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The role of FDI in regional economic growth in Central & Eastern Europe: the case of the Hungarian regions

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Abstract: FDI has been a key driver of economic transformation in Central and Eastern Europe (CEE). However, its long-term impact on GDP growth is limited, with benefits often concentrated in more developed regions, exacerbating regional disparities. This paper examines the relationship between FDI inflows, GDP growth, and gross fixed capital formation (GFCF) in Hungarian regions from 2000 to 2018 using panel econometric methods. Panel granger causality tests, and panel regression models (using first difference effect) are conducted controlling for GFCF, employment, R&D and the global financial crisis. Findings reveal that FDI does not significantly drive regional GDP growth, highlighting the importance of endogenous growth factors and local entrepreneurial ecosystems. The study critiques the FDI-led model, linking its shortcomings to economic nationalism and regional disintegration.

Keywords: FDI, dependent market economy, GDP, regional economic growth, fixed investments, Hungarian regions

Introduction

Research on the impact of FDI in host economies has drawn significant attention (Bermejo Carbonell & Werner, 2018; Estrin & Uvalic, 2014; Lane & Milesi-Feretti, 2007, 2011). While conventional economic theories and policymakers highlight the presumed benefits of FDI, empirical evidence lacks clear support for this claim. Studies predominantly focus on developing economies, yet developed countries remain the primary recipients of FDI flows (Lipsey 2000; Lucas 1990).

Recent empirical findings suggest that FDI exerts the most significant positive impact on economic growth in developed countries with educated workforce and mature financial markets capable of capitalizing on foreign investments (Alfaro et al., 2004). Bermejo Carbonell and Werner (2018) demonstrated a negative impact of FDI on economic growth, even in Spain, with a relatively developed financial market, whereas domestic bank loans had a positive effect. This study aims to

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validate these prior research findings in a less developed post-socialist country, specifically Hungary, at the regional level. It seeks to understand why FDI does not positively affect regional GDP growth and Gross Fixed Capital Formation (GFCF), questioning the rejection of FDI benefits at the regional level, too.

Among the studies focused on Central and Eastern European (CEE) countries, only some have addressed the relationship between FDI and economic growth (Mencinger, 2003; Mileva 2008) and even fewer have addressed the role of FDI in regional economic growth, both in the EU or in the CEE region (Bajo-Rubio et al., 2010; Casi & Resmini, 2017; Getzner & Moroz, 2020; Lengyel & Varga, 2018). The present paper follows the line of previous research by Lengyel and Varga (2018), which defines national economic growth as an aggregate of sub-national regional economic growth. The purpose of our research is therefore to examine:

- whether the influx of FDI into CEE transition economies has any direct impacts on economic growth,
- whether these GDP growth inducing impacts are manifest at the subnational (regional) level.

In order to answer these questions, we shall investigate the relevance of the link between FDI and economic growth as well as FDI and GFCF and controlling for indicators of the global financial crisis and the economic environment in the Hungarian regions.

FDI has played a pivotal role in Central and Eastern European (CEE) countries, serving as a major capital flow mechanism, but its impact has been nuanced. While initially seen as a solution for capital shortages and economic restructuring during the transition to market economies, FDI's contributions have varied. Despite bolstering competitiveness, it has sometimes led to resource outflows from CEE to Western countries (Bermejo Carbonell & Werner, 2018; Gowan, 1995; Pavlinek & Smith, 1998). The economic evolution in the region heavily relies on FDI, presenting challenges in breaking away from middle-income cycles and mitigating external dependency repercussions. CEE represents a paradigm of FDI dependent capitalism, marked by substantial reliance on foreign ownership in crucial sectors during the economic transition, perpetuating a semi-peripheral dependence on advanced Western European countries and hindering catch-up potential beyond middle-income status (Gál & Schmidt, 2017; Nölke & Vliegenthart, 2009).

Mainstream literature on the regional impacts of FDI emphasizes its positive effects, including employment, technology spillovers, and increased productivity (Cooke, 2002). The new regionalism studies highlight FDI's favorable contribution to regional development, while research into FDI's embeddedness focuses on regional links and collaborations between foreign investors and local suppliers (Jones & Wren, 2012). In the context of the knowledge economy, FDI is recognized as crucial for knowledge transfer, especially in less developed regions. Notably, in their analysis of Hungary's territorial economic growth factors, Lengyel-Varga (2018) revealed that FDI-driven manufacturing regions significantly contribute to

the national GDP growth. In Lengyel's (2004) study, FDI is posited as one of the prerequisites for enhancing regional competitiveness via capital accumulation and technological spillovers.

CEE thrived as a EU growth leader during the pre-COVID high-pressure economy period. However, the FDI-dependent model is showing its limits, with momentum slowing and structural challenges emerging. Transitioning to innovation-driven, domestically anchored strategies is vital for sustainable development and resilience. During periods of high economic pressure, FDI was widely regarded as the primary driver of economic growth. This belief was particularly prevalent in the context of transition economies and developing regions. The paper explores the subnational effects of FDI on economic growth and fixed capital formation in Hungarian regions (counties), with potential applicability to other less developed Central and Eastern European (CEE) regions. It investigates the regional-level connection between FDI and economic growth, emphasizing the lack of a direct link between regional development levels and FDI exposure. The study aims to contribute to the limited research on this topic in CEECs, providing novel insights into the regional impacts of FDI on economic development.

There is limited research on sub-national economic growth in Central & Eastern Europe. Our aim is to fill this gap by examining regional economic transformation post-socialism. We emphasize the importance of indigenous factors, such as institutional stability and economic policies, beyond GDP growth. The heavy reliance on FDI in some CEE regions has led to vulnerabilities, contributing to discontent and populism. Recent findings show varied trends, with FDI-dependent regions in Slovakia, Czechia, and Hungary experiencing stagnation, while Polish and Romanian regions, with stronger domestic economies, show more rapid convergence. This highlights the complex relationship between FDI and regional development. While FDI is often seen as a growth catalyst, the reality is nuanced, with some developed countries like Czechia facing stagnation and signs of the middle-income trap despite substantial FDI inflows. Our research underscores the importance of understanding this relationship for CEE regions transitioning to/from middle-income status. We advocate for nuanced policy approaches tailored to each region's specificities and broader socio-economic context. Critical political economy approaches suggest that FDI can reinforce structural dependence and a dual economy, where foreign-controlled sectors flourish while domestic industry stagnates. This is particularly evident in the case of Hungary, where empirical evidence shows limited domestic spillovers, stagnant wage growth, and increasing external shocks (Gál & Lux, 2022). These findings are consistent with the dependency theory, which assumes that peripheral economies can become locked into low-value-added roles within global value chains, limiting their long-term development potential (Gál & Lux, 2022).

The novelty of this study lies in its contribution to the literature on uneven regional development by providing insights into the role of FDI in territorial

differentiation. It also addresses the existing inconsistency in the literature regarding the relationship between FDI and economic growth. It highlights the vulnerability of the FDI dependent growth model. Policy mitigation strategies are crucial to address these vulnerabilities, including upgrading and diversification efforts, support for indigenous industries, investment in human capital and innovation. These strategies aim to foster resilient and inclusive growth across regions while reducing dependency on FDI. In the case of Hungary, our study covers 19 years until the end of the high-pressure economy period before the Covid crisis, when the effects of this crisis had not yet affected the macroeconomic and regional impact of FDI. Moreover, during this period, Hungary continued to have access to EU funds, so the expected impact of EU funds can be examined in addition to FDI; for example, the share of EU funds was higher in fixed investments than that of FDI.

The structure of the paper is as follows: the next section presents an overview of growth theories with implications of FDI and regional development. The next section presents the role of FDI in the post-socialist transformation of CEE, illustrated by statistical examples from the Visegrad countries[7]. After a brief overview of the host country impact and regional implications of FDI, the following empirical part examines the effects of FDI on the economic growth and gross fixed capital formation in the Hungarian regions with econometric analyses. The summary section evaluates and discusses the main findings of the model with brief policy recommendations and political implications.

1. Literature review

1.1. Macro level theoretical approaches: the relationship between FDI and economic growth

Neoclassical growth models posit that savings are crucial for economic development, but low savings rates in developing countries often lead to reliance on FDI as an alternative to domestic savings. Governments entice FDI with tax incentives, risking excessive profit repatriation over reinvestment (Dixon & Boswell 1996; Hughes 1979). Despite neoclassical theories suggesting higher returns on equity in developing countries, empirical evidence indicates that long-term growth is more reliant on technological progress than capital investment (Solow 1957). Endogenous growth theory emphasizes the technology's impact, while exogenous growth theories highlight FDI-mediated technology transfer (Blomstrom & Kokko, 1998; Lucas 1990; Romer 1990), with limited empirical evidence on the growth effect of imported technology (Ashraf et al., 2016).

Empirical studies on the impact of FDI on GDP growth in host economies present divergent conclusions, divided into three approaches: one indicating a

[7] Czech Republic, Hungary, Poland and Slovakia.

positive relationship (a), another suggesting a negative correlation (b), and the third asserting an ambiguous link heavily influenced by absorption capacity and socio-economic conditions (c). Modernization theory, which dominated the post-transition development agenda in CEE holds that FDI brings not just capital but know how, and market access that ensure convergence with the advanced economies of the EU. However, empirical results remained mixed.

a) Mainstream theories support the *positive impact of FDI on host countries' economic performance*, linked to technology transfer. Studies by Borensztein et al. (1998), Campos & Kinoshita (2002), Neuhaus (2006), and others emphasize this positivity but stress the importance of factors like human capital, financial market maturity, and absorption capacity. Alfaro et al. (2004) show that countries with mature financial markets are the most likely to benefit from FDI inflows, while Mileva (2008) shows a positive FDI relationship with investment in transition economies. The empirical findings of Hlaváček and Bal-Domańska (2016) support this view. They show that FDI positively contributes to GDP growth in the Czech Republic, Hungary, and the Baltic states, especially when paired with domestic fixed capital formation. However, many other studies challenge that optimistic narrative.

b) Conversely, some studies found *no significant positive correlation between FDI and economic growth*. The research by De Mello (1997), Carkovic and Levin (2005), Mencinger (2003), Bermejo Carbonell and Werner (2018), Prasad et al. (2007), and others highlights instances where FDI exhibited negative impacts on GDP growth, particularly in less mature markets reliant on foreign capital. Even in cases of balance of payment deficits, developed economies tend to grow despite FDI, while transition economies show similarities to developing countries regarding FDI's adverse effects on growth (Gunby et al., 2017; Jensen, 2006). According to recent literature on the smile curve, the primary problem for Central and Eastern European Countries (CEECs) lies in their heavy reliance on lower value-added (VA) manufacturing within global value chains (GVCs) (Baldwin & Ito, 2022). This positioning limits their economic potential as the deepening smile curve increasingly shifts value to pre- and post-production stages like R&D and marketing services, typically dominated by advanced economies. Consequently, CEECs may struggle to transition to higher VA activities, particularly when servitization involves lower VA services, further constraining their ability to capture more value and achieve sustainable economic growth. A recent study by Durova et al. (2022) covering the 2007-2019 period, finds no statistically significant causal relationship between FDI and GDP growth across the ten new member states, including Hungary. This finding raises important questions about the effectiveness of FDI-led growth strategies, particularly in countries that may lack the institutional capacity or human capital to absorb and diffuse foreign investment, or if FDI generates less high-value-added assembly activity at the bottom of the smile curve.

c) Certain models propose that *FDI promotes growth only under specific conditions*. Meta-analyses like Iwasaki and Tokunaga (2014) emphasize varying

outcomes based on calculation specifics, indicating lower productivity spillovers from FDI compared to direct management participation. It is suggested that advanced economies with better institutional conditions and lower risk attract more FDI, benefiting from advanced financial markets (Alfaro et al., 2004). Bilas (2020) found weak evidence for a statistically significant impact of FDI on GDP, suggesting only an indirect relationship between the GDP growth rate and FDI growth and argues that factors such as institutional quality, human capital, market size, and government incentives might be important. Karahan and Colak (2022) examine the nature of productivity spillovers from FDI in Eastern Europe. Their study finds positive backward spillovers – beneficial effects for domestic suppliers affiliated with foreign firms – but no significant horizontal or forward spillovers to domestic competitors or customers (Karahan & Colak, 2022). This suggests that the benefits of FDI are highly sectoral and structurally specific and do not necessarily generate broad-based economic dynamism.

In summary, the impact of FDI on GDP growth varies across economies, contingent upon factors such as absorptive capacity, institutional conditions, and financial market maturity. While FDI may stimulate short and long-term development, its effects can also be adverse, especially in less developed markets reliant on foreign capital. Advanced economies, with better absorptive capacities, are more likely to positively benefit from FDI, yet FDI-driven companies rarely dominate these markets, instead operating as complementary alongside domestic companies.

1.2. Regional approaches

Despite the large number of national economy-level studies, there is limited empirical research that addresses the territorial aspects of FDI beyond the national level (Menghinello et al., 2010). FDI tends to favour already-developed regions, exacerbating spatial disparities in regional economic development (Iammarino, 2018). The integration of regions into Global Production Networks (GPNs) can shape these disparities, with regions integrating autonomously through multinational corporations experiencing different impacts compared to subordinate locations of foreign affiliates (Iammarino, 2018).

While FDI enhances productivity and drives regional economic growth (Bajo-Rubio et al., 2010), its spillover effects vary depending on the absorption capacity of institutions and businesses (Casi & Resmini, 2017). Agglomeration can amplify FDI spillovers when foreign firms complement existing local industries (Menghinello et al., 2010), but adverse effects may occur in less developed regions, where dominant foreign investors overpower small local firms. Research suggests that FDI has greater long-term potential benefits in more advanced regions than in less developed regions, primarily due to the prevalence of vertical, efficiency-seeking FDI in the latter (Pavlínek, 2022). The branch plant economy prevalent in

many CEE regions creates jobs but suffers from significant profit outflows and a lack of decision-making and strategic functions (Pavlinek, 2022).

In Central and Eastern Europe, many regions are predominantly engaged in low-value-added manufacturing activities within Global Value Chains (GVCs), positioning them disadvantageously. These "factory" regions often struggle to capture higher economic returns, leading to slower GDP growth and lower income levels compared to "headquarters regions" involved in higher-value functions, such as research and development or corporate headquarters (Capello & Dellisanti, 2024). The limited value-added capture by factory regions exacerbates regional income disparities and hampers overall economic development and middle income trap (Diemer et al., 2022). This disadvantageous position in GVCs has been linked to persistent regional inequalities and slower economic growth within the CEE region.

Foreign-owned firms in reindustrialized manufacturing regions deviate significantly from the region's average capability match, leading to unrelated diversification with low spillover effects on domestic firms (Elekes et al., 2019). Adverse effects of FDI in Czechia during the 1990s include regional divergence and limited spillover effects (Pavlínek, 2004), while political and institutional factors limit the FDI impact on regional performance in Ukraine (Getzner & Moroz, 2020). FDI has widened regional disparities in Poland (Wisniewski, 2005), but has positively impacted Croatia's regional development, proportional to absorption capacity (Kersan-Skabic & Tijanic, 2014). Concentrated manufacturing FDI significantly drives national GDP growth in Hungary (Lengyel & Varga, 2018).

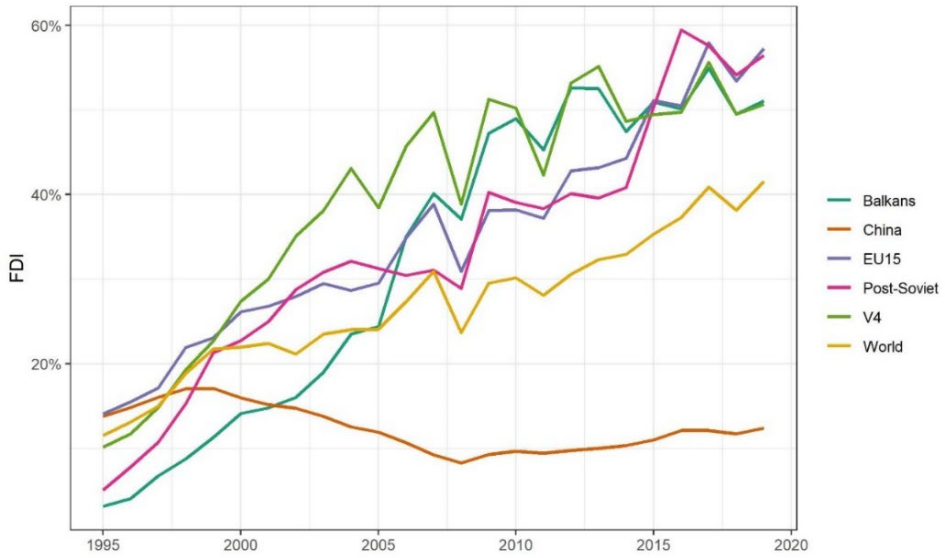
1.3. The role of FDI in Central and Eastern Europe

FDI significantly impacted post-socialist development in the Visegrad countries, driven by their proximity to Western Europe and market allure in CEE (Gál & Schmidt, 2017). Despite offering low-wage alternatives, CEE countries lacked in technological prowess, leading to asymmetric trade links and hindering industrial development (Becker et al., 2016; Gräbner et al., 2019). While foreign-owned companies were expected to enhance productivity and competitiveness (Javorcik, 2004), they often operated as enclaves, limiting interactions with domestic entities and potentially crowding out local firms (Barta, 2005; Hardy, 1998; Rugraff, 2010). By the late 1990s, foreign ownership dominated both the financial sectors and manufacturing in the Visegrád countries (Buch et al., 2003; Kalotay, 2010). However, this transformation, facilitated by CEE governments and transnational institutions within a neoliberal political framework, encountered limitations and diminishing advantages for upgrading, particularly highlighted by the 2008 crisis (Smith & Swain, 2010).

This section presents the situation of the CEE region in terms of FDI stocks, GDP growth and gross fixed capital formation compared to some global macro-regions. Figure 1 depicts the share of FDI stocks (as measured to GDP) for different

macroregions examined. With the exception of China, which predominantly uses domestic resources to finance fixed capital investments, FDI stocks increased relative to GDP in all regions, but grew most rapidly in the V4 countries and then in the Balkans. Until 2015, the V4 countries had the highest relative share in FDI stock, globally. However, the FDI stock has fallen in all Visegrad countries since 2017. Hungary has seen the largest drop to 56%, with the Czech Republic (71%) showing the smallest decline. Poland has stagnated at around 40% (UNCTAD WIR).

Figure 1. Average FDI stock by macroregions as % GDP 1995-2019 weighted by GDP



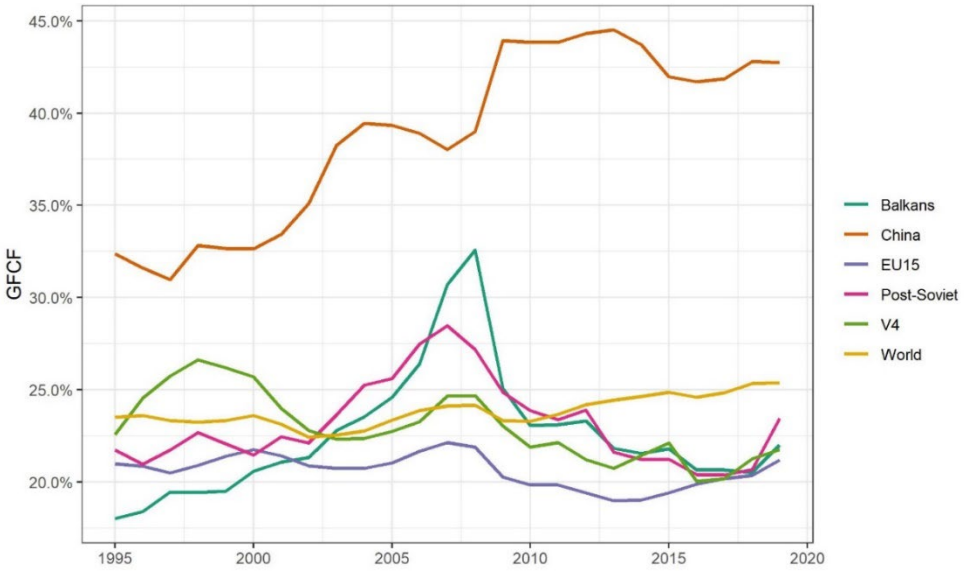
Source: edited by the authors based on UNCTAD (InwardFDI Stock)

An examination of GDP growth rates reveals that growth in emerging countries, such as China, which is less reliant on FDI, is soaring. By contrast, the CEE countries (V4, Balkans), which rely more on FDI, have not achieved exceptionally high growth rates, and the average annual growth rate of the V4 countries, for example, was also a modest 2.8% between 1991 and 2020, far below that of their emerging market peers (Figure 2).

Figure 2. Average annual GDP growth rate by macroregions, 1996-2019

Source: edited by the authors based on World Bank (GDP constant 2010 US $)

Figure 3. Gross Fixed Capital Formation by macroregions (as % of GDP) weighted by GDP, 1995-2019



Source: edited by the authors based on World Bank (GDP, GFCF current US $)

In terms of Gross Fixed Capital Formation - GFCF, China showed exceptionally dynamic growth, while V4 countries are significantly lagging behind the desirable level of GFCF throughout most of the examined period (Figure 3). These preliminary results question the robust effects of FDI on economic development in CEECs.

1.4 The host country impact of FDI in CEE

Building on stylized statistics, this section delves into the contentious impact of FDI on host countries, particularly in CEE countries. Integration into global markets has fostered external dependence on FDI, leading to reliance on Western European manufacturing exports and technologies within the integrated peripheries of the Central European Manufacturing Core (Raviv, 2008; Stehrer & Stöllinger, 2015). The FDI Dependent Market Economy model (Nölke & Vliegenthart, 2009) has shaped the political-economic framework for economic transformation. However, the FDI long-term contribution to economic growth has been limited, failing to trigger internal capital accumulation and innovation, which are essential for sustainable modernization (Stojcic & Orlic, 2019).

There is strong evidence suggesting that FDI inflow has created a dual economic structure in transition economies, with significant gaps between foreign and domestic companies in exports, productivity, innovation, and competitiveness (Lux, 2017). This dual economy fosters industrial enclaves, hindering potential spillovers due to weak spatial and structural embeddedness of foreign firms. Unequal competition with large foreign corporations, particularly in strategic sectors, can lead to the crowding out of domestic firms and labour market pools (Guzik et al., 2020). MNCs often monopolize product and labour markets, impeding the transfer of technology and managerial knowledge (Lux, 2017).

FDI exhibits a crowding-out effect on domestic investment, although developed financial markets may mitigate this effect (Jude, 2019). While job creation is often cited as a benefit of FDI, foreign parent companies tend to outsource capital-intensive production to their affiliates, contributing to income inequalities. Despite a short-term positive impact on the balance of payments, in the long run, FDI may lead to deficits due to increasing profit repatriation. Additionally, low domestic value added in exports and high import shares reinforce significant income extraction by MNCs from host countries (Lane & Milesi-Feretti, 2007).

2. Data and research methodology

This section explores the impact of FDI on regional GDP and gross fixed investment (GFCF) in Hungarian counties, building upon an overview of regional FDI distribution. While the literature shows consensus on the correlation between FDI and regional economic development, it remains ambiguous. Econometric

analysis is employed to test this relationship, considering the potential complexity of direct causation. We present the dataset and methodology, followed by causality analysis and regression models to assess the relationship between FDI and regional economic growth, as well as GFCF at the regional level.

2.1. Description of the data

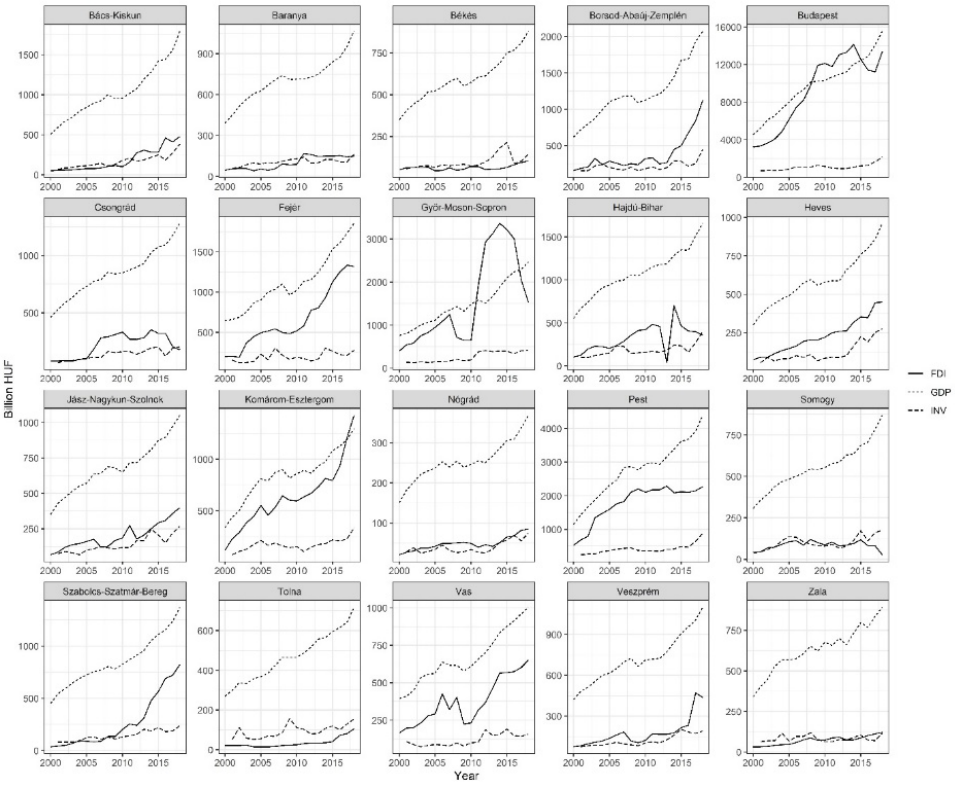
The scope of our analysis is Hungarian counties, for which data are available for the period between 2000 and 2018. The data covers the period prior to the high pressure economy. The data are provided by the CSO Information Database. This is a panel dataset with T=19 years and N=20 counties treating the capital city Budapest as a separate territory. Our analysis uses GDP as an indicator of economic performance calculated at market purchase value. The county-level distribution of FDI based on the invested foreign capital stock of foreign-owned enterprises for the period 2000-2007 was determined on the basis of the BPM5 methodology, and from 2008, we used data obtained via the most recent BPM6 methodology on the foreign capital of FDI-based firms. The changing methodology did not cause a major rupture in the county time series.

The FDI by foreign-owned enterprises in the country increased from € 18 billion to € 81.3 billion between 2000 and 2014, then fell to € 76 billion by 2017. The main reason for the drop can be explained by the decline in foreign capital stock in the capital city and the accelerating profit repatriation. An upward trend characterizes the total annual value of GDP, rising from € 41.7 billion to € 111 billion during the examined period. Figure 4 shows the distribution of FDI, nominal GDP and fixed investment among counties. Budapest significantly exceeds the rest of the counties in terms of all indicators due to a concentration of a majority of foreign subsidiaries' headquarters.

Figure 4 shows high concentration of FDI in the more developed northwestern counties, notably, in Győr-Moson-Sopron, Fejér, and Pest. Nominal GDP show a more balanced picture, despite inferior values for less developed and rural counties. A glance at the annual evolution of county-level GDP and FDI values reveals a strong correlation between the two indicators, as indicated by the high correlation coefficient of 0.97. This, however, does not signal a causal relationship between the two variables. Interpreting the causal effect of FDI on GDP is spurious for a number of reasons:

- It can also be assumed that GDP (as an indicator of economic performance) also has repercussions on FDI;
- The level of economic development (e.g. infrastructure, financial and technological development, business environment) can also cause this correlation, which affects both GDP and FDI;
- County-level GDP and FDI time series show a temporal trend and are not stationary.

Figure 4. Nominal GDP, FDI (inflows) and gross fixed capital investments (INV) in Hungarian counties, 2000–2018 (HUF Bn)



Source: edited by the authors based on CSO data

Based on empirical evidence and theoretical insights from the existing literature, we propose the following hypotheses:

Hypothesis 1: There is a significant causal relationship between FDI and regional economic growth.

To test Hypothesis 1, we explicitly define FDI as the annual change in the stock of foreign-owned capital per county (measured in Euros and derived from the FDI-BPM5/BPM6 series of the Central Statistical Office of Hungary), and regional economic growth as the annual percentage change in county-level GDP at market prices. According to Hypothesis 1, we expect a positive coefficient for Δ log FDI, indicating that higher foreign capital inflows result in faster regional GDP growth.

Hypothesis 2: FDI does significantly influence local GFCF.

In Hypothesis 2, we define local GFCF as the annual real investment by public and private actors at the county level. We then model Δ log GFCF as a function of

Δ log FDI (and its lag), with the same control group and a dummy variable for the 2009 financial shock. Operationally, a significant positive coefficient on Δ log FDI would strengthen the claim of Hypothesis 2, namely that FDI inflows stimulates domestic capital formation. By clearly defining the variables, data sources, and estimation framework, these refinements ensure that readers can easily follow and replicate our tests of the causal paths we hypothesize.

2.2. Econometric approach

First, we employed time series modelling techniques to assess the connection between FDI and regional economic performance, measured by GDP. To examine causation, we utilized the Granger causality test, which necessitates stationary time series. Addressing non-stationarity, we conducted a panel unit root test indicating non-stationarity for GDP, FDI, and investments. Therefore, we proceeded with calculating the growth rates of each variable, and conducting the Granger causality tests.

As a second approach, we estimated the FDI effect on GDP magnitude using a panel regression framework. We controlled for county-specific factors and country-wide economic cycles, reducing omitted variable issues. The panel data structure is useful, as the regression coefficients can be estimated within counties to implicitly control for factors that are specific to each county but remain constant over time or only change slowly (e.g. infrastructural development, business environment), and within years to control country-wide economic cycles (e.g. financial crisis). Natural logarithmic values were employed in the regression models to estimate the impact of a 1 percent change in FDI on GDP.

The usual procedure for panel structured data is to conduct a *fixed effect (FE)*, a *random effect (RE),* or a *first-difference (FD)* regression. First, we estimated the short-term relationship between FDI and GDP by using an FE model. The FE model incorporates county (regional) fixed effects (α_i) to control for county-specific factors, and year fixed effects (α_t) to control for time-specific factors. The lagged value of FDI was also included in the model to capture the potential long-term effect of FDI. We control for the effect of local investments by including the total value of gross fixed investment (INV) and its first lag as covariates. We include additional variables to control for the number of employees (EMP) and the total R&D expenditure in HUF (RD). The first lag of EMP and the first and second lag of RD are also included to control for longer-term effects. The FE model equation is the following, where i denotes a single county, t denotes a single year and ε is the error term.

$$\begin{aligned}\log(GDP_{i,t}) = \alpha_i + \alpha_t + \beta_1 \log(FDI_{i,t}) + \beta_2 \log(FDI_{i,t-1}) + \beta_3 \log(INV_{i,t}) \\ + \beta_4 \log(INV_{i,t-1}) + \beta_5 \log(EMP_{i,t}) + \beta_6 \log(EMP_{i,t-1}) \\ + \beta_7 \log(RD_{i,t}) + \beta_8 \log(RD_{i,t-1}) + \beta_9 \log(RD_{i,t-2}) + \varepsilon_{i,t}\end{aligned}$$

The FD model uses differenced variables implicitly controlling for county-specific time-invariant factors (e.g. infrastructural development, economic environment). The use of log-differences of each variable allows us estimate the relationship between the growth rates of FDI and GDP. This method comes with fewer observations, as the earliest observation for each county has no previous value to calculate the first-difference. Year fixed effects are not incorporated in this specification, so the economic cycles affecting both GDP and FDI might be responsible for the estimated impact of FDI. To control for the economic environment, we include the EU27 GDP[8] (EUGDP) and a single dummy variable for the year 2009 to capture the year when the financial crisis highly affected all Hungarian regions. The final FD model equation is the following, where

$$\Delta\log(Variable_{i,t}) = \log(Variable_{i,t}) - \log(Variable_{i,t-1}) \approx \frac{Variable_{i,t} - Variable_{i,t-1}}{Variable_{i,t-1}},$$ which is the growth rate of the variable.

$$\begin{aligned}\Delta\log(GDP_{i,t}) = \alpha &+ \beta_1 \Delta\log(FDI_{i,t}) + \beta_2 \Delta\log(FDI_{i,t-1}) + \beta_3 \Delta\log(INV_{i,t}) \\ &+ \beta_4 \Delta\log(INV_{i,t-1}) + \beta_5 \Delta\log(EMP_{i,t}) + \beta_6 \Delta\log(EMP_{i,t-1}) \\ &+ \beta_7 \Delta\log(RD_{i,t}) + \beta_8 \Delta\log(RD_{i,t-1}) + \beta_9 \Delta\log(RD_{i,t-2}) \\ &+ \beta_{10} \Delta\log(EUGDP_{i,t}) + \beta_{11} \Delta\log(EUGDP_{i,t-1}) + \beta_{12} D2009_t \\ &+ \varepsilon_{i,t}\end{aligned}$$

3. Results

First, we test the stationarity of the county-level GDP, FDI and gross fixed capital investments time series. After that, we proceed with the growth rates to perform the Granger causality test in order to separate the cause and effect in the FDI – GDP and FDI – GFCF relationships.

3.1 Causality among GDP, FDI and gross fixed capital investments

Performing the panel unit root test on the growth rates GDP, FDI, and gross fixed investment indicates stationarity for these variables. The test results are presented in Table 1.

[8] Constant 2010 US$ GDP obtained from The World Bank.

Table 1. Panel unit root tests for the county-level time series of GDP, FDI, gross fixed capital investments (INV)

	Levin-Lin-Chu Unit-Root Test statistics					
	GDP	FDI	INV	ΔGDP	ΔFDI	ΔINV
with intercept (1 lag)	7.439	4.026	2.994	-3.416***	-6.317***	-6.556***
with intercept and trend (1 lag)	7.048	1.588	-0.585	-2.975***	-5.793***	-5.233***

Note: *p<0.1; **p<0.05; ***p<0.01.

Thus, we could proceed by examining the relationship between GDP and FDI growth rates. For panel data of multiple time series, the Panel Granger Causality Test is used. Performing the Panel Granger Causality Test on GDP and FDI growth rates allows us to examine whether current and past values of FDI significantly contribute to GDP forecasts for the coming year. The test can also be performed in reverse order, with GDP as the cause and FDI the effect. The p-values of the tests are shown in the first two columns of Table 2, using two time lags in each test. In the first case, we cannot reject the null at a 5% significance level, so there is no evidence that FDI growth is a Granger cause of GDP growth. In the case of the second test (column 2) the null is rejected even at a 1% significance level, demonstrating that the GDP growth rate is the Granger cause of FDI growth in the counties.

Table 2. Panel Granger Causality Test results

	Null-hypothesis			
	ΔFDI does not Granger cause ΔGDP	ΔGDP does not Granger cause ΔFDI	ΔFDI does not Granger cause ΔINV	ΔINV does not Granger cause ΔFDI
p-value	0.7026	0.0002	0.2744	0.3135

Source: authors' calculations

Based on the findings of the Granger causality test, *Hypothesis 1 is not supported*. The test results indicate that there is no significant causal relationship between FDI and regional economic growth, as FDI growth rates do not Granger cause GDP growth rates. The p-values of the causality tests do not provide evidence to support the notion that FDI significantly contributes to GDP forecasts for the coming year. Causality tests, overall, suggest that the correlation between FDI and GDP cannot be explained by FDI inflows or presumed economic growth effects of FDI. Consequently, FDI does not have a significant impact on GDP growth. Conversely, the test results suggest that GDP growth rates Granger cause FDI growth rates, indicating that FDI tends to flow more intensively into more developed regions

where additional endogenous factors of economic growth (skilled labour, business environment, infrastructure, proximity to markets) are available.

One of the presumed positive effects of FDI is that it boosts local fixed capital formation. In order to test this assumption, we examined the causal relationship between the total value of gross fixed investments and FDI per county. The corresponding p-values are presented in the last two columns of Table 2, indicating that the null hypothesis about the lack of causality cannot be rejected in either direction. The results confirm that FDI growth does not lead to a rise in domestic GFCF, while no reverse causal relationship was found. Therefore *Hypothesis 2 is not supported.* Thus, FDI growth is not conducive to growth in local gross fixed capital formation, which is in line with the trend of the declining share of FDI in GFCF in Hungary and in the CEE since 2008. Therefore, GFCF accumulation is not generated by FDI, and even (higher) domestic GFCF does not attract (more) FDI. Overall, the causality tests suggest that *the correlation* between FDI and GDP is not caused by the FDI inflow, and assumed (spillover) effects of FDI on economic growth is much smaller.

3.2. Panel regression results

In this section we perform regression analysis on a panel data to estimate the contemporaneous and one-year lagged effects of FDI on the GDP of Hungarian counties. The *first-difference* (FD) estimator is found to be the most efficient panel method in our case.

Column 1 of Table 3 presents the parameter estimates of the FE model. It shows no significant effect of the simultaneous FDI, but the impact of the lagged FDI is slightly significant and positive. The impact of FDI on GDP cannot be ruled out using this method. However, this standard FE model is not efficient if the dependent variable contains a unit root. The FE model is only efficient if there is no serial correlation in the residuals, which is not the case for the non-stationary time series of GDP. The value of the generalized *Durbin-Watson* (modified BNF) statistic for our FE model is 0.637, indicating a considerable positive autocorrelation, which is a sign that the first-difference (FD) estimation proves to be a more efficient method (Bhargava et al., 1982; Wooldridge, 2010). The parameters of lagged variables are overestimated with the FE method because of the non-stationarity of the variables.

Again, the FE model, which shows a highly significant effect of lagged FDI, is not reliable in our case of non-stationary variables, but reported as a benchmark. The lagged values of FDI and INV are no longer significant in the FD model. However, the parameter estimate of FDI turns significantly positive compared to the FE model. The final FD model is shown in the second column of Table 3. The FD methodology and the inclusion of the control variables eliminates any significant effect of FDI.

Table 3. Results of panel regressions testing the effect of FDI on GDP in Hungarian counties

	Dependent variable:	
	log(GDP)	
	(FE model)	(FD model)
log(FDI)	0.014	0.022
	(0.015)	(0.014)
$log(FDI_{t-1})$	0.028*	0.001
	(0.016)	(0.012)
log(INV)	0.036**	0.043***
	(0.015)	(0.011)
$log(INV_{t-1})$	0.023**	0.021*
	(0.010)	(0.011)
log(EMP)	0.120	0.107*
	(0.108)	(0.059)
$log(EMP_{t-1})$	0.398***	0.199***
	(0.099)	(0.064)
log(RD)	-0.006	0.005
	(0.009)	(0.007)
$log(RD_{t-1})$	-0.011	0.001
	(0.008)	(0.006)
$log(RD_{t-2})$	0.007	0.015**
	(0.008)	(0.006)
log(EUGDP)		0.458***
		(0.155)
$log(EUGDP_{t-1})$		-0.078
		(0.139)
D2009		-0.064***
		(0.011)
Constant		0.041***
		(0.005)
Observations	323	304
R^2	0.349	0.427
Adjusted R^2	0.249	0.403

Note: Robust, heteroscedasticity consistent standard errors are displayed in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Source: authors' calculations

The log (FDI) parameter is no longer significant, not even at a 10% level, which points to a lack of evidence from the final model that FDI-inflow would shape the evolution of GDP within the given year.

On the other hand, the growth rate of fixed capital investments is proven to have a positive and significant effect on the regional GDP growth. As expected, the regional employment level, particularly the lagged value, also has a significant positive impact on GDP growth. The effect of the regional R&D expenditure is rather manifested on the longer term, as shown by the significance of only the second-year lag of the RD variable. The increase of EU27 nominal GDP also plays a large role in shaping up the regional GDP growth, which means that the external economic environment is an important factor to be controlled for. As a result of the global financial crisis, 2009 was the year when GDP fell considerably in all counties, so the D2009 dummy also proves to be a crucial determinant of GDP. Many other factors might influence the growth rate of GDP in counties, but lack available county-level data. However, it is more likely that the inclusion of other variables would even further reduce the already insignificant effect of FDI.

In summary, the results of our econometric analysis confirm that, in the case of Hungarian counties, FDI does not have a significant positive effect on regional GDP in the given year. Based on the findings of our panel regression, *Hypothesis 1 is not supported*. The Granger causality test also provided no evidence that growth in FDI would cause GDP growth at the regional (county) level. In the reverse case, however, a significant causal effect can be detected for several counties and at the national level, as well. This indicates that FDI tends to flow more intensively to more developed counties (with higher GDP growth). The causality test also shows that the majority of gross fixed capital formation is not generated by FDI. The regression analysis indicates that, at the county level, GFCF financed by EU and government funds and domestic private investment appears to play a much more significant role in GDP growth than FDI. The findings indicate that FDI has an insignificant impact on regional GDP growth in Hungarian counties. The econometric analysis reveals that FDI does not significantly boost regional GDP in the same year. Regional GDP growth is more strongly influenced by factors other than FDI, such as government and EU-funded gross fixed capital formation, domestic private investment, and employment growth, as suggested by the significant coefficients, while the impact of FDI on GDP growth remains insignificant.

3.3. Discussion

In Central and Eastern Europe, particularly in Hungary, the economic restructuring process has largely relied on FDI as a key driver, with initial phases showing promising signs of temporary boosts in productivity and competitiveness. However, our empirical analysis, consistent with insights from regional growth and

competitiveness literature (Lengyel & Varga, 2018), reveals a nuanced picture. Despite the significant influx of FDI, we find no substantial correlation between FDI and regional economic growth within Hungarian regions. This observation aligns closely with recent findings by Getzner and Moroz (2020), which underscore the limited impact of FDI on regional growth, highlighting instead the correlation of regional economic growth with past growth trajectories. Moreover, territorial analysis suggests that while there may be a direct link between FDI stock and regional development, its impact is often either negligible or transient. This observation echoes the conclusions of earlier studies, such as those by Gál and Singh (2023), who discuss the limitations of the FDI-led growth model in Central and Eastern European countries. Their research emphasizes that while FDI may initially contribute positively to growth, its long-term impact is insufficient to ensure sustained regional prosperity. In fact, the positive effects tend to be short-lived and may even exacerbate spatial disparities within regions.

Building on regional studies (Lengyel & Varga, 2018), our empirical analysis uncovers a more complex reality: despite sizeable FDI inflows, there is no clear link between foreign investment and GDP growth across Hungarian counties. Our regression analysis reinforces the insignificance of FDI on regional GDP growth in Hungarian counties. Despite its notable presence, particularly in specific regions, FDI fails to notably enhance regional GDP within the same year. Granger causality tests fail to support FDI's role in driving GDP growth at regional or national levels. Instead, a reverse causal effect is noted, indicating FDI's tendency to concentrate in developed regions rather than stimulating growth in less developed areas. Furthermore, our analysis highlights that the majority of GFCF is not linked to FDI, indicating a growing decoupling between the two at both national and regional levels. Regional GDP growth seems more influenced by factors like government and EU-funded capital formation, domestic private investment, and employment growth, underscoring FDI's limited contribution relative to other investment sources. FDI inflows exacerbate regional inequality in low- and middle-income countries, with limited long-term benefits due to constrained spillover effects (Lessmann, 2012). Völlmecke et al. (2016) stress the insufficiency of FDI alone in driving income convergence.

In advanced economies, agglomeration may amplify FDI spillovers, while deterring domestic enterprise entry (Driffield & Munday, 2000). Conversely, in most CEE regions, limited spillovers between domestic firms and MNCs are observed. Foreign-owned firms often crowd out local industries, deviating from the region's capability match (unrelated variety), and pursuing efficiency-seeking strategies that utilizes skilled but cheaper labour (Elekes et al., 2019). For instance, the predominantly German-owned Hungarian automotive industry exemplifies this trend, leading to limited economic growth impact (Pavlínek, 2022). In Hungary, the regional concentration of FDI exacerbates spatial disparities, hindering medium-sized companies due to MNCs' dominance (Lengyel et al., 2017). This constrains

the operational space for such companies, exacerbating economic and territorial disparities, underscoring their vulnerability and dependence on external factors for long-term development in Eastern Europe, emphasizing the necessity for complementary investments in human capital and technology.

Hungary's FDI experience rests on several country-specific features that may not hold elsewhere in the region. First, the vast majority of projects in Hungary are "efficiency-seeking" greenfield investments, particularly in the automotive and electronics sectors with limited domestic supplier linkages – in contrast to the Czech Republic's stronger SME and innovation cluster effects. Its polarized economic geography and volatile, tax-based state aid system – in contrast to Poland's stable, rules-based incentives – mean that Hungary's FDI results cannot be easily generalized to other CEE regions. Efficiency-seeking FDI imports key inputs and repatriate most profits, rather than developing deep local supplier linkages or R&D functions. This contrasts with, for instance, the Czech Republic, where foreign affiliates have been more prone to source from domestic SMEs and co-invest in innovation clusters (Lengyel & Varga, 2018). Second, Hungary's economic geography is highly polarized: Budapest and a handful of north-western counties concentrate both infrastructure and skilled labour, creating a two-speed dynamic that hampers spillovers into lagging regions. Other CEE countries, notably Poland, combine FDI inflows with larger internal markets and more dispersed industrial bases, which tends to diffuse benefits more evenly across territories (Cieslik, 2020). Institutional and policy frameworks also differ meaningfully. Hungary has relied heavily on targeted tax incentives and state aid to attract large multinationals, whereas countries like Slovakia and Slovenia have increasingly tied support to local content and innovation performance (Sass & Kalotay, 2021). Moreover, the political economy of investor–state relations in Hungary – marked by rapid shifts in industrial policy – can amplify risks of rent-seeking and reduce the predictability of long-term commitments. Because these historical, institutional and structural factors shape both the quantity and quality of FDI impacts, our Hungarian results cannot be uncritically generalized to the entire CEE region without further comparative analysis (Szanyi, 2022).

It can be argued that FDI has created a less embedded assembly platform economy, while endogenous growth conditions have remained relatively modest (Lengyel et al. 2017). As a result, FDI-led growth has made only a limited contribution to economic growth, failing to trigger domestic capital accumulation and mobilise endogenous growth factors. This challenges the effectiveness of the current DME model in promoting sustainable development and narrowing regional disparities. Without addressing these limitations, the current FDI-led growth model may struggle to promote further productivity improvements or maintain existing levels relative to the EU average in CEE regions, and is not well suited to ensure that lagging regions catch up and capture a significant share of the value of FDI (Lux, 2017; Myant, 2018).

Conclusions and policy implications

The economic growth of CEE has been constrained by its heavy reliance on low-value-added manufacturing within global value chains. According to Baldwin and Ito (2022), this positioning limits CEECs' economic potential, as the smile curve increasingly shifts value towards pre- and post-production stages, such as R&D and marketing services, which are typically dominated by advanced economies. Consequently, CEE "factory regions" engaged predominantly in low-value-added activities struggle to capture higher economic returns, leading to slower GDP growth and lower income levels compared to "headquarters regions" involved in higher-value functions like R&D (Capello & Dellisanti, 2024). This disadvantageous position exacerbates regional income disparities and hampers overall economic development, contributing to the middle-income trap (Diemer et al., 2022).

Even during the high-pressure economy of the mid-2010s, it was EU funds and government investment projects, rather than FDI, that boosted economic growth in the CEE region. Despite initial benefits, the FDI's role in driving economic restructuring has diminished, evident in its declining share of fixed investments. This decline underscores the challenges of sustaining growth and overcoming the middle-income trap, as reflected in slower productivity gains and employment-driven convergence to the EU average GDP per capita (Zsibók, 2021). For instance, Czechia's stagnant development highlights broader issues with the FDI-dependent model in CEE, where vertical FDI continues to seek low-cost locations with limited local spillovers (Pavlínek, 2022).

The diminishing impact of FDI on regional growth and welfare indicates the exhaustion of the FDI-dependent development model, exacerbating challenges like slow convergence, socio-economic disparities, and rising populism (Schmidt, 2018; Rodríguez-Pose, 2018). To address these issues, CEE policymakers should focus on balancing MNC interests with proactive industrial policies that promote domestic firms and address over-reliance on FDI. This includes enhancing indigenous industrial capabilities, particularly in knowledge-intensive sectors, and embedding FDI in local networks (Bailey et al., 2016; Gál-Lux, 2022; Iammarino, 2018; Pavlínek, 2022; Sass, 2017).

Three future policy alternatives are proposed in Gal and Lux (2022) to upgrade and reduce the risks of FDI-dependent regional development while promoting alternative sources of growth. The CEE region's FDI-driven, dependent market economy model is becoming fragile, especially in the Hungarian and Slovak regions with weaker domestic sector bases and the most exposed to GVCs: due to its narrow sectoral focus, countries are exposed to shocks, and the early productivity gains from global value chain integration are now fading away due to the lower value-added assembler trap. Maintaining – but upgrading – this model means building much stronger local linkages, innovation capacity and higher value activities to help the

region escape the "CEE paradox" of lagging behind in knowledge-based development.

First, *"FDI embeddedness"* focuses on replacing general incentives for job creation with tools that link foreign affiliates to local knowledge and supplier networks. Governments can redirect state aid to projects that raise local content thresholds, require demonstrable R&D or design functions on site, and reward companies that open their procurement lists to qualified domestic suppliers. Parallel cluster and triple helix programs can build trust among multinationals, universities, and startups, helping regions move up value chains rather than competing solely on labour costs.

Second, the "entrepreneur-state industrial policy" scenario mobilizes national capital and targeted state ownership to rebalance the relationship between FDI and the state. Tools include development bank credit lines for growing domestically owned enterprises, tax credits for reinvested profits, and minority state ownership. Repolonizing Poland's strategic banks and Czechia's voucher-privatisation legacy show that selective domestic control can coexist with an open investment regime, cushioning macro-shocks and retaining strategic decision-making in the region. Economic nationalism is increasingly shaping state interventions in Hungary and Poland, prioritizing domestic ownership in strategic sectors. However, politically driven ownership rearrangements everywhere increase the risk of cronyism, which may undermine competitiveness and institutional trust in the long term. The third scenario prioritizes "*upgrading SMEs and the entrepreneurial ecosystem*" to ensure that growth goes beyond large companies. The policy combinations used here combine patient capital (public seed funds, mezzanine financing) with smart specialization vouchers that reduce the costs of adopting Industry 4.0 standards for small manufacturers, and export acceleration platforms that match local suppliers with international buyers with an expected outcome that is closely linked to higher regional productivity in studies of entrepreneurial ecosystems in Central and Eastern Europe. Together, the three scenarios provide a menu for policymakers: tightening the conditions for FDI to maximize spillovers; using activist industrial tools to nurture nationally-rooted champions; and broadening the base of domestic firms capable of absorbing and amplifying these spillovers. Taken together, they outline a realistic path from the current dependent market economy to a more balanced, innovation-driven successor model for the Central and Eastern European region.

A limitation of this research is that it only uses two decades of data, with a scope restricted to Hungarian regions and the focus period ends before the Covid19 pandemic. One disadvantage of using county-level data is that it may lack several confounding variables that simultaneously influence GDP, FDI, and investments. However, we argue that our estimates still provide an indicative understanding of the phenomenon. By exploiting the panel structure, we can control for all county-specific, time-invariant factors. Additionally, supplementing the panel analysis with a time series approach further supports our results. Although there remains a

possibility of endogeneity in the FDI-GDP relationship, any confounding factors are likely to cause the two variables move together. Therefore, the estimated (already insignificant) effect of FDI on regional GDP is considered an upper limit and is highly unlikely to be biased downwards.

Since the pandemic, global market disruptions and shifting economic priorities have been reshaping FDI flows, with investors increasingly favouring sectors such as green energy and digital industries. Geopolitical tensions are also leading to a realignment in investment patterns as countries seek to secure supply chains and reduce dependence on rival powers. Stricter due diligence policies within the EU reflect growing concerns about economic security. However, Chinese capital is still on the move: Rhodium Group recorded a 47% increase in Chinese FDI into the EU and the UK in 2024, with Hungary alone accounting for a third of this (rhg.com). These external dynamics highlight the need for policymakers in Central and Eastern Europe to adapt their FDI strategies to the rapidly changing global environment.

Future research should include empirical investigations across the broader Visegrad Group (V4) regions to tackle the challenges of slowing convergence and the middle-income trap at both national and regional levels. Upgrading the export-led, FDI-dependent growth model and implementing appropriate policy interventions are crucial steps toward achieving sustainable economic development and regional competitiveness.

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