Economic restructuring and foreign direct investments as drivers of labour productivity growth in Central and Eastern European regions

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Abstract

The economic development model of Central and Eastern European countries has encountered significant challenges, which became pronounced after the crises of the early 2020s but were preceded by early warning signs in the years leading up to this period, with one prominent issue being stagnating labour productivity in specific regions. These challenges vary not only between countries but also among sub-national territorial units, strongly influenced by sectoral specialization. Through empirical research on sub-national labour productivity growth at a sectoral level and its decomposition, this study argues that increasing reliance on foreign direct investment alone cannot resolve the efficiency issues faced by non-metropolitan areas—or, ultimately, by these countries as a whole. While economic restructuring spurred labour productivity growth in the early 2010s, its broader positive impacts have diminished over time. Our findings indicate that non-metropolitan areas face a critical trade-off between improving labour productivity and enhancing domestic value-added content. Ideally, regions might shift positively along both of these dimensions by addressing the trade-off through well-targeted investment and human resource strategies.

Keywords

Foreign direct investments, Labour productivity, Central and Eastern Europe, Regional analysis, Economic structure, Gross value added

1. Introduction

In the early 2020s, multiple global crises have unfolded, impacting European economies in different ways. Draghi's influential report highlights that many of these challenges stem from deep-rooted structural issues, highlighting that "Europe is stuck in a static industrial structure with few new companies rising up to disrupt existing industries or develop new growth engines" (European Commission 2024, p. 6). The report points to lower labour productivity as the main culprit behind the cca. 70% gap between the EU and the US in terms of GDP per capita at purchasing power standards. Beyond the core economies struggling with stagnation, peripheral economies are also prone to these adverse effects arising from their vulnerability explained by their high external dependence (Lux 2023). Monfort (2020) shows that sub-national per capita GDP disparities in the EU countries are mostly attributable to labour productivity disparities, especially after the second half of the 2010s. This is largely due to the fact that labour markets are tight, and unemployment is relatively low even in peripheral areas. Labour productivity differentials within the EU reflect the low road of development in CEE countries, primarily following an east-west divide (Dyba et al. 2018), furthermore, the existence of a large core-periphery gap is confirmed not just at the EU level (between countries), but also at the sub-national level (within countries).

Sustainable catching-up and decreasing income per capita disparities depend on productivity growth. Carone et al. (2006, p. 8.) point out that the main factors driving trend productivity growth derived from the standard Cobb-Douglas production function relate to labour input (including its quantity, namely, hours worked and quality), capital input and technological progress, i.e. the residual which cannot be explained by the quantity and quality of either labour

or capital. Importantly, other factors, such as changes in the sectoral composition of the economy are also considered among the factors of labour productivity growth (Fagerberg 2000; Novák 2020; Sávai et al. 2022; Dobrzanski et al. 2024). Technically, the two main components of labour productivity growth are capital deepening (an increase of capital to labour ratio) and total factor productivity growth (representing overall efficiency). Carone et al. (2006) argue that during the transition phase, in less developed economies capital deepening contributes most to labour productivity growth, but in later stages of development, TFP growth is the dominant factor of the increase of labour productivity. As demonstrated by Slačík (2024), TFP made by far the largest contribution to value added growth in CEE countries both before and after the Great Financial Crisis. The TFP growth fundamentally relies on innovation and human capital investments, of which the availability of skilled labour and high-quality jobs are key factors (Nyström 2021, Fontanari and Palumbo 2022). Furthermore, the catching-up of wages is a competitiveness factor as it plays a key role in retaining and attracting skilled labour, boosting domestic demand and raising living standards in a globally integrated labour market (Galgóczi and Drahokoupil 2017). There is also a need for a developed entrepreneurial ecosystem (Komlósi et al. 2019; Márkus and Rideg 2021) to facilitate a more efficient use of human resources contributing to productivity improvement, while quality institutions with a high level of economic freedom are also essential to long-term TFP growth.

This paper focuses on the regional aspects of economic restructuring in the Visegrad countries and intends to reveal to what extent economic restructuring and FDI contributed to economic development in a regional disaggregation. The research is motivated by the insightful analyses of Boda et al. (2023) who used input-output tables to estimate the production of domestic value added in a NUTS2 level disaggregation in Hungary with a reference to this nexus in the international value chain relations. Their results make it clear that higher volume production and higher productivity do not always go hand in hand with higher profitability (income-generating capacity), which devalues the national performance and undermines the convergence of middle-income countries like Hungary. The authors recommend to address these tensions by increasing productivity, but not at the cost of significantly reducing value-added content. Based on these considerations, our study investigates the following research questions: How did labour productivity change as a result of structural changes in the different regions of the Visegrad countries? What was the productivity effect of FDI inflow on the sub-national level? This research contributes to the literature in several ways. First, to date, the sub-national distribution of FDI in the CEE countries has received relatively limited scholarly attention. We intend to fill this gap by analysing FDI data at lower spatial levels. Second, although the decomposition of labour productivity growth to structural and intra-branch effects is available in the literature, these results are not linked to the geographical distribution of FDI.

Section 2 summarizes the relevant literature in the context of economic restructuring and FDI in CEE countries. Section 3 introduces the data and the empirical methods used, then, the next section presents our results. Finally, section 5 concludes.

2. Related literature

Central and Eastern European (CEE) economies can be described as Dependent Market Economies (DME) (Nölke and Vliegenthart 2009), which is a distinct, specific variety of capitalism, because their economic transition led to strong foreign direct investment (FDI) dependency, foreign bank dominance and external control. Since the early 1990s, the Visegrad economies have converged on the DME model. In this model, *FDI provides not only the bulk of new capital stock but also the organisational blueprint of production*, leaving domestic firms in subordinate positions inside global value chains. Recent synthetic accounts show that, by 2020, foreign affiliates still controlled 71% of industrial output in Hungary and 80% in

Slovakia, while the Czech and Polish shares – though lower – remained well above EU15 averages (see Gál and Lux 2022). A part of this higher exposure might stem from the economic structure of the CEE economies, which are part of the so-called Central European Manufacturing Core, i.e., an area where Europe's manufacturing activity is increasingly concentrated and which is centred on Germany and includes Austria, the Czech Republic, Hungary, Poland and Slovakia (Stehrer and Stöllinger 2015). The fact that CEE countries have developed their manufacturing sectors through FDI particularly in automotive and electronics industries (Šipikal and Buček 2013) highlights their vulnerability to decisions by foreign MNEs (e.g., plant relocations, supply chain shifts). Early benefits were unquestionable: greenfield investments delivered managerial routines and export markets, pushing labour productivity levels in manufacturing close to EU benchmarks. However, Andrews and Serres (2016) point out that FDI and openness to trade are not sufficient to boost the catching-up of countries with a sizeable productivity gap vis-à-vis Western Europe, stronger productivity is largely influenced by the ability of domestic firms to make the most of knowledge diffusion, i.e., to learn from the frontier. Pavlínek's (2022) integrated periphery model argues that Central Eastern European manufacturing zones operate as low-cost, medium value-added "factory regions" strategically coupled to Western core lead firms, forging asymmetric dependencies that lock them into subordinate positions within global value chains, where high value added stages (R&D, design, strategic decision-making) were retained in investors' home economies. Capello & Dellisanti (2024) show that such positioning within the smile-curve constrains the scope for further labour productivity gains once process efficiencies are exhausted. Moreover, aggressive wage competition, exemplified by repeated *race to the bottom* investment tendering in Hungary and Slovakia, erodes the very cost advantage on which early productivity advances were built. Big automotive producers often bring with them their own first-and second-order suppliers, limiting potential spillover effects to domestic companies (Szalavetz 2022). Furthermore, despite having been the major recipients of FDI and with foreign companies responsible for the majority of their exports, scholarly appraisal of the role of FDI in driving the convergence of the CEE countries has been mixed at best. The result is a *middle-income productivity trap*: foreign-controlled plants achieve EU-core benchmarks, yet the domestic sector lags behind, dragging down the aggregate (Medve-Bálint 2014, Gál and Schmidt 2017, Pogátsa 2018, Gál 2021, Novák et al. 2024, Slačík 2024).

Econometric analyses of productivity convergence in the CEE reveal significant gaps in productivity growth for the respective countries (Niţoi and Pochea 2016, Peshev and Pirimova 2020, Sávai and Bodnár 2024), and the Baltic countries and Romania seem to outperform the other countries in this respect. Additionally, capital city-centricity is more evident compared to Western Europe, with capital cities having a productivity bonus, and second order cities lagging behind (Gál and Singh 2024, Vida et al. 2025). Capital regions attract nearly all high-end service FDI—ICT hubs, corporate headquarters—while outlying factory districts compete mainly on low wages. This split widens wage gaps and stalls convergence: county-level panel tests for Hungary show that, once regional differences are controlled, FDI no longer predicts GDP growth or fixed investment (Gál 2019). The fast convergence of the Visegrad countries and Slovenia in particular was driven by high investments and the resulting changes in the composition of their manufacturing sector toward more advanced industries, decreasing the productivity gap with Germany (see Petrović, and Matić 2023). Automotive and electronics manufacturing industries concentrating a large part of the economic activities of these countries show high levels of technological sophistication, making them important suppliers of final products and parts. The Harvard Growth Lab's economic complexity index

ranks Czechia seventh in the world, Hungary the 13th, Slovakia 17th and Poland 28th in 2022.[1] However, the quality of institutions (as measured by the World Bank's Worldwide Governance Indicators) plays a relatively minor role in driving productivity growth in the region, in contrast to the advanced "old European countries" where it is a major determinant of TFP growth (Borovic and Radicic 2023). Furthermore, scholarly criticism has emerged concerning profit repatriation and its contribution to uneven development, highlighting the notable gap between GDP and the GNI (gross national income) in selected FDI recipient countries (Artner 2017, Parnreiter et al. 2024). The devastating social consequences of foreign investors' low-cost strategies including relocation to more cost-effective regions and new locational advantages of host countries have also been studied (Galgóczi and Drahokoupil 2017, Götz et al. 2023). Notably, as emphasised by Gulácsi and Kerényi (2024), the below-EU-average labour cost levels in each of the CEE countries make labour arbitrage more appealing for foreign investors. Although a remarkable economic convergence has taken place over the past two decades in this area, these countries are still not exempt from the challenges of the middle-income trap (Győrffy 2022), and, due to the burden of large territorial inequalities, the regional development trap at the sub-national level (Diemer et al. 2022). The looming danger of the middle income trap has been cited as the main argument for seeking alternative approaches to the East European growth model to mitigate the lack of indigenous innovation potential through more active state intervention (Lechowski 2024).

The early-2020's crises marked the end of an economic era and some basic economic conditions have permanently changed, including the monetary environment (higher inflation and interest rates) and governmental indebtedness. Demographic challenges, including population ageing and skilled labour migration from East to West make labour markets tight, especially in the CEE countries, which have already witnessed these processes unfold in the middle of the 2010s. As a consequence, the extensive increase of labour supply can no longer be regarded as a source of economic growth. Both labour and raw materials have become scarce and expensive, nonetheless, the growth model followed by CEE countries has led to specialisation in economic sectors that are highly dependent on these resources. Antalóczy and Sass (2024) highlight the triple dependency of Hungary on Asian large investors, their targeted EU markets and energy imports, which undermines its economic sovereignty. This compounds the commonly observed dual dependency situation of CEE economies (Faragó 2016) reliant on FDI and EU funds for their public investments. Moreover, in several CEE economies, manufacturing is focused on low- to mid-value-added production rather than high-value activities like R&D or headquarters functions (extended workbench model), which constrains long-term growth and resilience. According to the smile curve concept, R&D activities are the most desirable specialisation pattern generating the most value added. The absence of lucrative HQ, R&D and post-production functions suggests that CEE economies are stuck in a functional specialisation trap (Grieveson et al. 2021), and research provides mixed evidence on the upgrading effects of their GVC participation through FDI (Klimek 2024). Empirical analyses (Kutan and Yigit 2009, Radicic et al. 2023) have shown that the role of R&D in driving innovation and the absorption of technological spillovers, and thus TFP growth, is statistically negligible for the CEE countries. Accordingly, R&D expenditure for the CEE countries is on average 52 percent of that of the EU14. This corresponds to their status of an integrated periphery, or more upgraded semiperipheral position in the global economy, as a result of the co-evolution of local suppliers with the foreign parent companies, a shift away from low-skilled, labour-intensive work and higher labour costs (Artner 2018, Pavlínek 2018, Szalavetz and Sass 2023). Propelling these economies toward a sustainable growth path would require

[1] https://atlas.hks.harvard.edu/rankings

more emphasis on intensive growth, i.e., enhancing labour productivity while increasing domestic value added of production.

A crucial dilemma highlighted by Kouli and Müller (2024) is that for the CEE countries to continue attracting FDI, costs have to remain low, but for FDI to induce technology improvements, i.e. the foundations of long-term growth, it is imperative that they invest in human capital. There is no guarantee, however, that investments in human capital will remain in the country to be harvested. Furthermore, as Winiecki (2016) argues, illiberal democracies may be less suited to manage the shift of the engine of economic growth from industry to human capital-intensive services due to the greater role of economic freedom in bringing about this second economic restructuring. Éltető and Medve-Bálint (2023) expose the tension inherent in the "illiberal readjustment" of the Eastern growth model between anti-FDI nationalist catch-up strategies in favour of domestic capital (selective economic nationalism, in particularly in Hungary) and their FDI dependent or low labour-cost development. Economic nationalism hinges on a risky trade-off: governments still need multinationals for technology and exports, yet favour domestic "national champions" with targeted perks. Pushed too far, this dual game breeds cronyism, leaving the economy stuck with foreign-controlled assembly lines and a supported – but uninnovative – local elite. Comparative experience from Poland—where foreign ownership is less overwhelming and industrial policy has systematically strengthened domestically controlled champions—suggests that a more balanced ownership structure can lift average labour productivity by fostering competition and collaboration between foreign and national firms.

CEE countries display a dual economic structure (Lengyel and Leydesdorff 2015) with a large gap between the performance of domestic and multinational, as well as SME and large firms (Sass 2017, Muraközy et al. 2018). This performance gap in terms of innovativeness and productivity is explained to a large extent by the size, age, and sectoral differences between the two sectors. This duality is manifest in the FDI-led production structures and the underdeveloped sectors of domestic production structures as their outcome. The higher rate of small firms in CEE economies leads to a greater dispersion of labour productivity among sectors compared to the northern and western parts of Europe (Ferrazzi et al. 2025). In order for FDI-dominated sectors to make a lasting contribution to economic catching-up, it is necessary to increase the share of domestic suppliers, to move up the value chains toward higher exported value added generated in the domestic economy, and to attract higher value-added activities (Slačík 2024). To achieve this, the region needs to become more discerning about its FDI attraction policies (Zavarská et al. 2024).

After the global financial and economic crisis, the growing emergence of services in global foreign trade became a general phenomenon with IT and other financial and business services increasingly entering international trade alongside traditional services (tourism, contract work, transport). The growth rate of services exports has recently been more stable than that of goods exports, as demand for services is less dependent on the cyclicality of the economy. The Visegrad countries' economies as developed economies show a high degree of tertiarization, but the share of the industry sector (dominantly manufacturing) in GVA and employment is still high (between 20 to 30 percent) compared to the Western European countries, where it is mostly below 20%. Also, the growth of the share of construction was spectacular in Hungary after 2010. This is a sector that relies on low-cost labour, intensive state involvement and relatively slow technological adoption, therefore its alignment with the high road of development was limited.

The export of goods was between 41 and 80 percent of the GDP in 2019 in the Visegrad countries (the lowest in Poland and the highest in Slovakia), the import of goods was comparably high, therefore, the trade balance of goods could not contribute positively to aggregate GDP growth in these countries excepting Czechia. In the meantime, the export of

services exceeded the import of services in all countries, therefore, the trade balance of services is positive, and so is its contribution to GDP growth. During the pandemic crisis the balance of services temporarily turned into negative, but it soon recovered. The process of tertiarisation was accompanied by a slow but steady growth of the share of services within the gross value added, which was around 63-67 percent (the lowest in Czechia and the highest in Hungary), while the EU-average was higher, around 73 percent. These figures confirm that the manufacturing export-oriented economic structure is not beneficial for long-term, sustainable economic growth. Analysing OECD data, Hrubý (2024) points out that a large part of all value added and employment in CEE manufacturing depends on foreign final demand as a result of export oriented production: ranging between 60 to 76 percent in the case of the Visegrad countries, but significantly lower in Croatia with 37 percent or Romania with 40 percent, respectively. However, specialisation in higher value-added services would require targeted policy efforts to increase human capital endowment and attractiveness for investments, and abandoning costly industrial policies based on state aid subsidizing the production tasks of large foreign companies, which do not generate long term benefits for these small open economies.

3. Data and empirical strategy

The aim of the research is twofold: first, we investigate the changes of economic structure in the four Visegrad countries in a comparative manner at the sub-national level over the period between the two crises with the help of exploratory statistics. Second, we investigate the relationship between FDI and labour productivity change in a regional disaggregation.

Sub-national labour productivity changes are decomposed with the help of the shift-share method to a structural change effect and a within-sector growth effect following the procedure presented in OECD (2018).

Our research questions are to be answered on the basis of an empirical analysis of NUTS3 regional economic data for the Visegrad countries. To this end, we use sectoral employment and gross value added (GVA) data collected from Eurostat's database. In the case of Poland, GVA data are only available in less detailed sectoral aggregates at NUTS3 level, but detailed sectoral breakdowns are reported at the NUTS2 level. This limitation holds for the FDI data, too. Therefore, we follow the approach of Dobrzanski et al. (2024) and consider NUTS2 level data for Poland and NUTS3 data in the other three Visegrad countries. For Poland and Slovakia, data are only available until 2021, so the time horizon of the analysis is 2010 to 2019 - this gives us a picture of how the Visegrad region's catching-up process has evolved over the previous decade, in a period of a favourable global economic environment. We split this period into two parts. The first half of the decade, 2010 to 2015 is a period when the post-crisis recovery took place. After this, between 2016 and 2019, the economic development of the Visegrad economies was mostly undisturbed, nevertheless, some structural tensions have emerged, questioning the continued sustainability of the growth momentum.

The four Visegrad countries have different exchange rate regimes and the three countries using national currencies have different levels of exchange rate volatility against the euro. For this reason, we decided not to assess Eurostat data measured in euro, but to look at the four countries separately, using national currency indicators. Sub-national level FDI data (according to BPM6) were collected from the national statistical offices in Czechia, Hungary and Slovakia, and from the National Bank of Poland. Because the availability of Poland's FDI data is limited to 2015, 2016, 2020 and 2021, we use an alternative data source, too. This covers the period between 2005 and 2020 and is based on data provided by Statistics Poland. As there were changes to the NUTS system in Poland, the Mazowieckie region (PL12) was split to Warszawski stołeczny (PL91) and Mazowiecki regionalny (PL92) regions, but comparable

FDI data are available for the previous division, excepting the National Bank of Poland data for 2020 and 2021. Therefore, we use these years' data to estimate the distribution of FDI between PL91 and PL92 regions, where only compound data are available. It is a challenge to collect comparable sub-national FDI data for the EU countries, including the Visegrad group. The comparability of our FDI data is limited, which is a further explanation for conducting four parallel analyses with respect to the four countries instead of a pooled one.

We measure the catching-up of the regions primarily in terms of the evolution of GVA, and decompose the change in GVA into its different components: we examine to what extent the regional increase in GVA over the period was due to an improvement in employment and to what extent to an improvement in the labour productivity of the employed (factor-specific decomposition, see Carullo et al. (2025) regarding the decomposition of the Theil index). GVA is evaluated at constant, 2015 prices using an implicit deflator published by Eurostat.

$$GVA_{t1} - GVA_{t0} = E_{t0} \cdot (LP_{t1} - LP_{t0}) + (E_{t1} - E_{t0}) \cdot LP_{t1} \qquad (1)$$

where *t0* and *t1* indicate the base and the current period, LP= $\frac{GVA}{E}$, is labour productivity, i.e., the gross value added per employee. Dividing both sides of the equation by the base period gross value added (GVA_{t0}) gives the percentage change and the percentage contribution of each factor.

Changes in labour productivity can be further broken down into components according to whether the improvement in labour productivity in a given region occurred because labour productivity within different sectors improved or because labour flowed to sectors of higher productivity or increasing productivity with unchanged labour productivity. This decomposition can be implemented by a shift-share analysis, during which we follow the procedure outlined in OECD (2018, p.28).

The labour productivity of the total economy can be expressed as the sum of the labour productivity of each sector weighted by employment shares:

$$LP_t = \frac{GVA_t}{E_t} = \sum_{i=1}^{n} \frac{GVA_{it}}{E_{it}} \cdot \frac{E_{it}}{E_t} = \sum_{i=1}^{n} LP_{it} S_{it} \qquad (2)$$

where LP_t, GVA_t and E_t denote respectively labour productivity, output (in our case gross value added) and employment in the total economy in period *t*, while LP_{it}, GVA_{it} és E_{it} are labour productivity, output and employment in sector *i* (*i* = 1, …, *n*) in period *t*, and S_{it} denotes the employment share of sector *i* in period *t*. The aggregate change in labour productivity between period 0 and *T* can be summarised as

$$LP_{t1} - LP_{t0} = \sum_{i=1}^{n}(LP_{it} - LP_{it0})S_{it0} + \sum_{i=1}^{n}(S_{it1} - S_{it0})LP_{it} + \sum_{i=1}^{n}(LP_{it} - LP_{it})(S_{it1} - S_{it}) \qquad (3)$$

Dividing both sides by the labour productivity of the base period (LP_{t0}) gives the percentage increase in productivity between the two periods. The first term in the decomposition represents the effect of the change in labour productivity within each sector, the second term represents the static effect of the structural change in the economy, and the last term represents the dynamic effect of the structural change.

While the within-sector productivity shift effect measures how productivity would have changed if we had assumed an unchanged distribution of labour across sectors and only growth within each sector contributed to the change in aggregate productivity, the second term, the static shift effect, measures the extent to which labour productivity growth was driven by labour flows from less productive sectors to more productive sectors. The dynamic shift effect shows the combined effect of productivity change and labour flows and is positive if the employment

share of sectors with higher productivity growth has increased and if the employment share of sectors with lower productivity growth has decreased. This effect is negative if employment increases in sectors with lower productivity growth or decreases in sectors with higher productivity growth. Static and dynamic shift effects can be interpreted together as the effect of structural change in the economy. These decomposition methods can be applied both at the national level and at the level of a region.

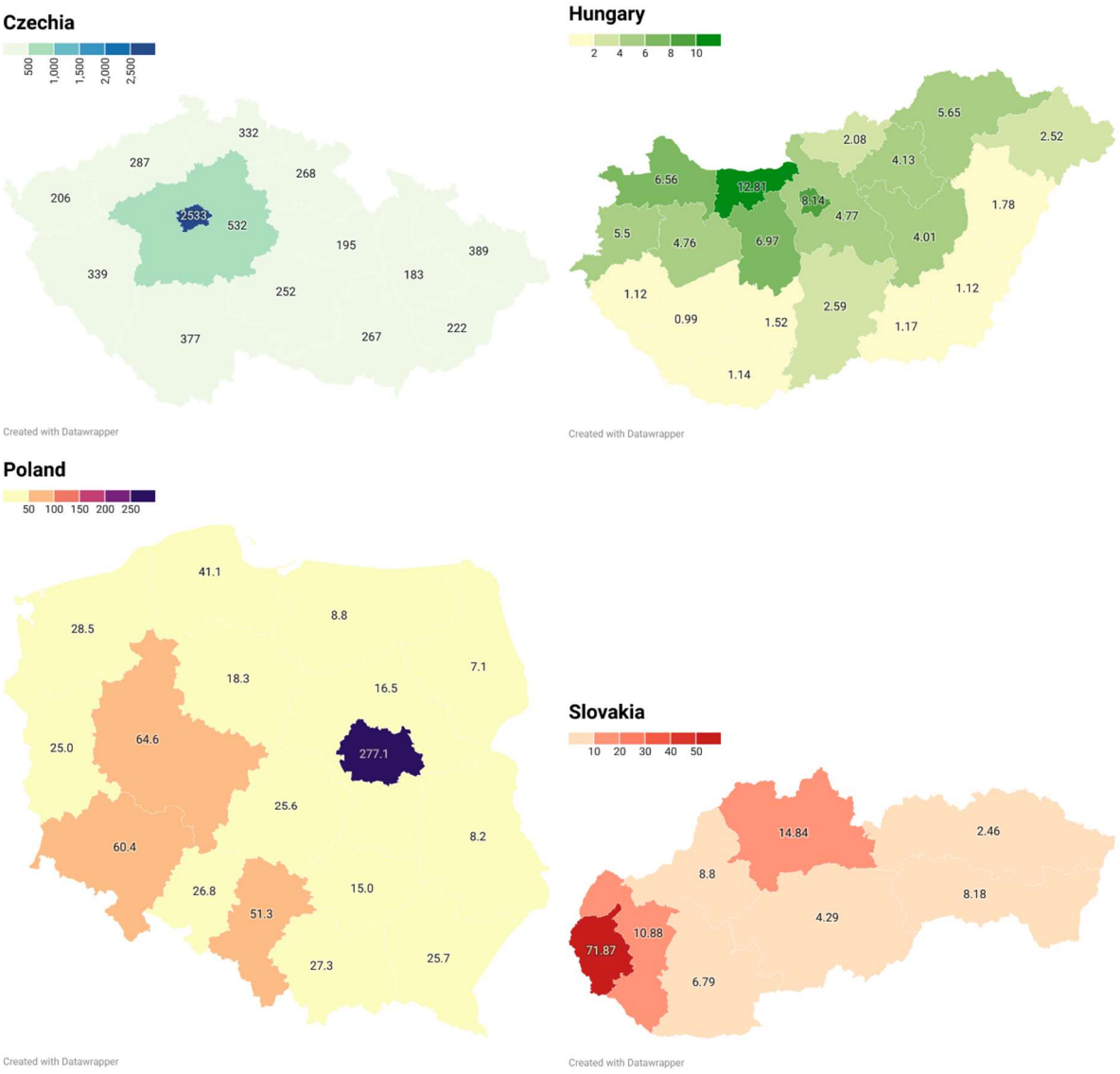
In recent research on the macro-region of Central and Eastern Europe, similar calculations have been carried out by Dobrzanski and Grabowski (2019), Dobrzansi et al. (2024), and in a slightly different approach by Sávai and Bodnár (2024), and only for Hungary by Sávai et al. (2022). For the period after 2010, it can be noted that in most cases (countries, regions) the impact of productivity improvements within sectors dominated, while the impact of structural change was much smaller, and in many cases the dynamic effect was small and negative.

We assume that the inflow of large-scale FDI has led to a structural change of the affected regional economies. Therefore, we regress the regional productivity change indicators against the distribution of FDI to find out whether the areas targeted by the inflow of foreign direct investments were able to benefit in terms of productivity growth driven by structural change.

4. Empirical results and discussion

The regional distribution of foreign direct investments is highly concentrated in the capital cities in Poland, Czechia and Slovakia, non-capital areas having a minor share. The capital city concentrated 64%, 47%, 42% and 68% of the total domestic FDI volume in Czechia, Hungary, Poland and Slovakia, respectively. The capital cities of Czechia, Poland and Slovakia are decoupled from the rest of the country in terms of FDI (specifically, the FDI to GVA ratio), but in Hungary, Budapest does not stand out considerably from the other leading regions. At the same time, concentration is an increasing trend in Czechia, a decreasing trend in Hungary and it is stagnating at a high level in Slovakia. In Poland, we cannot detect a clear trend. While per capita GDP territorial differences are larger in Hungary compared to the other three CEE countries, FDI appears less concentrated in Hungary.

Figure 1. FDI per employee in the regions of the Visegrad countries, 2019, thousand units of national currency per employee



Source: own elaboration based on Eurostat and national statistical office data
Notes: Poland's data refer to the NUTS2 level and the year 2020, Hungary's data are measured in million HUF per employee

The economy of Budapest might not be as reliant on FDI as that of Prague, Warsaw and Bratislava, but the opposite is true for the non-capital regions, that is, regions outside the capital city are more dissimilar in Hungary than in the V3 countries in terms of the FDI to employee ratio, and also the GDP per employee ratio. The structural composition of FDI also shows marked differences, because in Hungary, knowledge-intensive service-oriented investments are overly concentrated in the capital, while non-capital regions are dominated by manufacturing investments. The concentration of higher value-added sectors (J to N) is much more balanced in the rest of the Visegrad countries, particularly in Poland (see Figure A1 in *Appendix A*). As a result, a U-shaped relationship can be observed between the relative economic development and the relative share of manufacturing in a regional disaggregation (Egyed, Zsibók 2023). The economy of Slovakia and Hungary is highly reliant on the export and import of goods, furthermore, Hungary has a relatively high share of the export and import of services within its GDP compared to the EU average and countries in the CEE region. In this context, we can verify the positive association between the share of manufacturing

employment and the FDI-penetration at the regional level, the results are presented in *Appendix B*.

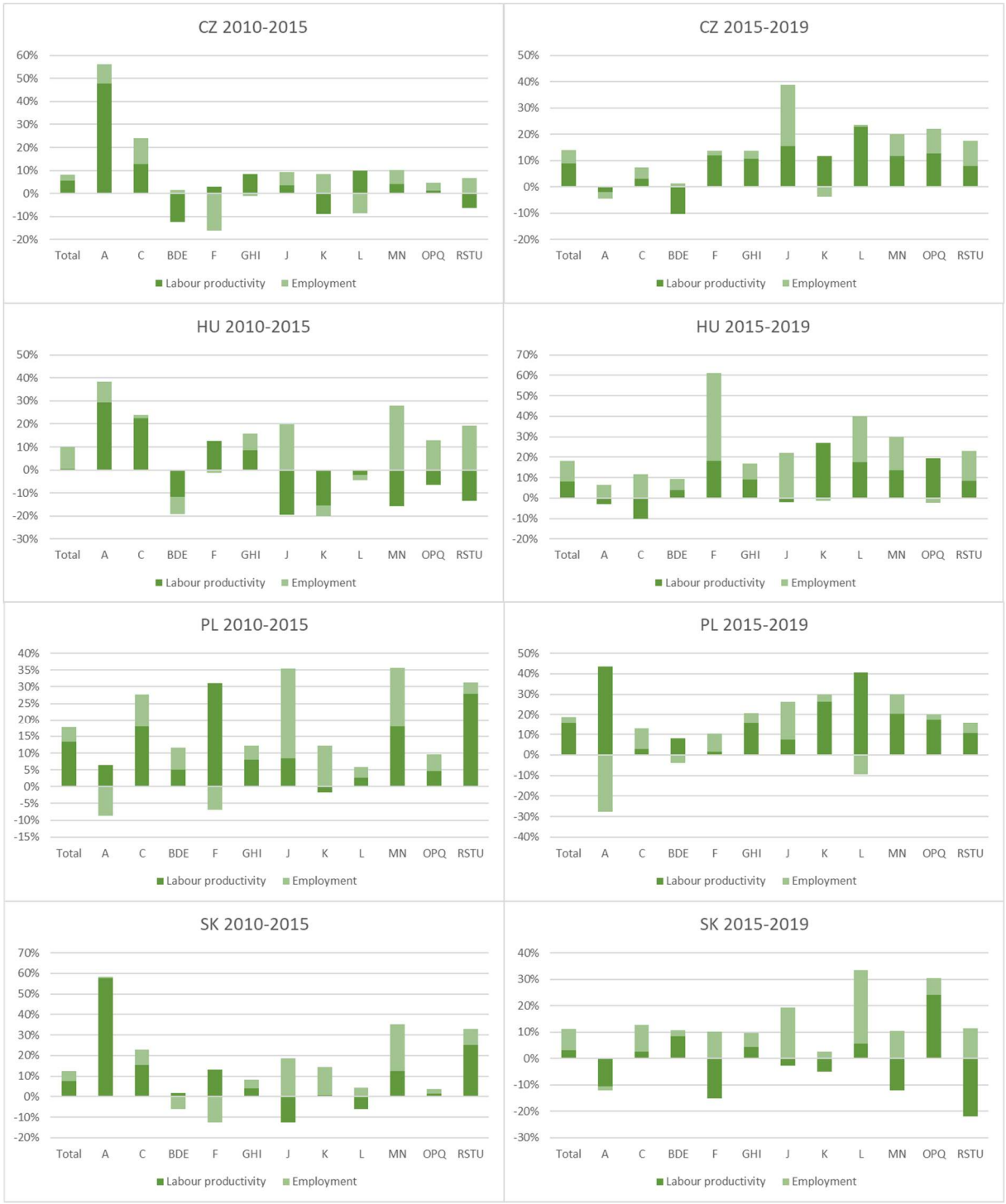
4.1. The decomposition of GVA change to the contribution of employment change and labour productivity change

The growth of gross value added (GVA) can be decomposed into the contribution of employment change and the contribution of GVA per employee change as represented by Eq. (1). Between 2010 and 2015 the GVA change was almost entirely attributable to the growth of employment in Hungary, while the contribution of employment and productivity growth was more balanced in the other three countries. Poland advanced in productivity during both periods. Hungary's post-crisis economic growth in the early-2010s was based on extensive job-creation to address the problem of excessively low employment rates. The idea was that from a societal point of view, it is more beneficial to first widen the workforce, and later to increase labour productivity on the expanded labour force basis. While this approach successfully boosted employment, it also resulted in a labour market structure where low-productivity jobs dominated, constraining efficiency and innovation based development. As a result, between 2015 and 2019, the contribution of productivity growth started to increase, but it has still remained relatively low in Slovakia and Hungary. Peripheral regions might be challenged by the so-called European regional innovation paradox (Uyarra et al. 2018, Muscio et al. 2015, Esparza-Masana 2022) that refers to the mismatch between a strong need for innovation in structurally weak regions and their limited capacity to absorb innovation funds (Hassink and Kiese 2021).

With a focus on sectoral differences, our calculations indicate that productivity development was driven by the agricultural and manufacturing sectors in the early-2010s in all Visegrad countries, as well as by the construction sector in Poland and the R-U sectors[2], and, to a lesser extent, M-N sectors in Poland and Slovakia. During the second half of the decade, manufacturing was the sector where productivity showed the largest decrease in Hungary, while it contributed relatively little to productivity growth in the other three Visegrad countries. Other industrial sectors (B-E) in Czechia, agriculture in all countries excepting Poland, the construction, M-N and R-U sectors, and, to some extent, J (together with extensive employment growth) in Slovakia also show a negative contribution.

Figure 2. The contribution of employment change and labour productivity change to GVA growth in the Visegrad countries in a sectoral breakdown

[2] NACE Rev.2 sectors are A - Agriculture, forestry and fishing; B - Mining and quarrying; C - Manufacturing; D - Electricity, gas, steam and air conditioning supply; E - Water supply; sewerage, waste management and remediation activities; F - Construction; G - Wholesale and retail trade; repair of motor vehicles and motorcycles; H - Transportation and storage; I - Accommodation and food service activities; J - Information and communication; K - Financial and insurance activities; L - Real estate activities; M - Professional, scientific and technical activities; N - Administrative and support service activities; O - Public administration and defence; compulsory social security; P - Education; Q - Human health and social work activities; R - Arts, entertainment and recreation; S - Other service activities; T - Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use; U - Activities of extraterritorial organisations and bodies.



Source: own elaboration based on Eurostat data

Concerning regional differentials, our results indicate that Poland had a consistently good performance across all regions and time periods between 2010 and 2019, and productivity advance appeared with reasonable weight everywhere. In Czechia, Středočeský kraj, surrounding Prague, outperformed the capital city in both periods, while some regions (Karlovarský kraj, Ústecký kraj and Moravskoslezský kraj) showed quite a slow growth, altogether 4 to 13 percent GVA change between 2010 and 2019. In Hungary, the FDI-manufacturing oriented and the re-industrialising regions recorded the highest progress during the first half of the decade, whereas Győr-Moson-Sopron and Zala counties represent the most

notable exceptions after 2015. The highest productivity improvement was measured in Budapest and in the otherwise relatively underdeveloped regions after 2015, some of which can be regarded as deindustrialised former old industrial regions (see Hassink and Kiese 2021). However, despite Budapest's role as the region's service and SSC hub, it falls behind in terms of high-tech manufacturing FDI, corporate R&D, international scale-ups (less competitive start-up ecosystem) and it hosts a few EMEA or global centres, particularly in financial and business services (Gál 2014). If it cannot channel higher value, knowledge-intensive activities, the city's advantages (human resources, university infrastructure) will not yield their full return. Taken together, these constraints make Budapest less able than Prague or Warsaw to capture the benefits of inward investment, upgrade its industrial mix, and sustain the 'smile curve' roles (R&D, design, regional HQ) essential for 21st century growth.

In Slovakia, in terms of GVA growth, the capital region was outperformed by some eastern areas (Prešovský kraj and Košický kraj), and, in contrast to Hungary, the contribution of productivity growth was larger before 2015, then, the contribution of the employment growth took on a more important role. In this period, Trnavský kraj recorded the best productivity performance, while the Trenčiansky kraj persistently lags behind.

Figure 3. The contribution of employment change and labour productivity change to GVA growth in the Visegrad countries in a regional breakdown

Source: own elaboration based on Eurostat data

4.2. A shift-share analysis of labour productivity change

Next, we focus only on the change of labour productivity and the decomposition thereof based on a shift-share method as presented in section 3 above. The shift-share analysis decomposes labour-productivity change to a within-sector productivity growth effect, a static shift effect and a dynamic shift effect (OECD 2018). The sum of the static and dynamic shift effects is often used as a measure of the overall resource reallocation process in the economy. This analysis helps us to see whether the structural change in the economy contributed to better efficiency or not.

Figure 4. The within-effect and the structural effect in the Visegrad countries between 2010 and 2019 in a regional breakdown

Source: own elaboration based on Eurostat and national statistical offices' data

The results of our calculations show that in general, the within-effect dominated in each country throughout the two examined periods, excepting Slovakia after 2015, where the two effects were more balanced. In several cases, particularly between 2010 and 2015, the structural change effect was not only small, but even negative. In these cases, economic restructuring was unfavourable for productivity improvement. Between 2015 and 2019, the structural effect was somewhat more favourable. It is reasonable to assume that productivity improvements driven

by within-sector productivity growth have a smaller potential, as they are constrained by the technological development of the sectors and tend to occur more gradually. In contrast to the within-sector effect, the structural effect enables more rapid growth. However, in the regions of the Visegrad countries, this effect was observed only to a limited extent and, in many cases, manifested in an unfavourable direction.

4.3. FDI, economic restructuring and labour productivity

Finally, we examine the cross-sectional relationship between FDI penetration and the two main components of labour productivity change (within sector effect and static+dynamic structural effect) as well as the overall labour productivity change. The regression was estimated with the OLS method (Table 1). Our results confirm that FDI positively contributed to labour productivity change between 2010-2015, which was attributable to the within-sector effect, but no significant relationship is detected in the second half of the period or with respect to the structural change effect. Given that the capital regions in three of the examined countries are outliers with respect to FDI, we conduct the regressions both including and excluding them. We conduct the regressions jointly for all four countries, given the limited number of observations per country, except in the case of Poland.

Table 1. Regression results for the relationship between the change of FDI and the labour productivity change including its two main components (within and structural effects) in the Visegrad countries' regions

a)

Dependent variable: labour productivity change	2010-2015	2010-2015, excl. capitals	2015-2019	2015-2019, excl. capitals
change of FDI, 2010-2015	0.0304	0.0296		
p-value	0.0004	0.0007		
change of FDI, 2015-2019			-0.0070	-0.0051
p-value			0.5140	0.6315
Constant	0.0240	0.0260	0.1015	0.0985
p-value	0.1053	0.0891	0.0000	0.0000
N	59	55	59	55
R^2	0.1965	0.1957	0.0075	0.0044

b)

Dependent variable: within effect	2010-2015	2010-2015, excl. capitals	2015-2019	2015-2019, excl. capitals
change of FDI, 2010-2015	0.0239	0.0230		
p-value	0.0018	0.0029		
change of FDI, 2015-2019			-0.0042	-0.0018
p-value			0.6931	0.8663
Constant	0.0405	0.0436	0.0907	0.0860
p-value	0.0029	0.0021	0.0000	0.0000
N	59	55	59	55
R^2	0.1589	0.1553	0.0028	0.0005

c)

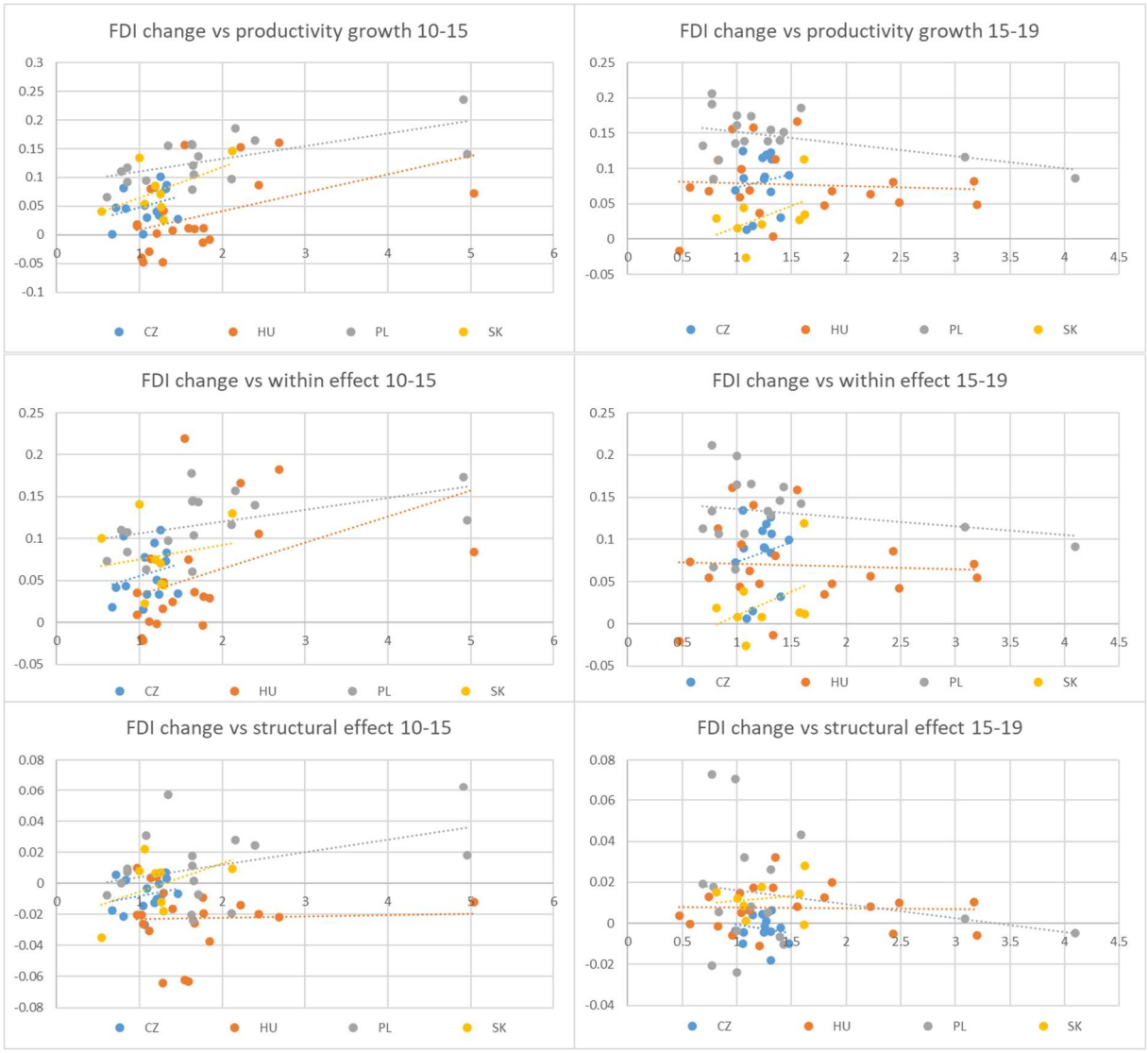
Dependent variable: structural effect	2010-2015	2010-2015, excl. capitals	2015-2019	2015-2019, excl. capitals
change of FDI, 2010-2015	0.0059	0.0059		
p-value	0.0790	0.0848		
change of FDI, 2015-2019			-0.0029	-0.0035
p-value			0.4064	0.3171
Constant	-0.0155	-0.0163	0.0115	0.0131
p-value	0.0115	0.0108	0.0321	0.0179
N	59	55	59	55
R^2	0.0531	0.0550	0.0121	0.0189

Source: own elaboration based on Eurostat and national statistical offices' data

Figure 5 suggests that if we look at the data in a country breakdown, the overall positive significant relationship between FDI change and labour productivity growth between 2010 to 2015 does not hold for each country. Significant country-level coefficients can be detected only in Hungary and Poland, if capital cities are considered in the OLS regression, and only in Poland if the regression is run without capitals. It is also observable that labour productivity change took place through the within effect, while the structural effect was not in place in any of the countries or time periods in its relationship with FDI.

Regression results presented in Table 1 provide a rough picture about the relationship between FDI growth and labour productivity growth at the regional level. Two main limitations apply to this approach of investigating this relationship. Firstly, control variables would help to assess the possibility whether other factors, e.g. human capital endowment, industrial structure, domestic investment, technological factors, play a role (see, e.g. Saidi and Ochi 2023). Secondly, potential reverse causality might be in place. Indeed, the relationship between FDI and productivity could work in both directions, but they are often not symmetric in practice. Although regions attracting more FDI will likely experience productivity improvements due to better technology, managerial practices, etc., the reverse i.e., productivity growth triggering more FDI inflows, may also take place, but with weaker effect or only in the long term once productivity improvements have been established.

Figure 5. The relationship between the change of FDI and labour productivity growth, the within effect and the structural effect between 2010 to 2015 and 2015 to 2019 in a regional breakdown by countries



Source: own elaboration based on Eurostat and national statistical office data

5. Conclusion

This study investigated the economic structure of the Visegrad countries' regions and the spatial distribution of foreign direct investments. In the aftermath of the Covid crisis, policy-makers are looking for new trajectories to reaffirm economic competitiveness. However, it appears that Hungary and Slovakia stick to a path which was temporarily successful and resonated well with the challenges of the early-2010s. This study has confirmed that the low road of development is no longer sustainable in the changing global and European economic environment. A central element of a shift towards a more competitive economy lies in the restructuring of the economy towards more local value-added activities not only in metropolitan areas but also in the non-capital regions with various development levels. Our research questions focussed on FDI and economic restructuring as drivers of growth and convergence in a regional setting. Our results indicate that the within-sector effect was considerably larger than the structural change effect, which underlines the need to rethink the economic specialisation of regions and the national economies, taking into consideration also the spatial and sectoral distribution of FDI attraction. This will help these countries to steer their growth path away from the low road of development.

Our research revealed that the Visegrad countries' economies were best able to benefit from the productivity-enhancing effects of FDI in the first half of the 2010s, but this impact was not detected after 2015. Although often regarded as a single bloc, the Visegrad countries exhibited distinct patterns in the FDI–productivity nexus. From several aspects, we found Poland to be a positive outlier (persistent productivity growth with balanced regional distribution) and Hungary to be a negative one (lack of knowledge-intensive, high value-added sectors in non-capital areas, stalling productivity in the manufacturing sector). In Hungary, FDI was able to stimulate the economies of the more developed, non-capital areas, thereby reducing territorial disparities. However, the benefits of FDI and export-oriented manufacturing growth faded in the second half of the decade, which is typical for regions in a middle-income trap. In the rest of the Visegrad countries, labour productivity growth occurred through other channels in the peripheral areas, given the high concentration of FDI in the capital cities. Nevertheless, Polish regions were able to benefit from the productivity-enhancing effect of FDI through the within effect.

The dominant part of labour productivity growth occurred in the form of within-sector growth, at the same time, the growth effect of structural reallocation was weak. Poland was best able to benefit from this type of restructuring, while in the other three countries the impact was, in some cases, even negative. The shift effect was largely negative in the first half of the period, but it turned into positive after 2015. Overall, the manufacturing export-oriented economic model is ill-suited to maintain the economy's internal income-generating capacity on a sustainable path.

The most important limitations of our research are the lack of fully comparable sub-national-level FDI data, the omission of control variables in the regressions and the disregard of potential reverse causality with regard to FDI and productivity. Given the exploratory nature of the study, we opted for a parsimonious model to highlight the direct association between FDI and productivity. In future research we intend to overcome the limitations by extending our research with more qualitative case studies within each country and applying methods that address potential endogeneity, such as instrumental variable techniques or panel data approaches.

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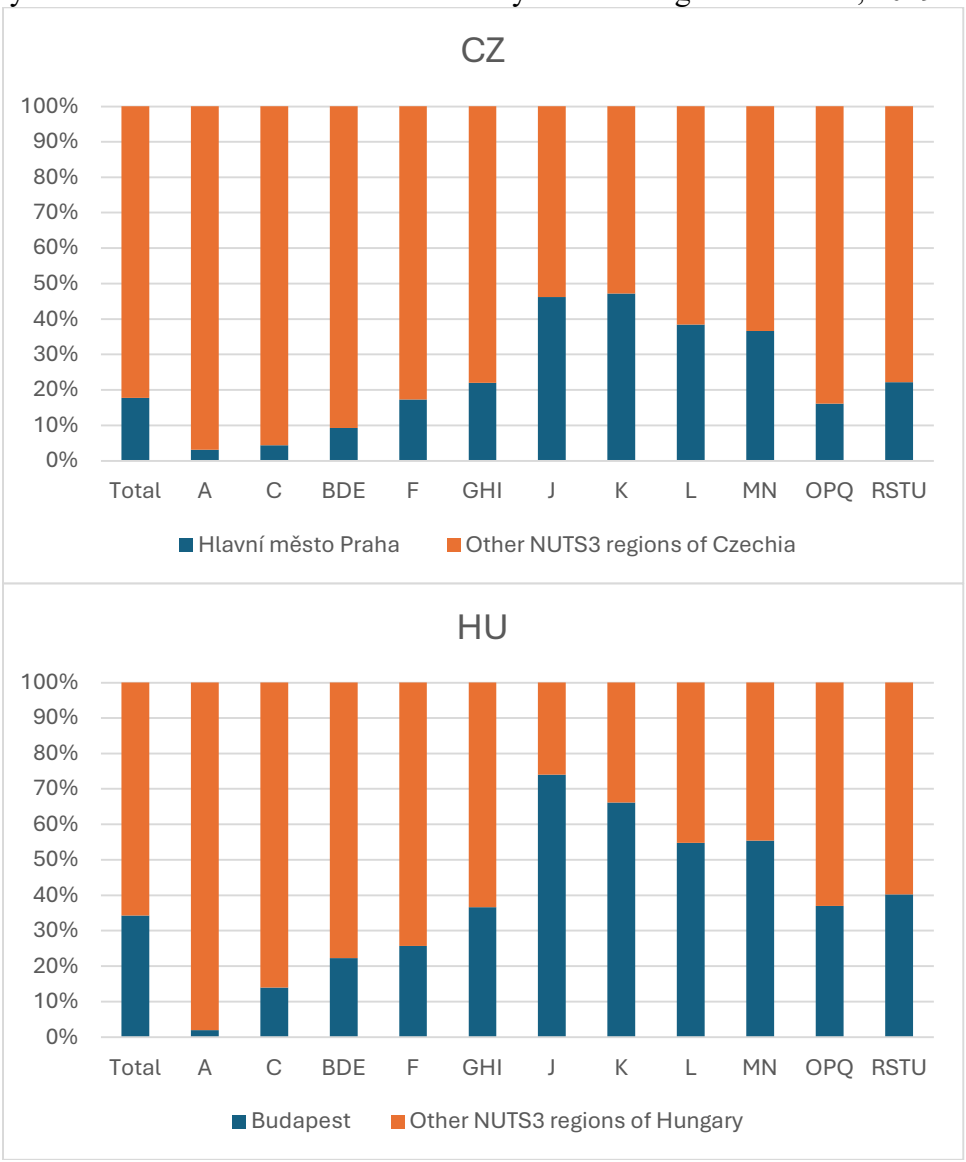
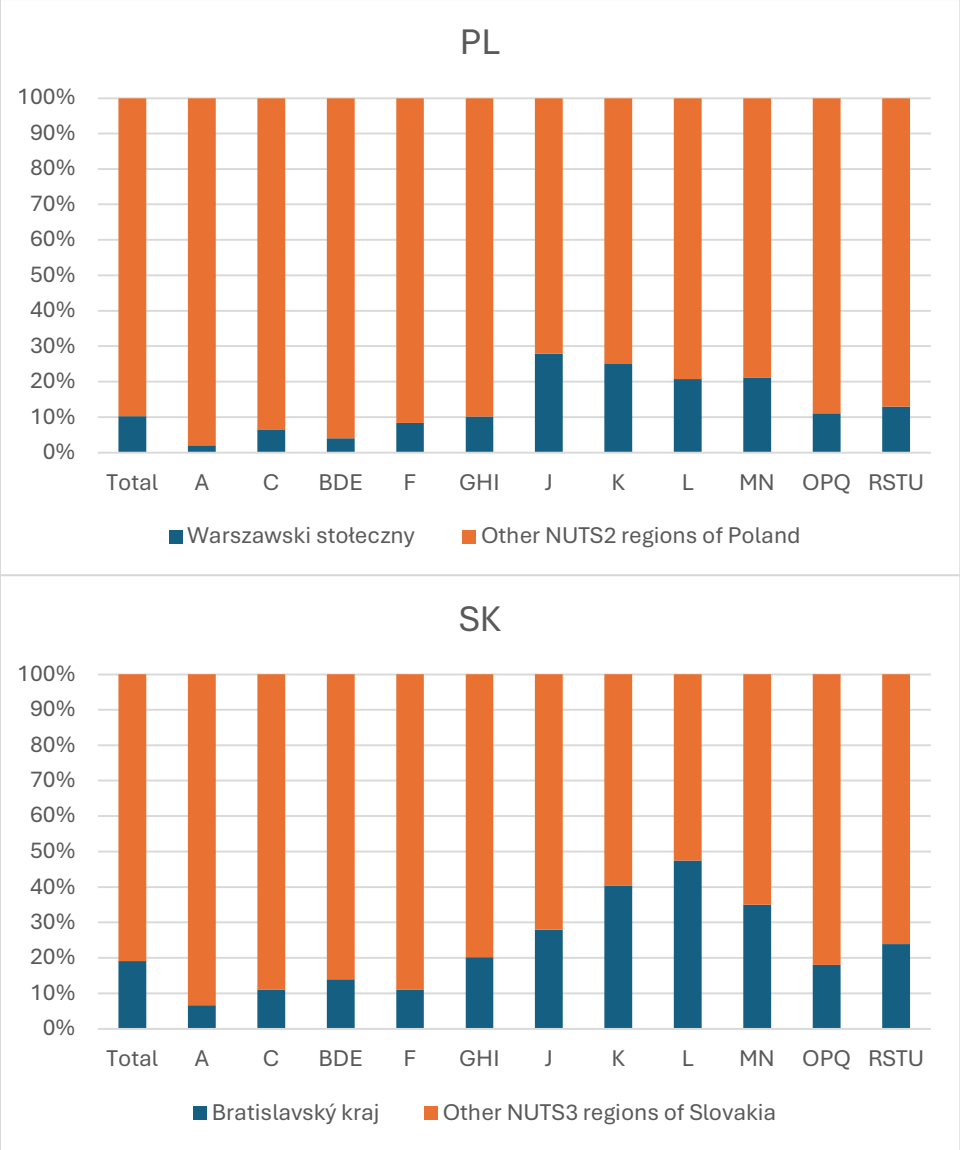
Appendix A

Figure A1. The distribution of the number of employees between the capital and the rest of the country in the different sectors of the economy in the Visegrad countries, 2019



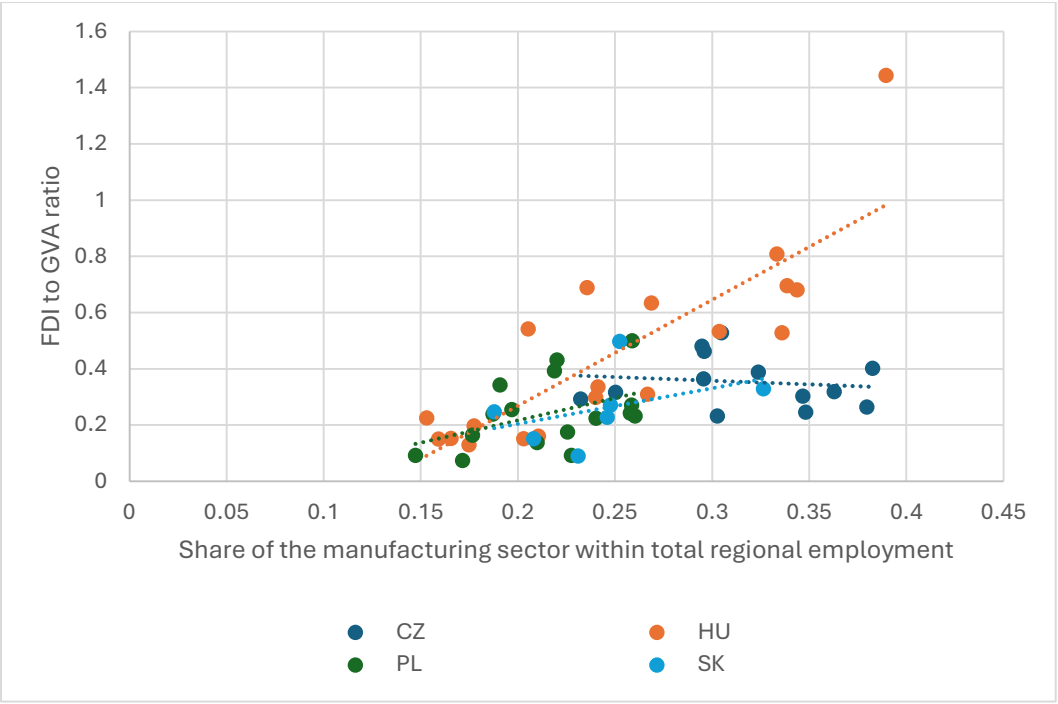


Source: own elaboration based on Eurostat data

Appendix B

Appendix B examines the relationship between the share of the manufacturing sector in regional employment and the share of FDI within gross value added in the NUTS3 regions of the Visegrad countries in 2019 (Poland: NUTS2 regions, 2020) without the capital city regions.

Figure A2. The relationship between the share of the manufacturing sector in regional employment and the share of FDI within gross value added in the NUTS3 regions of the Visegrad countries in 2019 (excluding capital cities)



Source: own elaboration based on Eurostat and national central bank data

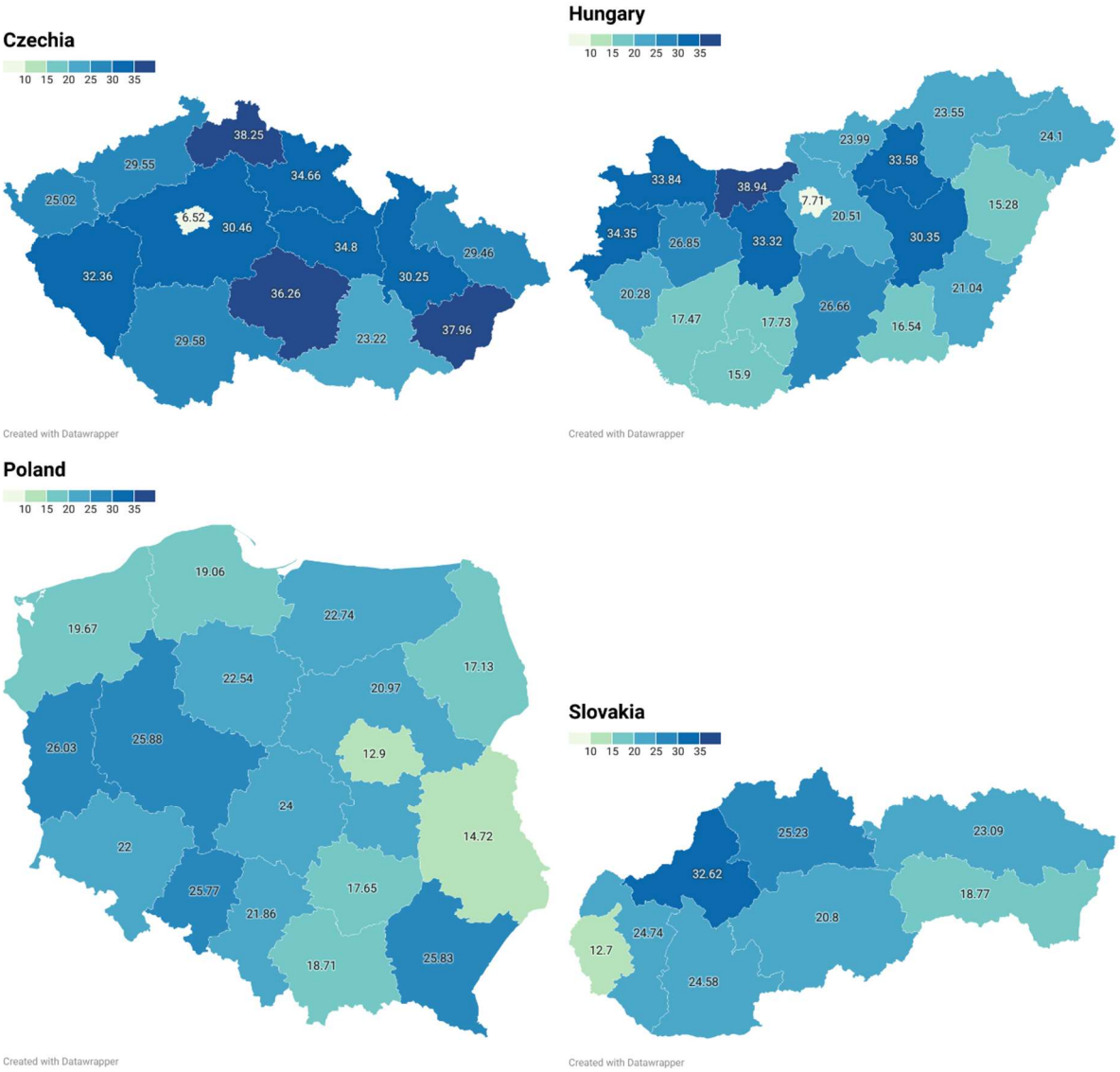
Figure A2. suggests that the overall relationship between the share of manufacturing and the importance of FDI within the regions, as measured by the FDI to GVA ratio, is positive. This is confirmed by the OLS regression results (Table A1), showing that the relationship is significant, but its strength is moderate (R^2=0.33). However, the results are different in the four countries. The most robust positive relationship is observed in Hungary, but in the other three countries, the relationship is weak or it is even negative in Czechia.

Table A1. Regression results for FDI to GVA ratio and manufacturing employment share

Variable	Coef.	Std. Err.	t	P > t
Manufacturing Share	2.0518	0.3974	5.16	0.000
Constant	-0.1781	0.1044	-1.71	0.094

Observations: 55
F(1, 53): 26.65
Prob > F: 0.000
R-squared: 0.3346

Figure A3. The share of the manufacturing sector within total regional employment in the Visegrad countries' NUTS3 regions



Source: own elaboration based on Eurostat data