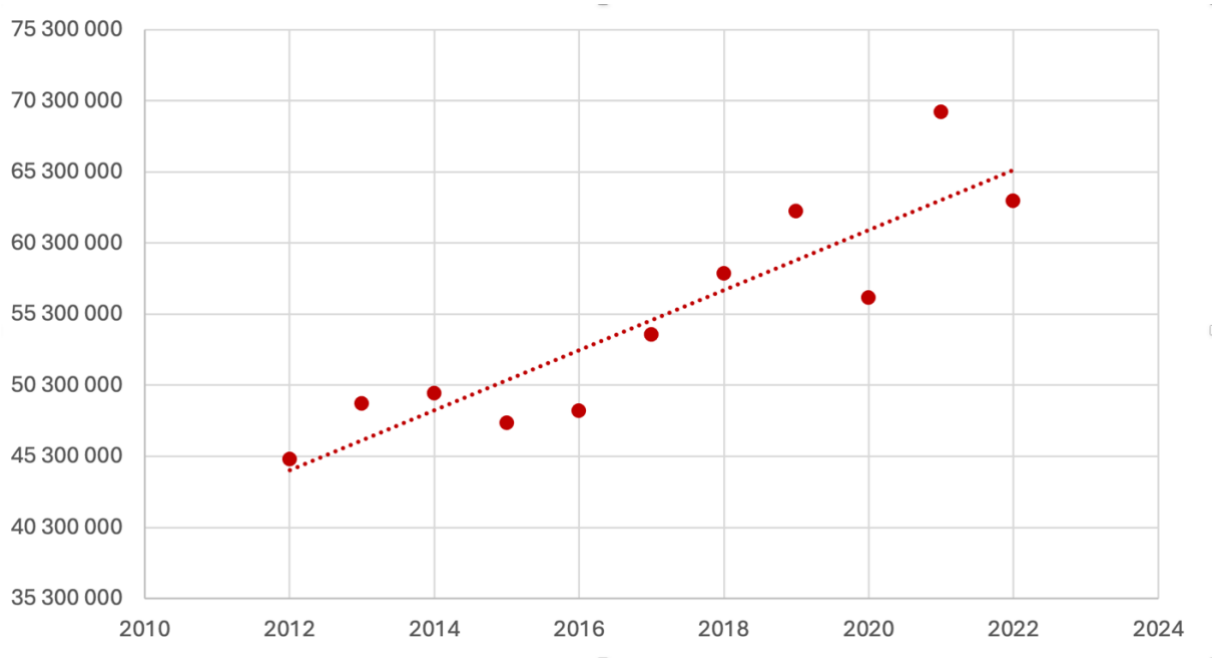

Figure 3. The Export Volumes of High-Value-Added Manufactured Products by Foreign-Owned Firms in Poland from 2012 to 2022 in U.S. Dollar, Thousands
Source: Prepared by the author on the basis of OECD data (OECD n.d.d).

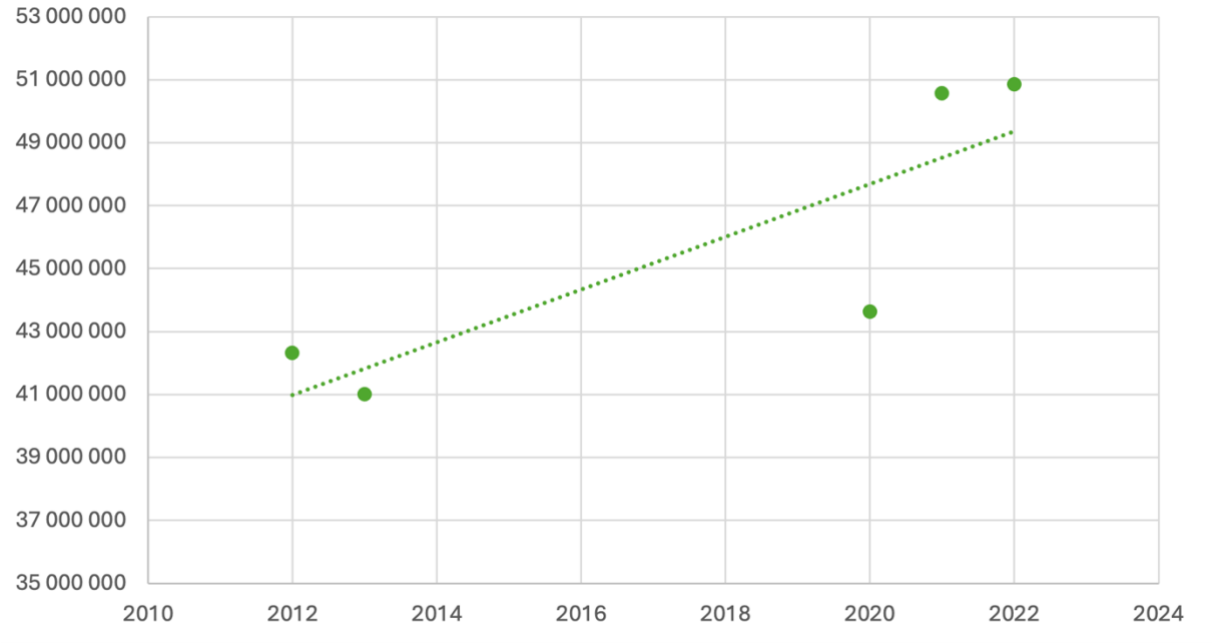

Figure 4. The Export Volumes of High Value-Added Manufactured Products by Foreign-Owned Firms in Hungary from 2012 to 2022 in U.S. Dollar, Thousands
Source: Prepared by the author on the basis of OECD data (OECD n.d.d).

On the other end of the value added spectrum, Figures 5 and 6 depict the evolution of the volume of low-value-added products exported by foreign-owned firms based in Poland and Hungary. Similar to the trend in high-value-added exports, Poland saw a strong and steady increase of its low-value-added exports by foreign-controlled enterprises, while Hungary's

growth was more modest and inconsistent. However, in terms of low-value-added export content, the two countries were at very different thresholds. In 2012, Poland had foreign-owned firms exporting up to 17.374 billion U.S. dollars, while Hungary had 9.134 billion U.S. dollars' worth of low-value-added exports by foreign-owned firms, almost half as much.

Both graphs feature a linear regression line that enables to visualize the variation trend over the past decade. Computing the annual variation trend rate reveals an annual increase of 997 million U.S. dollars in Poland's regression line, equivalent to a 5.74% increase based on the volume of low-value-added exports of 2012 as the reference value. Conversely, Hungary's regression line increased by 224 million U.S. dollars on a yearly basis, corresponding to a 2.46% growth compared to the value in 2012. Similar to Figures 3 and 4, Figures 5 and 6 show growth in low-value-added exports by foreign-owned firms in both countries. However, Poland's increase was considerably higher than Hungary's.

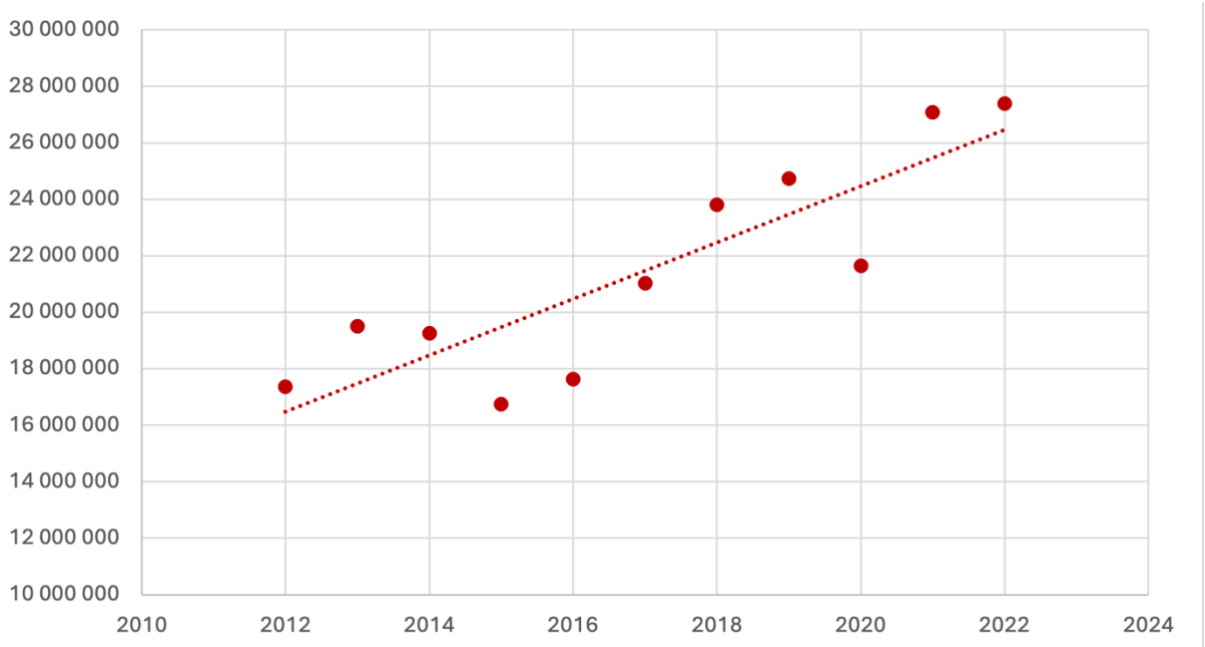

Figure 5. The Export Volumes of Low Value-Added Manufactured Products by Foreign-Owned Firms in Poland from 2012 to 2022 in U.S. Dollar, Thousands
Source: Prepared by the author on the basis of OECD data (OECD n.d.d).

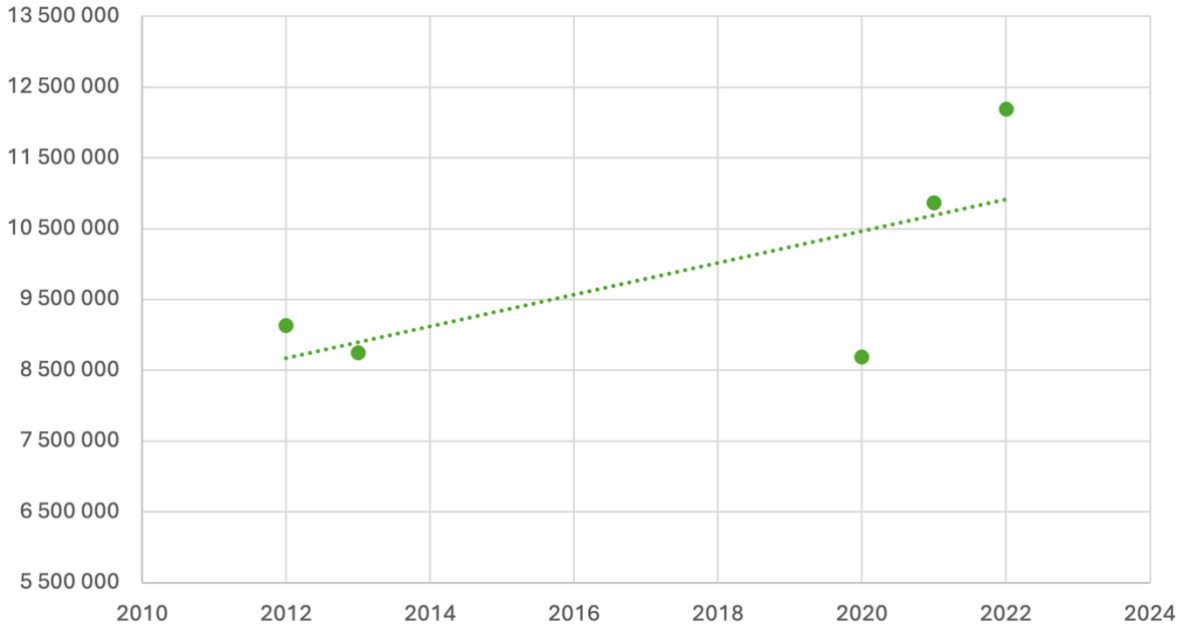

Figure 6. The Export Volumes of Low Value-Added Manufactured Products by Foreign-Owned Firms in Hungary from 2012 to 2022 in U.S. Dollar, Thousands
Source: Prepared by the author on the basis of OECD data (OECD n.d.d).

Following Domański and Gwosdz's work, I compare the evolution of the volume of high- and low-value-added exports by foreign-owned enterprises in Poland and Hungary (Domański and Gwosdz 2009, 466). Over the 10-year period examined, while both countries experienced a greater annual growth rate in exports of low-value-added products, in absolute terms, foreign-owned companies exported significantly more high-value-added products than low-value-added ones in 2022. In Poland, it was respectively USD 63.239 billion versus 27.383 billion, and in Hungary, it was USD 50.847 billion versus 12.186 billion. Based on Domański and Gwosdz's conceptualization, this trend can suggest that foreign-owned firms have continued to increase their reliance on local capabilities in both countries to produce and export more sophisticated goods, thereby enhancing their export abilities (Domański and Gwosdz 2009, 466). This functional upgrading of foreign-owned companies' activities may indicate an increasing trend of their embeddedness in their host economies, namely Poland and Hungary, as the manufacture of these higher value-added products necessitates the development of stronger localized capabilities (Domański and Gwosdz, 2009). Nevertheless, as it will be

discussed below, this interpretation does not suggest that functional upgrading is occurring throughout the entire domestic economic sector, especially among domestically owned firms.

4.2.2 Localized Capability 2: Non-production Function Abilities

The second economic indicator used by Domański and Gwosdz to determine the extent to which foreign-owned automotive firms became embedded in Poland between 1996 and 2006 is an analysis of the development of non-production activities carried out by foreign-controlled firms (Domański and Gwosdz 2009). Drawing from the available data, I thus examine changes in the volumes of high-value-added, non-production activities exported by foreign-controlled firms located in Poland and Hungary over the past decade. Figures 7 and 8 display the export value trends of non-production activities carried out by foreign-controlled firms based respectively in Poland and Hungary from 2012 to 2022. The linear regression lines allow to visualize the general trend of non-production activity exports over the years. This is particularly relevant for Hungary, which not only lacks data between 2014 and 2019, but also experienced major variations. However, considering the scarcity and high fluctuation of the data, no firm conclusions could be drawn.

The two figures first show that Poland and Hungary were not at the same baseline in 2012. In that year, exports of high-value-added, non-production activities by foreign-owned in Poland amounted to approximately USD 170 million, while Hungary recorded a significantly higher volume of around USD 551 million. The following year, Hungary experienced a sharp increase, reaching USD 839 million, while Poland's growth was more moderate. However, over the medium-term, the countries seem to diverge, with Poland recording a stable and rapid increase, and Hungary showing a general slight decrease, though its trajectory is less clear due to the lack of data between 2014 and the onset of the Covid-19 Pandemic. This absence of data distorts the visualization of a trend, as its declining linear regression line follows the major drop

that the country experienced during the most economically disruptive years of the pandemic (2020-2021). Interestingly, Poland recorded a decrease in foreign-owned firms exporting non-production activities in the same period, though its downturn was significantly less pronounced than Hungary's.

Focusing on the annual variation trend rate provided by the linear regression line, Poland has a trend rate increasing annually by USD 51 million, corresponding to a significant yearly increase of 30.08% compared to the export value of high-value-added, non-production activities of 2012. By contrast, although less statistically relevant due to the scarcity of data, Hungary's regression line has declined by a yearly value of USD 11 million, representing a decrease of 1.94% in comparison to the value of 2012.

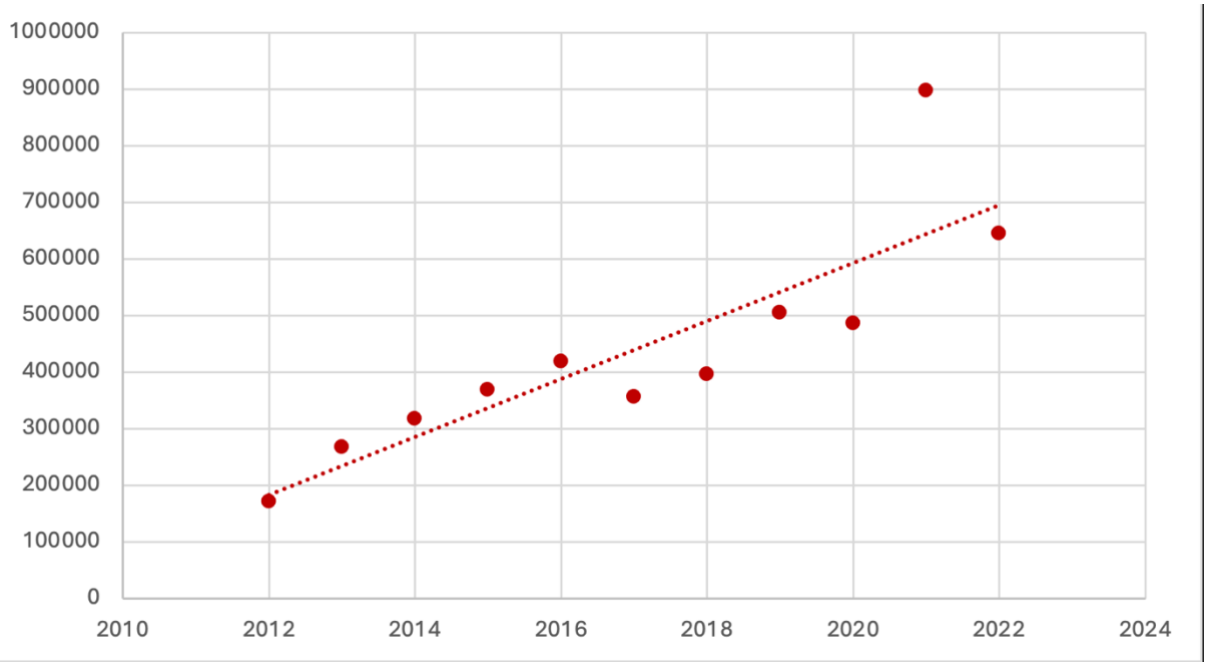

Figure 7. The Export Values of Non-Production Activities by Foreign-Owned Firms Based in Poland from 2012 to 2022 in U.S. Dollar, Thousands
Source: Prepared by the author on the basis of OECD data (OECD n.d.e).

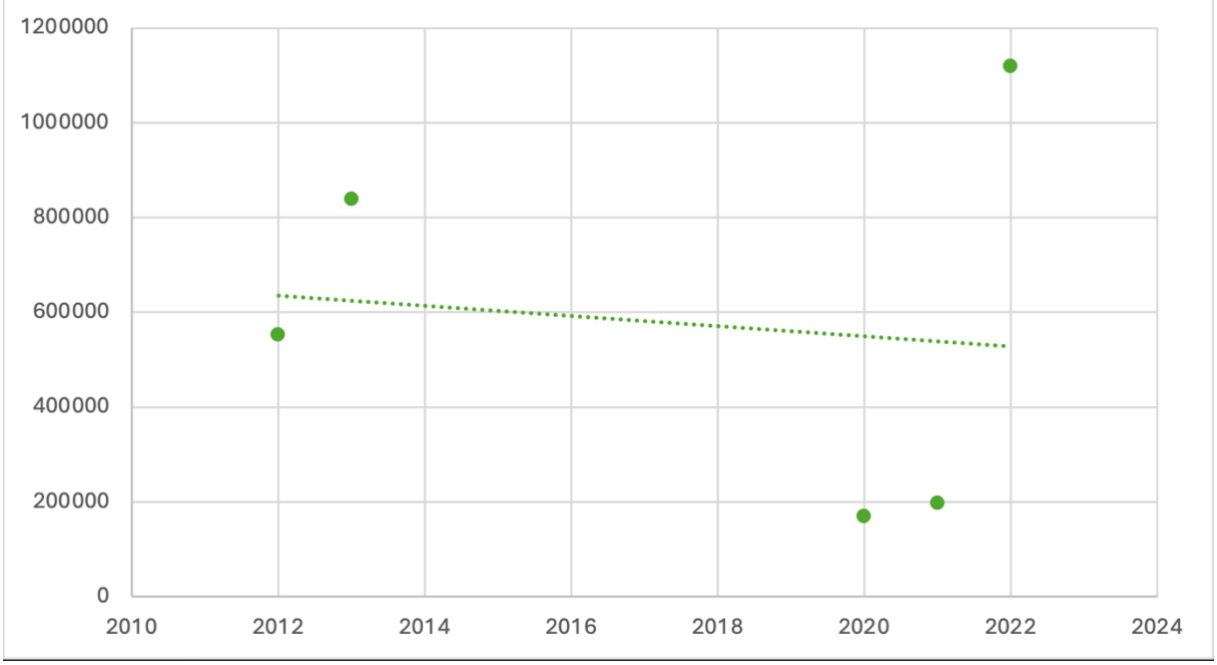

Figure 8. The Export Values of Non-Production Activities by Foreign-Owned Firms Based in Hungary from 2012 to 2022 in U.S. Dollar, Thousands.
Source: Prepared by the author on the basis of OECD data (OECD n.d.e).

In accordance with Domański and Gwosdz's argument, I interpret Poland's clearly marked increase in the export value of high-value-added, non-production activities by foreign-owned companies as a sign their deeper embeddedness into their host economy (Domański and Gwosdz 2009). Growth in the export of scientific and technical, as well as transport and storage activities, suggests that foreign-controlled enterprises have widened their range of industrial activities beyond the mere production of basic, low-value-added products (Domański and Gwosdz 2009, 468).

Conversely, in the case of Hungary, the scarcity and high fluctuation of the data makes it more difficult to evaluate the evolution of the embedding process of the foreign-owned firms exporting non-production activities. Although the 2022 value is the highest one of the measured period, being twice that of the initial measurement, the two preceding years, which correspond to the economically disruptive years of the Covid-19 pandemic, show that foreign-owned enterprises significantly reduced their more advanced operations in their host economy. Many factors could explain this outcome, such as lower global demand during the crisis or a foreign-controlled non-production sector that can be easily retracted. The explanations for this puzzling

observation, namely that Hungary experienced a far more pronounced decrease in export values of non-production activities exported by foreign-controlled firms during the Covid-19 Pandemic than Poland, falls outside the scope of this research.

Overall, the analysis of the two economic indicators constituting the first pillar, which aimed to assess the trajectory of foreign-owned firms in Poland and Hungary since 2012, reveals generally positive trends in the embedding of these enterprises in both countries, albeit to varying degrees. Through their analyses, Poland has exhibited promising signs of increased embeddedness of its foreign-owned firms, as these have significantly increased both the export volumes of their high-value-added products and the export values of their non-production activities. Hungary, by contrast, has also demonstrated indications of increased embeddedness of its foreign-owned firms, though to a less convincing extent. While there has been growth in the exports of more sophisticated, knowledge-intensive goods by foreign-controlled firms, the evolution of the exports of non-production activities have been characterized by significant variations. The high fluctuations in the available data do not allow for a meaningful interpretation of the evolution of the service activities in Hungary. As a result, combined, these two indicators suggest an overall less stable and more limited increased embeddedness of foreign-owned firms in to their host economy, Hungary.

Nevertheless, it is important to nuance these findings. While the results seem to indicate a general trend of increased embeddedness of foreign-owned firms in both countries, this cannot be directly associated with increased domestic functional upgrading. In other words, this cannot be directly paired with progress toward more advanced, knowledge-intensive activities that typically generate more local spillovers (Domański and Gwosdz 2009, 478). As expressed earlier, an increase in the export volumes and values of high-value-added products and services by foreign-owned firms is a necessary condition to achieve meaningful embeddedness, though it is insufficient. To drive the incremental progress toward higher domestic value-added, autonomous forms of production that Gál and Lux argued about, this embeddedness must be

coupled with the development of domestic capabilities and stronger local integration (Gál and Lux 2022, 82). In order to examine the progress in domestic capabilities, this research uses pillar 2 to investigate the evolution of the development of domestically based and managed innovation and R&D activities.

4.3 Analysis of Pillar 2: Establishment of Innovation and R&D Activities

4.3.1 Indicator 1: Gross Expenditures on Innovation and R&D Operations

The pillar 2 aims to examine the evolution of the integration of innovation and R&D activities into the overall economic activities of Poland and Hungary from 2008. The first economic indicator of this pillar is designed to analyze the evolution of the gross R&D expenditures in both countries over the past decade. Figure 9 shows how the total expenditures on research and development, expressed as a percentage of GDP, carried out within these two countries changed between 2008 and 2023.

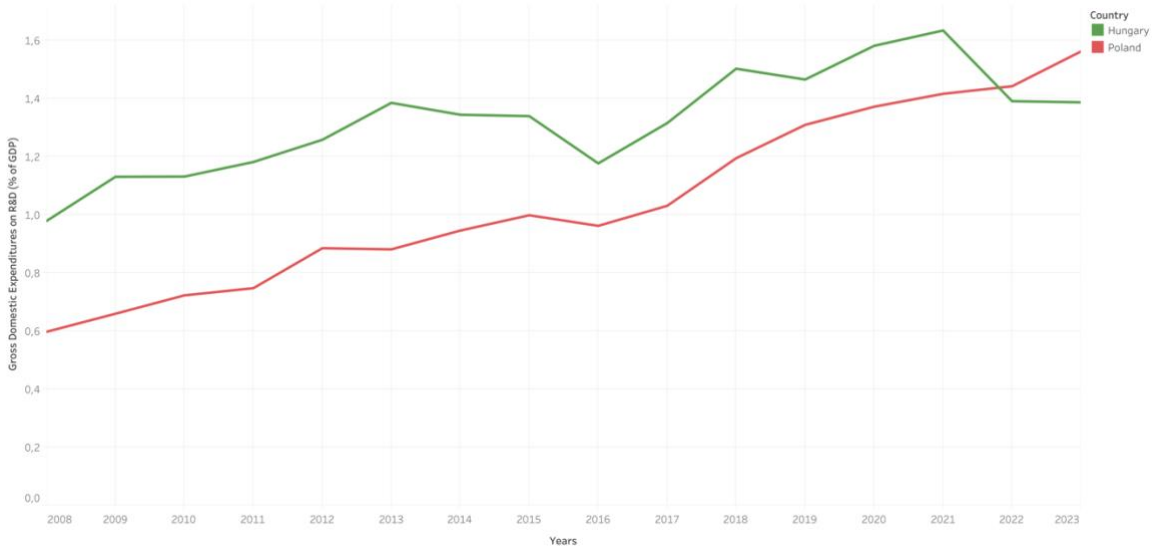

Figure 9. The Evolution of the Gross Domestic Expenditure on R&D in Poland and Hungary from 2008 to 2022, Expressed as a Percentage of GDP
Source: Prepared by the author on the basis of OECD data (OECD n.d.f).

This figure shows that Poland and Hungary had both low gross R&D spending volumes, with a total amounting to 0.6% and 0.98% of GDP, respectively. These statistics are highly comparable to the 2000-2005 averages reported by Nölke and Vliegenthart, namely 0.6% for Poland and 0.9% for Hungary (Nölke and Vliegenthart 2009, 689). Both countries followed an overall upward trajectory, with Poland's R&D spending consistently remaining just below Hungary's. However, in 2022, the trend reversed, with Hungary experiencing a drop in spending that fell below Poland's for the first time during the measured period. By 2023, Poland and Hungary had reached annual total expenditures of 1.56% and 1.39% of their respective GDPs.

In accordance with Nölke and Vliegenthart's theory, countries with an economic structure based on the dependent market economy model engage in very few research and development activities within their territories (Nölke and Vliegenthart 2009). As discussed above, these high-value-added activities are reserved for the headquarters of TNCs and are subsequently imported into the DME countries, which rely heavily on them for their industrial activities (Nölke and Vliegenthart 2009, 687-688; Nölke 2018, 271-272; Gál and Lux 2022, 82-83). Thus, in the words of Nölke and Vliegenthart, an increase in expenditures reflects a motivation to "valorize the production processes," which gradually shifts countries anchored in the DME model away from these assembly-based industrial activities and toward higher-value-added operations involving on-site knowledge generation (Nölke and Vliegenthart 2009, 687). Consequently, aligning with Gál and Lux's framework, I interpret the rise in the percentage of GDP allocated to R&D in Poland and Hungary as an indication of a general growing commitment to developing the R&D activity sector within their territories (Gál and Lux 2022).

However, in order to avoid creating the deceptive illusion that Poland and Hungary have been aligning with Western countries in their gross R&D expenditures, it is important to contextualize these increases alongside a Western country. Austria, a CME-type Western country, was specifically used by Nölke and Vliegenthart to demonstrate the necessity of establishing the DME category in the literature on comparative capitalism (Nölke and

Vliegenthart 2009). I argue that this country is an appropriate point of comparison because many of the TNCs based in their territories are headquartered in this neighboring country (Nölke 2018, 272). When comparing Austria's percentage of GDP allocated to gross R&D expenditures with those of Poland and Hungary, it is clear that the latter remain far behind. While Austria had a markedly higher level of R&D expenditures in 2008 at 2.59%, it has recorded a practically constant rise since then, reaching 3.29%, more than twice that of Poland (OECD n.d.f). This comparison emphasizes that compared to Austria, Poland and Hungary are far from valuing knowledge-intensive activities in their domestic sectors as much as the West does.

4.3.2 Indicator 2: Expenditures on Innovation and R&D Operations Disaggregated between Domestic and Foreign Firms.

Drawing on indicator 1, I disaggregated further the data to examine the separate participation of the domestically and foreign-based enterprises in gross R&D spending respectively in Poland and Hungary over the past decade. Figure 10 illustrates the evolution of domestically and foreign-based firms' R&D expenditures in Poland and Hungary from 2008 to 2022, expressed as a share of the total amount spent on research and development.

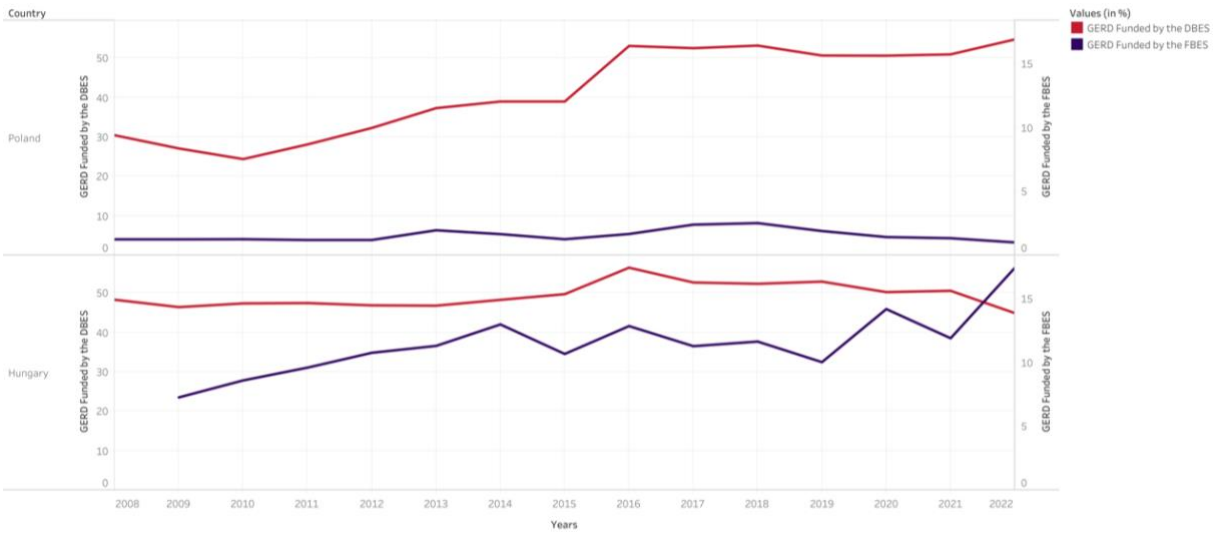

Figure 10. The Evolution of the Gross Domestic Expenditure on R&D (GERD) Funded by the Domestic Business Enterprise Sector (DBES) and the Foreign Business Enterprise Sector (FBES) in Poland and Hungary from 2008 to 2022 as a Percentage of Total GERD
Source: Prepared by the author on the basis of OECD data (OECD n.d.g).

This figure suggests that Poland and Hungary have experienced different trajectories in terms of the development of their R&D systems. On the one hand, the graph shows that Poland relied heavily on its domestically based sector of enterprises to fund its R&D activities. This sector's share of the total R&D spending increased from 30.46% in 2008 to 54.76% in 2022. Regarding the foreign-based enterprise segment, it shows that their contribution remained stagnant at a very low level, evolving from 1.25% in 2008 to 1.01% in 2022. On the other hand, Hungary demonstrated a different picture, with a significantly high yet stagnant, share of R&D expenditures financed by its domestically based companies. Measured at 48.31%, it remained constant throughout the years until 2022, when it decreased to 44,90%. However, contrasting with Poland, Hungary had a higher share of its R&D spending carried out by the foreign enterprise sector, rising from 7.26% in 2009 to 17.41% in 2022.

Following Nölke and Vliegenthart's analysis and focusing first on the case of Poland, the already high and growing share of R&D expenditures carried out by the domestic enterprise sector is a demonstration of the growing ability of domestically based firms to increasingly engage in knowledge-intensive activities, while decreasing its reliance on foreign research and development decision-making (Nölke and Vliegenthart 2009, 688). This interpretation is reinforced by the low and stagnant financial contribution of the foreign enterprise sector. Combined, these two curves tend to indicate the development of a more domestically based R&D system that has been strengthening Poland's innovation domestic capacities.

By contrast, Hungary presents a less clear-cut picture. While its share of R&D funded by domestically based firms remained relatively high despite a slight decrease in 2022, the significantly increasing share of R&D financed by the foreign enterprise sector suggests that foreign actors have taken up a growing role in influencing the development of the country's

innovation systems. While this result may reflect foreign firms' commitment to engaging in more knowledge-intensive, higher-value-added activities, from this pillar's perspective, it indicates an increasing externalization of R&D activities, with innovation development increasingly directed and financed by foreign firms. Therefore, based solely on these two curves, it can be argued that although Hungary has predominantly experienced a rise in R&D activities within its territory, it has been gradually occurring under the direction of foreign actors. It is thus difficult to argue that Hungary has grown its domestically rooted R&D capabilities.

Overall, the analysis of the two indicators constituting the second pillar, which aimed to assess the extent to which Poland and Hungary have achieved integration of innovation and R&D activities into their territorial units, reveals that both countries have experienced a general commitment to increasing their innovation and R&D sectors, though with a crucial nuance. However, it also shows that these two countries have differed in terms of the sources of funding that have enabled them to develop their R&D sectors. While Poland demonstrated to mostly rely on its domestically based enterprises to develop its R&D sector, Hungary appeared to have a significantly higher and growing share of its R&D operations being shaped by foreign firms. This raises doubts to the extent of domestic spillover effects and the potential for building long-term domestic innovation capacity.

4.4 Analysis of Pillar 3: The Entrepreneurial Role of Universities

4.4.1 Indicator 1: Government Spending in Tertiary Education

The pillar 3 aims to examine the evolution of the entrepreneurial role of Polish and Hungarian universities in advancing industrial economic upgrading within their respective countries over the past decade. The first indicator is intended to assess the recent evolution of

national governments' engagement in general-skills training education, in particular universities, which, as discussed above, were underfunded in both countries at the turn of the century (Nölke and Vliegenthart 2009, 687). Figure 11 shows how government spending on tertiary education in Poland and Hungary evolved from 2008 to 2023.

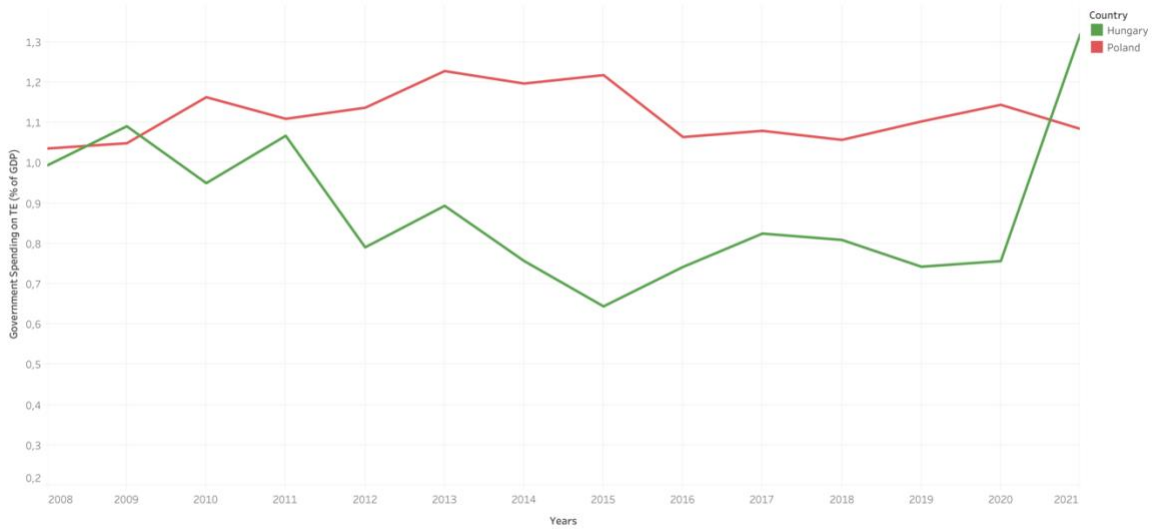

Figure 11. Government Spending on Tertiary Education (TE) in Poland and Hungary from 2008 to 2023, Expressed in Percentage of GDP
Source: Prepared by the author on the basis of UNESCO data (UNESCO n.d.b).

This figure shows that Poland and Hungary have followed quite different trajectories in their government spending on tertiary education. In 2008, both countries allocated a similar percentage of their GDP to higher education: 1.03% and 0.99%, respectively. However, while Hungary's investment followed a downward trajectory, reaching a minimum of 0.64% in 2015, the Polish government's investment remained relatively stable throughout the measured period, ranging mostly between 1.04% and 1.25% of GDP. From 2016 onward, Hungary slightly increased its public spending on tertiary education until 2021, when it experienced a sudden and sharp rise. For the first time since 2009, Hungary's government investment in TE surpassed Poland's spending (at 1.08%), reaching 1.32% of its GDP.

Considering the entire period under measure, these statistics suggest that both countries' governments have not further engaged in the gradual development of a higher-quality, general-

skills public tertiary education system that would address the deficiencies of vocational training. Furthermore, following Nölke and Vliegenthart's (2009, 686-687) analysis, one could argue that the Polish and Hungarian governments have further withdrawn their involvement in the education sector, as total government spending in this area decreased in both countries (Nölke and Vliegenthart 2009, 686-687). Between 2008 and 2021, they ranged at values lower than those introduced by Nölke and Vliegenthart to distinguish these countries from LME and CME Western countries (Nölke and Vliegenthart 2009, 686). During that period, the shares fluctuated between 4.57% and 5.10% in Poland and between 4.14% and 4.97% in Hungary (UNESCO, n.d.b). This distinction remains relevant in the education sector to this day, as illustrated by Austria, where the share of GDP allocated to the entire education sector fluctuated between 5.22% and 5.73% from 2008 to 2021 (UNESCO, n.d.b).

4.4.2 Indicators 2 & 3: Collaboration between the Tertiary Education and Business Enterprise Sector

The following two indicators have been designed to provide an assessment of the evolution of the linkages between the national tertiary education institutions and the industrial sector (Santiago et al. 2008, 98-99). As mentioned earlier, the collaboration between the TEIs and industry plays an important role in the development of a firm's innovation capabilities (Santiago et al. 2008, 96). Their collaboration can occur in various ways, from firms financially contributing to universities' R&D activities to more tangible forms of cooperation, such as joint research endeavors, training, and conferences (Santiago et al. 2008, 96). Figure 12 aims to show the degree to which firms based in Poland and Hungary have collaborated with tertiary education institutions. It compares the percentage of innovative enterprises that collaborated on R&D as well as other types of innovation activities with universities and other types of TEI, to the total number of innovative companies in each country between 2012, 2020, and 2022.

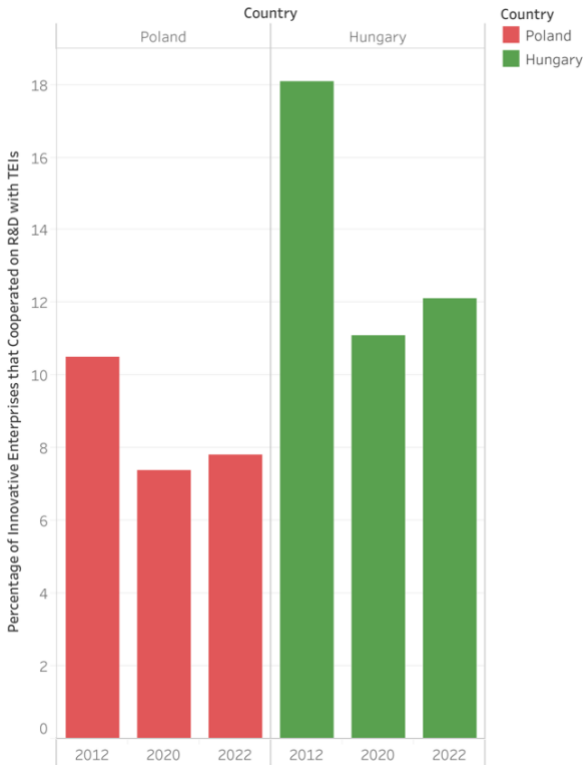

Figure 12. Percentages of Innovative Firms that Cooperated on R&D and Other Innovation Operations with Universities and Other Tertiary Education Institutions (TEI) in Poland and Hungary in 2012, 2020, and 2022
Source: Prepared by the author on the basis of Eurostat data (Eurostat n.d.c; Eurostat n.d.d; Eurostat n.d.e).

This figure reveals that Poland and Hungary experienced similar trajectories in terms of the engagement of their innovative firms with tertiary education institutions in their R&D operations, but at different levels. Initially, Poland had a lower percentage of innovative firms collaborating with a TEI than Hungary did, at 10.50%. This percentage declined to 7.80% in 2022. Meanwhile, Hungary recorded the same decline, but it started from a higher baseline, with 18.10% of its innovative firms collaborating with TEIs in 2012. This percentage decreased to 12,10% in 2022. In a CME-type country like Austria, the statistics are higher, with 21,80% of its innovative firms reporting that they had cooperated with the higher education sector in 2012 and 17,90% in 2020 (Eurostat n.d.c; Eurostat, n.d.d).

Figure 13 dives deeper into the analysis of collaboration between higher education and industry through an examination of the evolution in the share of research and development

activities performed higher education and financed by businesses in Poland and Hungary from 2008 to 2022.

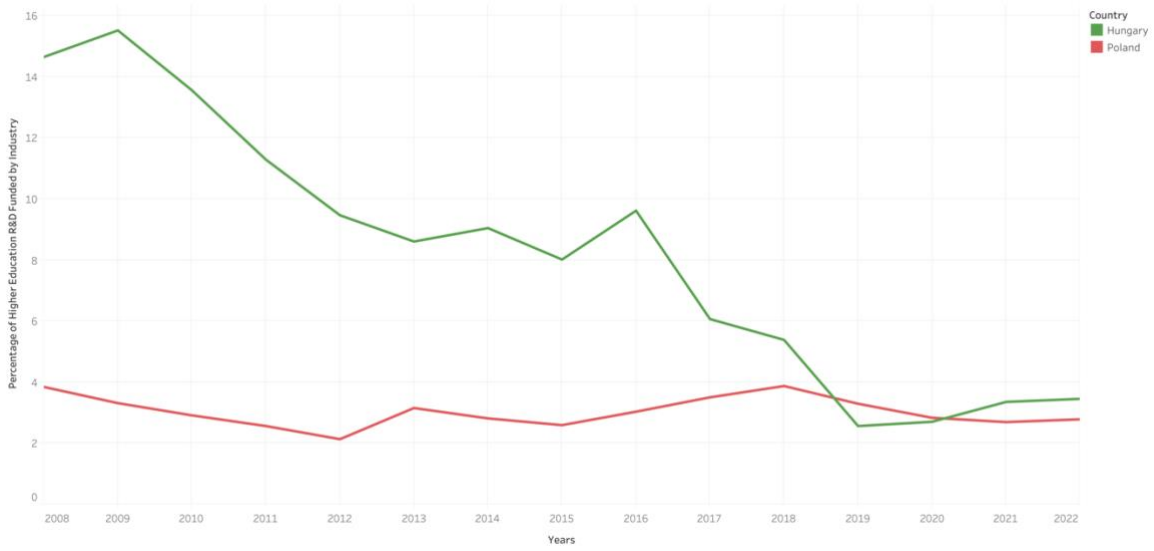

Figure 13. Percentages of Higher Education R&D Funded by the Industrial Sector in Poland and Hungary from 2008 to 2022
Source: Prepared by the author on the basis of Eurostat data (Eurostat n.d.f).

Figure 13 exhibits a similar trend to that observed in Figure 12. Between 2008 and 2022, both countries saw a decline in the percentage of higher education R&D financed by the business enterprise sector, though they departed from significantly different thresholds. Figure 13 shows that, initially in 2008, Hungary had a significantly higher percentage of its higher education R&D funded by the industrial sector at 14.65%. In comparison, Poland was at 3.85% that same year. Although the two countries had notably distinctive levels in 2008, they practically converged by 2022, reaching 2.79% in Poland and 3.46% in Hungary. While Poland's line remained relatively stable, albeit with a slight decline beginning in 2018, Hungary's line dropped steadily from 2009 onward.

These two last figures show evidence that Poland and Hungary experienced gradual weakening of the linkages between their tertiary education institutions and the business enterprise sector. Both countries saw within their territories, with differing proportions, a diminution of the percentage of innovative enterprises that collaborate with the industrial sector

and a direct financial involvement of the latter into the R&D activities. One could argue, based on the work of Etzkowitz and Santiago et al. that these two countries are missing opportunities to upgrade their industrial processes with knowledge and research outputs generated through collaboration between tertiary education institutions (notably universities) and enterprises (Etzkowitz 2003, 332; Santiago et al. 2008, 96).

The analysis of the three indicators constituting the third pillar strived to assess the evolution of the participation of Poland's and Hungary's higher education sectors in the training of the labor force and the transfer of knowledge and research outputs aimed at developing innovation capabilities and, in turn, upgrading industrial processes. Overall, the analysis of this pillar revealed a gradually weakening role of the tertiary education sector in both countries. The Polish and Hungarian states have generally shown a pattern of disengagement from their tertiary education systems, and thus in addressing underdevelopment of general-skills higher education (Nölke and Vliegenthart 2009, 687). The sudden and sharp increase of the Hungarian government's spending in tertiary education may signal a renewed commitment to the sector. However, given the overall volatile and mainly downward trajectory over the past decade, it is difficult to predict whether this trend will continue.

These governments' disengagement from education is coupled with the erosion of linkages between tertiary education institutions and the business enterprise sector in both countries. These weakening linkages, observable over the past decade, suggests missed opportunities for both countries to upgrade their industrial sectors through the transfer of knowledge and research outputs between TEIs and firms.

The analysis of these three pillars enables this research to attempt to provide an answer to the research question in the conclusion.

Conclusion

This research has been seeking to examine the extent to which domestic economic upgrading in two East and Central European countries, namely Poland and Hungary, has led to a transition away from the dependent market economy model, as theorized by Nölke and Vliegenthart in 2009, prior to the legacies of the global financial crisis (Nölke and Vliegenthart 2009).

Through a post-Global Financial Crisis lens, the debate within the DME framework has explored whether those countries have undergone domestic economic upgrading over the past decade in a way that could lead to a transition away from that model. However, no consensus has emerged. It is within this contextual backdrop that this research took shape.

Building on Gál and Lux's three-pillar framework (Gál and Lux 2022, 81-83), this research found that, while Poland and Hungary remain entrenched in foreign-led production networks, as shown by the continued high inflows of FDI into their economies, they have both demonstrated some incremental progress toward higher domestic valued-added, autonomous forms of production (i.e., domestic economic upgrading). According to Gál and Lux's framework, this progress can be interpreted as a sign of steps toward a transition away from the DME model (Gál and Lux 2022, 81-83). However, this progress remains relative, particularly when compared to Austria, a neighboring Western country characterized by a coordinated market economy, and varies enormously between the two countries under study.

Based on Gál and Lux's framework, Hungary can be argued to have achieved some degree of domestic economic upgrading (Gál and Lux 2022, 81-83). However, this research contends that this is primarily reflected in the increased export volumes of high-value-added manufactured products by foreign-owned firms. Such functional upgrading of foreign firms' activities may suggest a trend toward deeper embeddedness, as the production of more sophisticated goods typically requires the development of stronger localized capabilities

(Domański and Gwosdz, 2009). This may, in turn, generate positive spillover effects at the national level, such as incentivizing or enabling domestically owned firms to pursue functioning upgrading themselves (Gál and Lux 2022, 82-83). However, as previously noted, an increase in the volumes of high-value-added activities dictated by foreign actors is a necessary but not sufficient condition for concluding that meaningful domestic functional upgrading is taking place. Pillars 2 and 3 are necessary to assess whether this increased embeddedness translates into enhanced domestic capabilities and stronger institutional linkages. In the case of Hungary, results under both pillars turned out to be unconvincing.

In Pillar 2, which assessed the evolution of the integration of R&D activities into the overall economic activities of the country between 2008 and 2022, Hungary showed a general commitment to developing its national innovation and R&D sectors, demonstrated by a general increase in R&D expenditures. However, a significant and growing share of this R&D funding came directly from foreign firms, raising concerns about the limited domestic spillover effects necessary to strengthen national domestic R&D capabilities. Regarding pillar 3, which evaluated the evolution of the contributing entrepreneurial role of Hungarian universities to improving industrial processes within their territories between over the last decade, it clearly appeared that the Hungarian governments remained financially disengaged from the tertiary education sector overall. Although the state budget rose sharply in 2022, in view of past fluctuations, it is difficult to judge whether this sudden renewed commitment will continue. Additionally, this overall disengagement is paired with a decline in collaboration between universities and the enterprise sector, revealing a missing institutional link that is crucial to develop domestic capabilities.

By contrast, Poland demonstrated more convincing incremental progress toward domestic economic upgrading. The analysis revealed a positive trend in the embeddedness of foreign-owned firms, reflected in increases in both their export volumes of high-value-added manufactured products and their export values of high-value-added non-production activities

between 2012 and 2022. These developments suggest the potential for the nationwide spillover effects discussed above. Moreover, unlike Hungary, Poland provided additional evidence that the increased embeddedness of foreign-owned firms may contribute to domestic economic upgrading. Pillar 2 showed a significant rise in gross domestic R&D expenditures, driven primarily by domestic based companies, while foreign firms appeared barely involved in national R&D expenditures. This trend highlights the growing capacity of domestically based firms to increasingly engage in knowledge-intensive activities, thereby decreasing reliance on foreign-led research and development decision-making.

However, the progress of Poland is not without limitations. The Polish government failed to show a renewed engagement with the tertiary education sector, and the country has experienced a gradual weakening of the linkages between their tertiary education institutions and the business enterprise sector. This result highlights that, despite progress, Poland continues to miss opportunities to economically converge with the West due to a tertiary education system that remains underdeveloped and increasingly disconnected from the enterprise sector.

In conclusion, while this research argues that these advancements represent signs of progress toward a transition away from the DME model, both Poland and Hungary remain far from achieving full economic convergence with the West.

This research involves some limitations that are important to acknowledge. First, this study lacks sufficient quantitative indicators to fully assess the extent of each pillar and relies on limited data to measure the export volumes and values of high-value-added manufactured products and non-production activities. Second, the research does not take into consideration the role of transnational structures, such as the European Union, in shaping the dependent market economy model in Poland and Hungary. Finally, the research does not account for differences in the economic size of these two countries' domestic markets and historical legacies. These limitations can serve as directions for further research. Nevertheless, despite the limitations, this thesis has brought to light some evidence suggesting a positive trend toward

Hungary's and Poland's transition away from the DME model, contributing to the field of comparative political economy.

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Appendix

Modified Data Set 1:
Analysis of Pillar 1: Local Embeddedness of Capital: Localized Capability 1: Export Ability: Link

Modified Data Set 2:
Analysis of Pillar 1: Local Embeddedness of Capital: Localized Capability 2: Non-production Function Abilities: Link

Modified Data Set 3:
Analysis of Pillar 2: Establishment of Innovation and R&D Activities: Indicator 2: Expenditures on Innovation and R&D Operations Disaggregated between Domestic and Foreign Firms: Link

Modified Data Set 4:
Analysis of Pillar 3: The Entrepreneurial Role of Universities: Indicator 3: Collaboration between the Tertiary Education and Business Enterprise Sector: Link