Ukraine's Value Chain Opportunities in the EU
Lessons from Eastern Europe

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Opportunity in Crisis

Empowering Ukrainian Refugees to Rebuild the Ukrainian Economy

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1 Executive Summary

As part of the project "Opportunity in Crisis – Empowering Ukrainian Refugees to Rebuild the Ukrainian Economy," this report assesses Ukraine's prospects for growth and development through deeper trade integration and foreign direct investment (FDI), with a particular focus on ties to Germany and Austria. The analysis highlights a set of opportunities—and binding constraints—that should inform medium- and long-run reconstruction and industrial strategy.

Ukraine's development and growth conundrum (Section 2). Compared to its peers in Central and Eastern Europe, Ukraine has underperformed in export growth and in attracting FDI. After the collapse of the USSR, Ukraine's inherited value-chain relationships unraveled, producing not only a decline in export volumes but, importantly, a downgrade in export sophistication. Over time, Ukraine's export basket shifted away from complex industrial goods toward lower-complexity agricultural products; geographically, exports reoriented away from Russia and toward the European Union. While EU demand is large and expanding, Ukraine's export volumes and complexity to the EU have not yet reached a scale that would meaningfully accelerate structural transformation.

Learning from past experience (Section 3). Several Eastern European economies achieved rapid development through export-led growth anchored in global value chains (GVCs) linked to Western Europe. Many of these countries climbed a familiar development ladder—from textiles into machinery, electronics, and vehicles. As a result, their GVC-related exports soared, rising by factors between 8 and 14 over the last 25 years. Simultaneously, FDI played an outsized role: in some countries, employment in foreign-owned establishments exceeded 8% of the overall labor force. This successful pivot away from Soviet-era value chains toward value chains centered on Western Europe, and especially on Germany and Austria, suggests that Ukraine may be able to follow a comparable pathway. We therefore document how central and eastern European Union members (EU-CEE countries) integrated into Western European GVCs and identify which opportunities plausibly translate to Ukraine. This includes original methods to infer salient upstream–downstream product linkages from trade data and to track FDI-driven employment over time.

Opportunities (Sections 3 and 4). In EU-CEE countries, the surge in GVC-related exports and inward FDI concentrated in a small set of value chains and industries. Based on the trajectories of these countries, prominent opportunities for Ukraine are in GVCs related to vehicles and electronics. In terms of foreign investments, the most promising sectors similarly relate to motor vehicles and electronics, but also to professional, scientific, and technical services, including IT.

Challenges and feasibility (Section 4). Ukraine faces additional frictions relative to many EU-CEE peers: it is geographically farther from Western Europe and has only recently entered the formal EU accession trajectory. We therefore evaluate potential GVC opportunities by combining information on expected scale, the extent to which certain exports can be driven by FDI, sensitivity to distance, the boost historically associated with EU candidacy and membership, and the fit with Ukraine's existing industrial know-how. This yields sets of products that are both accessible and strategically valuable for pivoting toward Western European value chains, with particularly strong candidates in vehicle- and electronics-related industries.

Regional fit (Section 5). Ukraine's economy and capability base differ across regions. Eastern regions have strong capabilities in electronics, vehicles, and (especially in the south-east)

heavy manufacturing, though proximity to the frontline currently constrains investment attractiveness. Several of these activities are also compatible with western regions. Kyiv and central regions are particularly suited for a range of business services, including IT and software-related activities.

Software development (Section 6). Ukraine has a substantial software sector with strengths in high-value activities such as advanced app development and DevOps. These capabilities can complement future manufacturing-oriented value-chain linkages, as software constitutes an increasingly valuable input in many global value chains. Ukraine also has a sizeable diaspora of programmers abroad, with relatively greater activity in AI and machine learning tasks as well as cloud computing. Connecting to this diaspora could provide an additional pathway for capability upgrading and economic development.

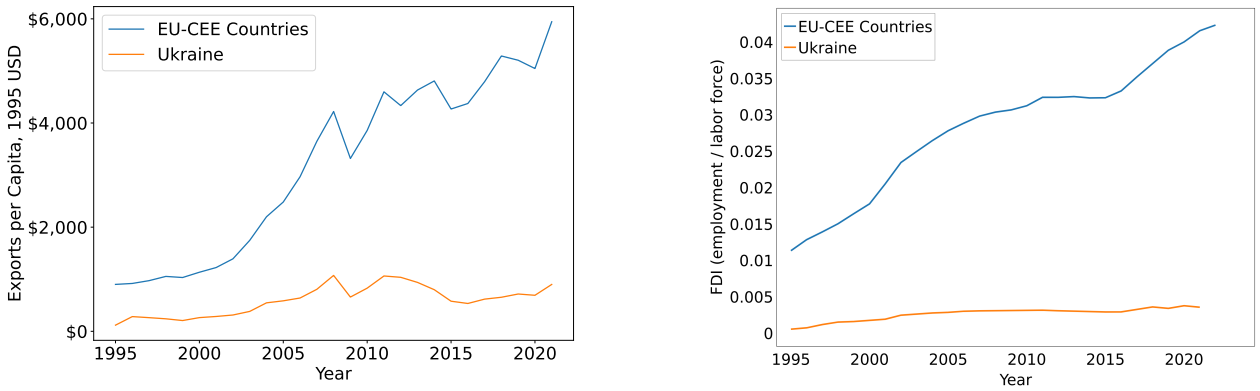
Further recommendations. Beyond deepening trade and investment links to Germany and Austria, Ukraine may be able to integrate more with neighboring EU-CEE economies. While outward FDI from these countries is still limited today, over time Ukraine's own economic scale may shift parts of Europe's manufacturing geography further eastward. This could generate spillover opportunities—especially along Ukraine's western border—that merit targeted analysis. Finally, we use the framework developed here to score priorities put forward by the Ukrainian government.

2 Trade and foreign direct investment in Ukraine

Ukraine faces the enormous task of rebuilding its economy. At the same time, reconstruction creates a window to modernize and reorient toward new trading and investment partners. Such links matter not only because they bring revenue and capital, but also upgrade the country's knowledge base and quality of work. This is important, because modern production draws on a large body of collective knowledge distributed across the world to produce an expanding set of increasingly complex goods and services. Countries can raise productivity and living standards by embedding themselves in these advanced production systems.

In this report we focus on two channels through which Ukraine can access global knowledge and capabilities: international trade (exports) and foreign direct investment (FDI). Exporting – i.e., selling goods and services on international markets – not only provides foreign currency, but also exposes the economy to competition and opens it up to inflows of knowledge. Likewise, FDI is more than a financial inflow: it also often provides access to technological and managerial know-how, and knowledge of foreign markets. We therefore analyze trade and FDI primarily as mechanisms for capability upgrading and deeper participation in global production networks.

Fig. 1 compares Ukraine's experience to that of Central and Eastern European countries that joined the European Union in the 2000s and 2010s (henceforth, EU-CEE countries). Panel 1a plots exports per capita in constant 1995 USD. Panel 1b plots inward FDI (see Box 2.1), measured as employment in foreign-owned multinational enterprise (MNE) establishments as a share of the recipient country's labor force.



(a) Exports per capita.

(b) Foreign direct investment.

Figure 1: **Exports and FDI per capita.** **a.** Value of exports per capita in constant 1995 USD for Ukraine compared to EU-CEE countries. **b.** Foreign direct investment quantified as the share of the labor force employed in foreign-owned establishments.

Although exports and FDI have grown in Ukraine, the country underperforms its EU-CEE peers. Between the mid-1990s and recent years, Ukraine increased real exports per capita by just over $570 (1995 USD), whereas EU-CEE countries increased real exports per capita by more than $4,000. Similarly, the share of workers employed in foreign-owned establishments rose by about 0.3 percentage points in Ukraine, compared to roughly 4 percentage points in EU-CEE states.

Fig. 2 shows that these aggregates mask substantial heterogeneity across destination markets. After the USSR's collapse, the share of Ukraine's exports going to Russia fell from about 40% in 1996 to roughly 25% in the 2000s. Still, until 2014—when Russia annexed Crimea and separatist fighting erupted in eastern Ukraine—Russia remained the single largest destination for Ukrainian goods.

The post-2014 collapse in exports to Russia was offset in *quantitative* terms by growing

Box 2.1: Foreign direct investment and economic development

Foreign direct investment (FDI) matters to economies not only as a source of capital, but also as a channel for accessing know-how. FDI can raise the efficiency of local production factors through transfers of technological and managerial capabilities (Borensztein et al., 1998), and it may generate spillovers that support productivity and innovation of local firms (Blomström and Kokko, 1998). Such spillovers can occur through training employees, upgrading local supplier networks, and collaborating with domestic firms (Markusen and Venables, 1999).

To study the evolution of FDI, we use data provided by Dun and Bradstreet ("D&B data"), which contain detailed information on roughly 400 million unique establishments worldwide. For each establishment, D&B data record its location, industry, and number of employees. Establishments are linked in corporate ownership trees, allowing us to identify establishments whose headquarters are located abroad. We quantify FDI as employment in establishments owned by foreign headquarters ("FDI employment"; see also Alfaro et al. (2009); Bahar (2020); Hartog et al. (2020)). Appendix B describes data cleaning, extrapolation, and validation in more detail.

exports to Eastern and Western Europe. Yet these volumes understate the broader impact of losing trade with Russia. A key subset of trade is organized through global value chains (GVCs; see Box 2.3). GVCs coordinate production across countries, with different locations specializing in different stages of production. Participating in GVCs allows countries to tap into other countries' knowledge bases, while leveraging their own comparative strengths.

Historically, Ukraine was embedded in Soviet value chains centered on Russia. The remnants of these (shrinking) GVC trade ties remained visible until the mid-1990s (Fig. 3). In the late 2000s, Ukraine's GVC trade with Russia expanded again, only to collapse across sectors after 2014. Russian hostilities therefore impeded export growth not only through destruction, but also by terminating previously growing Ukraine-Russia trade ties value-chain relationships. Fig. 3 illustrates this dynamic, showing that bilateral GVC trade between Russia and Ukraine persisted for more than five years after the USSR collapse (though declining), but then completely collapsed in the 2010s.[1]

The decline in GVC trade has left Ukraine's export basket heavily reliant on agricultural products. The shift away from heavy industry and toward agriculture (Fig. 4) has resulted in a decline in the economic complexity of Ukrainian exports (Fig. 5a; see Box 2.2 for an elaboration on economic complexity). Fig. 5b shows that the loss of industrial exports to Russia contributed substantially to this trend, as Russia historically received a comparatively higher-complexity subset of Ukraine's exports.

More recently, new GVC connections to Eastern and Western Europe have begun to form. Indeed, Fig. 2 shows that the EU now accounts for close to half of Ukraine's GVC-related trade. This holds the promise that export complexity may recover in the medium run. However, in absolute terms, this trade has not yet reached significant scale. Overall, Ukraine therefore, these dynamics have left Ukraine with low levels of GVC-related trade, limiting access to the advanced collective knowledge mobilized by GVCs and thereby constraining growth potential.

[1] Unlike elsewhere in this report, we include metal products here in metals to GVC exports, even though our method cannot identify precise value chains in this sector. The motivation is that metals—traditionally concentrated in the Donbas—were a central component of Russia–Ukraine value-chain linkages.

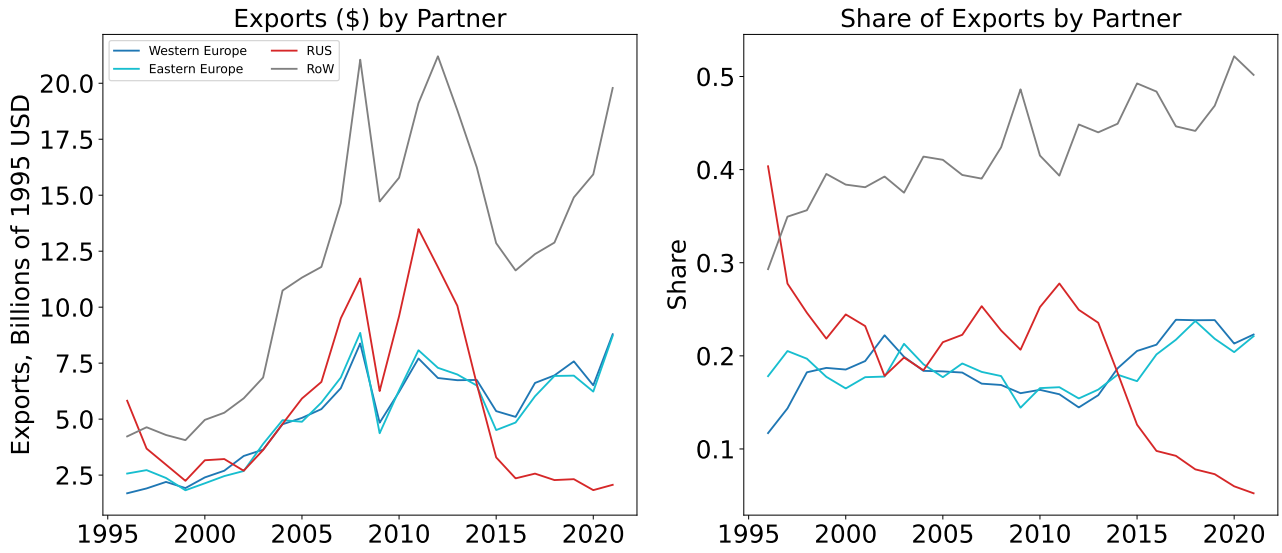


Figure 2: **Export destinations Ukraine.** **a.** Export volumes in constant 1995 USD from Ukraine to different destination markets. **b.** Export shares from Ukraine to different destination markets.

3 Learning from the Past: the experience of Eastern EU member states

With Russia-centered value-chain ties severed, Ukraine must reorient toward new international production networks. Because GVCs are often geographically concentrated (e.g., Baldwin and Lopez-Gonzalez, 2015), a pivot toward Western Europe is the most plausible pathway. To identify which opportunities may exist, we first examine the experience of countries that executed a comparable pivot from Russian to EU value chains in the recent past: the EU's newer member states in Central and Eastern Europe. These countries faced a similar challenge, albeit in peace time, when their traditional embedding in the Soviet production systems unraveled with the collapse of the USSR. After an initial period of turbulence, countries like Poland, Hungary, the Czech Republic, Slovakia and later also Bulgaria and Romania managed to seize opportunities by integrating into the EU and Western European value chains through a combination of trade expansion, institutional reforms, and FDI inflows.

3.1 International trade and global value chains

Integration with Western Europe reshaped EU-CEE economies. Fig. 6 illustrates the growth of exports per capita to Western Europe for Hungary, Poland, and Romania, driven in large part by vehicles, machinery, and electronics.

A central feature of this transformation was GVC-oriented trade (Box 2.3) with Western Europe. Fig. 7 shows how rapidly this integration into GVCs occurred. For some countries, such as Slovakia and Romania, the share of exports identified as belonging to bilateral GVC relationships rose from roughly 20% of total exports to 40% or more within just two decades.[2] Notably, the strongest growth in GVC exports is recorded for countries close to Germany and Austria, highlighting the importance of proximity for GVC integration.

As EU-CEE economies entered new GVCs, GVC exports steadily grew. However, this export growth did not occur uniformly in time across sectors. Instead, countries tended to

[2]Note that this is an undercount of the full expansion of GVC trade, as our methodology will not identify every GVC product or corridor.

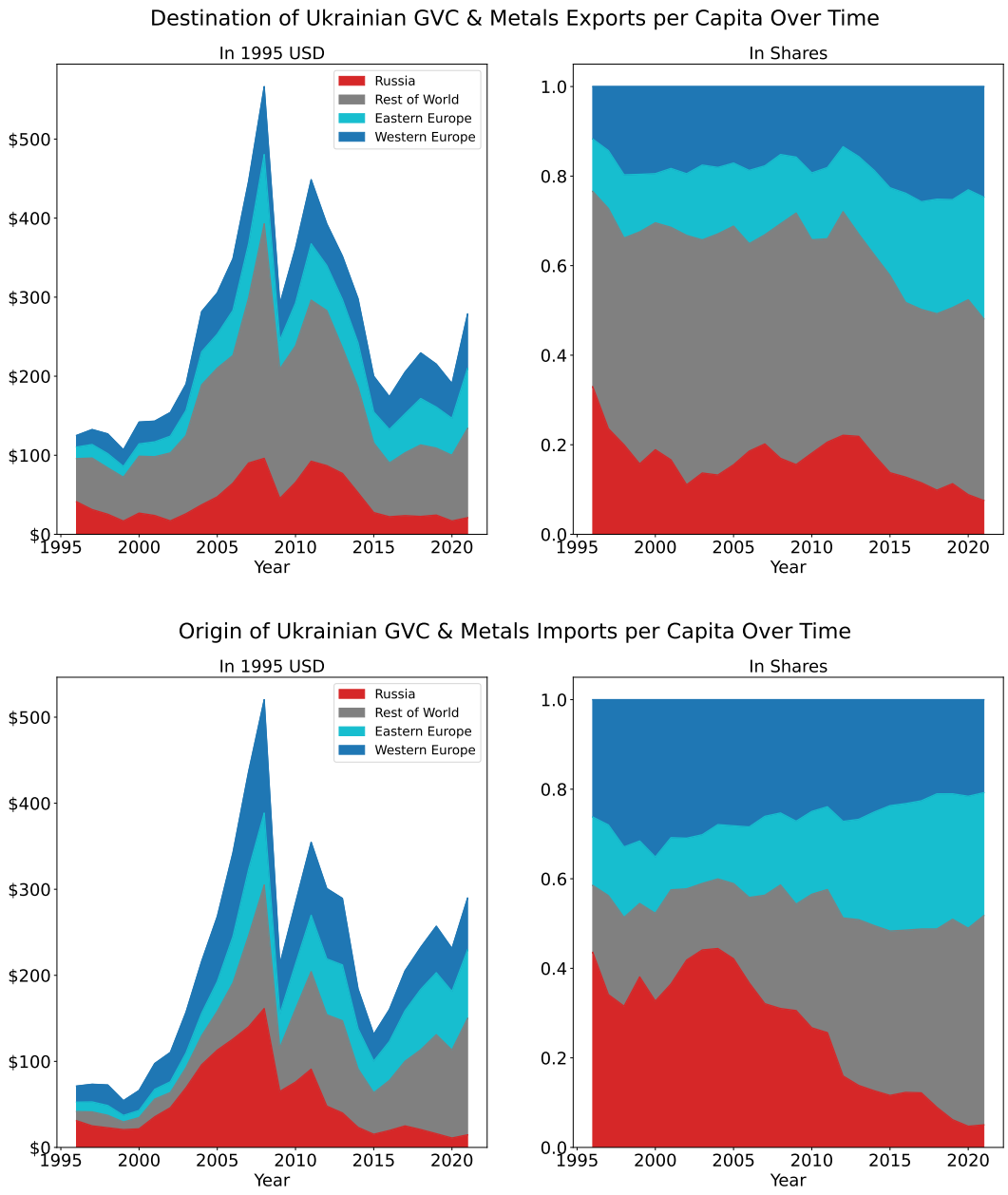


Figure 3: **Value-chain partners of Ukraine.** **a.** Total exports of GVC products and metal products from Ukraine to destination regions in constant 1995 USD. **b.** Idem, as percentages, showing the distribution across destination regions. **c.** Total imports of GVC products and metal products by Ukraine from different origin regions in constant 1995 USD. **d.** Idem, as percentages, showing the distribution across origin regions.

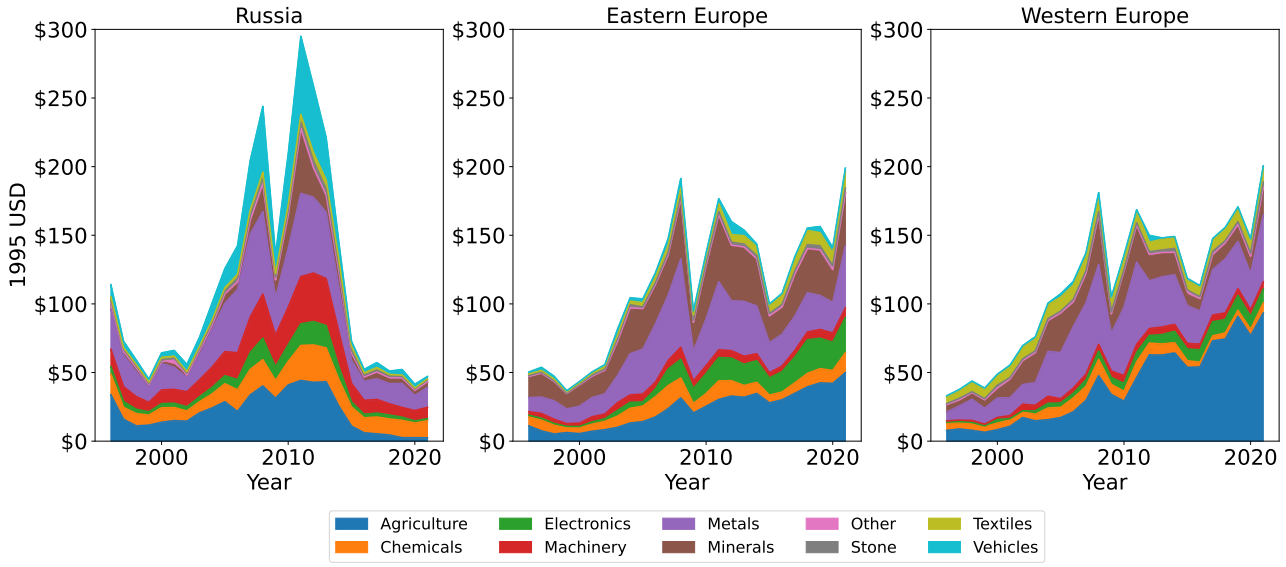
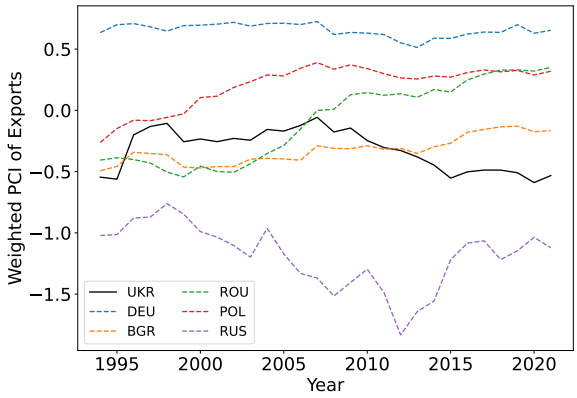
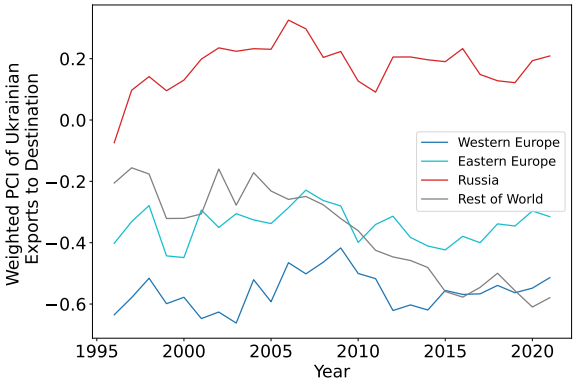


Figure 4: **Ukrainian exports by sector.** **a.** Exports to Russia. **b.** Exports to Eastern EU. **c.** Exports to Western EU.



(a) Weighted PCI of exports by exporting country



(b) Weighted PCI of Ukrainian exports by destination

Figure 5: **Complexity of Ukraine's exports.** **a.** Weighted average Product Complexity Index (PCI, Hidalgo and Hausmann, 2009) of exports for selected countries. **b.** Weighted average PCI of Ukrainian exports by destination market.

enter GVCs sequentially, moving up a classic development ladder over time. Fig. 8 illustrates this pattern by showing how the dominant GVC sector in each country shifted between 1995 and 2020: EU-CEE countries often entered textiles first and later diversified into more advanced sectors such as vehicles and electronics.

The GVC exports from Eastern Europe that we were able to identify using the approach in Box 2.3 are today highly concentrated in a small number of product clusters (for a discussion of how we define these clusters, see Box 3.1). Fig. 9 plots the shares of total exports accounted for by different GVC clusters (i.e., clusters of related products plus their immediate upstream inputs). The largest cluster is related to vehicle production and accounts for roughly twice the export volume of the next two largest clusters, both related to electronics. This concentration suggests that EU-CEE integration into Western European value chains hinged on a small set of large opportunities.

Fig. 10 shows the growth of the four largest GVC clusters in EU-CEE countries. Since the 1990s, export volumes in these GVC clusters expanded dramatically, growing by factors between

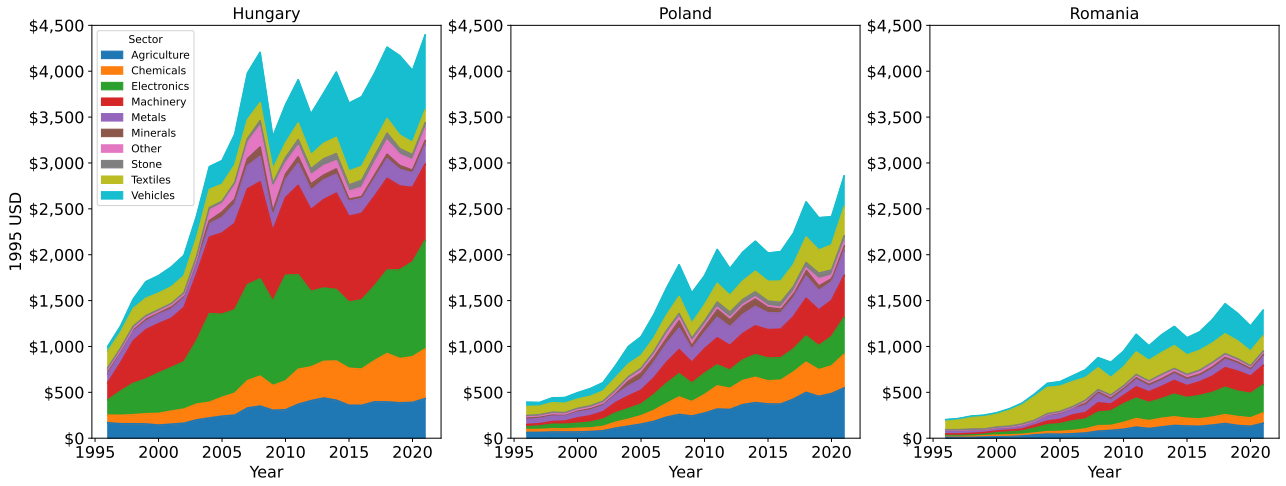


Figure 6: **Per capita exports to Western Europe by sector.** **a.** Exports from Hungary. **b.** Exports from Poland. **c.** Exports from Romania. Exports are expressed in constant 1995 USD.

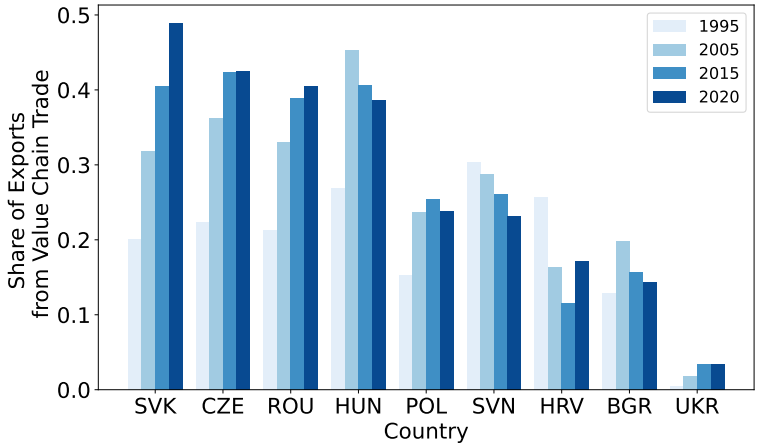


Figure 7: **GVC trade.** Shares of exports identified as GVC-related in Eastern European countries over time.

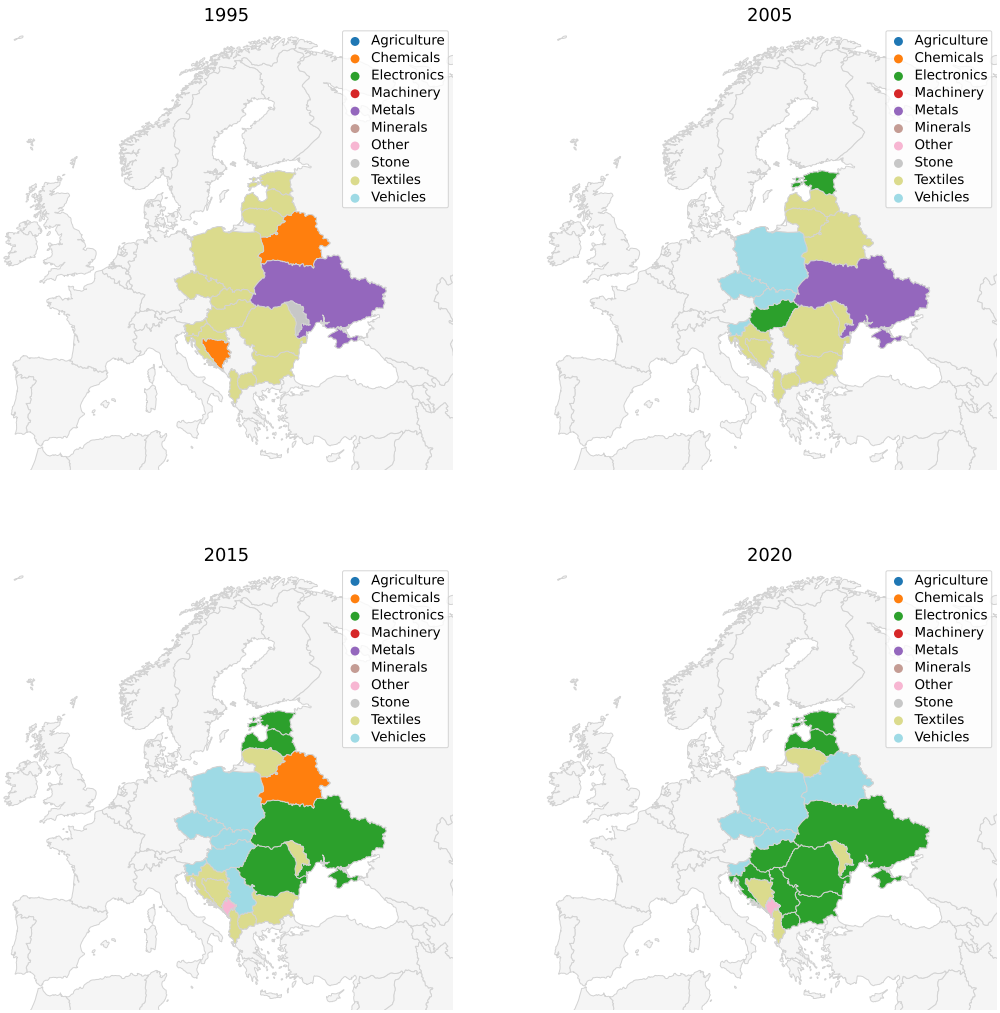


Figure 8: Dominant global value chains

Box 2.2: Economic Complexity

Economic complexity approaches aim to quantify (i) the productive capabilities of an economy and (ii) the capability requirements of products. In this context, Hidalgo and Hausmann (2009) developed the Economic Complexity Index (ECI) for countries and the Product Complexity Index (PCI) for products. These metrics aim to deduce how complex countries and products are from data about which products are produced by which countries. The intuition is that complex countries can produce many, but also complex products, whereas complex products are typically produced by few, complex, capability-rich countries. Economic complexity is a strong predictor of future growth (Hidalgo and Hausmann, 2009), a result replicated across scales and settings, from regional industrial employment to urban innovation (see Balland et al. (2022) for a recent overview).
Here, we decompose export complexity by destination market and study its evolution over time. To do so, we calculate the PCI for all exported products in the world between 1995 and 2022. We then compute the complexity of a country's export basket as the weighted-average PCI, with weights given by products' shares in the counrty's total export volume. Appendix A provides additional details.

8 and 14 in real terms. By 2021, some of these GVC clusters had become major contributors to overall export performance: the vehicles cluster alone accounted for more than 14% of total EU-CEE exports, while electronics-related clusters (electronic machinery and electronic components/devices) accounted for about 6%. These averages mask substantial cross-country heterogeneity. For example, in 2020, around 35% of Slovakia's exports came from the vehicles GVC cluster, while about 14% of Czechia's exports came from electronics and communications equipment GVCs. Fig. 11 shows that both global and Western European markets for these GVC clusters continued to expand in recent years, underscoring the continued revenue potential of participating in these value chains.

3.2 Foreign direct investment

The expansion of exports in EU-CEE countries coincided with a surge in inward FDI. Since the early 1990s, FDI, expressed as the total number of workers employed in foreign-owned establishments increased sharply in EU-CEE economies (Fig. 12a), especially compared with the evolution of FDI in Ukraine. Fig. 12b expresses FDI employment as a share of the recipient country's total labor force. Growth was particularly rapid in smaller economies located near Germany and Austria: in Czechia, Hungary, and Slovakia, foreign-owned establishments accounted for roughly 8% of total employment. Poland benefited strongly in absolute employment terms, though less so in relative shares. Finally, starting in the 2010s, Romania—which joined the EU only in 2007—also experienced an influx of FDI that surpassed Ukraine's by the middle of the decade.

Germany—and, relative to its size, Austria—are major sources of FDI in Eastern Europe (Fig. 13). Distance appears to shape this geography of FDI. For instance, Germany is a larger investor in Poland than in Romania, while Austria invests heavily in Czechia, Hungary, and Slovakia but less so in Poland. In Croatia, Austrian investments even surpass German investments not only in relative but also in absolute terms.

The nature of FDI also matters. Broadly, firms invest abroad for two reasons: either to access strategic assets and local factors of production or to serve new local markets. The former is typically referred to as *asset-seeking* FDI; the latter as *market-seeking* FDI (Box 3.2). Fig. 14 decomposes FDI into these two components, as well as some minor other components. In most

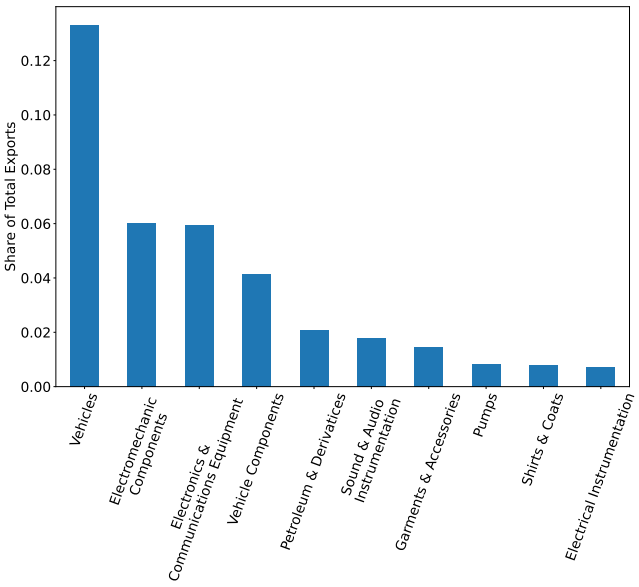


Figure 9: **Largest GVCs in EU-CEE countries.** Bars show the share of total exports identified as GVC-related using the approach described in Box 2.3 and Appendix D. Each bar represents a cluster of closely related products (see Box 3.1), as well as the immediate upstream inputs of these products. Labels refer to the largest product in each cluster.

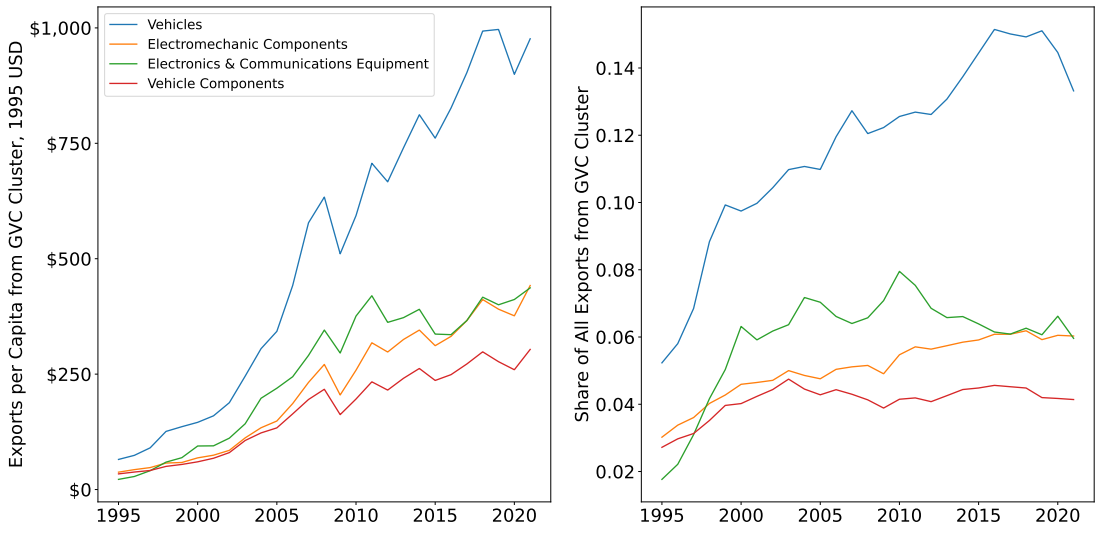


Figure 10: **Growth of main GVCs in EU-CEE countries.** **a.** Size of GVC-related exports from 1995 to 2020 (constant USD). **b.** Share of GVC-related exports in total exports from 1995 to 2020.

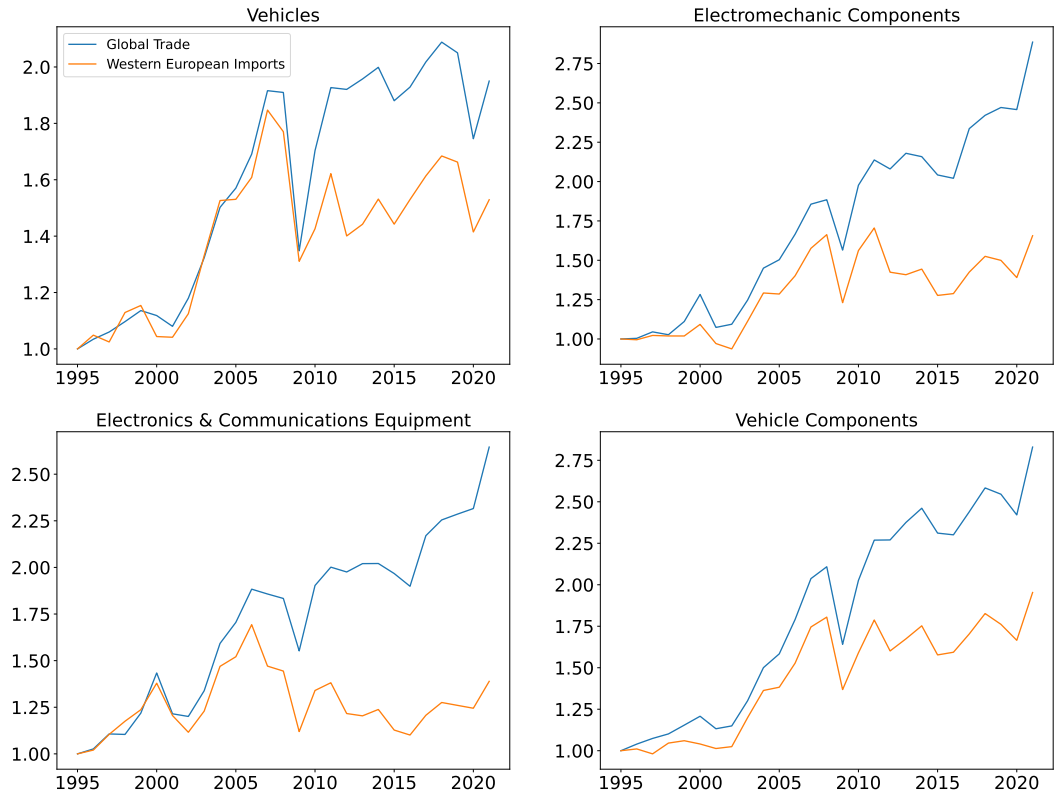
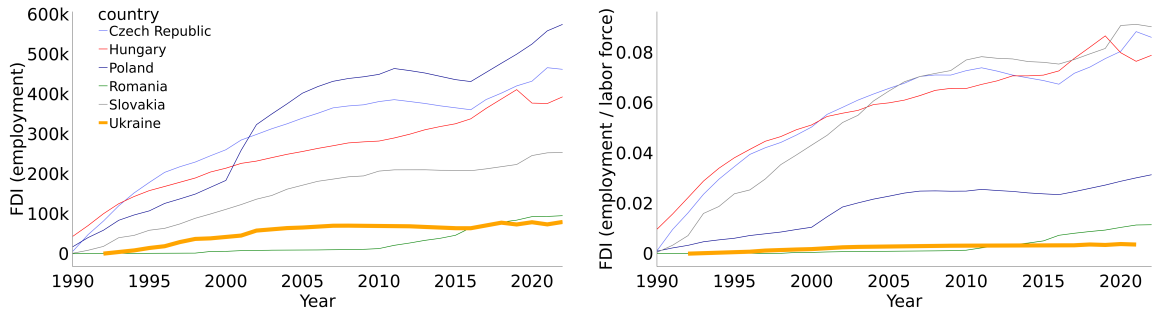


Figure 11: Growth of trade in four largest GVC clusters



(a) FDI (employment)

(b) FDI (employment/labor force)

Figure 12: **FDI in a selection of EU-CEE countries and Ukraine.** **a.** FDI measured as employment in foreign-owned establishments. **b.** FDI expressed as the share of a country's labor force employed in foreign-owned establishments.

Box 2.3: Global Value Chains and Economic Development

Global value chains (GVCs) describe the linked stages through which goods and services are produced — from initial conception to final distribution. These chains increasingly span countries, allowing locations to specialize in particular segments of these value chains rather than producing an entire product domestically. By doing so, GVCs can help countries access advanced capabilities that reside elsewhere in the global economy (Frenken et al., 2023), generate local employment, and create learning opportunities through cross-border collaborations (Gereffi et al., 2005; Pietrobelli and Rabellotti, 2011; Bank, 2019). Improvements in communication and transportation contributed to the expansion of GVCs — leading to a "second unbundling" where the disintegration and distribution of production processes allow countries to bypass traditional industrialization stages in their development (Baldwin, 2013).

Although conceptually appealing, identifying GVCs empirically, and distinguishing GVC-coordinated trade from arm's-length trade, is challenging. We infer salient GVC relationships between products by examining how often they co-occur. We take trade data that covers each country's imports and exports, and look at the strength of association between pairs of imported and exported goods and commodities. That is, we ask: if a country is strongly specialized in exporting a certain good is it also strongly specialized in importing another good? Strong and consistent associations plausibly reflect upstream–downstream relationships (e.g., countries exporting cars often import motor vehicle parts). Appendix D describes the methodology in detail.

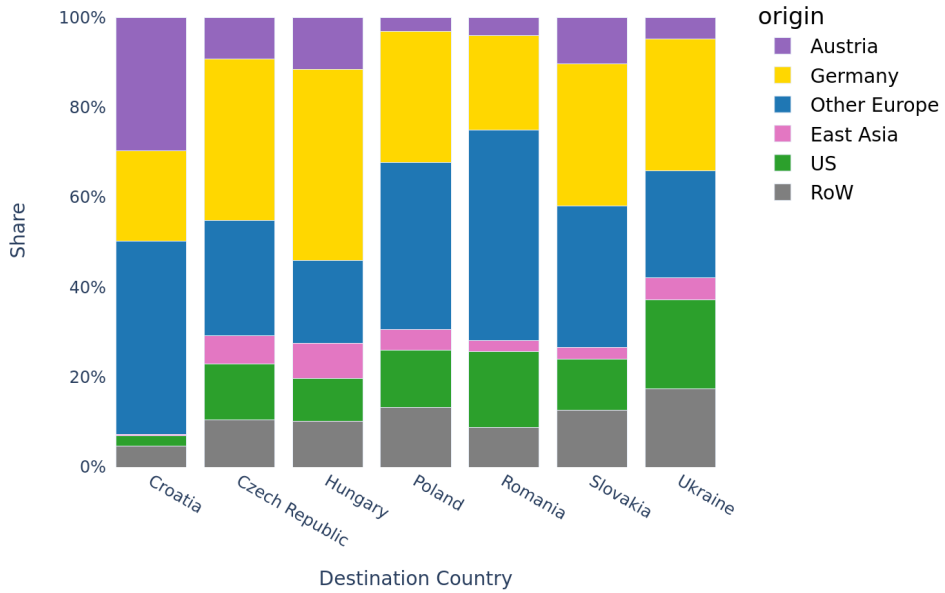


Figure 13: **Composition of FDI in EU-CEE countries and Ukraine.** Share of employment in foreign-owned establishments by origin country of the establishments' headquarters.

EU-CEE countries, asset-seeking FDI accounts for the bulk of the foreign investments, followed by market-seeking FDI.

FDI in Ukraine remains substantially underdeveloped, amounting to about 0.4% of total employment in 2021 according to our data. Fig. 15 shows that Ukraine attracts much less FDI from EU countries than its EU-CEE peers. Even FDI in business services (e.g., software

Box 3.1: Product Relatedness

Hidalgo et al. (2007) introduced the *product space*: a network representation of the economy, in which products are related if they are frequently exported by the same countries. Such co-export patterns are interpreted as reflecting shared underlying capabilities. Relatedness matters for development because countries tend to diversify into products that are close to their existing exports; intuitively, entering related activities is less costly because it leverages similar existing technologies, skills, and knowledge. The predictive validity of product spaces and similar concepts has been corroborated across contexts and spatial scales (see, e.g., Hidalgo et al., 2018; Li and Neffke, 2024).

We use relatedness to group closely related products into *product clusters*. For each cluster, we identify immediate upstream activities using the methodology described in Box 2.3 and Appendix D. When we refer to a "value chain" in this report, we mean a product cluster together with its immediate upstream and downstream neighbors. Because individual products can serve as inputs into multiple downstream activities, the resulting GVC sets may partially overlap.

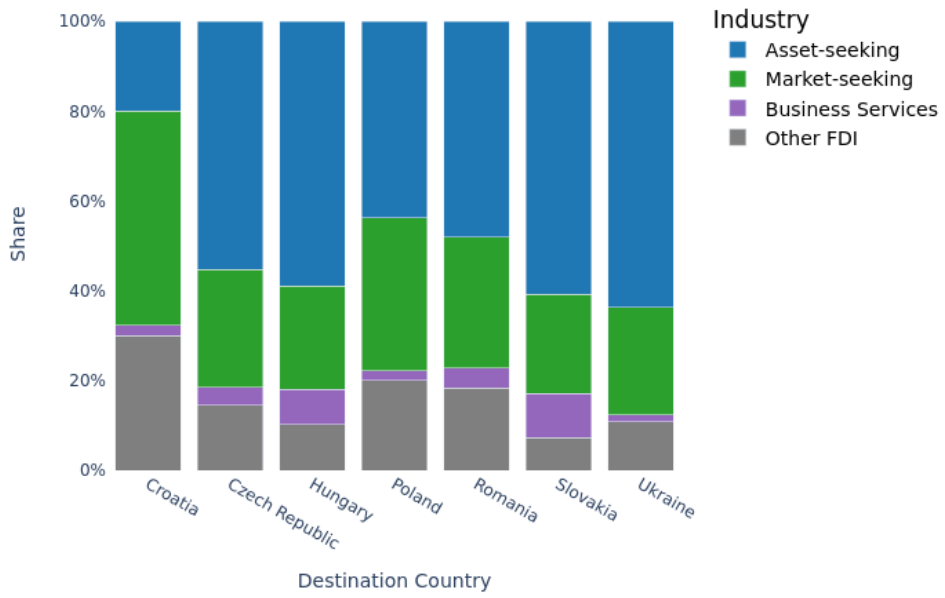


Figure 14: **FDI by type in Eastern Europe and Ukraine.** Bars show the composition of FDI in a selection of EU-CEE countries and Ukraine across asset-seeking FDI, market-seeking FDI, business services FDI, and other FDI (see Box 3.2).

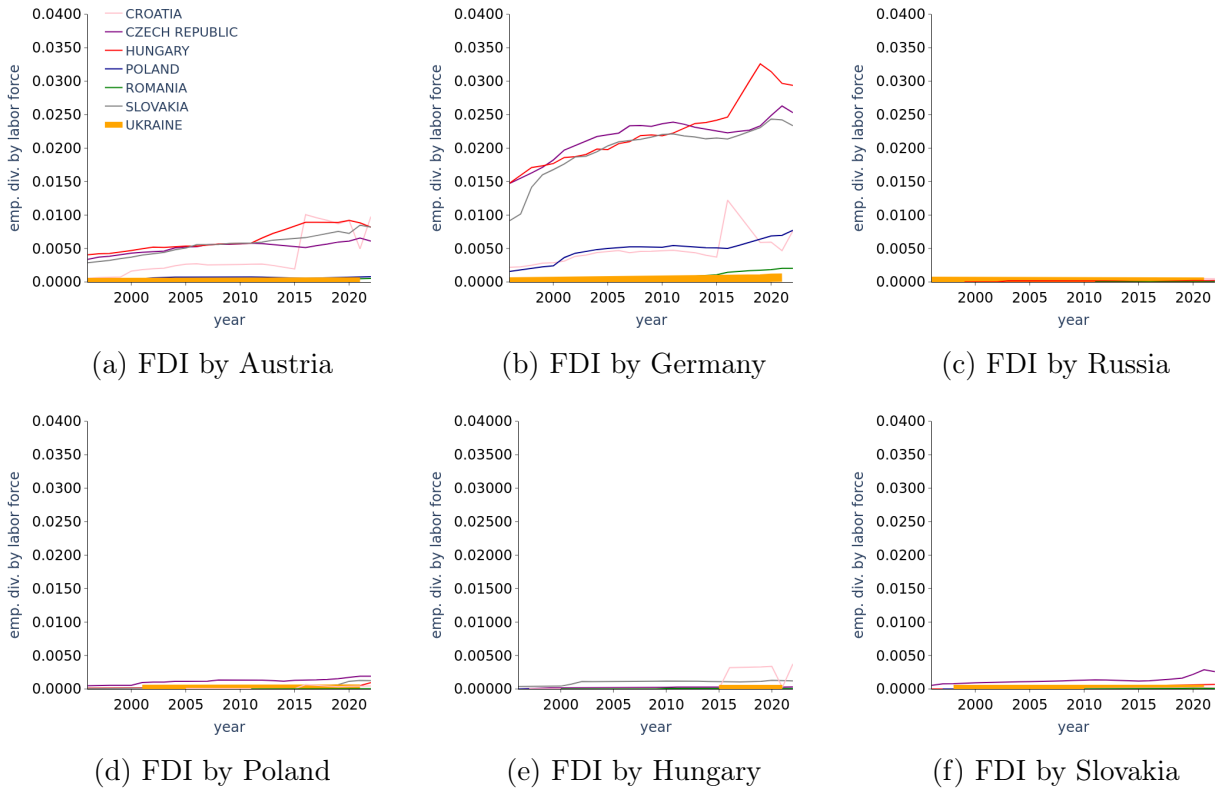
development and R&D; Fig. 14) is surprisingly low, given Ukraine's high education levels and capabilities in software and programming. Because FDI is sensitive to distance, Ukraine's most immediate opportunities for attracting investments may come from neighboring EU-CEE countries. However, as shown in the bottom row of Fig. 15, Poland is the only EU-CEE country that accounts for a notable share of outward FDI in the region. By contrast, Austria and Germany play a much larger role in EU-CEE countries, suggesting that — in spite of being farther away — they will be dominant sources of FDI for Ukraine in the longer run. Russia, meanwhile, plays only a minor role in EU-CEE countries and in Ukraine, even prior to the 2022 invasion.

Box 3.2: Asset-Seeking vs Market-Seeking FDI

Foreign direct investment (FDI) is often divided into *asset-seeking* (resource-seeking) and *market-seeking* investments (Dunning, 1988; Narula and Dunning, 2000; Dunning and Lundan, 2008). Asset-seeking FDI is motivated by strategic assets and factors of production in the destination region (e.g., manufacturing plants that rely on a skilled workforce). Market-seeking FDI is attracted by local demand and proximity to customers, suppliers, and distribution networks; typical activities include retail or wholesale trade and transportation and warehousing.

To classify investments in our dataset, we use the primary industry (NAICS) code assigned to foreign-owned establishments. We define asset-seeking FDI as foreign-owned establishments in manufacturing (2-digit NAICS 31, 32 and 33). Market-seeking FDI comprises establishments in wholesale trade (42), retail trade (44–45), and transportation/warehousing (48–49). We treat advanced business services (54) as a separate category, since such investments are sometimes, but not always, asset-seeking. Good examples include advertising, software services and research and development (R&D)activities.

Of the two categories, asset-seeking FDI is most likely to generate spillovers that help recipient locations connect to global production systems and the collective knowledge embedded therein. Through such asset-seeking FDI, countries can upgrade their capability bases and expose them to foreign know-how. It is therefore particularly relevant for countries aiming to accelerate upgrading and GVC integration.



(a) FDI by Austria (b) FDI by Germany (c) FDI by Russia

(d) FDI by Poland (e) FDI by Hungary (f) FDI by Slovakia

Figure 15: **FDI in selected markets by origin.** **a.** FDI from Austria. **b.** FDI from Germany. **c.** FDI from Russia. **d.** FDI from Poland. **e.** FDI from Hungary. **f.** FDI from Slovakia.

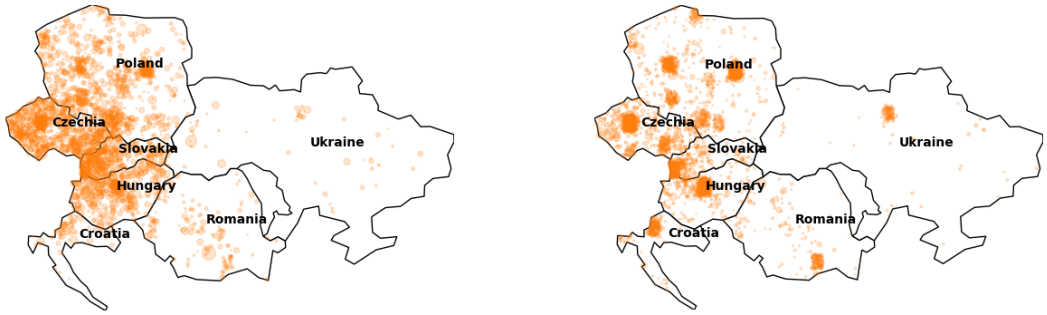
4 Ukraine's future GVC participation

4.1 Obstacles and opportunities

The experience of EU-CEE countries in integrating into Western European GVCs and attracting FDI are, *prima facie*, encouraging for Ukraine. Eastern Europe experienced a growth transformation after the fall of the USSR, and GVC ties to Western Europe evidently played a critical role. This experience suggests that Ukraine may have opportunities to connect to different GVC clusters, some of which are substantial in size.

Despite the promising growth of Eastern European GVC trade with Western Europe, a few important factors must be taken into account when assessing which GVC opportunities are most relevant for Ukraine:

The role of distance. Ukraine is geographically farther from the core of Western Europe[3] than most EU-CEE countries. Fig. 16 shows that distance can have substantial consequences for FDI: while market-seeking FDI spread to many of the larger cities in Central and Eastern Europe, manufacturing (asset-seeking) FDI remains concentrated in the western-most countries and, within these countries, the western-most regions. We estimate how sensitive trade is to distance in each product more formally using so-called *gravity models* (see Box 4.1).



(a) Manufacturing FDI (b) Market-seeking FDI

Figure 16: **Western European FDI.** Location of manufacturing and market-seeking FDI by Western European MNEs in Eastern Europe for 2022. The maps show a strong distance decay for manufacturing FDI and a concentration in large and capital cities for market-seeking FDI.

The role of EU accession. EU-CEE countries benefited substantially from the EU accession process. Fig. 17 illustrates this for FDI: both Poland and Romania began attracting more FDI as they progressed toward EU membership (Box 4.2). For Poland, these benefits seem to have materialized already during candidacy; for Romania, the surge in investments is most visible after full membership had been attained. To quantify how strongly trade in a product responds to EU candidacy and membership, we augment gravity models with EU status variables that capture EU candidacy and EU membership information. The more EU candidacy and membership boost exports, the greater the short-run disadvantage for Ukraine (which is early in the process). At the same time, a large boost from EU membership also serves as an indicator of longer-term trade opportunities once accession progresses.

[3]Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

Box 4.1: Gravity Models

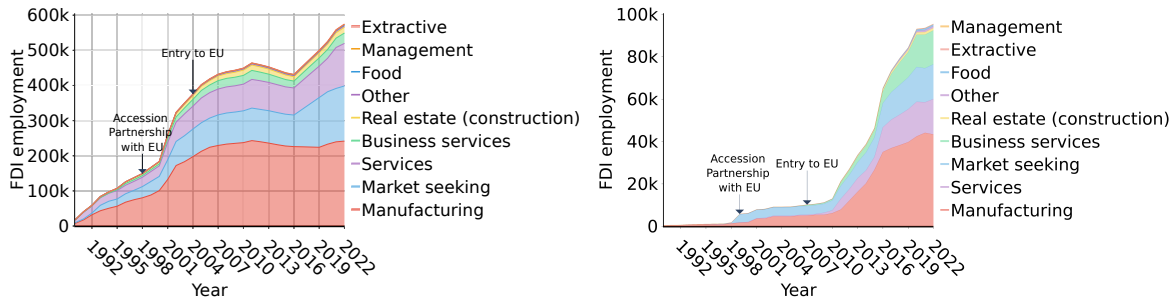
Gravity models are widely used in economics to predict and explain flows between entities — most prominently international trade — following Tinbergen (1962). The idea behind them is analogous to Newton's law of gravity where the gravitational pull between two objects is directly proportional to the product of their masses and inversely proportional to the square the distance between them. In trade applications, masses are typically proxied by the economic sizes (such as GDP) of the countries, and distance by geographic distance between them (though other forms of distance, such as linguistic or institutional distances, can also matter).
A basic gravity equation for trade flow T_{ij} between countries i and j is

$$T_{ij} = G \cdot \frac{M_i^{\alpha} \cdot M_j^{\beta}}{D_{ij}^{\gamma}},$$

where M_i and M_j are the economic sizes of countries i and j, D_{ij} is distance between them, G is a constant, and α, β, and γ are parameters to be estimated.
Empirically, gravity models are often estimated in a log-log form using ordinary least squares (OLS), with parameters being interpreted as elasticities:

$$\ln(T_{ij}) = \ln(G) + \alpha \ln(M_i) + \beta \ln(M_j) - \gamma \ln(D_{ij}) + \epsilon_{ij},$$

where ϵ_{ij} is an error term capturing unobserved factors affecting trade between i and j. In this report we estimate gravity models at the country level for trade and at the regional (city) level for FDI. We use a Pseudo-Poisson Maximum Likelihood (PPML) estimator (Silva and Tenreyro, 2006) to deal with non-existent flows of which there are many.



(a) 2004 EU Entry: Poland

(b) 2007 EU Entry: Romania

Figure 17: Inward FDI by industry in EU entry waves.

The role of FDI in creating GVC export relationships. FDI is a potentially actionable lever for integration into Western value chains, but its effectiveness likely differs across products and industries. We therefore analyze, for each product, how strongly bilateral trade and FDI between a pair of countries co-vary after controlling for distance. A higher correlation suggests that FDI and trade tend to move together, suggesting that FDI can plausibly facilitate the formation of GVC ties. To quantify the potential of FDI as a facilitator of GVC trade, we estimate how much additional exports Ukraine could expect if it attracted FDI volumes consistent with its size and distance from Western Europe. To do so, we first calculate the expected FDI between Western European countries and Ukraine, using augmented gravity models (see Appendix E). We then calculate how much trade would typically be associated with a given

Box 4.2: The EU membership process and benefits

Ukraine's ability to integrate into EU value chains will depend in part on the timing and depth of EU accession. EU membership provides access to the EU's single market and increases predictability for investors looking to invest in Ukraine. However, some of these benefits will materialize already during the accession pathway. Accession requires institutional and economic reforms aligning a candidate's legal framework with EU requirements (e.g., the Copenhagen Criteria). The process can span years and culminates in EU membership once an accession treaty is ratified by all existing EU members and the candidate itself.

To determine the effects of EU candidacy and EU membership, we study past EU-CEE accession waves: 1995 (Austria, Finland, Sweden), 2004 (Czech Republic, Hungary, Poland, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Cyprus, Malta), 2007 (Bulgaria, Romania), and 2013 (Croatia). Membership dates are clear, but the onset of meaningful negotiations and movement along the accession trajectory are less well defined. We draw on Böhmelt and Freyburg (2013, 2018); Petrović (2013); Kollias and Messis (2022) to define candidacy periods. We then extend gravity models (Box 4.1) with EU candidacy and EU membership variables to assess how EU status relates to trade and FDI.

level of FDI. Finally, we combine these measures to estimate how much trade from FDI Ukraine could expect based on these calculations and express this as both the 1995 USD and the percent gain Ukraine would obtain from each FDI opportunity.

Changing global markets. EU-CEE integration into Western European value chains occurred under past global market conditions. To assess whether opportunities remain, we analyze product-specific trends in global and European market growth.

Fit with Ukraine's industrial ecosystem. Countries differ in their capability bases, which conditions which opportunities are easier to enter. To measure how well a product fits Ukraine's current strengths, we compute its *density* (Box 4.3) in the Ukrainian economy, a standard metric in economic complexity analysis that captures how related the product is to Ukraine's existing export basket.

4.2 Feasible and attractive opportunities

With these considerations in mind, we construct measures of each GVC product's feasibility and attractiveness for Ukraine.

We illustrate the framework using example products that represent promising opportunities for Ukraine. For each product, we score performance across the feasibility and attractiveness metrics described above. We express scores in standard deviation units over the mean (z-scores) relative to the distribution across products.

Next, we focus on large supply chains that are consistently attractive and viable. We therefore consider products from the four largest GVC clusters in 2021. From each cluster, we select up to three top-performing products based on their median score across metrics, filtering for consistently strong performance. The resulting products are listed in Table 1. Appendix F provides extended tables covering a wider set of products.

Box 4.3: Density

Density measures how strongly a country's current export basket is related to a new product. Higher density indicates that entry is more likely and typically less costly.
To compute density, we begin with a binary indicator for whether a country is competitive in exporting a product, following Hidalgo et al. (2007). We then measure how related each product is to other products based on co-export patterns, using *proximity*:

$$Proximity_{ij} = \min\{Pr(Presence_i|Presence_j),\, Pr(Presence_j|Presence_i)\}.$$

Density for country c and product j is then defined as the proximity-weighted share of related products that are already present in the country:

$$Density_{cj} = \frac{\sum_{i=1}^{35} Proximity_{ij} \cdot Presence_{ci}}{\sum_{i=1}^{35} Proximity_{ij}}.$$

We focus on the 35 most proximate products to capture the most relevant neighborhood in the product space.

Product	GVC Cluster	(a) distance	(b) EU accession	(c) EU membership	(d) FDI corr	(e) Export Gains (USD)	(f) Export Gains (ratio)	(g) Fit
HS 8703, Cars	Vehicles	87%	158%	132%	64%	$6.6 billion	4118	0.09
HS 8704, Motor vehicles for transporting goods	Vehicles	78%	594%	172%	22%	$235 million	693	0.27
HS 8708, Parts of motor vehicles	Vehicles	82%	110%	111%	96%	$453 million	66	0.13
HS 8544, Insulated electrical wire	Vehicle Components	77%	96%	28%	35%	$1.1 billion	2.8	0.51
HS 8537, Electrical boards	Electromechanic Components	84%	-8%	0%	52%	$734 million	49	0.08
HS 8504, Electrical transformers	Electromechanic Components	83%	-9%	1%	45%	$346 million	22	0.27
HS 8538, Parts for electrical apparatus	Electromechanic Components	80%	11%	6%	52%	$160 million	49	0.13
HS 8541, Semiconductor devices	Electronics & Comms. Equipment	90%	75%	127%	100%	$2.0 billion	1394	0.04
HS 8471, Computers	Electronics & Comms. Equipment	85%	-24%	98%	68%	$2.8 billion	852	0.04
HS 8532, Electrical capacitors	Electronics & Comms. Equipment	83%	226%	63%	100%	$85 million	1393	0.08

Table 1: **Selection of top GVC opportunities for Ukraine** Columns: (a) product-specific sensitivity of exports to distance. (b) expected increase in export volume associated with entering the EU accession process. (c) expected increase in export volume associated with full EU membership. (d) extent to which trade is FDI-driven: correlation between FDI and trade volumes. (e) expected export gain in USD if Ukraine were to attract FDI volumes predicted by its size and distance to the EU. (f) expected export gain as a ratio over current exports under the same scenario. (g) fit with Ukraine's industrial capabilities as expressed in its current export mix.

These opportunities fall within four GVC clusters but can be grouped into two broad categories: vehicle-related activities and electronics-related activities. While some vehicle opportunities are extremely large (e.g., $6.6 billion for cars), several electronics opportunities are also sizable (e.g., $1.1 billion in insulated electrical wire and $2.0 billion in semiconductors). EU accession boosts are often somewhat larger in vehicle-related products but remain substantial in electronics (e.g., 226% for capacitors). The concentration of opportunities is consistent with the fact that vehicles represent the largest EU-CEE GVC cluster, but the results also suggest that Ukraine may want to pursue opportunities in both categories to diversify strategic bets. We provide more extensive tables, covering opportunities in the ten largest GVC clusters, in Appendix F.

Within these candidates, some appear more compatible with Ukraine's current industrial ecosystem than others. For example, *motor vehicles for transporting goods* and *insulated electrical wire* fit relatively well with existing capabilities. By contrast, several products in the *electronics & communications equipment* GVC are somewhat less related to Ukraine's current export basket and may therefore require more time and targeted effort to develop.

4.3 Scoring priorities in the Ukraine Plan

We also evaluate priorities identified by the Ukrainian government in the *Ukraine Plan* (Facility, 2024). This strategic document highlights export sectors to target for future growth. These priorities address several goals, including import substitution to reduce exposure to Russia; near-term export growth related to Ukraine's existing expertise; and expansion into wholly new fields for long-term growth. We apply the above methodology to score and rank opportunities aligned with these priorities in Appendix C.

4.4 Linking to Eastern Europe

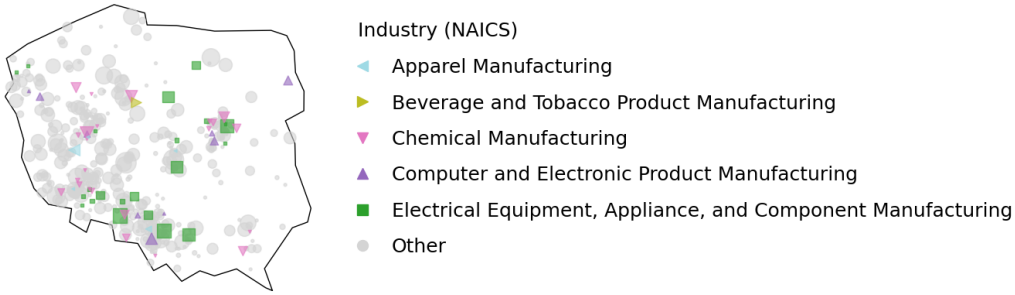
To mitigate the distance barrier, Ukraine could seek stronger integration with its immediate EU-CEE neighbors. However, as shown above, EU-CEE countries currently play a much smaller role in Eastern Europe as sources of outward FDI than Germany and Austria.

Nevertheless, Ukraine's close proximity to EU-CEE countries may still generate meaningful opportunities for integrating in the wider European economy. Moreover, Ukraine's own economic scale could gradually shift the center of gravity of European manufacturing eastward. Such shifts would have implications not only for Ukraine but also for the broader region.

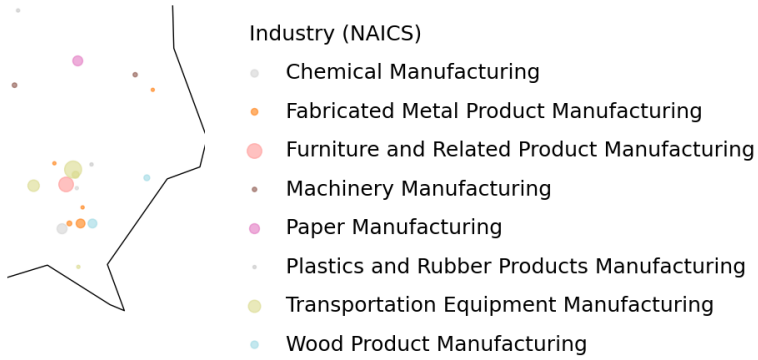
With this in mind, Fig. 18 decomposes German asset-seeking FDI in Poland by industry. Along Poland's border with Ukraine, there are significant concentrations of FDI in heavy manufacturing, particularly related to *motor vehicles*, as well as *aircraft manufacturing* and *household furniture manufacturing*. Much of this activity spans the corridor from Przemyśl to Rzeszów, including what is known in Poland as "Aviation Valley" (Suwala and Micek, 2018) and the Rzeszów University of Technology. Over time, parts of this advanced activity could spill over into western Ukraine to take advantage of Ukraine's skill base and cost structure. Such spillovers would represent an important opportunity for developing GVC ties not explored further in this report.

5 Opportunities by region

Ukraine's capabilities vary across regions. In this section we assess which regions are best positioned for different economic opportunities. Specifically, we ask: given that EU-CEE countries expanded trade and attracted FDI in certain industries and products (e.g., vehicles, semicon-



(a) All of Poland



(b) Eastern Poland

Figure 18: German FDI in Poland by industry (2019)

ductors, and related electrical equipment), where could Ukraine best tap into and contribute to these value chains with existing industrial capabilities?

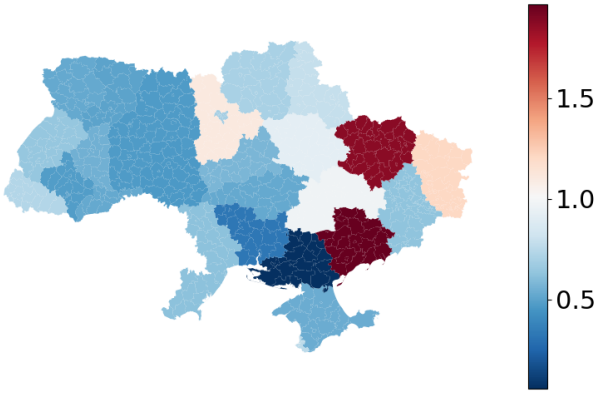
To analyze this, we quantify how closely each Ukrainian region's existing portfolio of industries matches the industries that have attracted substantial FDI and trade in EU-CEE countries. Following Li and Neffke (2024), we compute industry relatedness based on the extent to which industries co-occur within firms in the D&B data. We then measure, for each region, how many related industries it is specialized in. This is conceptually analogous to the density measure used above for trade.

In the east, Ukraine is particularly well suited for higher-tech industries, including semiconductor-related activity and electrical equipment manufacturing. Fig. 19 maps the regional fit ("density") of these industries across regions. Kharkiv and Zaporizhzhia stand out as especially suitable locations. However, proximity to the frontline and active hostilities can constrain investment in these regions.

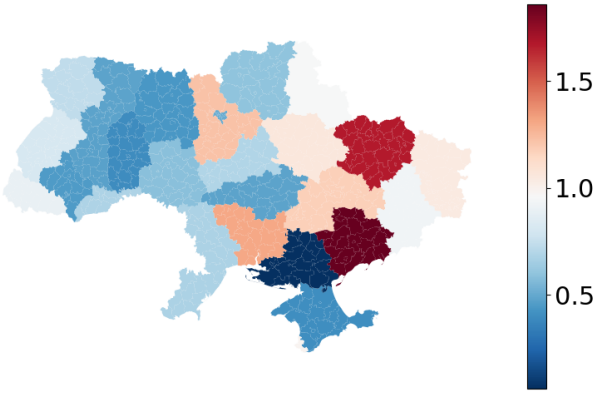
What makes Zaporizhzhia particularly suitable for these industries? Fig. 20 shows the related industries to electrical equipment in which the region is specialized. A major advantage is the local presence of aerospace production and parts manufacturing. The region also specializes in material-handling equipment and related fabricated metal products—activities that share capabilities with electronics-related value chains.

Similarly, in terms of trade opportunities, eastern Ukraine is well positioned for vehicle-related value chains, particularly car parts. Fig. 21 shows which regions have the strongest fit with this capability base, with Kharkiv standing out. The region already hosts related heavy manufacturing activities such as diesel engine production and engine repair, as well as vehicle production.

However, these opportunities are far from Western European vehicle-producing hubs, which may be problematic given the distance sensitivity of many manufacturing investments. Notably, some western regions also show potential for developing these value chains (Fig. 22a). This is especially true for Ternopil and Zakarpattia, which have high densities for industries related to



(a) FDI density: semiconductor manufacturing



(b) FDI density: electrical equipment manufacturing

Figure 19: FDI density in eastern Ukraine: semiconductor and electrical equipment manufacturing

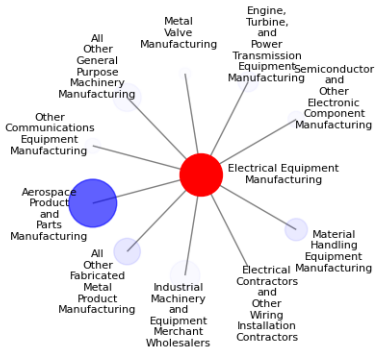
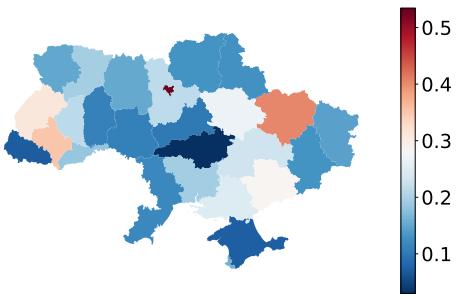
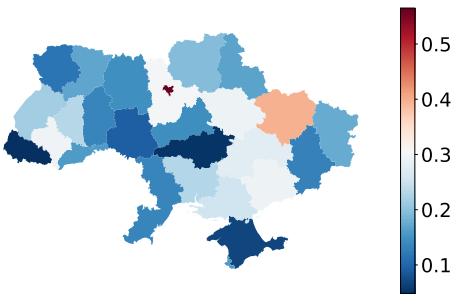


Figure 20: Related industries to electrical equipment in which Zaporizhzhia is specialized



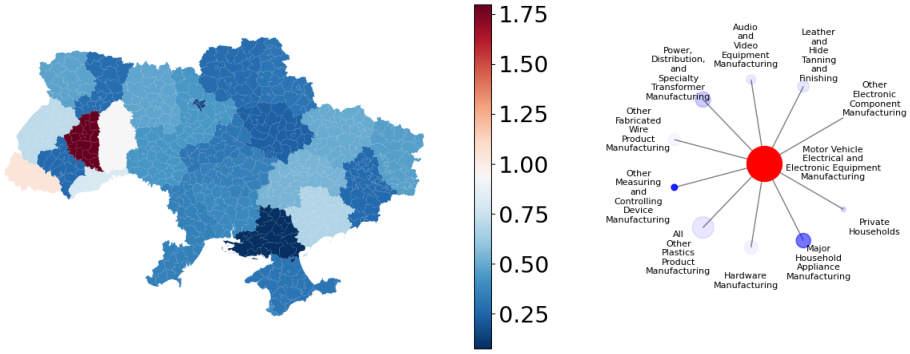
(a) Trade density: cars



(b) Trade density: car parts

Figure 21: Trade density in eastern Ukraine: car parts and cars

motor vehicle electrical and electronic equipment manufacturing. Ternopil already hosts related activities such as manufacturing measuring and controlling devices and household appliances (Fig. 22b), and it is home to the Ternopil Ivan Puluj National Technical University.

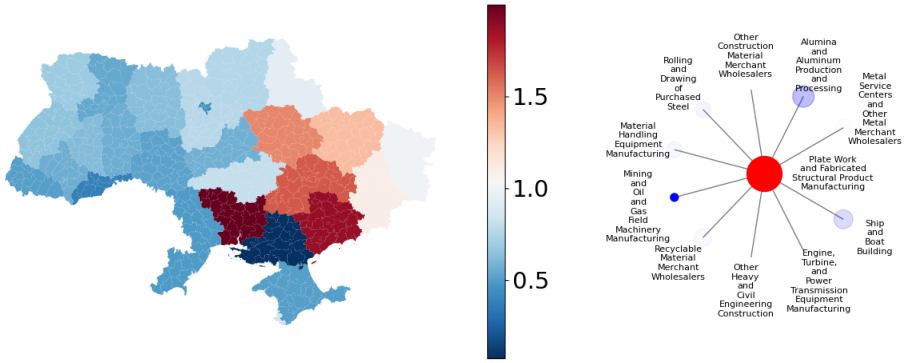


(a) Density: motor vehicle electrical equipment manufacturing

(b) Related industries in which Ternopil is specialized

Figure 22: Ukrainian regional suitability for motor vehicle electrical equipment manufacturing

Southern Ukraine is better suited for heavy manufacturing than for electronics. Industries there are more oriented toward natural resource extraction and the manufacturing of related products. This makes them more suitable for attracting FDI in plate work and fabricated structural product manufacturing (Fig. 23a). Fig. 23b shows that Mykolaiv is specialized in related activities including aluminum products and equipment used in resource extraction.



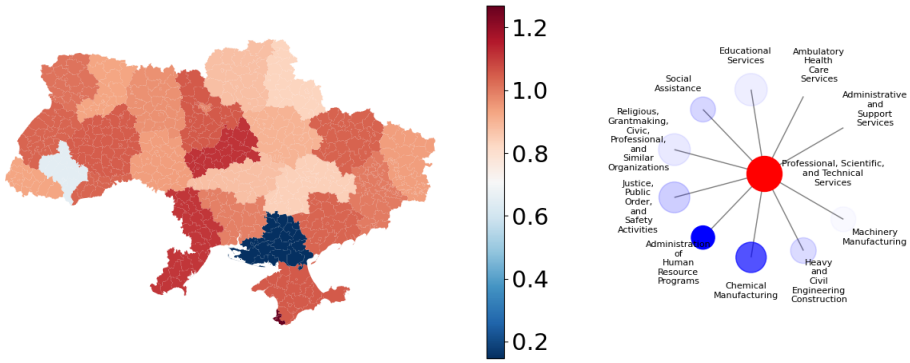
(a) Density map for plate work and fabricated structural product manufacturing

(b) Related industries in which Mykolaiv is specialized

Figure 23: Ukrainian regional suitability for plate work and fabricated structural product manufacturing

Finally, western and central Ukraine—especially Kyiv and surrounding regions—is highly suitable for professional, scientific, and technical services (Fig. 24a). Related activities include administrative services, educational services, and civic and professional organizations. In some locations, the co-presence of more sophisticated manufacturing (e.g., chemical manufacturing in Cherkasy; Fig. 24b) may further support higher-end services such as applied science and R&D.

A notable exception is Zaporizhzhia, which—in addition to Kyiv—is a particularly good fit for custom computer programming and IT services (Fig. 25a). This may reflect the presence of higher-tech manufacturing activities in the region, particularly aircraft-related industries, as

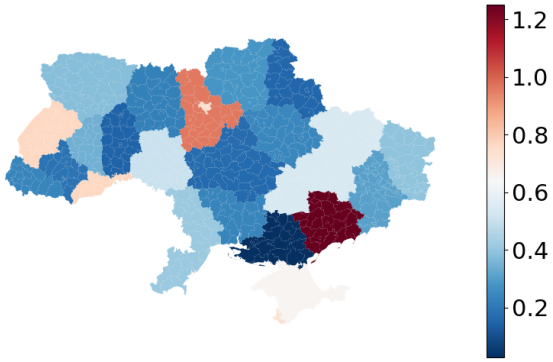


(a) FDI density: professional, scientific and technical services

(b) Related industries in which Cherkasy is specialized

Figure 24: Ukrainian regional suitability for professional, scientific and technical services

well as local higher education capacity (e.g., the Engineering Institute of Zaporizhzhia National University).



(a) FDI density: computer programming services

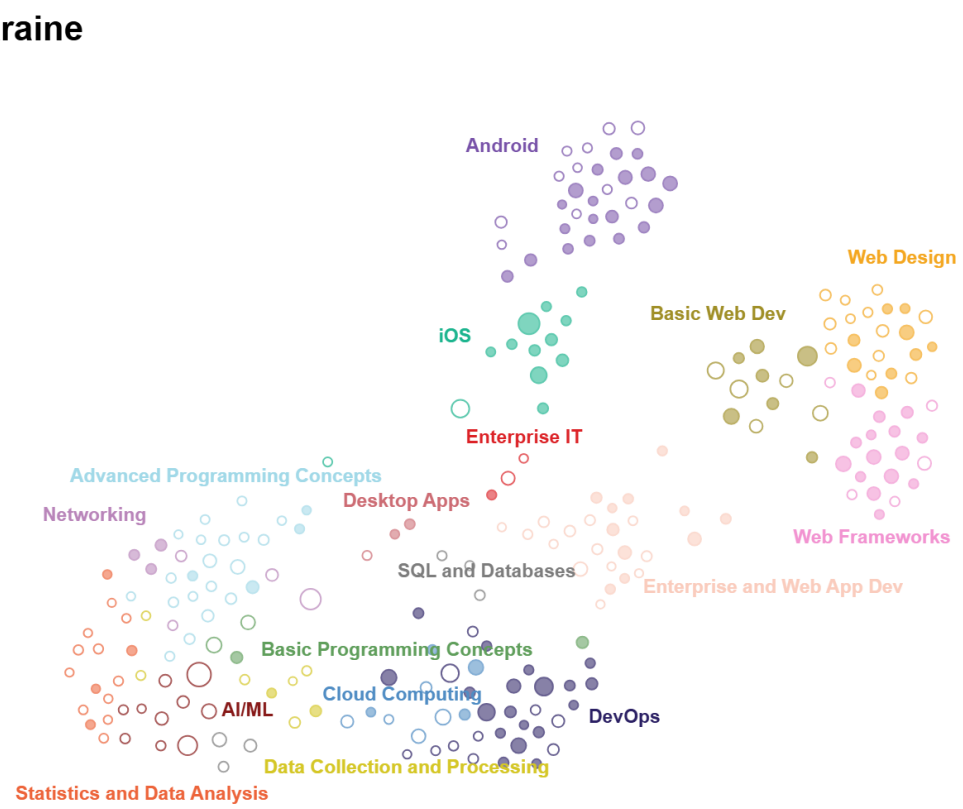
6 Ukraine's capabilities in software development

In this chapter we examine Ukraine's strengths in software development. We rely on data from Stack Overflow, the largest question-and-answer repository for software development. Feng et al. (2025) show how these data can be used to assess fine-grained specializations of programmers in specific areas of software across countries and cities.

6.1 Methodology: defining software tasks

Stack Overflow (SO) provides yearly data dumps describing user activity on the platform. Users contribute by posting questions and by answering questions posted by others. Following Feng et al. (2025), we treat answer posts as signals that a user has expertise in the domain of the corresponding question. Questions are labeled using a curated system of tags, which we use as structured descriptors of a question's content. Aggregating answer posts using the tags of the corresponding questions, Feng et al. (2025) construct a taxonomy of 237 detailed software development tasks (e.g., "Set up and secure a remote Linux server environment," "Develop an interactive data visualization dashboard," or "Develop a 3D mobile game using rendering and physics libraries").

As described in Box 3.1, it is possible to represent economic activities in abstract spaces such as product or industry spaces. Similarly, software tasks can be mapped into an abstract *task space* based on co-occurrence patterns in user activity. Fig. 26a shows Ukraine's position in this software task space.



(a) Ukraine's position in the software task space

We use the software task space to analyze Ukraine's strengths and weaknesses in software development in a manner analogous to our trade and FDI analyses. Many Stack Overflow users list their location, often at the city level. We focus on users active on SO between 2020 and 2024 and select all users who, at any point since the start of the dataset in 2008, listed a Ukrainian place as their location on their SO profile. This yields two groups of software developers linked to Ukraine.

The first group consists of users whose last known location is in Ukraine, totaling 12k SO users with usable task information. We use this group to describe the software development expertise of the four most active cities in Ukraine: Kyiv, Lviv, Kharkiv, and Odesa. Note that because SO's user base declined after the introduction of coding assistants based on large language models, this information primarily reflects activity in the early 2020s. Moreover, we cannot verify whether users remain in the locations listed on their SO profiles.

The second group consists of users whose last known location is outside Ukraine. This group is smaller (1k users). Nearly half reside in Western Europe and close to another third in North America. We refer to this group as *migrants*.

6.2 Ukraine's position in software task space

Fig. 26a also highlights which activities are overrepresented in Ukraine relative to the global software development sector as a whole. To do so, we compute the revealed comparative

advantage (RCA) of each task and highlight tasks with $RCA > 1$.

Ukraine exhibits clear strengths in web-related activities and in building and operating websites. Ukrainian developers are also overrepresented in advanced app development in both the iOS and Android ecosystems, including gaming-related tasks. Finally, Ukraine's programmers show a pronounced specialization in DevOps — system reliability engineering roles that integrate software development and IT operations to continuously develop, maintain, test, and improve software.

We can further use the software task space to conduct a strengths–weaknesses–opportunities–threats (SWOT) analysis. We plot each software development task along two axes. The horizontal axis shows Ukraine's RCA in the task, reflecting how overrepresented the activity is relative to the global software sector. The vertical axis shows how well the activity fits Ukraine's current set of software specializations. It is defined as the ratio of the *density* (Box 4.2) around the task in Ukraine to the density around the task in the world as a whole. Positive values indicate that Ukraine is well positioned to expand into the task; negative values indicate poor fit with existing capabilities.

The four quadrants of the SWOT analysis are shown in Fig. 27 at two levels of aggregation. The upper-right quadrant contains tasks where Ukraine is both strong and well positioned (strengths). The lower-left quadrant contains tasks where Ukraine is underrepresented and poorly positioned (weaknesses). The upper-left and lower-right quadrants capture anomalies. In the upper left, we find tasks that would fit Ukraine's software capabilities well, but that are currently comparatively underdeveloped. In the lower right, we find activities that are very large, but don't seem to fit the other software activities that Ukraine specializes in. These anomalies are interesting because they can reflect either opportunities and threats for future development in the software sector, or hidden capabilities that have so far remained underutilized ("threats") and hidden obstacles that constrain the sector's development ("opportunities").

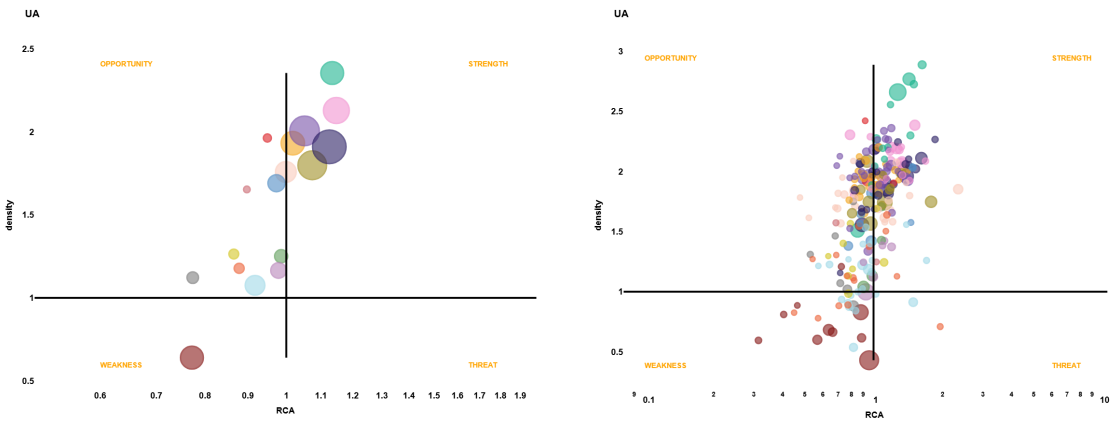


Figure 27: SWOT analysis of Ukraine's software sector. Left panel shows software tasks aggregated to the level of clusters. Right panel shows detailed software tasks.

The SWOT results reinforce the patterns observed in the software task-space map. Ukraine's strongest capabilities are concentrated in web activities, advanced app development, gaming-related tasks, and DevOps. These activities are not only large but also well connected to Ukraine's broader capability set. By contrast, AI and data science related activities are underdeveloped in Ukraine and also appear to fit less well with the current capability base. We observe relatively few clear "threat" tasks. Instead, Ukraine displays multiple opportunities for diversification in software development. These include cloud computing and enterprise software. The detailed panel of Fig. 27 suggests that these opportunities span many tasks, ranging from identity management solutions to scalable cloud-native applications and implementing game physics.

6.3 Software development profiles by city

Most software developers active on SO are located in Kyiv, which hosts 13.2k SO users according to our data. Other notable cities include Lviv (3.3k), Kharkiv (3.3k), Odesa (1.6k), Dnipro (1.2k), Vinnytsia (0.4k), and Zaporizhzhia (0.4k). Fig. 28 shows the task-space positions of the four cities with the largest software sectors.

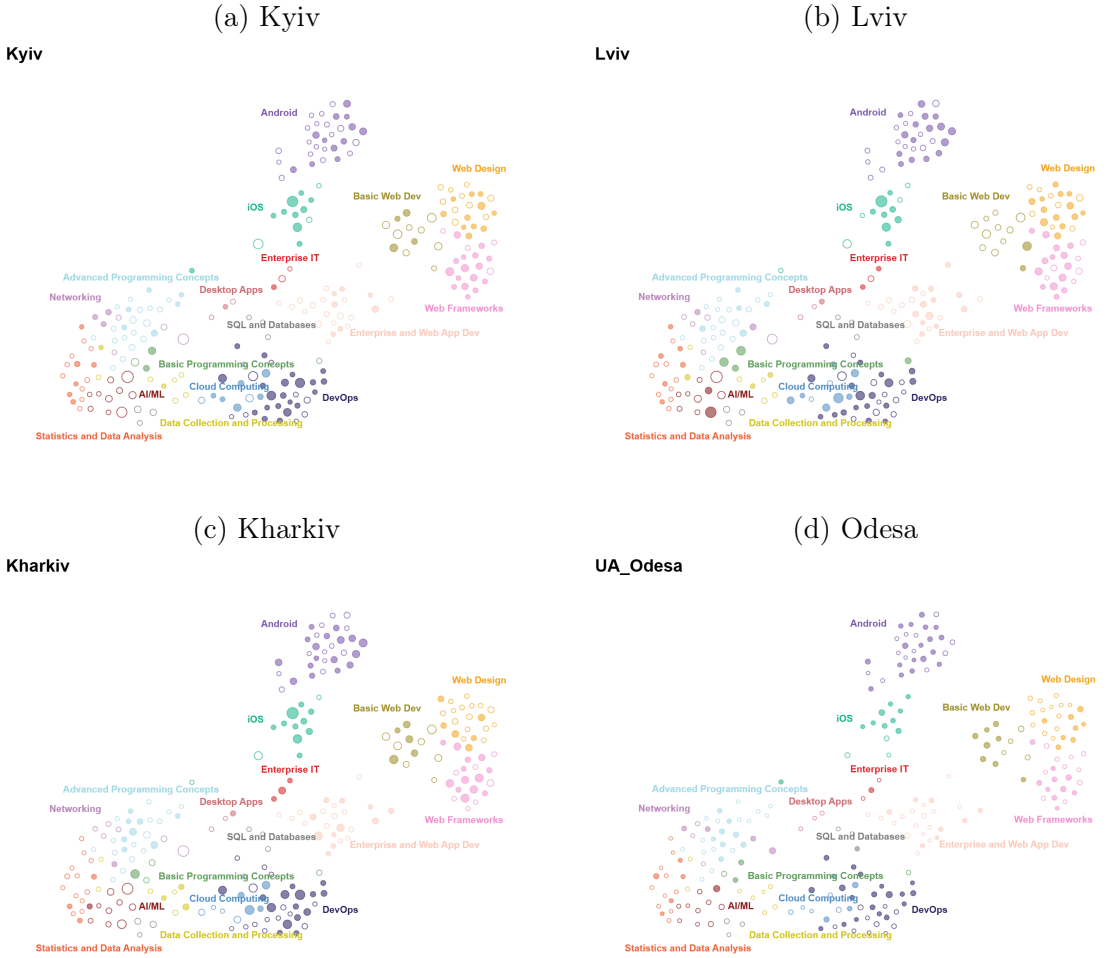


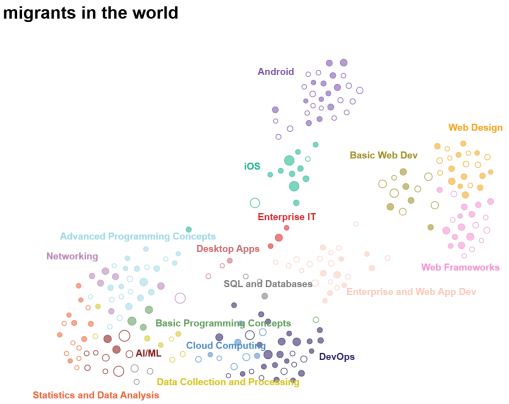
Figure 28: Software development in Ukrainian cities. Each panel shows the position of one of the four most prominent Ukrainian software cities in the software task space. Markers highlight software activities that are overrepresented relative to the global software development sector.

Software specialization patterns are broadly similar across these cities, though there are differences in the precise mix of tasks. Overall, this suggests that Ukraine's software sector may be relatively integrated nationally rather than segmented into sharply differentiated local niches, possibly reflecting collaboration across locations. This also implies that Ukraine's software capabilities can be leveraged from multiple cities — especially Kyiv, Kharkiv, and Odesa, as well as Lviv in the west. Moreover, DevOps strengths and diversification opportunities such as cloud computing can support upgrading in a wide range of global value chains, reinforcing software development as a strategic asset in Ukraine's efforts to forge new value chains links to Western Europe.

6.4 Software development profile of Ukraine's diaspora

Finally, we analyze the profile of Ukrainian programmers abroad — SO users whose last known location is outside Ukraine but who at some point reported a Ukrainian location in their user history. Fig. 29 overlays the diaspora's task specializations on the software task space. Panel **a** shows the diaspora as a whole; panel **b** focuses on developers residing in Germany or Austria.

(a) All diaspora



(b) Diaspora in DE and AT

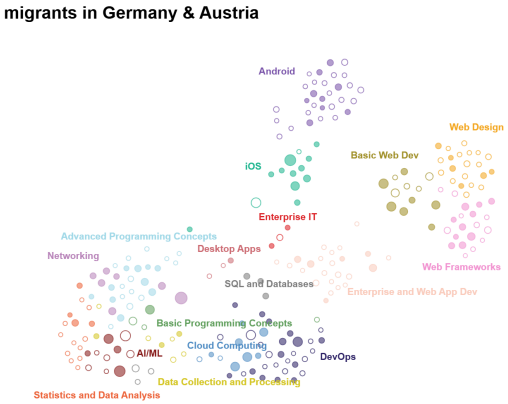


Figure 29: Software development by the Ukrainian diaspora. The panels show software capabilities of Ukrainian programmers living outside Ukraine. The left panel aggregates the diaspora globally; the right panel focuses on the diaspora in Germany and Austria. Markers highlight overrepresented activities relative to the global software development sector.

Ukrainian software developers abroad tend to be active in similar domains as those residing in Ukraine, but their specialization patterns are somewhat more skewed toward AI/ML-related tasks and cloud computing—especially among those residing in Germany and Austria. This suggests that connecting to the diaspora could help Ukraine branch into such high-value software tasks.

6.5 Conclusion

Ukraine has a sizeable population of software developers with clear strengths in web technologies, advanced app development, gaming, and DevOps. The sector is centered in Kyiv but is also substantial in Lviv, Kharkiv, and Odesa. Cities share broadly similar specialization patterns, suggesting a national rather than local structure of capabilities. As software increasingly drives value added in products and services, these strengths can complement Ukraine's efforts to enter new global value chains. Ukraine's diaspora of software developers exhibits comparable profiles, with relatively greater activity in AI/ML and cloud computing. Leveraging these diaspora capabilities may provide an additional route for upgrading and for connecting to Western European markets.

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Appendix

A Trade data

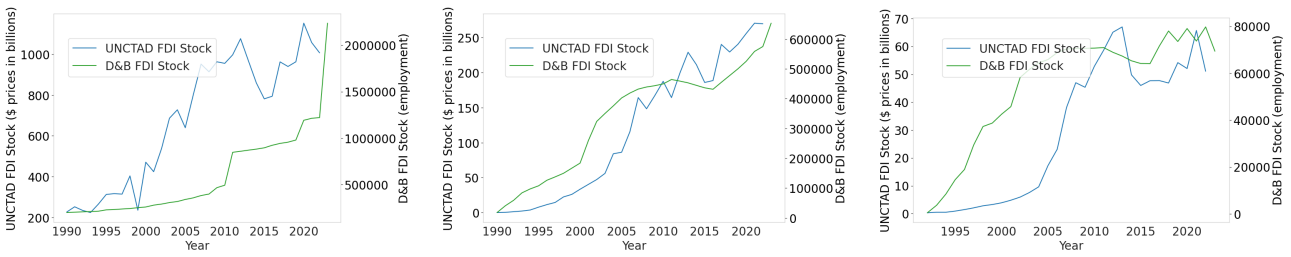
Trade data are taken from the Harvard Atlas of Economic Complexity. The data use the HS 1992 classification at the 4-digit level and cover the years 1995–2021. For analyses that involve economic complexity metrics such as the Product Complexity Index (PCI) or density, we focus on the 133 countries flagged by the Harvard Atlas as having reliable trade data.

B FDI

B.1 Data

To measure FDI, we use Dun and Bradstreet (D&B) data for the years 2011, 2016, 2019, 2020, 2021, and 2022. In 2022 these data cover about 400 million unique establishments. Establishments can be tracked over time using unique identifiers (DUNS IDs). For each establishment, the data provide (estimated) employment, physical location, industry, and DUNS IDs for local and global headquarters. From 2020 onward, the data also include founding year information for about 45% of establishments. We use founding years to reconstruct historical FDI employment and to track how FDI evolved in Eastern Europe and Ukraine since the early 1990s.

To infer historical FDI stocks between 1990 and 2011, we assume that an establishment's employment remained constant between its founding year and the first year it appears in our data. This is a simplification, but it provides a tractable way to approximate the evolution of foreign-owned employment. In Fig. B1, we assess the validity of this approach by comparing D&B-based FDI stocks (employment) for Germany, Poland, and Ukraine to UNCTAD estimates (in millions of US dollars)[4]. Apart from minor discrepancies, the series follow similar trends in all three countries: both metrics indicate substantial growth in FDI since 1990. We therefore use the D&B data as our main source for describing FDI dynamics in Eastern Europe.



(a) Germany FDI (b) Poland FDI (c) Ukraine FDI

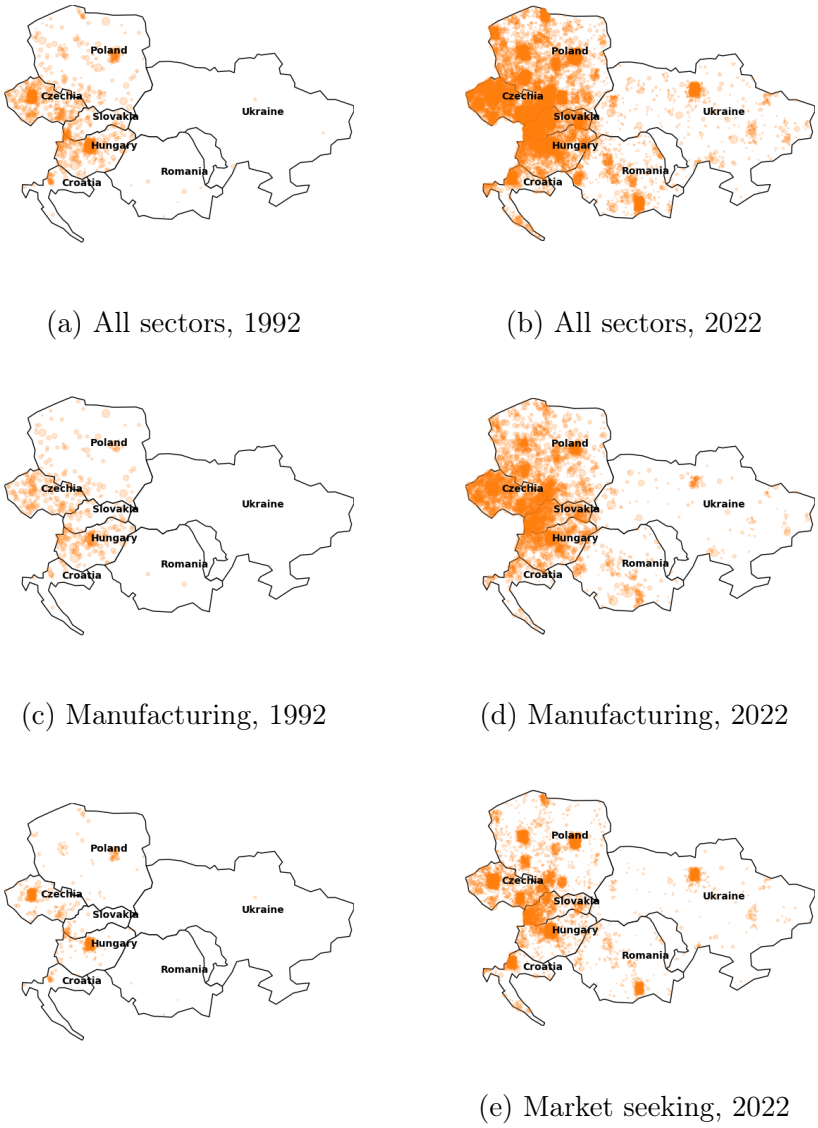
Figure B1: **Comparison of FDI trends in D&B and UNCTAD data.** Between 1990 and 2011, as well as in 2012–2015 and 2015–2019, FDI employment is extrapolated from establishments' first observed employment sizes.

B.2 Gravity models of FDI

In the main text we argue that Ukraine's greater distance to Western Europe, relative to many EU-CEE peers, may hinder the attraction of FDI from countries such as Germany and Austria. Fig. 15 shows where Western European companies locate their FDI in Eastern Europe.

[4]We drop origin countries likely serving as tax havens for headquarters locations following Hartog et al. (2020).

The rapid spatial decay of FDI is immediately apparent in Fig. B2. The maps in this figure show the locations of establishments in Central and Eastern Europe that are owned by MNEs headquartered in Western Europe. Marker sizes reflect employment. In 1992, investments concentrated almost entirely along the German and Austrian borders, especially in manufacturing (asset-seeking) establishments. Market-seeking FDI, by contrast, concentrates more in capital and large cities. Over time, Western European investments expand and reach further east, but manufacturing FDI remains disproportionately concentrated in the western parts of Central and Eastern Europe.



(a) All sectors, 1992

(b) All sectors, 2022

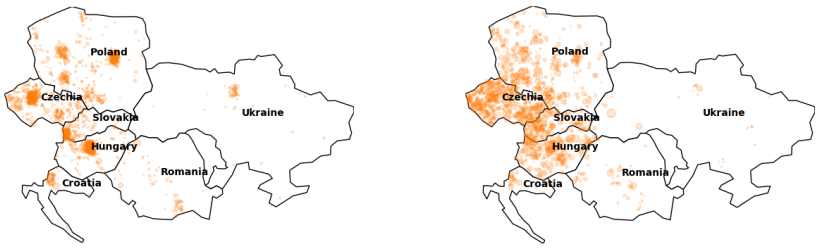
(c) Manufacturing, 1992

(d) Manufacturing, 2022

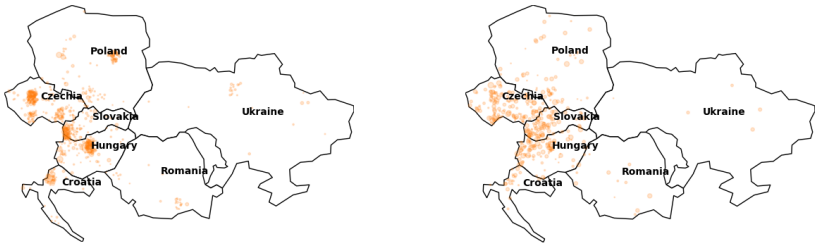
(e) Market seeking, 2022

Figure B2: **Western European FDI.** *Top row:* overall FDI by Western European MNEs in Eastern Europe. *Middle row:* manufacturing (asset-seeking) FDI. *Bottom row:* market-seeking FDI. Marker sizes reflect employment in foreign-owned establishments.

Fig. B3 further highlights distance effects by comparing German and Austrian outward FDI. Germany invests heavily in Poland, Czechia, Slovakia, and Hungary, while Austria's investments concentrate more in its direct neighbors (Czechia, Slovakia, Hungary) and also in Croatia. Market-seeking FDI for both origins concentrates more strongly in capitals and large cities, while manufacturing FDI appears more distance-sensitive and less tied to population size.



(a) Market-seeking FDI (DE, 2022) (b) Manufacturing FDI (DE, 2022)



(c) Market-seeking FDI (AT, 2022) (d) Manufacturing FDI (AT, 2022)

Figure B3: **FDI in market-seeking and manufacturing activities.** *Top row:* location of FDI by German MNEs in Eastern Europe. *Bottom row:* location of FDI by Austrian MNEs in Eastern Europe. Marker sizes reflect employment in foreign-owned establishments.

In light of these patterns, Ukraine is likely to face frictions due to distance to Western Europe compared to most EU-CEE countries, especially when attracting asset-seeking FDI from Austria and Germany. However, western Ukraine is at distances comparable to Romania and Bulgaria, both of which attracted substantial FDI and integrated into Western European GVCs. Moreover, distance and EU accession matter to different degrees across industries.

To illustrate this, Fig. 17 shows that Poland's and Romania's surge in inward FDI during EU accession was especially pronounced in manufacturing. Fig. B5 breaks this down across manufacturing subsectors. A large share of post-accession FDI growth — particularly in Romania — was driven by *transportation equipment*. The *computer and electronic products* industry — although less important in absolute terms — also expanded rapidly in both countries. Romania's experience suggests that EU membership can generate significant FDI inflows over distances comparable to western Ukraine.

In general, most Austrian and German FDI in Central and Eastern Europe concentrates in a small number of industries (Fig. B4). The largest flows by far are tied to motor vehicles, but professional and technical services and certain electronics-related industries also account for large shares.

To analyze these mechanisms more rigorously, we estimate gravity models of FDI. Specifically, we model expected FDI flow from origin city o in Germany or Austria to destination city d in Eastern Europe (including Belarus, Russia, and Ukraine (we only use destination cities with at least a 1000 employees in our dataset)[5]) in year t, F^t_{od}, as:

$$E\left[F^o_{d,t}|\mathbf{Z}^t_{od}\right] = e^{\mathbf{Z}^t_{od}\beta+\varepsilon^t_{od}}, \tag{B1}$$

where $\mathbf{Z}$ includes:

[5]Full list: Bulgaria, the Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia, Turkey, Belarus, Ukraine, Russia.

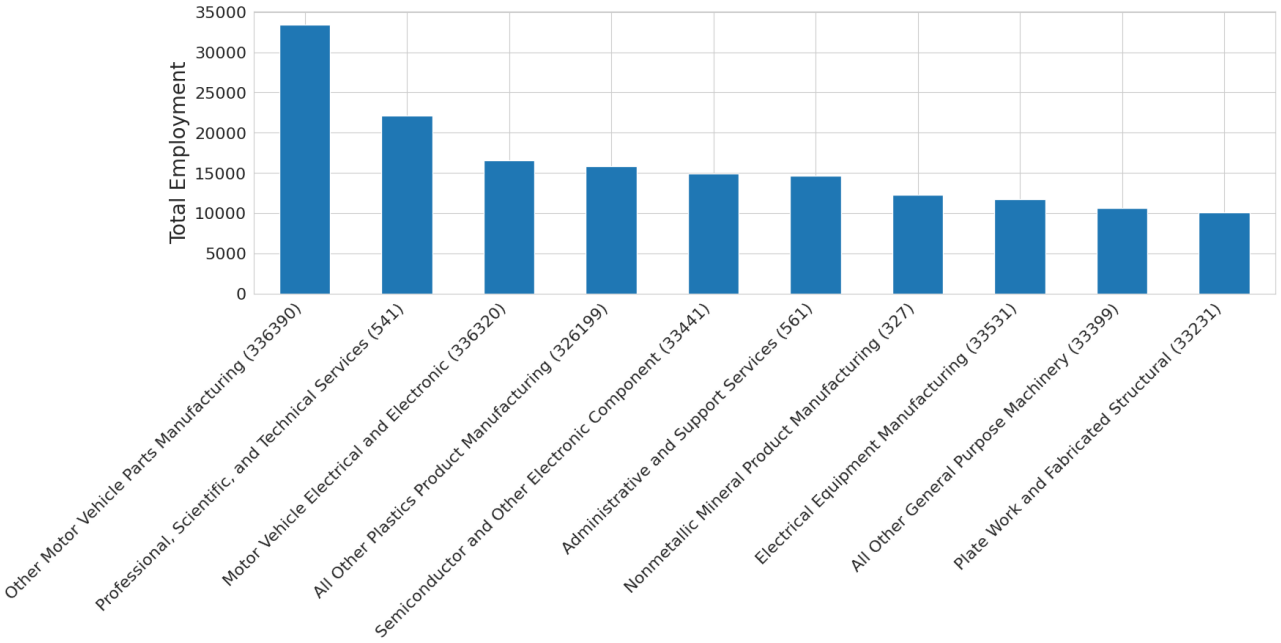
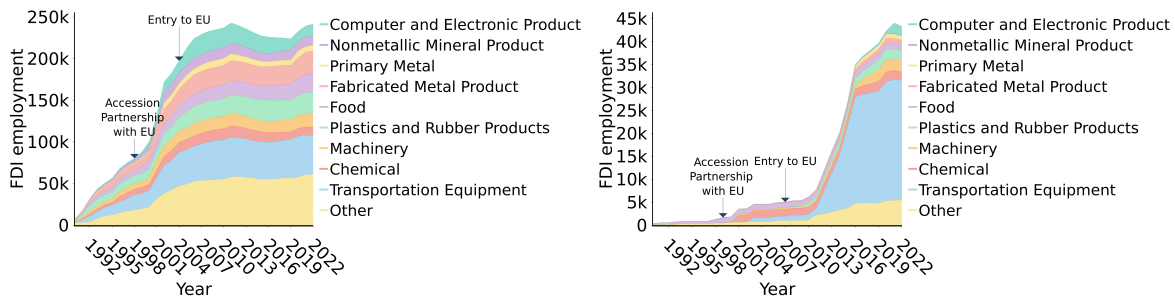


Figure B4: **Top FDI industries (AT+DE).** Ten industries with the largest FDI flows from Austrian and German firms to Central and Eastern Europe. Together these ten industries account for about 50% of German and Austrian FDI in the region.



(a) Poland (b) Romania

Figure B5: **FDI in manufacturing and EU membership.** Number of employees in Poland (left) and Romania (right) in foreign-owned manufacturing establishments. Colors indicate different manufacturing industries.

- $\log(\text{dst.})$: log kilometer distance between cities o and d;
- $\log(\text{pop}_o)$: log population of city o (2015) (Morales-Arilla and Gadgin Matha, 2024);
- $\log(\text{pop}_d)$: log population of city d (2015) (Morales-Arilla and Gadgin Matha, 2024);
- EUC_d^t: 1 if the country of city d is an EU candidate in year t, 0 otherwise;
- EUM_d^t: 1 if the country of city d is an EU member in year t, 0 otherwise.

Fig. B6 plots estimated parameters for manufacturing FDI (blue) and market-seeking FDI (green). As expected, regardless of the type of FDI, distance has a negative effect on FDI and EU membership a positive effect. Both distance decay and the EU membership effect are larger for manufacturing than for market-seeking FDI. Interestingly, EU candidacy effects are often close in magnitude to membership effects, suggesting that Ukraine, which has started its accession talks already, may see many benefits materialize well before full membership.

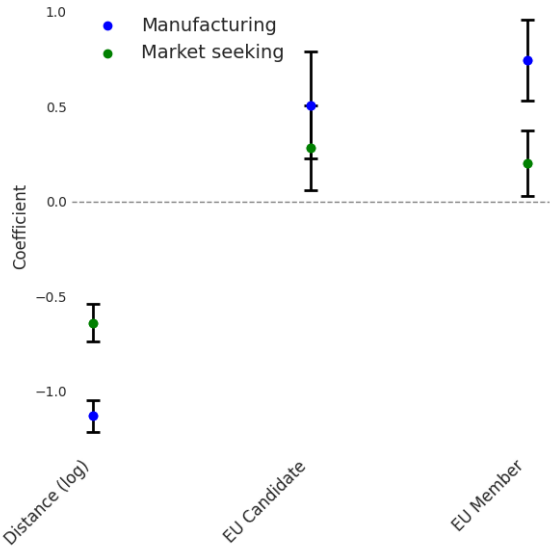


Figure B6: **Estimated effects on FDI from German and Austrian cities to Central and Eastern European cities.** *Blue*: effects on manufacturing FDI; *Green*: effects on market-seeking FDI. Vertical lines indicate 95% confidence intervals.

These effects vary across industries. Fig. B7 shows distance decay by industry for the top FDI industries in Fig. B4. For most industries, distance is negatively associated with incoming FDI, with semiconductor manufacturing as a notable exception.

Fig. B8 shows that EU candidacy and membership effects also differ by industry. With the exception of *Non-metallic mineral production manufacturing*, for all industries[6] point estimates suggest that becoming an EU member has a strong and positive effect on FDI. Interestingly, for almost all industries, there is little difference between full EU members and candidate members. The exception is *professional, scientific and technical services*, where effects only materialize with full EU membership.

Together, these findings imply that distance and EU accession shape FDI strongly, but in industry-specific ways. For example, FDI in *other motor vehicles electrical and electronic equipment manufacturing* appears relatively insensitive to distance but more dependent on EU progress. Correspondingly, we identify related trade opportunities for Ukraine, particularly such

[6]Note that for half of the industries, the effect is imprecisely estimated, leading to very wide confidence intervals.

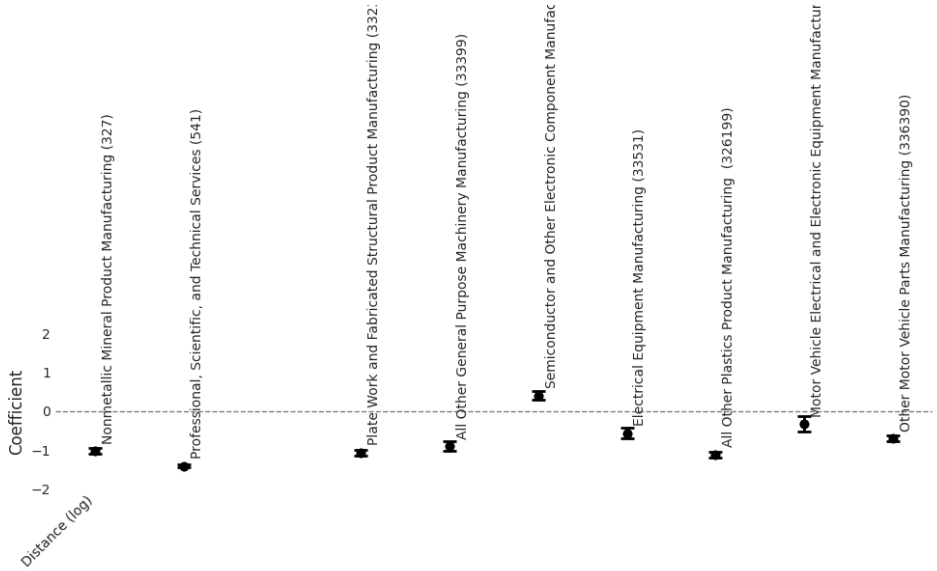


Figure B7: **Distance decay by industry.** Impact of distance on FDI from Austrian and German firms in Central and Eastern Europe for the largest industries by FDI flows.

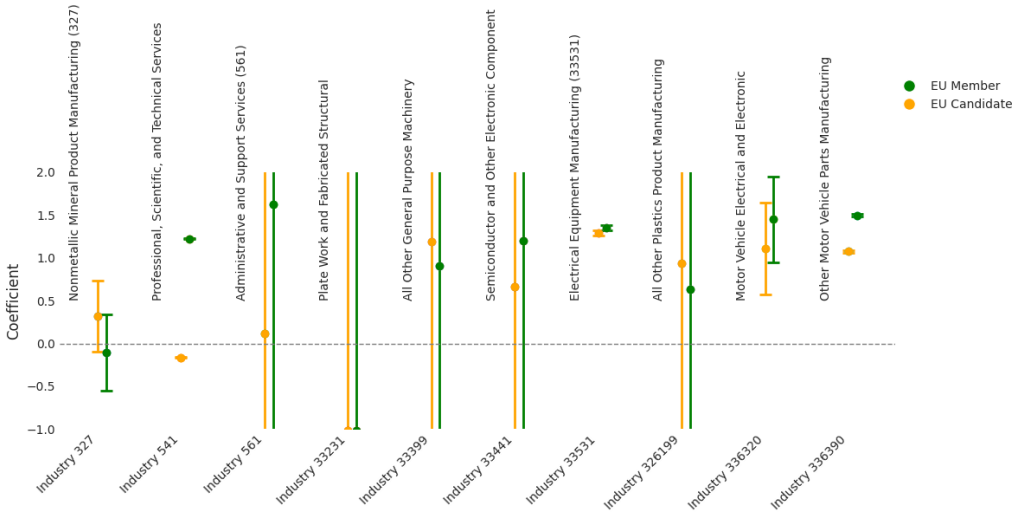


Figure B8: Impact of EU candidacy and membership on Austrian/German FDI by industry in Eastern Europe

Import Substitution	Near-Term Export Generation	New Export Industries
• Food and dairy • Light petroleum products • Building materials • Mineral fertilizers and plant protection products • Machinery used in transport, energy, heavy industry, and construction	• Iron and steel metallurgy, including green steel • Food processing • Critical minerals	• Energy equipment • Railway equipment • Textiles • Leather and garments • Pharmaceuticals • Rubber and plastics • Chemicals

Table C1: Government priorities by category.

as self-propelled bulldozers and excavators (Table C2 - corresponding to the sector priorities of Ukraine's government) as well as motor vehicle parts such as spark-ignition piston engines and other electrical ignition equipment (Table F1 in Appendix F).

Semiconductor-related FDI also stands out as relatively distance-insensitive and less dependent on EU status. This also holds for corresponding products that we identify as trade opportunities for Ukraine, particularly, semiconductor devices and electrical capacitors and electrical resistors (Table F1).

C Sector Priorities for the Ukrainian Government

The Government of Ukraine identifies diversification targets in its *Ukraine Plan* Facility (2024). The plan gives special attention to iron and steel metallurgy, a historically important heavy industry. Beyond this, priorities fall into three broad categories, summarized in Table C1:

- **Import substitution.** Ukraine previously imported certain inputs at scale (including from Russia) that served as inputs for domestic production. Going forward, Ukraine aims to increase self-sufficiency in selected inputs.
- **Near-term export generation.** Ukraine has traditionally been competitive in several prominent sectors. These represent opportunities, which may be expanded and modernized to generate export revenue.
- **New export industries.** The plan also targets entry into new, higher value-added industries oriented toward Western European export markets, including GVC-related sectors. These industries may be harder to enter but offer larger long-run payoffs.

We score products aligned with these categories using the feasibility and attractiveness criteria introduced above. Table C2 summarizes selected top opportunities within government-identified priority sectors.

Product	(a) distance	(b) EU accession	(c) EU membership	(d) FDI corr	(e) Export Gains (USD)	(f) Export Gains (ratio)	(g) Fit
HS 2914, Ketones and quinones	86%	238%	55%	68%	$1.4 million	10.5	0.05
HS 2907, Phenols, phenol-alcohols	85%	270%	91%	68%	$1.9 million	10.5	0.04
HS 5106, Yarn of carded wool, not for retail sale	73%	6%	18%	67%	$158 million	616	0.22
HS 6202, Womens overcoats, not knit	87%	131%	24%	61%	$368 million	15.5	0.2
HS 6403, Leather footwear	83%	71%	40%	47%	$904 million	56.8	0.27
HS 8429, Self-propelled bulldozers, excavators, etc.	81%	-35%	-7%	96%	$13 million	65.9	0.18

Table C2: **Selection of top GVC opportunities for Ukraine in government-identified priority sectors.** Columns: (a) product-specific sensitivity of exports to distance. (b) expected increase in export volume associated with entering the EU accession process. (c) expected increase in export volume associated with full EU membership. (d) extent to which trade is FDI-driven: correlation between FDI and trade volumes. (e) expected export gain in USD if Ukraine were to attract FDI volumes predicted by its size and distance to the EU. (f) expected export gain as a ratio over current exports under the same scenario. (g) fit with Ukraine's industrial capabilities as expressed in its current export mix.

To enhance Ukraine's general business competitiveness, and thereby enable these diversification targets, the Ukraine Plan sets out a number of reform objectives. These include:

- **Regulatory modernization.** Ukraine aims to reduce the number of regulatory barriers that businesses face in order to obtain permits, licenses, etc. and to simplify and digitize necessary procedures.
- **Access to finance and markets.** These reforms aim to enact a number of measures that are geared towards improving access for Small and Medium Sized Enterprises (SMEs). These include a simplified and supportive regulatory environment that enables various financial instruments (such as affordable loans and insurance against war damage), the creation of industrial parks, and rapid access to electricity.
- **Improved public procurement.** This includes improving skills of public servants, creating more robust procurement procedures, and combating corruption.
- **Harmonization of standards and legislation with the EU.** These reforms not only improve access to EU markets but also set the stage for EU accession. They include harmonization on safety standards for non-food products and harmonization on standards with regard to three value-added industries: machinery, electromagnetic compatibility of equipment, and low-voltage electrical equipment.

D Reconstructing global value chains from international trade data

We identify pairs of HS products that plausibly have Global Value Chain relationships through the following steps:

1. We start from the US Bureau of Economic Analysis input–output table describing which imported inputs each US industry uses. We concord these inputs to HS products and filter for upstream inputs that account for at least 1% of total imports used by a downstream activity. This yields a candidate set of upstream–downstream HS pairs.

   Because BEA industries are broad and concordances are imperfect, some of these candidate relations are implausible. Nonetheless, this step substantially reduces the search space and provides a useful first filter.

2. We take the filtered candidate HS product pairs and examine the associations between them in international trade data. Using 4-digit HS bilateral trade data from 1995–2020, we divide the period into five 5-year windows. For each window, we compute countries' average yearly exports and imports by product and calculate their RCAs in all countries:

$$RCA^X_{cp} = \frac{X_{cp} / \sum_{p'} X_{cp'}}{\sum_{c'} X_{c'p} / \sum_{c''} \sum_{p''} X_{c'',p''}}$$
$$RCA^M_{cp} = \frac{M_{cp} / \sum_{p'} M_{cp'}}{\sum_{c'} M_{c'p} / \sum_{c''} \sum_{p''} M_{c'',p''}},$$

   where X_{cp} represents the value of exports in product p and country c and M_{cp} the value of imports of product p by country c. We then normalize each RCA value, mapping it onto the interval $[-1, 1]$:

$$\overline{RCA}^z_{c,p} = \frac{RCA^z_{cp} - 1}{RCA^z_{cp} + 1}, \tag{D1}$$

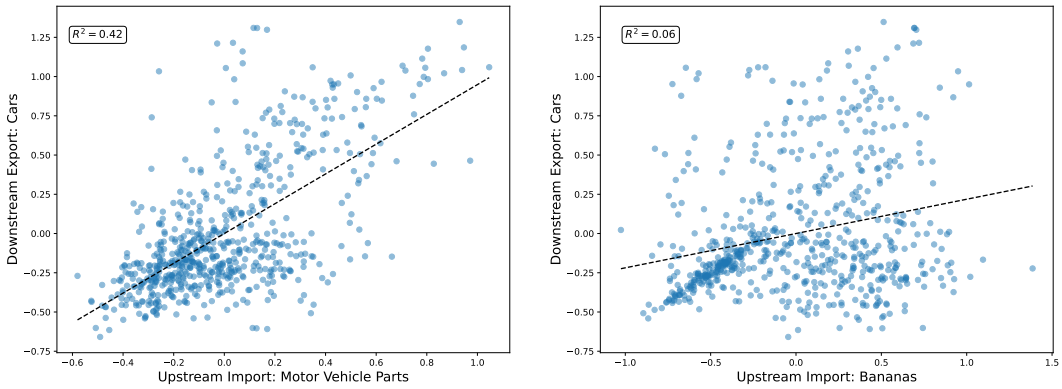


Figure D1: **Illustration of identification of value-chain linkages.** Controlling for import diversity, importing motor vehicle parts is associated with exporting cars, while the association between exporting cars and importing bananas is far weaker.

where $z \in X, M$.

We compute import diversity of country c, D_c^M as the number of products in which it has a non-normalized import RCA greater than 1. We then perform a series of regressions across all candidate pairs of HS upstream imports and downstream exports, where we filter for a normalized export RCA of at least -0.75 and run partial regressions:

$$\begin{aligned}
\overline{RCA}_{cp}^{X} &= \beta_0^X + \beta_1^X D_c^M + \varepsilon_{cp}^X \\
\overline{RCA}_{cp}^{M} &= \beta_0^M + \beta_1^M D_c^M + \varepsilon_{cp}^M \\
\varepsilon_{cp}^M &= \gamma \varepsilon_{cp}^X + \epsilon_{cp}.
\end{aligned}$$

Fig. D1 illustrates example residuals from upstream and downstream goods. Whereas the downstream export cars is associated with the upstream import motor vehicle parts, its association with the upstream import bananas is far weaker. We can thus be more confident that there is an upstream-downstream relationship among cars and motor vehicles parts than cars and bananas.

The intuition is to examine country-product observations where there is at least some export presence and then ask whether stronger specialization in exporting a downstream product is systematically associated with specialization in importing a particular upstream product. That is, if a country is specialized in exporting a particular product, p_x, is it also highly likely to be specialized in importing another upstream product, p_y? Partialling out import diversity reduces spurious associations driven by broad importing behavior (e.g., high-income countries importing many products in general. We partial out rather than simply control for import diversity so that we can obtain measures of fit that are specific to export and import RCAs.

3. We retain import–export relations where the estimated slope is positive, the Bonferroni-corrected p-value is below 0.05, and $R^2 \geq 0.2$. This filters for relationships with consistent co-occurrence patterns.

4. For each downstream product, we drop outlier upstream products that are highly unrelated to other upstream products. We use the UMAP algorithm to convert a matrix of country-product RCAs into two-dimensional coordinates for all products, where products

that are co-exported more often are closer together. We then extract the coordinates for the set of products that are upstream of a given downstream product, and calculate the average distance from each upstream product to each other upstream product. We order upstream products from smallest to largest average distance from each other, and algorithmically calculate the knee in this distribution and discard upstream products that are significantly above the knee.

In some analyses we further identify strong bilateral GVC corridors between country pairs. We require:

- The upstream country exports the upstream good with overall RCA ≥ 0.5 and $RPOP \geq 1$, where $RPOP^X_{cp} = \frac{X_{cp}/\sum_{p'} X_{cp'}}{pop_c/\sum_{c'} pop_{c'}}$ with pop_c the population of country c;
- The downstream country exports the downstream good with overall RCA ≥ 0.5 and $RPOP \geq 1$;
- The bilateral RCA of the export of the upstream good from the upstream country to the downstream country must be at least 1. Bilateral RCA from an origin country o to a destination country d in a product p is calculated as follows (which can be interpreted as the concentration of o's exports of p to d, X_{odp}, relative to d's share of global imports of p):

$$RCA_{odp} = \frac{X_{odp}/X_{op}}{M_{dp}/\sum_{o'} X_{o'p}}$$

E Extended Gravity Models of Trade and FDI

We estimate a gravity model of trade separately for each HS 4-digit product using bilateral trade data from the Harvard Atlas of Economic Complexity (1995–2021). Analogous to the FDI analysis, we run PPML regressions:

$$E\left[X^t_{odp}|\mathbf{Z}^t_{odp}\right] = \exp^{\mathbf{Z}^t_{odp}\beta+\varepsilon^t_{odp}}, \tag{E1}$$

where Z^t_{odp} includes:

- $\log(\text{dst.})$: logarithm of the harmonic population-weighted distance between o and d;
- $\log(\text{pop}_o)$: logarithm of country o's population in year t;
- $\ln(\text{pop}_d)$: logarithm of country d's population in year t;
- $\log(\text{gdp}_o)$: logarithm of country o's GDP in year t;
- $\ln(\text{gdp}_d)$: logarithm of country d's GDP in year t;
- a set of dummies and their interactions that indicate the EU candidacy and membership status of country o and country d;
- origin, destination and product fixed effects;
- variables that describe the contiguity, shared language and colonial ties between o and d.

We extract distance and EU parameters to compute product-specific distance decay and EU accession boosts.

Separately, we estimate basic OLS gravity models for trade and FDI with the following specifications, taking logs of each variable plus one to deal with zeros:

$$\begin{aligned}\log X_{odp} &= \beta_0^X + \beta_1^X \log dst_{od} \\ &\quad + \beta_2^X \log pop_o + \beta_3^X \log gdp_o + \beta_4^X \log pop_d + \beta_5^X \log gdp_d + \varepsilon_{odp}^X \\ \log F_{odp} &= \beta_0^F + \beta_1^F \log dst_{od} \\ &\quad + \beta_2^F \log pop_o + \beta_3^F \log gdp_o + \beta_4^F \log pop_d + \beta_5^F \log gdp_d + \varepsilon_{odp}^F\end{aligned}$$

We compute $corr(\hat{\varepsilon}_{odp}^X, \hat{\varepsilon}_{odp}^F)$ as a measure of trade–FDI co-variation. We then estimate a fuller PPML gravity model for FDI:

$$E\left[F_{odp}\right] = e^{\beta_0 + \beta_1 \log dst_{od} + \beta_2 \log pop_o + \beta_3 \log pop_d + \beta_4 \log gdp_o + \beta_5 \log gdp_d + \varepsilon_{odp}}.$$

We use this model to obtain the predicted FDI from each Western European country to Ukraine, based on standard gravity effects. We then run a PPML regression that relates exports to FDI:

$$E\left[X_{odp}\right] = e^{\beta_0 + \beta_1 \log F_{odp} + \varepsilon_{odp}}.$$

Plugging predicted FDI from the gravity model above into this regression, we obtain the predicted amount of exports that we would expect Ukraine to obtain through FDI from Western Europe if Ukraine managed to attract the FDI according to the gravity model. We compare this prediction against actual exports to compute potential gains in dollars and percentage terms.

F Extended GVC Opportunities for Ukraine

This section reports extended GVC opportunity tables for Ukraine from the ten largest GVC product clusters in Eastern Europe for which sufficient data are available. We score 4-digit HS exports using the feasibility and attractiveness factors described in Section 4. Ultimately, this yields opportunities across nine GVC clusters with sufficient data coverage.

Product	GVC Cluster	(a) dist.	(b) EU acc.	(c) EU memb.	(d) FDI corr	(e) Export gains (USD)	(f) Export gains (ratio)	(g) Fit
HS 8431, Parts for use with hoists and excavation machinery	Pumps	82%	139%	40%	95%	$911 million	65	0.32
HS 8544, Insulated electrical wire	Vehicle Components	76%	96%	28%	35%	$1.1 billion	2	0.51
HS 6104, Women's suits, knit	Shirts & Coats	84%	290%	157%	61%	$393 million	15	0.09
HS 6105, Men's shirts, knit	Shirts & Coats	82%	185%	119%	61%	$4 million	15	0.13
HS 6114, Other garments, knit	Shirts & Coats	86%	138%	11%	61%	$32 million	15	0.09
HS 6110, Sweaters, pullovers, sweatshirts etc., knit	Shirts & Coats	79%	145%	50%	61%	$89 million	15	0.09
HS 6206, Women's shirts	Shirts & Coats	77%	153%	23%	61%	$167 million	15	0.16
HS 6111, Babies' garments, knit	Shirts & Coats	76%	29%	13%	61%	$93 million	15	0.04
HS 8704, Motor vehicles for transporting goods	Vehicles	77%	594%	172%	22%	$235 million	693	0.27
HS 8703, Cars	Vehicles	86%	157%	132%	64%	$6.6 billion	4117	0.09
HS 8708, Parts of motor vehicles	Vehicles	81%	110%	111%	95%	$453 million	65	0.13
HS 8407, Spark-ignition piston engines	Vehicles	81%	136%	63%	70%	$32 million	80	0.04
HS 8511, Electrical ignition equipment	Vehicles	82%	55%	58%	95%	$1.4 billion	65	0.04
HS 3102, Nitrogenous fertilizers	Petroleum & Derivatives	74%	206%	136%	32%	$569 million	23	1.0
HS 2905, Acyclic alcohols	Petroleum & Derivatives	81%	219%	86%	68%	$197 thousand	10	0.4
HS 2917, Polycarboxylic acids	Petroleum & Derivatives	79%	133%	103%	68%	$2 million	10	0.13
HS 2902, Cyclic hydrocarbons	Petroleum & Derivatives	74%	80%	73%	68%	$306 million	10	0.19
HS 8504, Electrical transformers	Electromechanic Components	83%	-9%	1%	44%	$346 million	21	0.27
HS 8538, Parts for electrical apparatus	Electromechanic Components	79%	10%	5%	52%	$160 million	48	0.13
HS 8537, Electrical boards	Electromechanic Components	83%	-8%	0%	52%	$735 million	48	0.09
HS 8540, Thermionic, cold cathode or photocathode tubes	Sound & Audio Instrumentation	83%	175%	79%	100%	$79 million	1393	0.08
HS 8522, Parts for video or sound equipment	Sound & Audio Instrumentation	83%	221%	42%	100%	$37 million	1393	0.0
HS 8470, Cash registers, calculators, etc.	Sound & Audio Instrumentation	84%	-76%	46%	68%	$26 million	246	0.08
HS 8541, Semiconductor devices	Electronics & Communications Equipment	89%	75%	126%	100%	$2 billion	1393	0.04
HS 8532, Electrical capacitors	Electronics & Communications Equipment	83%	226%	62%	100%	$85 million	1393	0.08
HS 8473, Parts and accessories for office machines	Electronics & Communications Equipment	86%	-1%	78%	68%	$264 million	246	0.08
HS 8471, Computers	Electronics & Communications Equipment	84%	-23%	98%	67%	$2.8 billion	852	0.04
HS 8533, Electrical resistors	Electronics & Communications Equipment	82%	109%	44%	100%	$1.1 billion	1393	0.04
HS 8543, Electrical machines n.e.c.	Electronics & Communications Equipment	86%	-22%	18%	83%	$492 million	411	0.09
HS 8525, Transmission apparatus	Electronics & Communications Equipment	82%	-38%	65%	51%	$2.6 billion	340	0.09
HS 3818, Chemical elements for electronics	Electronics & Communications Equipment	91%	-40%	23%	100%	$460 million	1393	0.04
HS 8517, Telephones	Electronics & Communications Equipment	86%	-31%	41%	49%	$393 million	78	0.06
HS 8531, Electric sound or visual signaling apparatus	Electronics & Communications Equipment	81%	-38%	9%	55%	$123 million	11	0.0
HS 6202, Womens overcoats, not knit	Garments & Accessories	86%	131%	24%	61%	$368 million	15	0.2
HS 6201, Men's overcoats, not knit	Garments & Accessories	87%	151%	47%	61%	$472 million	15	0.2
HS 6403, Leather footwear	Garments & Accessories	82%	71%	40%	47%	$904 million	56	0.27
HS 4203, Leather apparel	Garments & Accessories	86%	73%	-11%	46%	$60 million	5	0.18
HS 6212, Brassieres	Garments & Accessories	76%	85%	5%	61%	$114 million	15	0.17
HS 6205, Men's shirts	Garments & Accessories	78%	133%	15%	61%	$62 million	15	0.15
HS 6108, Women's undergarments, knit	Garments & Accessories	76%	82%	42%	61%	$84 million	15	0.16
HS 6211, Activewear	Garments & Accessories	83%	74%	-53%	61%	$121 million	15	0.12
HS 6305, Bags for packing goods	Garments & Accessories	75%	102%	10%	29%	$229 million	25	0.27
HS 6207, Men's undergarments	Garments & Accessories	73%	20%	10%	61%	$1 million	15	0.16
HS 6209, Babies' garments	Garments & Accessories	78%	3%	-15%	61%	$12 million	15	0.09

Table F1: **Extended selection of top GVC opportunities for Ukraine.** Columns: (a) product-specific sensitivity of exports to distance. (b) expected increase in export volume associated with entering the EU accession process. (c) expected increase in export volume associated with full EU membership. (d) extent to which trade is FDI-driven: correlation between FDI and trade volumes. (e) expected export gain in USD if Ukraine were to attract FDI volumes predicted by its size and distance to the EU. (f) expected export gain as a ratio over current exports under the same scenario. (g) fit with Ukraine's industrial capabilities as expressed in its current export mix. See also Table 1.