Foreign direct investment, global value chains and regional economic development in Europe

Final Report

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Executive Summary

This Report is aimed at illustrating the points of contact and synergies between Global Value Chains (GVCs), Foreign Direct Investment (FDI) and national and regional development trajectories. The Report provides key facts and figures and a tentative analytical and policy framework to detect opportunities and challenges confronted by the Member States of the European Union (EU) and their regions. The growing interdependence of national and regional economies in the international division of labour in GVCs and FDI shapes design, implementation and evaluation of public policies for internationalisation, innovation and economic development at the regional, national and EU level.

Informed by different streams of academic literature, and based on a variety of data sources, the Report focuses on three levels of analysis. First, it positions national value chains of European economies in the wider context of international value chains (within and outside the EU) with respect to backward and forward linkages. The latter are also compared with the composition of total value added in final demand within each economy. The role played by foreign affiliates by Multinational enterprises (MNEs) in shaping the host economies by creating gross value added and contributing to trade is also explored, together with inward and outward greenfield FDI.

Second, the Report considers the same national level indicators at the industry level, by selecting three GVC-sensitive manufacturing industries: 1. Computer and electronics, one of the most technology-intensive and iconic industries in exemplifying GVCs; 2. Automotive, characterised by high capital-intensity and specialised clusters strongly interconnected within macro-areas; 3. Textiles and apparel, a truly global industry marked by low fixed costs and technology-intensity, and largely offshored to developing economies.

Third, the Report provides preliminary insights on the regional level, looking at the spatial heterogeneity of GVC integration on the basis of FDI inflows and outflows (as a proxy of GVC participation) by function/value chain stage, geographical orientation, and network position. The Report also considers, always through the lenses of FDI, the overlapping dimension of regions and GVC-sensitive industries.

Based on the relative position in terms of backward and forward linkages of each European country with respect to the EU28 average, the Report identifies four broad groups of economies:

- *High GVC Integration* (Belgium, Czech Republic and Slovenia): these economies, notwithstanding their heterogeneous levels of overall economic development, have in common a relatively high integration in EU GVCs in terms of both backward and forward linkages.
- *Low GVC Integration* (Croatia, Cyprus, Greece, Italy, Portugal, Spain and Latvia): characterised by strong subnational imbalances, this group is overall less integrated and more dependent on rest of the World with respect to both backward and forward linkages.

- *Backward GVC Integration* (Lithuania, Estonia, Slovak Republic, Hungary, Bulgaria, and Ireland, Denmark, Luxembourg and Malta): these economies are net 'receivers' from the rest of the EU, and the Central and Easter European countries in this group are strongly influenced by the large presence of EU15 MNEs there located.
- *Forward GVC Integration* (Germany, Austria, Sweden, France, Finland, the United Kingdom, the Netherlands, and Poland and Romania): the overall position of this group is that of a net 'sender'. The most innovative countries in Europe are here included, whilst Poland and Romania have experienced fast growth in their innovation indicators.

The Report identifies and discusses some key emerging issues that provide a basis for an informed policy debate on how GVCs can be fully embraced in the design and implementation of regional policies in the EU:

- European integration generates patterns of intra-area interdependence: the EU28 has on average a larger share of its value added in exports of other EU countries compared to the rest of the World.
- The involvement in continental GVCs is increasing over time: 23 countries out of 28 register an increase in the role of foreign affiliates in gross value added creation, and a simultaneous expansion in their role in international trade in the year between 2005 and 2015.
- Although the GVC groups identified on the basis of backward and forward linkages show important regularities, a variety of national patterns in GVC integration both within and outside Europe emerges with respect to MNE operations and FDI networks.
- Overall, defining features characterise the process of internationalisation of Central and Eastern European economies.
- In terms of FDI connectivity, a limited number of higher order regions appears to dominate the European scene for both inward and outward FDI, and for FDI specific to the selected GVC-sensitive industries here considered.
- The nexus sector-function-region in GVCs shows that understanding the detailed structure and evolution of GVC and FDI networks, and identifying the potential for integration of cities and regions, must become a central action point for future public policies.
- Data constraints are severe, particularly at the subnational level: it has become apparent how difficult it remains to capture the features and evolution of GVC integration for European regions.
- Even though connectivity entails bi-directional links – i.e. regions are simultaneously value receivers and senders in GVCs – attractiveness to foreign capital has long been underestimated as a regional policy tool and has often remained uncoordinated with other regional development and innovation policies.
- Active internationalisation through investment abroad has often been completely disregarded in regional development policy agendas.

The Covid-19 pandemic has contributed to an unprecedented contraction of the global economy. This calls for a full re-consideration of available public policy options to support and relaunch economic

growth and employment in a sustainable and equitable manner in all EU regions. Coordinated multi-level evidence-based public policies are essential for GVCs and FDI to support recovery. Targeted interventions are crucial to rebuild investor confidence and to maintain the eco-system conditions needed for FDI retention. This is particularly relevant to less developed regions where resources are scarcer and local government quality is often lower.

When considering the operationalisation of GVC concepts to guide regional policies on the ground, this Report points to three key issues:

- More research is needed to strengthen the conceptualisation of the links between 'global' and 'local' value chains and the transmission channels linking GVCs and local actors.
- A quantum leap is needed in terms of data availability and design of suitable indicators and measures to better characterise the participation and position of regions in GVCs as well as the local embeddedness of key GVC actors.
- When academic concepts, models and frameworks are used to shape public policies (and guide the use of public funds) solid evidence on 'what works in practice' is fundamentally needed.

Section 1. Introduction

The purpose of this Report is to contribute to the current paradigm shift in European regional economic development policy, which is increasingly paying attention to interregional and international collaborations, production networks and linkages, within and across the European Union (EU).

The Report sheds new light on the points of contact and synergies between Global Value Chains (GVCs), Foreign Direct Investment (FDI) and national and regional development trajectories in the context of interdependent economies, providing some stylized facts and an initial analytical framework to help Member States identify opportunities and challenges for innovation-led growth.

The Report first presents some key concepts in various streams of academic literature, with the aim of showing the complementarity between GVCs, FDI and the role of business firms, particularly multinational enterprises (MNEs). It then elaborates a broad analytical and policy framework linking GVCs, FDI and regional development in order to support the design of more effective innovation and development policies in Europe. The framework briefly depicts the importance of GVCs and FDI and why they matter for regional economic development and policy.

The Report presents key facts and figures on GVCs at national and industry level. This situates 'national' value chains of EU economies in the wider context of international value chains (within and outside the EU). The Report looks at the position of EU28 countries with respect to backward and forward linkages in order to classify countries into broad categories of GVC participation. Backward and forward linkages are also compared with the composition of total value added in final demand within each economy. MNEs are a critical element in understanding GVCs. In this context the Report introduces the role played by foreign affiliates in shaping the characteristics of the host economies: creating gross value added, and importing and exporting goods. Moreover, the Report considers the sourcing structure of foreign affiliates in order to uncover their role as buyers and sellers within an economy and internationally.

The Report narrows down the analysis of backward and forward linkages and composition of value added in final demand to cover the industry level. It focuses in particular on three GVC-sensitive industries identified by the existing literature, and each characterised by very different features: 1. the Computer and electronics industry, one of the most important technology-intensive manufacturing sectors in the world economy, and one of those most iconic in exemplifying GVCs; 2. the Automotive industry, characterised by high capital-intensity and specialised clusters strongly connected mostly within national economies and macro-regions; 3. the Textiles and apparel industry, one of the oldest and truly global industries, with low fixed costs and technology-intensity and a steady increase over time in offshore production towards developing economies.

Furthermore, the Report analyses facts on emerging trends and tendencies of FDI (as a proxy of GVC participation and internationalisation) at regional level in Europe, in order to offer some preliminary insights on the heterogeneity of subnational GVC integration on the basis of maps of FDI inflows and outflows by function/value chain stage, geographical orientation, and network position. The Report also considers, always through the lenses of FDI, the overlapping dimension of the regions and the GVC-sensitive industries mentioned above.

The descriptive analysis conducted in this Report is based on various comparable indicators of GVCs and MNE activities, covering mainly national and sectoral characteristics, and only marginally subnational regions' GVC integration. The data used in the Report comes from a variety of sources. First, the OECD-WTO Trade in Value Added (TiVA) database includes a number of indicators that can help capture at least in part the extent of GVC participation on the basis of how and where value is created and sourced. Second, the Analytical AMNE database describes the interdependencies between trade and MNE investment in GVCs, allowing to measure the contribution of domestic firms, MNEs and their foreign affiliates to global trade and production. Third, Eurostat provides information at the national and regional level for the main economic indicators (GDP, unemployment, education, patents, and R&D), through which it is possible to identify the major differences in the structure of the European economies. Fourth, fDI-Markets database has been analysed to include evidence on foreign direct investments of multinational enterprises in the study, and to grasp the regional dimension of GVCs, not covered by the TiVA and AMNE database.

The analysis of these indicators offers hints for a reflection on the implications of the growing interdependence of national and regional economies in the current international division of labour in GVCs and FDI, and identifies key issues for policy and future research in the area of GVCs. The Report is structured in 7 Section. The following Section 2 sketches a broad interpretative framework, useful to reflect on policy implications, on the basis of various views of GVCs in the academic literature. Using a variety of indicators built on the basis of the data sources mentioned above, Section 3 presents stylised facts on GVC focussing on the national dimension and identifying country groups based on their models of GVC integration. Section 4, using some of the same indicators, reports on the industry aspects, concentrating in particular on three selected GVC-sensitive industries. Relying especially on fDI-Markets indicators, Section 5 grasps GVC integration at the subnational level. Sections 6 offers a summary of the main features by country group, and highlights important emerging issues for policy thinking and further research, whilst Section 7 concludes.

Section 2. Analytical and Policy Framework

Section 2.1 Global Value Chains, Foreign Direct Investment and the role of Multinational Enterprises

Over the last three decades, the international division of labour organised through GVCs and production and innovation networks has powerfully altered the interdependence of countries, regions and local economic systems around the world. For countries and regions, access to internal and external value creation and knowledge is not about simple *connectedness* – i.e. the architecture of transport and communication infrastructure – but rather about broader *connectivity* that is the capability of individuals, firms, organizations and institutions to interact and engage across geographical space and within networks. Connectivity is defined as the degree of two-way openness and integration that shapes the domestic churn of skills, talent, competences, and business functions (Crescenzi and Iammarino, 2017).

The concept of GVC rests on that of value chain, or the view of business organisations as systems, made up of subsystems or functions, each with inputs, transformation processes and outputs, each of the latter in turn involving the acquisition and consumption of resources (Porter, 1985). Over time, this sequence of functional activities that add value to products from suppliers to customers has become increasingly specialised, unbundled and sliced up across companies and geographies, becoming steadily "global" (Gereffi, 1996). The GVC framework thus places the value chain concept in the context of economic globalisation and development, enabled by technological and institutional transformations, strengthening the importance of connectivity for the competitive advantage of firms, countries and regions. It covers activities that have been carried out in inter-firm networks on a global scale (Gereffi and Fernandez-Stark, 2011).

GVCs have received significant attention in the academic literature and policy circles (e.g. Gereffi, 1996; Gereffi, 1999a,b; Gereffi and Korzeniewicz, 1994; Gereffi and Kaplinsky, 2001; Humphrey and Schmidt, 2002; Sturgeon, 2001; Gereffi et al., 2005). In particular, Gereffi and co-authors provide a seminal framework for studying GVCs based on five main dimensions (see Crescenzi et al., 2018, for an extensive review):

1. Input-output structure – the process of transforming raw materials into final products.
2. Geographical dimension – the identification of lead firms in the value chain, and their location.
3. Governance structure – how the value chain is controlled.
4. Institutional context – in which the industry value chain is embedded.
5. Upgrading and transformation – the dynamic movement within the value chain, or how producers shift between different stages of the chain.

Lead firms, often MNEs, are those that "govern" their global-scale supplier networks. Importantly, the geographical analysis is based on the identification of the lead firms in each section of the value chain (Gereffi and Fernandez-Stark 2011). GVC governance is the "authority and power relationships that determine how financial, material and human resources are allocated and flow within a chain" (Gereffi and Korzeniewicz, 1994, p. 97): these relationships are defined as 'buyer-driven' or 'supplier/producer-driven' chains. In 'buyer-driven' chains global buyers use coordination in order to create a competent and coordinated supply base. For this purpose, ownership is not required, but MNEs prescribe standards and protocols throughout the supply chain. Conversely, 'supplier/producer-driven' are vertically integrated supply chains where MNEs play a key role through ownership and direct control (Gereffi, 2001). Different typologies of GVC governance are associated with heterogeneous power structures. Beyond buyers' control over their suppliers, buyers themselves have been able to consolidate their power in some in industries by means of strategies to create and retain value (Dallas et al. 2019). In addition, power in GVCs is multipolar in nature: it involves actors outside the value chain, such as international NGOs, trade unions and (supra-national, national and local) governments. In this framework Dallas et al. (2019) have identified four typologies of power observed in GVCs: bargaining, demonstrative, institutional and constitutive. Bargaining Power is typical of firm-to-firm relationships or when large firms interact with individual governments and can be exhibit varying degrees of asymmetry. Demonstrative Power is based on more informal mechanisms but still involves dyadic linkages, for example in the case of quality conventions. Conversely, Institutional Power emerges when a multiplicity of GVC (and non-GVC) actors are simultaneously entrenched in power relations via – for example – government regulations or specific local production rules or standards. Instead, Constitutive Power is the key typology where this influence operates among loosely affiliated actors through non-formalised arrangements, broadly accepted norms or best practices. In the framework developed by Dallas et al. (2019) these typologies co-exist, overlap and evolve. Understanding power in GVCs is critically important when assessing how GVCs interact with local eco-systems as well as the challenges of pursuing regional policy objectives in the context of a highly interdependent regional economies (Thun and Sturgeon, 2017). Power in GVCs and local institutional arrangements and policies co-evolve, shaping local upgrading opportunities (Crescenzi et al. 2018)

Another, largely overlapping, approach that has developed in the literature on the international division of labour is that of Global Production Networks (GPNs), which similarly confers to MNEs a significant role in the establishment and governance of such value added-generating pipelines, as major 'flagships', or network nodes (e.g. Dicken, 1994, 2003, 2007; Ernst and Kim, 2002; Henderson et al., 2002; Dicken and Henderson, 2003; Coe et al., 2004, 2008; Hobday et al., 2005; Wrigley et al., 2005; Hess and Yeung, 2006; Yeung, 2009). Although the core of the two conceptualizations, GVCs and GPNs, is somewhat overlapping — the nexus of interconnected functions, operations and transactions through which a specific product or service is produced, distributed and consumed across geographies — there are two differences that actually ensure their complementarity. First, the GVC approach places more emphasis on the essentially linear structures of industry-specific value chains, whereas GPNs try to incorporate all kinds of network configurations, having a more inter-industry view. Second, GVCs focus specifically on the governance of inter-firm transactions, while GPNs gives relatively more relevance to the management of intra-firm relationships (Coe, Dicken and Hess, 2008).

What is relevant for our purposes here is that MNEs, by carrying out different forms of investment abroad, are considered key actors behind connectivity and global economic integration of countries and regions worldwide, being them also critical players in international trade flows. “While often described as “two sides of the same coin”, (Krugman, 2007), trade and investment seem to be intertwined in a more complex manner within GVCs” (OECD, 2018 p. 31). In fact, trade flows can be equity led or non-equity led. The former involves networks of foreign affiliates established via FDI, which are highly engaged in GVCs (e.g. Altomonte et al., 2012), whilst non-equity led trade involves more contractual partners and arm’s length external suppliers (Taglioni and Winkler 2014).

MNEs have a critical role in the global economy: together they account for one third of global output and world GDP, as well as being responsible for half of global exports (OECD, 2018). Indeed, the growing fragmentation of production seen within GVCs in the past decades has been driven by MNEs (OECD, 2018); they have also been behind the internationalisation of technology and of knowledge creation and diffusion processes (e.g. Cantwell, 1995; Pearce, 1999; Cantwell and Iammarino, 2003; Baldwin, 2016). Importantly, the relentless growth of the role of MNEs in the world economy has been increasingly nourished by small and medium-sized firms (SMEs), either born-global, or growing into MNEs. Estimates of their numbers are very sporadic, indicating a growth from around 3,000 in 1990, to 63,000 in 2000, to more than 100,000 MNEs, with close to 1 million affiliates, in 2012 (Javidan and Bowen, 2013; UNCTAD, 2014), reflecting the expansion in global output and trade. A crucial factor behind this growth has been the widening geography of world international investors, experiencing a steady rise in the number of MNEs originating from developing and, especially, emerging economies (Goldstein, 2007; UNCTAD, 2015, 2017). It has also been pointed out that the majority of MNEs’ cross-border flows and networks span neighbouring economies, rather than being genuinely global. This global regionalism is characterised by the slicing up and recombination of GVCs in which establishments and groups of activities are ‘unbundled’ (Baldwin, 2011) primarily across groups of neighbouring economic systems (e.g. Rugman, 2005; Guy, 2009; UNCTAD, 2017).

Thus, the growing fragmentation and modularisation of MNE operations have altered investment decisions and governance modes which, along with GVCs, have evolved over time (e.g. Dunning and Lundan, 2008). Considering the motivations behind FDI in the light of their interdependence with GVCs suggests that MNE location choices can also be influenced by two key elements: the value chain segment and the governance modality utilised by the MNE when operating abroad (Giroud and Mirza, 2015). With respect to the first, the link between FDI and GVCs may be particularly evident for efficiency seeking reasons. In fact, MNEs investing to rationalise and restructure previous investments, either resource- or market-led, may be on the one hand seeking cost efficiency, taking advantage of international differences in factor costs and endowments among locations typically at different stages of economic development. Alternatively, MNEs can pursue scale and scope economies, looking for rationalisation across different institutional settings, market and industrial structures, and policies, among locations with fairly similar levels of economic development (Iammarino and McCann, 2013). Since different functions are targeted by MNEs’ investments, different levels of local embeddedness are required (Dimitratos et al., 2009; Jordaan, 2009; Rugman et al., 2011) and MNE locational preferences differ

depending of the value chain stage of each new investment (Crescenzi et al., 2014). In other words, the relationship between FDI and the host (national and regional) economies is largely shaped by GVCs. With respect to the governance modes, the once stable relationship between ownership and control has been disturbed both along the value chain and within the corporation (Ietto-Gillies, 2005). In fact, in outsourcing and offshoring strategies, ownership changes but control of the value chain activities is largely retained through various means of pressure on the suppliers and their competitive bidding (e.g. narrow transfers of technology, strict product specifications, tight supplying schedules, etc.) (UNCTAD, 2013). Conversely, in vertical integration strategies ownership is not altered, but the distribution of control within the MNE can vary greatly, with different degrees of autonomy of the affiliates and subsidiaries that can lead to intra-firm competition and even to various degree of restraint in the powers of the central headquarters of the MNE (e.g. Birkinshaw and Hood, 1998, 2000; Birkinshaw et al., 2005).

Therefore, in the current phase of economic globalisation, geography is increasingly important for firm strategic decisions, and in turn firm networks are progressively more important for the interdependence across different places. The profound transformation of organisation and control of internal (i.e. intra-firm) and external (inter-firm) value chains have led to increasingly differentiated geographies across all parts of the world, shaping competitive advantages and affecting spatial inequality across and within national states (Iammarino and McCann, 2015).

Section 2.2 An Analytical and Policy Framework

Technological change – currently in the midst of a shift from the mature ICT revolution to a new, still undefined, technological paradigm based on automation and data exchange – coupled with the intensification of GVCs have spurred the need to place national and regional economic development and innovation policy in an open and interdependent framework.

With growing division of labour within GVC different segments of the production process tend to be associated with increasingly diverse shares of value added, skills and employment. This segmentation has relevant – and largely under-explored – sectoral and geographical implications. The more the chain leading to a final product is divided into separate steps, the more manufacturing activities can be separated from associated services and other support activities. In this process knowledge-intensive services can attract more of the total value added at the expenses of other routinely stages of the production process that can be delocalised towards cheaper locations or automated. In terms of geography, higher quality and creative jobs will tend to concentrate in ‘core regions’ where they can benefit from agglomeration economies, while highly automatized manufacturing will be located in low-cost peripheral locations capturing smaller parts of the value added over time.

From the various strands of literature that have engaged with GVCs and FDI, and more generally internationalisation processes, trade in GVCs and FDI are complementary phenomena that need be taken simultaneously into account when trying to capture the geographical and functional dimension of global connectivity. The latter, however, has been largely considered at the national level, and still fails to be recognized as an essential engine of development in the case of subnational regions (on FDI: Gambardella et al., 2009; Iammarino and MCann, 2013; Crescenzi and Iammarino, 2017; Iammarino, 2018; on GVCs: Crescenzi et al., 2014; Crescenzi et al. 2018). This is a relevant gap in both research and policy domains. In MNE and GVC research, centre stage as key drivers of the global economic integration is taken by factors such as industry structure – especially in terms of sectoral composition, degree of specialisation and diversification, technological-intensity – innovation capacity, and institutional settings. However, as long-term established research in economic geography has pointed out, structural and institutional factors are especially relevant at the subnational level, and economic and innovative activities tend to cluster and agglomerate differently in different areas and subnational regions within national boundaries. Regional structural socio-economic features as well as (formal and informal) institutional conditions and quality of government are highly heterogeneous across as well as within countries (Charron and Lapuente 2013). And these institutional conditions play a key role in shaping regional economic trajectories due to their impact on the behaviour and performance of local actors (Cortinovis et al. 2017; Rodriguez-Pose and Ketterer 2019) as well as on the patterns of global connectivity of countries and regions (Ascani et al. 2016).

Regional comparative advantages (or disadvantages) have long be attributed to 'untraded interdependencies', formal and informal flows of knowledge, interactive learning and network intensity, which generate the bulk of territorial externalities (e.g. Saxenian, 1994; Storper, 1995, 1998). However, the existence of spatially localised interdependencies and relations does not necessarily imply that innovation depends principally on them: knowledge circulation within regions is complementary to that occurring across regions, and to the linkages between local and non-local actors (Wolfe and Gertler, 2004). Being able to build new competences and capabilities involves the ability to form links at all levels, from the 'global' to the 'local' (Bathelt et al., 2004). Such linkages can be established through many different channels, in particular trade flows and inward and outward FDI within GVCs.

The extent to which regions attract external production resources and transfer new products and ideas outwards – spurring their global connectivity – depends first and foremost upon their extant absorptive capacity and knowledge base (e.g. Simmie, 2003; Morgan, 2004). On the other hand, the long-term processes of specialisation and diversification able to reconfigure regional competitive advantages over time adapting them to technological change, are shaped by the region participation in the global division of labour. This endogenous relationship can provide new knowledge links and opportunities to shape and re-orient the regional industrial base and economic functionality, increasing competitiveness and employment (Cortinovis et al. 2020). In addition, it has been suggested that European regions showing a balanced connectivity in terms of inward and outward FDI – possibly managing in a more effective way the integration between intra- and extra-region networks – are also those more resilient to shocks both in terms of GDP and unemployment (Crescenzi and Iammarino, 2017).

Global connectivity plays a key role in shaping structural change and long-term economic performance at the local level. At the same time, the corresponding transformations in the worldwide division of labour have exacerbated the uneven spatial distribution of wealth and rising within-country inequality in wealth and economic opportunities. As a result, the analysis of global connectivity and its consequences needs to be re-framed from the nation-state level, traditionally conceived in theory and policy, to a more fine-grained subnational geography consisting of regions, cities, and industrial clusters, thus embedding inter- and intra-regional scales of analysis. A multi-scalar geographical approach to the analysis of global connectivity and value creation makes it possible to unveil the inequality of its effects on growth and economic development, which change absolute and relative advantages of territories.

The framework here presented aims to provide an overview on the interdependencies and critical aspects related to GVCs, FDI, and more broadly internationalisation processes in economic and innovation activities to uncover economic development and innovation opportunities and challenges, at different geographical levels. The framework, based on different streams of academic literature summarised above, is used as an analytical lens to look at the integration in GVCs and consider its potential effects.

Figure 1 offers a visual summary of the key concepts that will be operationalised in the following sections of this Report.

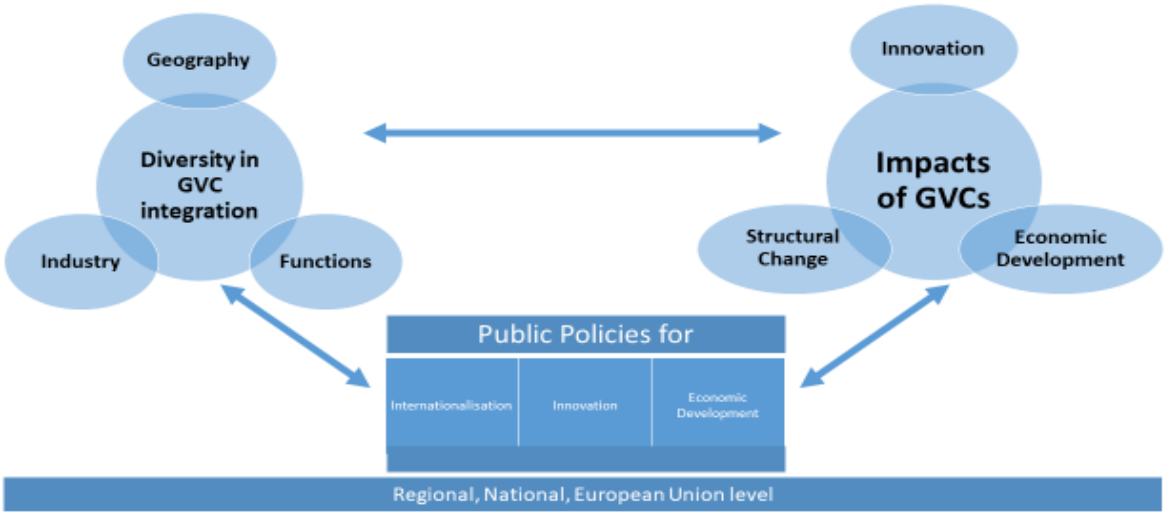
Regions show a large diversity of GVC configurations, participation and embeddedness (Crescenzi et al., 2018). This heterogeneity can be captured by combining three key dimensions of connectivity, as mentioned above: geography, industry and function (left-hand side of the diagram in Fig.1). Geography makes reference to the geographical nature and scope of GVC connectivity (e.g. from domestic value chains to those that span neighbouring countries; from intra-EU value chains to truly global linkages). Industry makes reference to the industry in which a particular value chain is embedded, with associated technological, organisational and institutional characteristics, ultimately affecting value creation and retention (e.g. mobile telecom industry as in Thun and Sturgeon, 2017 vs. wine industry as in Dallas et al., 2019). Function makes reference to the specific business function pursued by each GVC 'node'/actor active in the regional eco-system, capturing the value chain stage of local nodes of global GVC networks and their potential for (local) upgrading (e.g. MNE production activities vs. MNE R&D and innovation facilities as discussed in Crescenzi et al., 2014).

The diversity in national and regional GVC configurations, degrees of embeddedness and integration, and potential for upgrading generates heterogeneous local impacts in terms of innovation, structural change and economic development (right-hand side section of the diagram in Fig.1). In other words, when regions have the capacity to attract and embed specific nodes of global GVC networks, and if the right local conditions are in place, GVCs might trigger local spillovers, learning and upgrading i.e. the ultimate targets of GVC-sensitive regional policies. However, in order to inform regional policies, we need to conceptualise and assess not only GVC configurations (the first part of our framework) but also a) how and under what conditions they translated into desirable regional outcomes (i.e. Innovation,

structural change and wider economic development) and b) what (if any) the potential trade-offs are between policy outcomes and objectives.

This leads to the third pillar of our framework: EU-level, national and regional policies for internationalisation, innovation and economic development need to be considered as part and parcel of the same policy portfolio and duly coordinated at the design, implementation and evaluation stages. These three policy areas simultaneously impact GVC configurations and the nature of local impacts.

Figure 1. Analytical and Policy Framework



This Report offers a descriptive exploration of the association between national and (to a more limited extent due to data limitations) regional typologies of GVC integration and outcomes. The analysis aims to offer new insights for public policies targeting (ideally in a coordinated fashion) internationalisation, innovation and economic development at the regional, national and EU level.

The schematic policy framework outlined above necessarily overlooks part of the complexity of the literature on GVCs and their economic development impacts. In addition, the operationalisation of this framework for practical policy purposes is constrained by significant data limitations in capturing the heterogeneity of GVC integration, both at national and, even more, at the subnational levels. An additional layer of complexity emerges when moving from the analytical to the normative level: specific public policy 'that works' needs to be associated with the key components of the framework where EU policies aim to leverage GVC for (regional) economic development.

Section 3. Key stylised facts on GVC trends: the national dimension

Section 3.1 Backward and Forward Linkages

Studying GVCs implies first of all to consider to what extent countries are involved in vertically fragmented production processes. One way to measure this participation – and, indeed, the most used indicator in the literature – is to calculate the country's vertical specialisation share, measured by the import content of the country's exports. More specifically, the indicator measures the value of imported intermediate inputs in the overall national exports, with the remainder being the domestic content of exports, or what is produced domestically for sales abroad. However, this vertical specialisation share only accounts for the overall importance of foreign suppliers backward in the value chain. As a country also participates in GVCs by being itself a supplier of inputs used in foreign countries' exports (moving forward along the value chain), we need to take into account also the share of exported goods and services of that country used as intermediate inputs in other countries' exports (Hummels et al., 2001). The combination of these two shares allows to provide a first description of the participation of an economy in GVCs, both as a user of foreign inputs (upstream links, i.e. backward participation) and as a producer of intermediate goods and services used in other countries' exports (downstream links, i.e. forward participation). In this context, the present Report applies a methodology developed by Koopman, Powers, Wang and Wei (2011) and described in Aslam, Novta, and Rodrigues-Bastos (2017) – and extensively used also by international organisations such as the IMF, the WTO and the OECD – to decompose gross exports to value-added components based on the location of value-added creation and its purpose.

Box 1 – Measuring GVC integration

There is a recent body of literature which aims at better understanding the fragmentation of production and trade in the context of global value chains (GVCs) by allocating value added to the countries where it is created. This exercise is important for two main reasons. First, to accurately measure and assess countries' participation in GVCs. Conventional gross trade statistics tally the gross value of goods at each border crossing, rather than the net value added between border crossings. This results in the so called "double-counting", meaning that conventional trade statistics overstate the country's domestic contribution to its exports. Second, multi-country production networks imply that intermediate goods can travel to their final destination by third countries, distorting bilateral trade flows. The potential implications of both these aspects are clearly significant.

A series of recent papers have thus introduced accounting frameworks for decomposing gross exports relying on inter-country input-output tables. The first paper to propose a full decomposition of a country's gross exports into domestic value added, foreign value added (i.e. the contribution of foreign countries) and double-counted terms is Koopman et al. (2014) (KWW). However, this decomposition received criticisms for lacking intuition and being imprecise in measuring the foreign components. To solve for this issue, Miroudot and Ye (2020) and Borin and Mancini (2019) introduced two decompositions to precisely measure these components.

In addition, Los et al. (2016, 2020) proposed an alternative unified framework for measuring how much domestic value added is included in a country's exports. Their so-called "hypothetical extraction" derives the domestic value added by comparing two scenarios: the actual country's GDP and the country's GDP after setting international trade to zero (i.e. by extracting the trade flows). The difference between these two components will thus result in the domestic value added in a country's exports. While this methodology is more intuitive than KWW, one important limitation of Los et al. (2016, 2020) is that it does not allow to decompose a country's gross exports into the foreign value added and double-counted components.

In general, bilateral exporter-importer relations and the sectoral dimensions of trade flows are overlooked in these works. Instead, when studying the implications of GVCs for policy purposes, it is important to consider the position of a country (or sector) within the production chain and to identify its direct upstream and downstream trade partners. Borin and Mancini (2017) thus developed a decomposition of bilateral exports that is largely consistent with the KWW approach and can be extended to consider the sectoral dimension.

To summarise, this active body of literature has not yet agreed on what the best method is for decomposing bilateral trade flows and for measuring countries' participation in GVCs. Instead, it seems that there is no unique correct methodology to address all possible empirical questions and different questions call for distinct approaches. This is also reflected in the OECD's TiVA indicators which are based on different methodologies. In particular, there are two main groups of indicators. A first one takes the perspective of the country where the value added originates (e.g. "foreign value added content of gross exports"), a second one that of the country that ultimately absorbs it in its final demand (e.g. "domestic value added embodied in foreign final demand). While having two perspectives allows to choose the most appropriate approach to the purpose of the analysis, the use of different accounting frameworks is not clearly explained in the OECD's manual. As a result, it becomes difficult to fully understand the nuances of each indicator available in the TiVA database and most importantly to tailor the analysis to the researchers' needs. Finally, the TiVA database is not enough for addressing all potential research questions faced by researchers, especially in measuring bilateral and sectoral trends between countries.

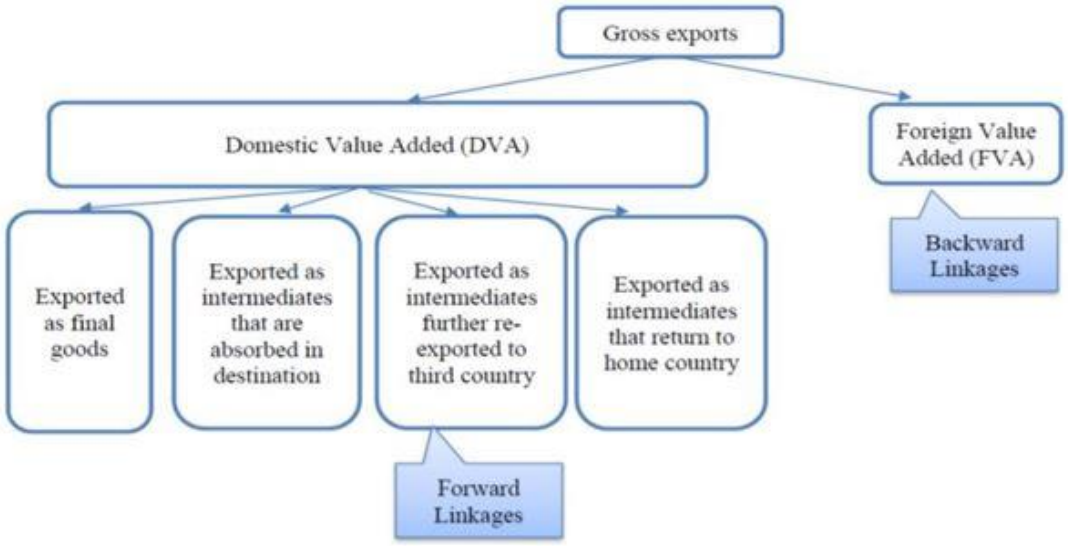
As illustrated in Figure 2, gross exports are decomposed into two broad components: the foreign value added (FVA) embedded in the gross exports of a country (backward linkages) and the domestic value added (DVA) in the exports of that country. The latter part is further decomposed into exports of final goods, exports of intermediate inputs that are absorbed in the destination country, and those that are used as intermediate inputs for exports to third countries (forward linkages) or re-exported to the home economy.

Given this decomposition, the Report focuses on two measures of GVC participation: (a) Backward Linkages: share of foreign value-added in the total exports of a country; and (b) Forward Linkages: domestic value-added embodied in exports of intermediates that are further re-exported to third countries, expressed as a ratio of gross exports. As shown by Figure 2 and explained above, forward linkages are only a subset of the domestic value added in gross exports, and they take into consideration only intermediate goods and services that are re-exported from the destination countries to other economies. Thus, one important caveat to mention is that the two indicators are not symmetric measures. Backward linkages account for all foreign value added (i.e. imported intermediates) embodied in the gross exports of in the country under observation, irrespective of whether these gross exports directly meet the final demand in the recipient countries or "continue their journey" from the first export destination to subsequent destinations. Conversely, the forward linkages measure only considers

domestic value added in the exports of the observed country that is incorporated as intermediate inputs in the rest of the world's gross exports – disregarding flows that directly feed into final demand.

This section of the Report aims to describe and classify backward and forward linkages in the EU28 countries.

Figure 2. Decomposition of Gross Exports into Value added Exports



Source: Figure from Raei et al. (2019).

The analysis uses the OECD-WTO Trade in Value Added (TiVA) database, launched in 2013, which includes a number of indicators that can help capture at least in part the extent of GVA participation on the basis of how and where value is created and sourced. The TiVA indicators are based on inter-country input-output tables constructed by the OECD by combining national input-output matrices and international trade in goods and services statistics, benchmarked to national accounts figures.[1] The indicators cover, for the period 2005-2015, 64 economies (i.e. all OECD, European Union and G20, countries as well as most of East and Southeast Asia) and a selection of macro-regions, and 36 industries and related aggregates (i.e. manufacturing and service sectors).

In line with the decomposition described above, Figure 3 shows the position of the EU28 countries in terms of backward and forward linkages in 2015 for all industries[2], with the blue lines identifying the

[1] The indicators reported in the TiVA database are estimates. The OECD Inter-Country Input-Output (ICIO) Tables, from which the TiVA indicators are derived, attempt to eliminate inconsistencies within and between official national statistics, and balance bilateral trade asymmetries to achieve a coherent picture of global production, trade and consumption of goods and services. This implies that the bilateral trade positions presented in TiVA and those published by national statistics institutions may differ.

[2] In the *Appendix* we also include the scatterplots for manufacturing and service sectors separately (Figure A.1 and Figure A.2). However, given the dominant role played by GVCs in manufacturing, at least until recently, the picture for the manufacturing sector is almost overlapping with that for all industries.

EU28 average for each variable and the dashed lines the standard deviation of the sample from the EU average[3]. Looking at the relative position of each country with respect to the average, it is possible to identify four broad groups of economies:

1) **High GVC Integration:** Higher Backward – Higher Forward **(H-H)** Linkages

2) **Low GVC Integration:** Lower Backward – Lower Forward **(L-L)** Linkages

3) **Backward GVC Integration:** Higher Backward – Lower Forward **(H-L)** Linkages

4) **Forward GVC Integration:** Lower Backward – Higher Forward (**L-H)** Linkages

In 2015 only three countries – Belgium, Czechia and Slovenia – are included in the group ***high GVC integration***, with both forward and backward linkages' values above the EU average. Conversely, Southern European economies – Croatia, Cyprus, Greece, Italy, Portugal, and Spain – together with Latvia are in the ***low GVC integration*** group, with relatively weaker backward and forward linkages. The group ***backward GVC integration*** shows simultaneously relatively high foreign value added in domestic exports and low domestic contribution to other countries exports of intermediates. This group includes a number of Eastern EU economies – Bulgaria, Estonia, Hungary, Lithuania, and Slovakia – together with Denmark and Ireland, and the two outliers Luxembourg and Malta.[4] The last group, ***forward GVC integration,*** consists of mostly large economies in Northern and Central Europe – Austria, Finland, France, Germany, Netherlands, Poland, Sweden, and United Kingdom – as well as Romania.

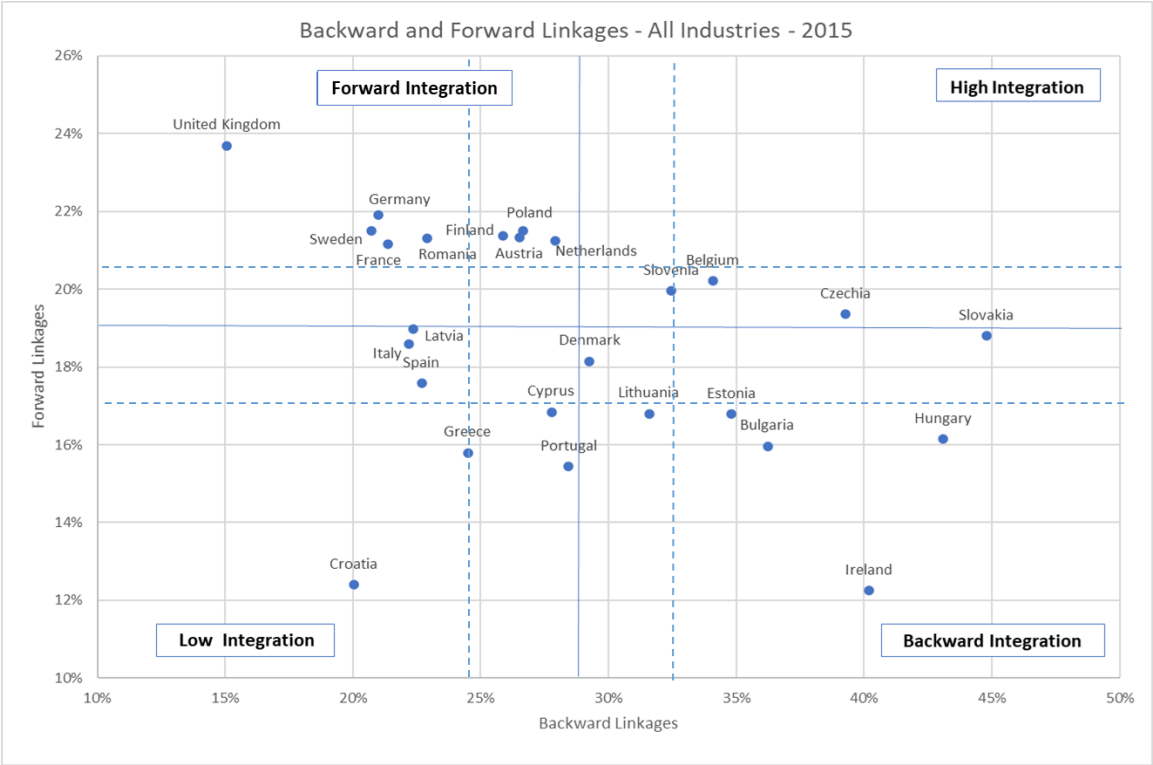
As discussed in Section 2, a number of factors should be taken into account when considering this simple and broad country classification. Among them, economic size and industry structure, in terms of both sectoral composition, diversification and technological intensity, are highly relevant. As the ***forward GVC integration group*** clearly indicates***,*** larger countries on average tend to display lower backward linkages (as they can source more domestically) and higher forward linkages (as they can contribute more to other countries exports). Exceptions here are Italy and Spain, included in the ***low GVC integration*** category, possibly due to their weaker specialisation in technologically advanced products compared to other economies with similar domestic market size. The picture is rather blurred for smaller economies. Some tend to have higher backward linkages and lower forward linkages – as the Eastern EU members in the ***backward GVC integration*** group, which are likely to be influenced by the extended presence of EU15 MNEs located there and their intra-firm trade. Others show GVC high or low integration on both the upstream and downstream sides. On the other hand, in the latter group displaying ***low GVC***

[3] One standard deviation from the EU average has been included for both backward and forward linkages in Figure 3 and Figure 4. This can provide an additional layer of information and help to identify the relative position of each country in terms of backward and forward linkages. At the same time, it shows how the groups have somewhat discretionary boundaries. The EU average is a reference point around which we can identify an area of interest.

[4] Luxembourg and Malta are outliers in the analysis of forward and backward linkages as the share of foreign value added in their exports is by far larger than the rest of EU28 (59% and 69% respectively), at the same time being the lowest contributors to the value added of other countries' exports (7% and 17%). For reasons of presentation they are excluded from the figures here.

integration, most economies, large and small, are strongly specialised in services such as tourism, which imply less GVC integration.

Figure 3. Backward and Forward Linkages - All Industries, 2015

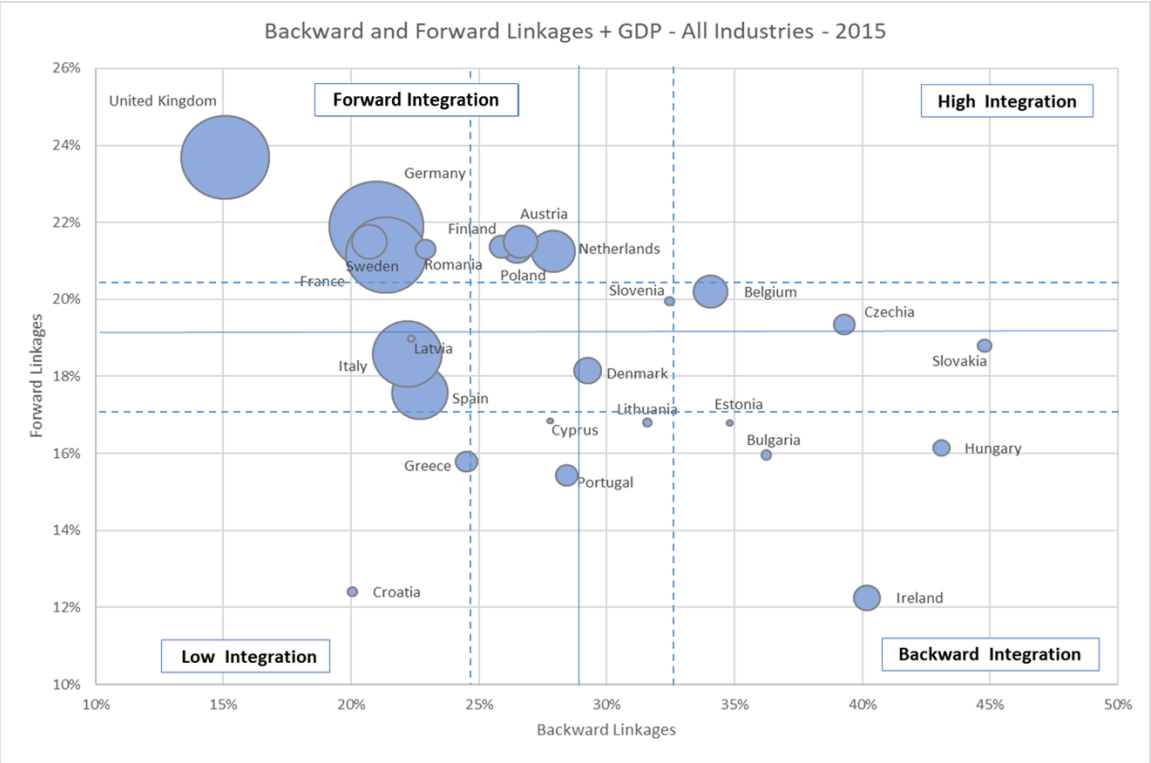


Note: Malta and Luxembourg are outliers and excluded from the chart and the EU average values (blue lines). The dashed blue lines identify the standard deviations from the EU average for backward and forward linkages.

In order to complete the previous picture based solely on backward and forward linkages, Figure 4 takes into account the size of each national economy proxied by its gross domestic product (GDP). The figure confirms that national market size plays a crucial role in shaping the nature of the linkages. Larger economies – such as France, Germany and the United Kingdom – have stronger forward linkages and weaker backward linkages, although this is not the case of Italy and Spain, fourth and fifth in the ranking of GDP in Europe. Conversely, on average smaller economies show higher backward linkages and lower forward linkages. However, even if the size of the economy plays an important role in defining the participation in GVC, other elements need be taken into consideration[5]. Similarly sized economies – such as Ireland and Belgium – can occupy very different positions in this space. As further discussed in Section 4 below – looking at the industry dimension of GVCs – any country-specific analysis needs to contrast backward and forward linkages against the features of industry structures in national economies in order to achieve a more meaningful picture of the extent of GVC integration.

[5] As reported the country size plays a major role in defining the shares of value added. Smaller countries are characterized by lower shares of domestic value added. At the same time the export structure also has an effect, with higher domestic value added shares in primary good (compared to secondary goods) and low-tech sectors (than high-tech industries).

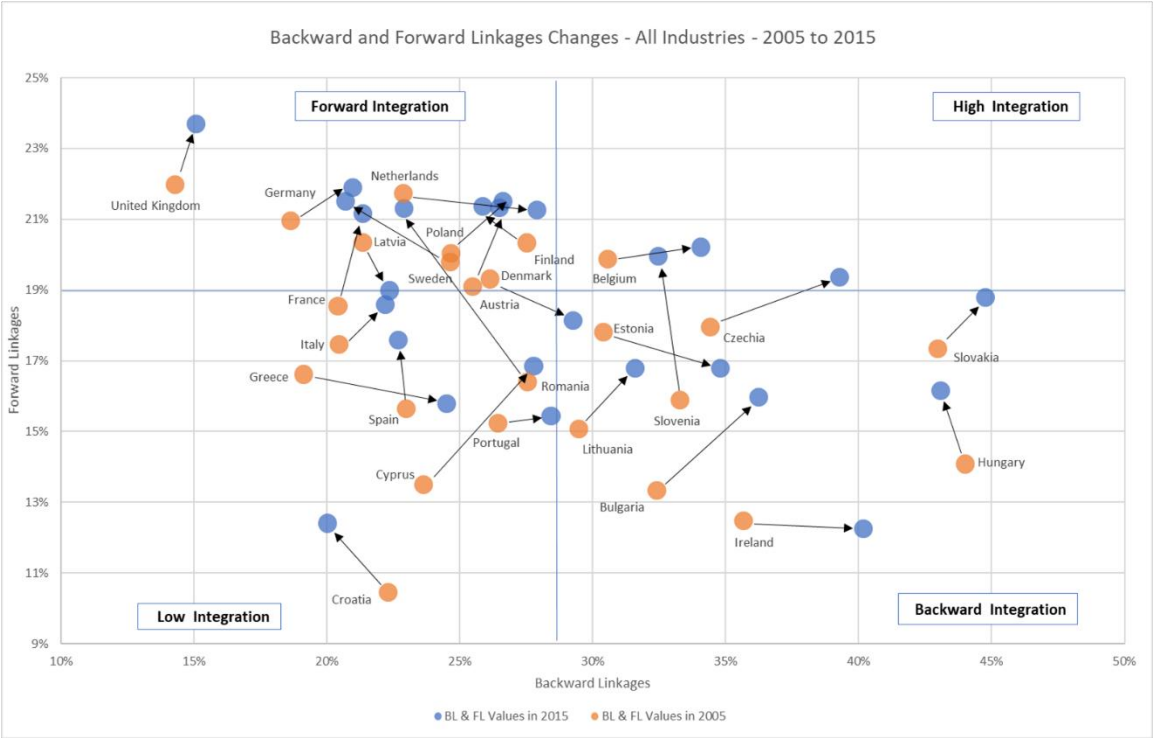
Figure 4. Backward and Forward Linkages + GDP – All Industries, 2015



Note: Malta and Luxembourg are outliers and, therefore, excluded from the chart and the EU average values (blue lines). The size of the dots is proportional to each country's GDP in 2015 – data from Eurostat, GDP at current prices. The dashed blue lines identify the standard deviations from the EU average for backward and forward linkages.

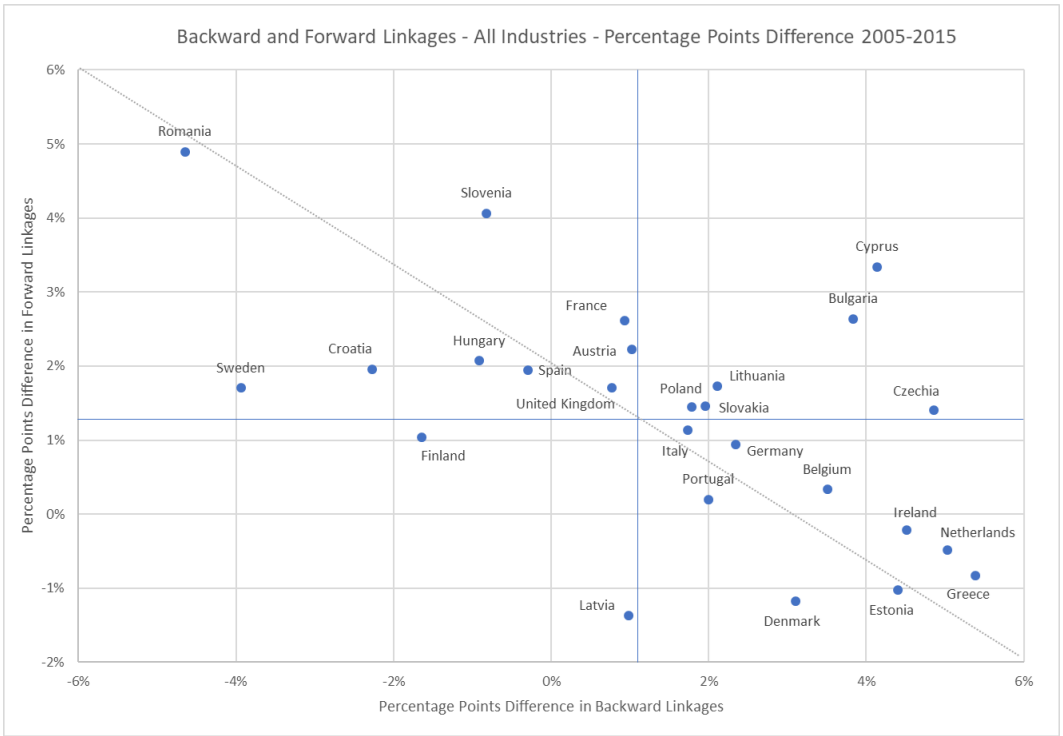
The figures below show the change, identified by the different dots' colours (Figure 5) and expressed in percentage points difference (Figure 6), in backward and forward linkages between 2005 and 2015 for European countries. The countries recording an increase in both backward and forward linkages are mostly Eastern European in the ***backward GVC integration*** group: Bulgaria, Lithuania and Slovakia experienced a fairly balanced growth in GVCs participation, with changes in both backward and forward linkages all above the average. The same dynamic is shown by some of the largest economies in the group ***forward GVC integration*** – such as France, Germany, Poland and the United Kingdom – where both backward and forward linkages have grown over time. Yet, change patterns are not homogenous for the categories identified above: Romania for example, together with Slovenia in the group of ***high GVC integration***, saw the largest growth in forward linkages with respect to the average, recording at the same time a substantial decrease in backward shares; some of the Southern European countries in the ***low GVC integration*** group – Italy, Portugal, and Greece – were characterized by an increase in backward linkages, similarly to the Netherlands, Estonia, Denmark and Ireland. Once again, in order to make sense of changes in GVC integration, it would be necessary to compare them with the processes of specialisation and diversification occurred over the period considered, also characterised by the huge shock of the economic and financial crisis.

Figure 5. Backward and Forward Linkages – All Industries – Changes 2005 to 2015



Note: Malta and Luxembourg are outliers and excluded from the chart and the EU average values (blue lines).
The orange dots show the values in 2005, the blue dots in 2015; arrow highlights the direction of change between the two periods.

Figure 6. Backward and Forward Linkages – All Industries, Percentage Points Difference 2005-2015



Note: Malta and Luxembourg are outliers and excluded from the chart and the EU average values (blue lines).

Table 1 provides more detailed geographical information about backward and forward linkages for the EU28 in 2015, and the change between 2005 and 2015.[6] On the backward linkages side, for each country, the table shows the foreign value added component of gross export coming from the Rest of the World (total), and then disaggregated into other EU28 and rest of the World.[7] Similarly, for forward linkages Table 1 shows for each country the domestic value added embodied in gross exports of the Rest of the World (total) and the split between other EU28 countries and rest of the World. On average, the share of foreign value added in gross exports is rather balanced between value added coming from other EU28 (17%) and from the rest of the World (14%), while the EU28 has on average a larger share of its value added in exports of other EU countries (12%) compared to the rest of the World (6%). Interestingly, the ***high GVC integration*** group has the largest relative share of foreign value added in their exports coming from other EU28 (more than 60%), at the same time showing the largest share of their value added into other European countries' exports (77.5%). On the contrary, the economies in the ***low GVC integration*** category are more dependent on foreign value added from the rest of the World (almost 50%) and contribute more to the value added of the rest of the World's exports (64%), compared to the other GVC groups. The ***backward GVC integration*** economies tend to receive more foreign value added from Europe, and those in the ***forward GVC integration*** group provide relatively more value added to the exports of other European economies.

As shown in Tables 2 and 3, within the EU28 both EU15 and EU13 countries tend to have larger shares of their domestic value added in EU15 countries' exports. Among the EU15 countries, Belgium and the United Kingdom show the highest shares of domestic value added in EU15 countries' exports (13% and 14%); while Austria and Germany contribute the most to EU13 countries' exports (4% and 3% respectively), at the same time recording the highest values of foreign value added in exports from EU13 (3% and 2%), possibly due to the large presence of their MNEs in central and eastern Europe. Excluding Luxembourg (an outlier, with 37%), the highest shares of backward linkages from other EU15 countries are in Belgium (18%), Denmark (14%), Ireland (18%), and Portugal (16%). Looking at EU13 countries, Poland and Romania (***forward GVC integration group***) as well as Czechia and Slovenia (***high GVC integration***) appear to be well integrated with EU15 countries in both forward and backward linkages.

Table 4 and 5 add information about backward and forward linkages in 2015 distinguishing between Euro and Non-Euro countries[8]. Independently on their currencies, all countries tend to have a larger share of forward and backward linkages to and from the Euro adopters, which however have grown in number over time, representing the majority.

[6] It is impossible to distinguish between manufacturing and services when selecting a partner country different from World on TiVa Indicators. The changes are expressed as percentage points difference between values in 2005 and 2015.

[7] The TiVa indicators database provides data for foreign value added from the World and the EU28 for all individual countries as well as for aggregations (EU15 and EU13). However, the database does not provide information about foreign value added from the Rest of World: this was calculated as the difference between foreign value added from the World and the EU28.

[8] TiVA indicators provide information about backward and forward linkages from/in EU28 and Euro countries. Backward and forward linkages from/in the Non-Euro area was calculated as the difference between EU28 and Euro area values.

Table 1. Backward & Forward Linkages – All Industries – EU28

		Backward Linkages - ALL INDUSTRIES - EU28						Forward Linkages - ALL INDUSTRIES - EU28					
		FOREIGN VA in EXPORTS FROM WORLD		FOREIGN VA in EXPORTS FROM OTHER EU28		FOREIGN VA in EXPORTS FROM RoW		DOMESTIC VA in WORLD EXPORTS		DOMESTIC VA in OTHER EU28 EXPORTS		DOMESTIC VA in RoW EXPORTS	
Classification	***COUNTRIES***	2015	Diff 2015-2005	2015	Diff 2015-2005	2015	Diff 2015-2005	2015	Diff 2015-2005	2015	Diff 2015-2005	2015	Diff 2015-2005
Backward Integration	**Bulgaria**	36%	4%	17%	6%	19%	-2%	16%	3%	11%	3%	5%	0%
Backward Integration	**Denmark**	29%	3%	15%	0%	14%	3%	18%	-1%	11%	-1%	8%	0%
Backward Integration	**Estonia**	35%	4%	20%	3%	15%	2%	17%	-1%	11%	-1%	5%	0%
Backward Integration	**Hungary**	43%	-1%	28%	2%	15%	-3%	16%	2%	12%	1%	4%	1%
Backward Integration	**Ireland**	40%	5%	19%	1%	21%	3%	12%	0%	7%	0%	5%	0%
Backward Integration	**Lithuania**	32%	2%	13%	5%	19%	-2%	17%	2%	12%	2%	5%	0%
Backward Integration	**Luxembourg**	69%	11%	38%	1%	31%	9%	11%	-1%	9%	1%	2%	-1%
Backward Integration	**Malta**	59%	8%	36%	6%	23%	3%	7%	-3%	4%	-2%	3%	-2%
Backward Integration	**Slovakia**	45%	2%	25%	0%	19%	1%	19%	1%	16%	1%	3%	0%
Forward Integration	**Austria**	27%	1%	17%	-1%	10%	2%	21%	2%	15%	1%	6%	1%
Forward Integration	**Finland**	26%	-2%	14%	0%	12%	-2%	21%	1%	13%	1%	8%	0%
Forward Integration	**France**	21%	1%	11%	0%	10%	1%	21%	3%	14%	2%	7%	1%
Forward Integration	**Germany**	21%	2%	10%	0%	11%	2%	22%	1%	13%	0%	8%	1%
Forward Integration	**Netherlands**	28%	5%	12%	2%	16%	3%	21%	0%	14%	-1%	7%	0%
Forward Integration	**Poland**	27%	2%	15%	1%	12%	1%	22%	1%	17%	2%	5%	0%
Forward Integration	**Romania**	23%	-5%	15%	0%	8%	-5%	21%	5%	16%	5%	5%	0%
Forward Integration	**Sweden**	21%	-4%	12%	-3%	9%	-1%	21%	2%	14%	1%	8%	0%
Forward Integration	**United Kingdom**	15%	1%	7%	0%	8%	1%	24%	2%	15%	2%	8%	0%
High Integration	**Belgium**	34%	4%	20%	0%	15%	3%	20%	0%	15%	0%	5%	1%
High Integration	**Czechia**	39%	5%	24%	2%	15%	3%	19%	1%	16%	1%	4%	1%
High Integration	**Slovenia**	32%	-1%	20%	-3%	12%	2%	20%	4%	16%	3%	4%	1%
Low Integration	**Croatia**	20%	-2%	13%	-1%	7%	-2%	12%	2%	9%	2%	3%	0%
Low Integration	**Cyprus**	28%	4%	13%	1%	14%	3%	17%	3%	9%	1%	8%	3%
Low Integration	**Greece**	25%	5%	7%	0%	17%	5%	16%	-1%	8%	0%	7%	-1%
Low Integration	**Italy**	22%	2%	11%	0%	12%	2%	19%	1%	11%	0%	7%	1%
Low Integration	**Latvia**	22%	1%	13%	2%	9%	-1%	19%	-1%	13%	-1%	6%	0%
Low Integration	**Portugal**	28%	2%	17%	0%	11%	2%	22%	1%	17%	2%	5%	0%
Low Integration	**Spain**	23%	0%	11%	-1%	12%	1%	18%	2%	12%	1%	6%	1%

Note: The difference 2005 to 2015 is expressed in percentage points. Cell colours: cells with minimum values are red, those with median value are yellow, and those with maximum value are green. All other cells are coloured proportionally.

Table 2. Backward & Forward linkages – All Industries – EU15

		Backward Linkages - ALL INDUSTRIES - EU15		Forward Linkages - ALL INDUSTRIES - EU15	
		FOREIGN VA in EXPORTS FROM EU13	FOREIGN VA in EXPORTS FROM OTHER EU15	DOMESTIC VA in EU13 EXPORTS	DOMESTIC VA in OTHER EU15 EXPORTS
Classification	***COUNTRIES***	2015	2015	2015	2015
Backward Integration	**Denmark**	1%	14%	1%	9%
Backward Integration	**Ireland**	1%	18%	1%	6%
Backward Integration	**Luxembourg**	1%	37%	1%	8%
Forward Integration	**Austria**	3%	13%	4%	11%
Forward Integration	**Finland**	2%	12%	2%	11%
Forward Integration	**France**	1%	10%	2%	12%
Forward Integration	**Germany**	2%	8%	3%	10%
Forward Integration	**Netherlands**	1%	11%	2%	12%
Forward Integration	**Sweden**	1%	10%	2%	12%
Forward Integration	**United Kingdom**	1%	6%	1%	14%
High Integration	**Belgium**	2%	18%	1%	13%
Low Integration	**Greece**	1%	6%	2%	6%
Low Integration	**Italy**	1%	9%	2%	9%
Low Integration	**Portugal**	1%	16%	1%	10%
Low Integration	**Spain**	1%	10%	1%	10%

Note: Cell colours: cells with minimum values are red, those with median value are yellow, and those with maximum value are green. All other cells are coloured proportionally.

Table 3. Backward & Forward linkages – All Industries – EU13

		Backward Linkages - ALL INDUSTRIES - EU13		Forward Linkages - ALL INDUSTRIES - EU13	
		FOREIGN VA in EXPORTS FROM OTHER EU13	FOREIGN VA in EXPORTS FROM EU15	DOMESTIC VA in OTHER EU13 EXPORTS	DOMESTIC VA in EU15 EXPORTS
Classification	***COUNTRIES***	2015	2015	2015	2015
Backward Integration	**Bulgaria**	4%	14%	3%	8%
Backward Integration	**Estonia**	6%	14%	3%	9%
Backward Integration	**Hungary**	6%	22%	3%	9%
Backward Integration	**Lithuania**	4%	8%	4%	8%
Backward Integration	**Malta**	1%	35%	0%	4%
Backward Integration	**Slovakia**	8%	17%	6%	9%
Forward Integration	**Poland**	2%	13%	4%	13%
Forward Integration	**Romania**	3%	12%	4%	12%
High Integration	**Czechia**	5%	19%	5%	11%
High Integration	**Slovenia**	4%	16%	5%	11%
Low Integration	**Croatia**	3%	9%	3%	6%
Low Integration	**Cyprus**	2%	12%	2%	6%
Low Integration	**Latvia**	6%	7%	5%	8%

Note: Cell colours: cells with minimum values are red, those with median value are in yellow, and those with maximum value are in green. All other cells are coloured proportionally.

Table 4. Backward & Forward linkages – All Industries – EURO Countries

		Backward Linkages - ALL INDUSTRIES - EURO		Forward Linkages - ALL INDUSTRIES - EURO	
		FOREIGN VA in EXPORTS FROM OTHER EURO COUNTRIES	FOREIGN VA in EXPORTS FROM NON-EURO COUNTRIES	DOMESTIC VA in OTHER EURO COUNTRIES EXPORTS	DOMESTIC VA in NON-EURO COUNTRIES EXPORTS
Classification	***COUNTRIES***	2015	2015	2015	2015
Backward Integration	**Estonia**	14%	6%	8%	3%
Backward Integration	**Ireland**	11%	8%	5%	2%
Backward Integration	**Lithuania**	8%	5%	8%	4%
Backward Integration	**Luxembourg**	21%	17%	8%	1%
Backward Integration	**Malta**	23%	13%	3%	1%
Backward Integration	**Slovakia**	16%	10%	9%	7%
Forward Integration	**Austria**	13%	4%	11%	4%
Forward Integration	**Finland**	8%	6%	9%	5%
Forward Integration	**France**	8%	3%	11%	3%
Forward Integration	**Germany**	7%	4%	9%	5%
Forward Integration	**Netherlands**	9%	4%	11%	3%
High Integration	**Belgium**	15%	5%	12%	3%
High Integration	**Slovenia**	15%	5%	11%	5%
Low Integration	**Cyprus**	9%	4%	6%	2%
Low Integration	**Greece**	5%	2%	5%	3%
Low Integration	**Italy**	8%	3%	8%	3%
Low Integration	**Latvia**	9%	4%	9%	4%
Low Integration	**Portugal**	15%	2%	9%	2%
Low Integration	**Spain**	9%	3%	9%	2%

Note: Cell colours: cells with minimum values are red, those with median value are yellow, and those with maximum value are green. All other cells are coloured proportionally.

Table 5. Backward & Forward linkages – All Industries – NON-EURO Countries

		Backward Linkages - ALL INDUSTRIES - NON-EURO		Forward Linkages - ALL INDUSTRIES - NON-EURO	
		FOREIGN VA in EXPORTS FROM EURO COUNTRIES	FOREIGN VA in EXPORTS FROM OTHER NON-EURO COUNTRIES	DOMESTIC VA in OTHER EURO COUNTRIES EXPORTS	DOMESTIC VA in OTHER NON-EURO COUNTRIES EXPORTS
Classification	***COUNTRIES***	2015	2015	2015	2015
Backward Integration	**Bulgaria**	13%	5%	8%	3%
Backward Integration	**Denmark**	10%	5%	7%	3%
Backward Integration	**Hungary**	21%	7%	9%	3%
Forward Integration	**Poland**	12%	3%	12%	5%
Forward Integration	**Romania**	11%	4%	12%	4%
Forward Integration	**Sweden**	8%	4%	10%	4%
Forward Integration	**United Kingdom**	6%	1%	14%	2%
High Integration	**Czechia**	19%	6%	12%	3%
Low Integration	**Croatia**	10%	3%	7%	2%

Note: Cell colours: cells with minimum values are red, those with median value are yellow, and those with maximum value are green. All other cells are coloured proportionally.

Section 3.2 Composition of Total Value Added in Final Demand

A complementary perspective on GVC participation can be offered by looking at the composition of Total Value Added in Final Demand. Foreign value added embodied in a country final demand corresponds to the share of value added in final goods and services (purchased by domestic households, government, non-profit organisations and as investment) originating from abroad.

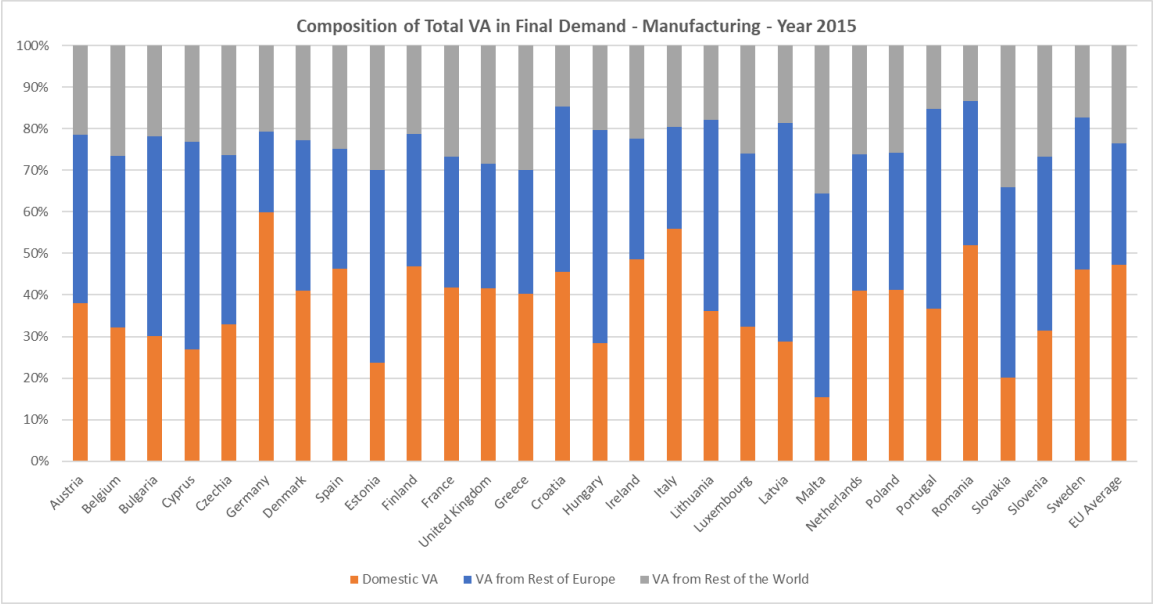
Relaying on TiVA indicators, Figure 7 shows the composition of total value added in final demand for manufacturing industries in 2015 for the EU28 and their average. For any given economy the figure shows the 'decomposition' of value added generated by manufacturing industries[9] into domestic value added (created in the focal country), value added from the rest of Europe (created in other European countries, excluding the focal country) and value added from the rest of the World. The TiVa indicators provide information on the value added generated by all countries in the World and aggregation of countries: thus, value added from the rest of Europe is the difference between domestic value added and value added from the EU28, while value added from the rest of the World is the difference between value from World and value from the EU28. In the data the value added source industry is the same as the industry of final demand. In most European countries more than 70% of value added comes from the combination of domestic and other European sources, confirming the importance of the EU economic integration. Some Eastern European members in the ***backward GVC integration*** group – such as Estonia, Lithuania and Hungary – along with some ***low GVC integration*** countries – such as Croatia, Portugal and Latvia – show the largest share of value added in manufacturing from other European economies (more than 40%). The lowest shares of value added from the rest of the World, between 18% and 13%, are registered in Croatia, Lithuania, Romania and Portugal. Conversely, the largest shares of value added from the rest of the World are found in Slovakia (34%) and Greece (30%); some of the most advanced EU economies such as France and the United Kingdom (in the ***forward GVC***

[9] The macro-sector source of value added is the same as that of the final demand (manufacturing with manufacturing and services with services).

integration group) have also shares from the rest of the World above the average (27% and 28% respectively). As expected, larger economies generate large proportions of value added domestically, as shown by the case of Germany and Italy (domestic value added 60% and 56% respectively).

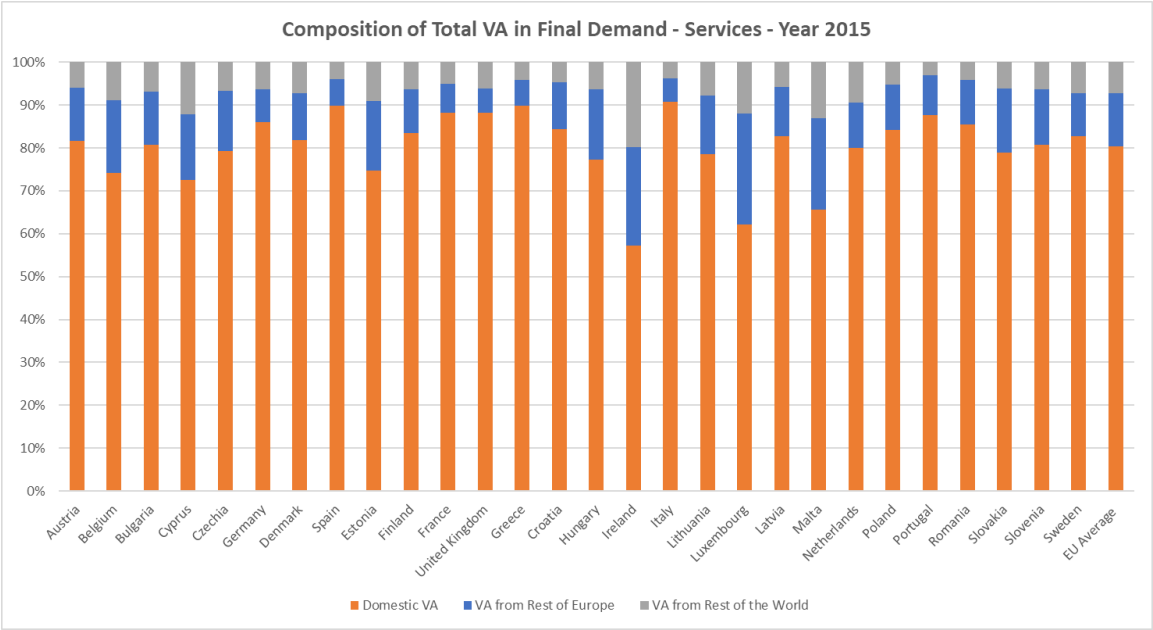
As previously mentioned, services are a less prominent but increasingly vital part of GVCs. The international fragmentation of goods' production in GVCs has been associated with outsourcing of both manufacturing and service tasks. In the United Kingdom, France, Germany and Italy, services contribute for more than half of the total value added embodied in exports (OECD, 2016). However, and not surprisingly, given the relevance of non-tradeable services, when compared to manufacturing, most of the value added in final demand for services is generated domestically (Figure 8). In Europe, on average 80% of total value added in final demand for services is generated internally, with ***low GVC integration*** countries such as Greece, Italy and Spain all above 90%, and the largest European economies in the ***forward GVC integration*** group – Germany, France and the United Kingdom – all above 86%. On the opposite side, Ireland – being a major hub in the service sector, particularly in finance and banking – shows the highest share of value added from rest of the World (20%), followed by other European smaller financial services centres – Cyprus (12%), Luxembourg (12%) and Malta (13%).

Figure 7. Composition Total Value Added in Final Demand, Manufacturing - 2015



Note: the value added source industry is the same as the industry of final demand (Manufacturing, TiVA code D10T33).

Figure 8. Composition Total Value Added in Final Demand, Services - 2015



Note: In the data the value added source industry is the same as the industry of final demand (Services, TiVa code D45T98).

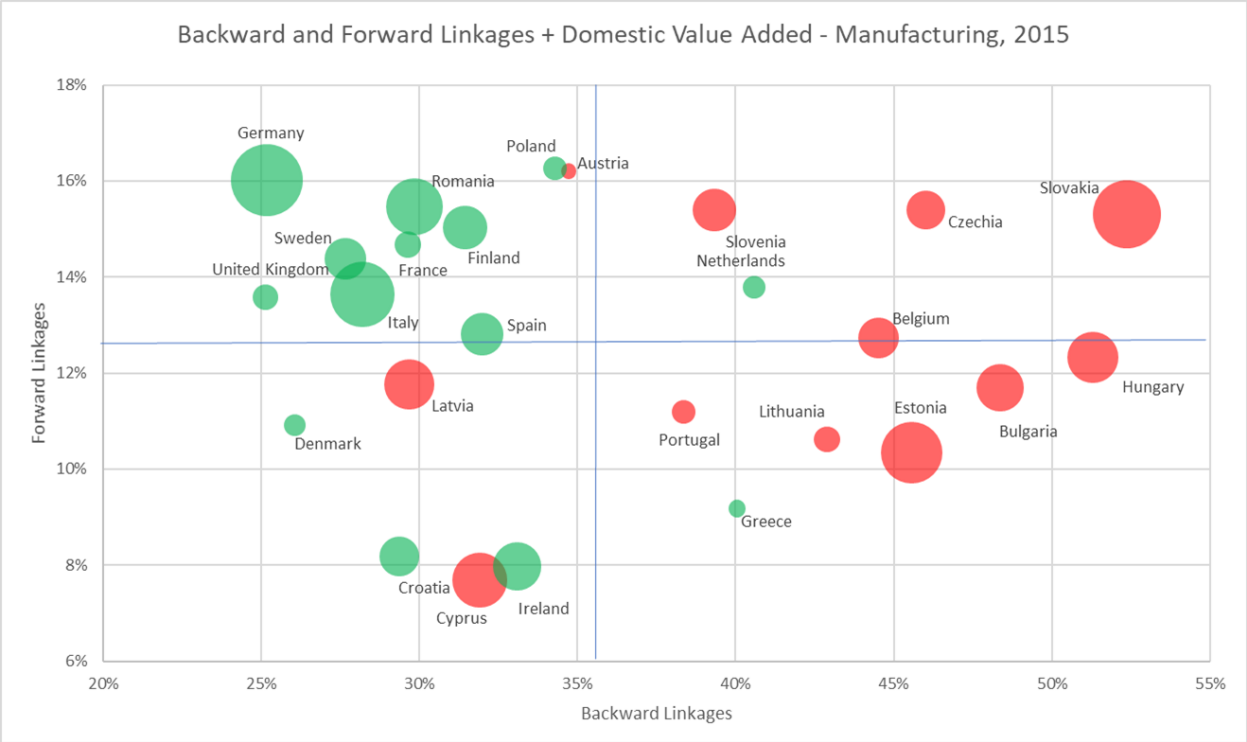
Combining backward and forward linkages with domestic value added in final demand within a country gives a broader picture of the value added generated and redistributed through a given economy. The two axes in Figure 9 report backward and forward linkages, whilst the colour of the dots (red or green) represents the difference (negative or positive) from the EU average in domestic value added in final demand; the size of the dots represents the distance of each country from the EU average. Here we keep our focus exclusively on manufacturing, given the prominence of domestic value added in services in virtually all countries. ***high GVC integration*** countries all show lower shares in domestic value added compared to the EU28 average. Czechia, Slovenia and Belgium, all receive and send high shares of value added internationally and – as expected – all show a lower domestic value added in final (domestic) demand compared to the average[10]. Conversely, economies in the ***forward GVC integration*** group not only are characterized by their ability to provide value added to other countries' exports, but all record figures for domestic value added in final demand higher than the EU28 average (with the exception of Austria). As shown in Figure 8, the EU average in backward linkages provides a clear cutting line in terms of domestic value added: countries with larger backward linkages than the EU average – ***high GVC integration*** and ***forward GVC integration*** groups – have domestic value added below the EU average[11]. In general most of the countries saw a reduction in domestic value added in final demand in manufacturing industries between 2005 and 2015 (not shown in

[10] Similar patterns hold in services industries as reported in Figure A.3 in the *Appendix.*

[11] Exceptions are only Greece and Netherlands. This result is also found in service industries, as shown in the figure in the *Appendix.*

the Figures), with the exception of Greece (2% increase), Ireland (9%), Luxembourg (5%), and Sweden (1%).

Figure 9. Backward and Forward Linkages and Domestic Value Added in Final Demand – Manufacturing, 2015



Note: the colour of the dots (red/green) represents the difference (negative/positive) of domestic value added in final demand from the EU average; the size of the dots illustrates the deviation from the EU average. Malta and Luxembourg are outliers and excluded from the figure and the EU average for backward and forward linkages (blue lines).

Section 3.3 Gross Value Added, Export, and Import of Foreign Affiliates

As highlighted in Section 2, MNE and their affiliates play a crucially important role in the global economy, accounting for about 10% of world GDP in 2014 and creating around USD 7.7 trillion of value added in host countries (Cadestin et al., 2019). Between 2000 and 2014, global gross output of foreign affiliates grew from 7 to 20 trillion USD. This steady growth of offshore production came to a halt during the Great Recession with a sharp contraction in 2009, exactly as global trade and FDI dramatically decreased during the same period. However, MNE affiliates maintained a strong position as drivers of both exports and imports: in 2014 they were responsible for 31% and 28% of global exports and imports respectively. These shares were higher than those of MNE headquarters (24% and 21% respectively), but important differences

exist across countries (Cadestin et al., 2019), due to both the structural features of the economies involved, and MNE organisation and management practices.

In order to capture the interdependencies between trade and MNE investment in GVCs, in 2019 the OECD developed a new dataset on the Activities of MultiNational Enterprises (AMNE). This dataset combines official AMNE statistics with the Inter-Country Input-Output (ICIO) forming the "Analytical AMNE database"[12]. This dataset allows the contribution of domestic firms, MNEs and their foreign affiliates to global trade and production to be assessed. The analytical AMNE database is essentially built on two main sources: (a) World Input-Output Database (WIOD) providing the whole structure of ICIO, and (b) data from MNEs based on the OECD database on Activities of MultiNational Enterprises (AMNEs). Initially, the ICIOs tables helped to better understand GVCs, providing information on trade in value-added terms and the contribution of each country and industry to the value of final product. However, as discussed in Section 2 above, GVCs do not involve only independent companies exporting and importing intermediate and final products: MNEs, who rely on their own network of foreign affiliates, are crucially important players. Information on the role played by foreign affiliates in GVCs was missing: when 'domestic value' was added to exports, it can be both value added by domestic-owned firms, and value added by foreign-owned firms established in the country. To overcome this problem a full matrix of world output by country and by industry, split according to the ownership of firms, was created. The Analytical AMNE allows, for each country-sector observation, to obtain information on the role in trade and value added created by each type of firm.

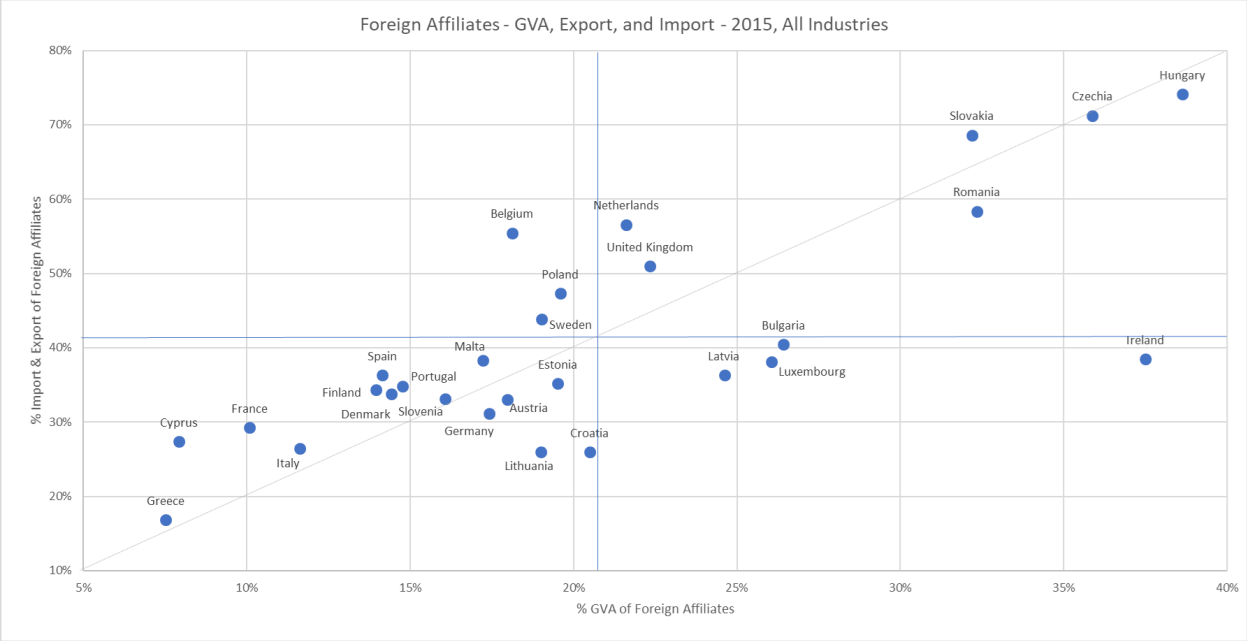
In 2015 foreign affiliates (both European and extra-EU28) in Europe were the major driver of exports (43%), followed by domestic non-MNE firms (39%) and domestic (i.e. nationally-owned) MNEs (18%). While non internationalised domestic firms are still the main importers (around 50%) – as well as the generators of the bulk of gross value added (70%, against the 20% of foreign affiliates in 2015) – the role of MNE affiliates in imports is increasing over time (from 33% in 2005 to 37% in 2015).

Figure 10 shows a positive relationship between the gross value added generated by foreign affiliates and their participation in exports and imports. In other words, European countries where foreign affiliates contribute more to value added creation tend also to experience a more pronounced presence of foreign affiliates in their trade flows. In particular, a group of Eastern European economies – Czechia, Hungary, Romania, and Slovakia – display a strong involvement of foreign MNE affiliates in their economies, creating more than 30% of gross value added and accounting for over 60% of total imports and exports. The same high contributions of MNE affiliates is observed in two of the most internationalised advanced economies in the ***forward GVC integration*** group, the Netherlands and the United Kingdom, whilst most of the other countries in their category show relatively low percentage shares of foreign affiliates in both GVA

[12] https://www.oecd.org/industry/ind/analytical-amne-database.htm, OECD (2019).

and export and import. Conversely, in Cyprus, Greece, Italy and France foreign affiliates play a much smaller role, due to rather differentiated structural factors. Not surprisingly in fact, with the exception of Latvia, the whole ***low GVC integration*** group records foreign affiliates' activities for both GVA and trade below the EU28 average – under 12% of GVA and 30% of imports and exports. More generally, the groups identified in previous sections on the basis of TiVA indicators of backward and forward linkages do not always show consistency when considered in terms of the activities of MNEs. Despite the strong complementarity between trade and FDI, structural differences in the degree of openness, industrial composition and specialisation, agglomeration and urbanisation, regulations and other institutional factors – not least political and economic power concentration – are behind the variety of national patterns in GVC integration with respect to MNE operations and networks. This evidence aligns with the insights of the literature summarised in Section 2 above highlighting how MNEs are only one particular form of governance of GVCs, whilst at the same time GVCs do not capture the whole complexity of internationalisation processes.

Figure 10. Percentage of Foreign Affiliates in Total GVA, Import & Export – All industries, 2015

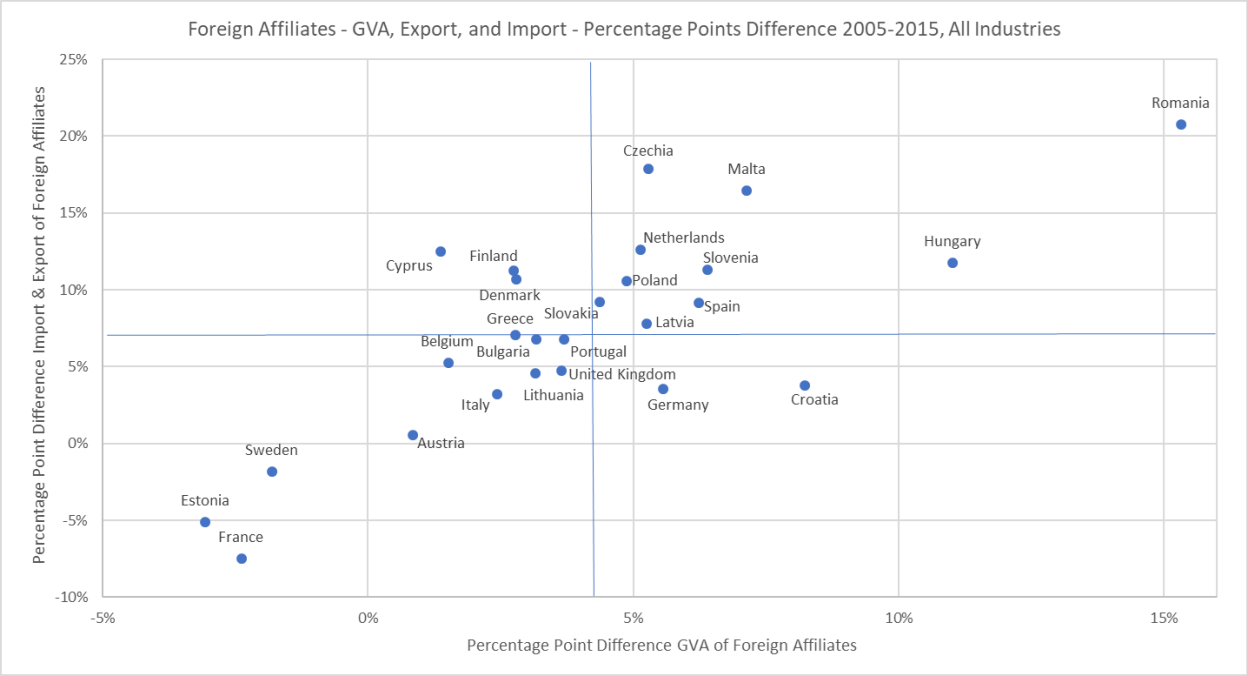


Note: Import and export are summed up together as a proxy of trade. Average values (blue lines) are for the EU28.

The generally positive contribution of foreign affiliates in gross value added, imports, and exports in host economies has not been uniform even over time. As shown in Figure 11, most of the European countries which experienced an expansion of value generated by foreign affiliates registered also increases in the share of total trade accounted for by these foreign entities. In

fact, between 2005 and 2015 only five countries – Estonia, Ireland and Luxembourg[13], in the group of ***backward GVC integration*** , and France and Sweden in the ***forward GVC integration*** – saw a decrease in the role of foreign MNE affiliates in trade, at the same time experiencing a contraction of gross value added creation by these same firms. All remaining 23 countries – with differences in magnitude – saw an increase in the role of foreign affiliates in gross value added creation and a simultaneous expansion in their role in international trade. This is especially relevant in Eastern Europe – Czechia, Hungary, Latvia, Poland, Romania, Slovakia, and Slovenia – where foreign-owned firms increased their shares above the European average for both GVA and trade.

Figure 11. Percentage of Foreign Affiliates in GVA, Import & Export – Percentage Points Difference, All industries, 2005-2015



Note: Import and export are summed up as a proxy of trade. Luxembourg (-15% GVA, -15% Export & Import) and Ireland (-5% GVA, -35% Export & Import) were excluded from the charts and from the EU averages (blue lines) as outliers.

[13] Ireland and Luxembourg are the two countries with the biggest decrease in trade by foreign affiliates, -35% and -15% respectively, likely to be due to the contraction of the financial and banking services following the 2008 crisis.

Section 3.4 Value Added and Sourcing of Intermediate Inputs of Foreign Affiliates

In order to analyse more in depth domestic linkages and MNE involvement in domestic and global value chains we analyse more in detail the sourcing structure of MNE affiliates in the host countries. A first type of linkage arises when foreign affiliates buy part of their inputs from local suppliers. The general expectation, from both economic theory and policy practice, is that the establishment of foreign MNEs will benefit domestic suppliers, although ample evidence in the literature indicates that foreign affiliates may produce as enclaves in host economies and import the majority of their inputs from abroad, often from within their intra-firm networks (Cadestin et al., 2019).

Relying always on the OECD Analytical AMNE database, Table 8 and 9 report information about the sourcing structure of foreign affiliates operating in each European country, for manufacturing and services respectively. The full matrix of the Analytical AMNE database is composed by the intermediate consumption matrix, the final demand matrix, the value-added vector and the gross output vector. Cells across columns correspond to a country-sector's inputs, while cells across lines correspond to the output of a country-sector. To account for firms' ownership the intermediate consumption matrix is divided to distinguish between the inputs used by domestic-owned and foreign owned-firms. The final demand matrix is split only across rows to reflect the final demand of products from domestic-owned and foreign-owned firms. The value-added and gross output vectors are split across columns to indicate the value-added and gross output of domestic-owned and foreign-owned firms in each country and sector. This structure provides the elements to identify the input requirements of foreign affiliates operating in a given country and sector. In the Report, for each EU28 country and sector, we calculated the inputs used by foreign affiliates, distinguishing between inputs obtained from firm operating in the country where the foreign affiliate is operating, other foreign affiliates located in the country, internationally in other EU28 countries, or in firms in other Non-EU countries.

Foreign affiliates can source intermediate inputs from domestic firms in the host economy, from other foreign affiliates operating in the same economy, internationally from other EU countries, or internationally from extra-EU countries. Data show that in 2015 on average overall domestic sourcing – either from domestic firms or foreign affiliates operating in the focal country – accounted for 37% in manufacturing (Table 6) and 41% in services (Table 7)[14]. In addition, domestic sourcing, in both manufacturing and services industries, decreased between 2005 and 2015, reflecting the growing international provision of intermediate goods.

[14] The source industries of intermediate inputs are all industries (manufacturing and services) for both Tables 6 and 7.

Table 6. Foreign Affiliates: Value Added and Sourcing of Intermediate Inputs, Manufacturing - 2015

		Manufacturing - 2015				
Classification	***COUNTRY***	GVA of FA	Domestic firms	Other FA	Other EU	Non-EU
Backward Integration	Bulgaria	22%	33%	15%	13%	18%
Backward Integration	Denmark	37%	26%	5%	21%	10%
Backward Integration	Estonia	24%	24%	8%	29%	15%
Backward Integration	Hungary	22%	15%	8%	31%	23%
Backward Integration	Ireland	38%	17%	15%	16%	15%
Backward Integration	Lithuania	41%	27%	6%	15%	11%
Backward Integration	Luxembourg	27%	14%	15%	32%	11%
Backward Integration	Malta	21%	1%	0%	49%	28%
Backward Integration	Slovakia	20%	23%	12%	22%	22%
Forward Integration	Austria	24%	27%	9%	24%	16%
Forward Integration	Finland	37%	28%	5%	18%	12%
Forward Integration	France	28%	35%	8%	16%	14%
Forward Integration	Germany	31%	34%	9%	13%	13%
Forward Integration	Netherlands	27%	29%	11%	15%	18%
Forward Integration	Poland	24%	35%	12%	19%	10%
Forward Integration	Romania	40%	24%	18%	11%	7%
Forward Integration	Sweden	35%	25%	7%	20%	13%
Forward Integration	United Kingdom	30%	27%	14%	13%	16%
High Integration	Belgium	23%	26%	10%	27%	14%
High Integration	Czechia	25%	20%	20%	22%	13%
High Integration	Slovenia	26%	28%	6%	27%	14%
Low Integration	Croatia	34%	32%	6%	17%	12%
Low Integration	Cyprus	33%	29%	0%	25%	12%
Low Integration	Greece	37%	36%	3%	13%	11%
Low Integration	Italy	24%	33%	8%	15%	20%
Low Integration	Latvia	33%	34%	9%	17%	7%
Low Integration	Portugal	26%	28%	8%	30%	7%
Low Integration	Spain	23%	37%	12%	16%	11%

Note: Cell colours: minimum value is coloured red, median yellow, and maximum green; all other cells are coloured proportionally.

Table 7. Sourcing of Intermediate Inputs and Value Added of Foreign Affiliates, Services - 2015

		Services - 2015				
Classification	***COUNTRY***	GVA of FA	Domestic firms	Other FA	Other EU	Non-EU
Backward Integration	Bulgaria	53%	23%	11%	8%	5%
Backward Integration	Denmark	49%	22%	6%	12%	11%
Backward Integration	Estonia	51%	26%	10%	8%	4%
Backward Integration	Hungary	56%	15%	8%	14%	8%
Backward Integration	Ireland	36%	11%	15%	19%	19%
Backward Integration	Lithuania	59%	22%	8%	6%	5%
Backward Integration	Luxembourg	17%	17%	16%	28%	22%
Backward Integration	Malta	22%	16%	8%	37%	17%
Backward Integration	Slovakia	47%	27%	10%	10%	6%
Forward Integration	Austria	43%	32%	8%	10%	7%
Forward Integration	Finland	48%	30%	6%	11%	6%
Forward Integration	France	44%	38%	7%	7%	5%
Forward Integration	Germany	51%	30%	7%	5%	6%
Forward Integration	Netherlands	48%	27%	6%	9%	9%
Forward Integration	Poland	50%	31%	8%	7%	4%
Forward Integration	Romania	47%	27%	16%	6%	4%
Forward Integration	Sweden	51%	30%	7%	8%	5%
Forward Integration	United Kingdom	48%	31%	13%	4%	4%
High Integration	Belgium	42%	31%	7%	14%	7%
High Integration	Czechia	46%	24%	15%	9%	6%
High Integration	Slovenia	48%	31%	6%	10%	6%
Low Integration	Croatia	58%	22%	11%	5%	4%
Low Integration	Cyprus	37%	25%	4%	18%	16%
Low Integration	Greece	51%	32%	4%	7%	7%
Low Integration	Italy	47%	37%	9%	4%	3%
Low Integration	Latvia	51%	26%	11%	7%	5%
Low Integration	Portugal	52%	29%	8%	8%	3%
Low Integration	Spain	48%	34%	10%	4%	3%

Notes: Cell colours: minimum value is coloured red, median yellow, and maximum green; all other cells are coloured proportionally.

Looking at domestic sourcing, on average, foreign affiliates in the EU28 source intermediate inputs primarily from domestic firms (27% in manufacturing and 31% in services), with smaller shares coming from other foreign affiliates operating in the country (9% in manufacturing and 10% in services). This shows nonetheless rather relevant linkages among foreign affiliates located in European countries: especially in services, the share of inputs' sourcing from other foreign affiliates within the observed economy is comparable to that of international sourcing with and outside the Union (7% international EU and 6% international non-EU).

Not surprisingly, foreign affiliates' international sourcing of intermediate inputs in manufacturing industries is much bigger within Europe, on average 20% of the total, due to the single market and economic integration, whilst 14% on average is sourced from the rest of the World. Figures on the international sourcing of inputs for services indicate that the phenomenon is still fairly limited.

A number of differences emerge in the sourcing structure of foreign affiliates across the 28 European countries. In the ***low GVC integration*** group foreign affiliates, in both manufacturing and services, rely more on domestic firms for intermediate inputs. Especially in Croatia, Greece, Italy, Latvia and Spain the share of domestic suppliers is by far bigger than the EU28 average. Important domestic linkages exist also in Austria, Germany, France, and Poland (all in the ***forward GVC integration*** category). This is in line with recent studies indicating that across all countries domestic SMEs are found to be the most important suppliers to foreign affiliates (Cadestin et al., 2019).This is the case particularly in countries like Italy, whilst in economies such as France the domestic sourcing of foreign affiliates is rather balanced between nationally-owned MNE and SMEs (Cadestin et al., 2019).

The size of the economy clearly matters in defining the structure of sourcing: in smaller countries – Belgium, Ireland, and Luxembourg – foreign affiliates appear to source especially from abroad. In both ***high GVC integration*** and ***backward GVC integration*** groups, foreign affiliates tend to purchase more intermediates from the rest of Europe, underling once again the embeddedness of global value chains and production networks in the area. In Eastern European members foreign affiliates tend to buy intermediate inputs from other foreign affiliates co-located in the same economy, possibly for acquiring technology-intensive inputs: this is the case particularly in Bulgaria (15%), Czechia (20%), and Romania (18%).

Section 3.5 Foreign Direct Investment

GVCs and FDI are closely interlinked phenomena. As previously discussed, FDI is a relevant mode of governance of GVCs with MNEs often acting as lead firms in a variety of GVC configurations. As a result, the sourcing structure of intermediate inputs by MNE subsidiaries has been presented as a backbone for GVCs and domestic value formation. Therefore, the analysis of FDI flows remains central to a full picture of the internationalisation patterns of European economies and their position in global value chains. A full picture of global connectivity through FDI should cover both inward (investments made in the domestic economy from another country) and outward (investments made by domestic companies in a foreign economy) flows in order to capture the nature, directionality and functional profile of internationalisation processes.

This section of the Report focuses on inward and outward greenfield[15] FDI for European economies, highlighting the relative position of each country as an investment origin (for outward flows) and destination (for inward flows). Information comes from fDiMarkets, a database created and maintained by the Financial Times, covering cross-border greenfield investments for all countries and sectors worldwide between 2003 and 2017. The accuracy of fDiMarkets and its coherence with official statistical sources has been tested and confirmed by a consolidated literature (see Crescenzi et al., 2014). This data source offers a twofold advantage for the purposes of the present study. First it makes it possible to monitor and trace individual investment projects down to the regional level, offering a coherent and integrated picture throughout the Report. Second, fDiMarkets offers detailed information on the business function pursued by each investment (e.g. it specifies whether a particular new investment project is a production site vis-à-vis, for example, a Research and Development unit or a regional Head Quarter). By following Crescenzi et al. (2014) and linking the business functions classification in fDiMarkets with Sturgeon's (2008) identification of GVC stages (based on occupations), it is possible to associate each investment project with a particular stage of the Value Chain. The functional classification of inward and outward FDI flows makes it possible to organically link the GVC analysis based on backward and forward linkages and value generation with FDI and their sub-national geography.

Figure 12 plots the cumulative value of inward (x-axis) and outward (y-axis) FDI normalised by the EU average (=100% at the origin of the axes) over the 2003-2017 period[16]. The size of the dots is proportional the countries' average total nominal GDP (PPS) over the same period. Table

[15] "Greenfield FDI relates to investment projects that entail the establishment of new entities and the setting up of offices, buildings, plants and factories from scratch. (…) Greenfield FDI involves capital used for the purchase of fixed assets, materials, goods and services, and to hire workers in the host country" (UNCTAD 2005, Training Manual on Statistics for FDI and the Operations of TNCs, p.98, unctad.org/en/docs/diaeia20091_en.pdf).

[16] Normalizing the cumulative value of inward and outward of FDI with respect to the EU average shows the relative position of each country with respect to the total amount of EU28inflows and outflows . This normalisation is biased by country size, with larger economies characterized by larger inward and outward FDI. Other normalisation processes (e.g. per capita FDI) were tested, but overcoming this limitation would anyway distort the results and mislead the analysis.

8 offers the detail of the cumulative value of inward and outward FDI in the same countries and time period, together with FDI cumulative inflows as a share of total cumulative outflows. As expected, the largest economies – France, Germany, and United Kingdom – are at the same time major origins and destinations of FDI in Europe. These three countries, together with the Netherlands in the same group of ***forward GVC integration***, and Italy and Spain as the large economies in the ***low GVC integration*** category, are all above the European average in terms of both inward and outward investments, in both manufacturing and service sectors (see Tables A.1 and A.2 in the *Appendix*). These economies are the main gravitational poles of FDI flows in Europe with significant international circulation that follows GVC patterns.

The lower right quadrant of the diagram is occupied by FDI big net receivers with relatively lower outward flows, like Poland and Romania, members of the ***forward GVC integration*** group. Both countries have received investments for values comparable to the largest European economies in the same category, highlighting their ability to attract foreign capital and the interest of MNEs, but they are still characterized by a more limited internationalisation of domestic firms (see also column 3 of Table 8). This is a defining feature of the process of internationalisation of Central and Eastern European economies, where significant FDI inflows have not been matched by a corresponding process of domestic upgrading supportive of outward internationalisation, at the same time maintaining – relative to the rest of Europe – cost advantages that prevent offshoring elsewhere by the MNEs there located. Ireland is also in this quadrant given the rather unique nature of its FDI orientation and attraction policies, but its position is more balanced and qualitatively different.

The lower left quadrant of the diagram is occupied by different types of countries. Smaller advanced economies in the 'core' of the EU-15 with inward FDI values below the EU average (as to be expected given their size) coupled by outward FDI mostly in line with the EU average include Austria, Sweden and Finland, all in the ***forward GVC integration*** group, and Denmark and Luxembourg in the ***backward GVC integration*** group. In the latter group, some Central and Eastern European countries – Bulgaria, Hungary and Slovakia – together with Belgium and Czechia (***high GVC integration***) and Portugal (respectively ***high*** and ***low GVC integration***) – display attractiveness slightly below the EU average and even weaker outward internationalisation. Croatia, Cyprus, Greece and Latvia from the ***low GVC integration*** group, together with Estonia, Lithuania and Malta in the ***backward GVC integration*** category, show all smaller 'gravitational' forces in term of FDI, but exhibit relatively balanced patterns in terms of inflows and outflows when compared to the EU average[17].

[17] As shown in Table A.1, A.2 and Figure A.4, A.5 in the *Appendix* there are similar patterns when the focus is on manufacturing industries and services industries alone.

Tables 9 and 10 look at the geographical orientation of inward and outward FDI flows, reporting FDI flows by country and area of origin and destination, and considering EU28 countries – dividing between EU15 and EU13 – and the other countries of the World.

Table 9 shows that a large share of FDI flows circulates within the EU as an integrated block. Most of EU inward FDI flows come from other European countries (EU28 average 60%), and within Europe the EU15 countries are by far the most prominent investors (EU28 average 93%). There are however large differences. Central and Eastern European countries are more dependent on other EU28 countries: Croatia, Estonia, Poland, Romania, and Slovakia all have more than 70% of inward FDI from other EU28 countries. While most EU15 economies, such as Germany, Ireland, Netherlands, and United Kingdom tend to receive more FDI from the rest of the World. Similarly, Lithuania have a larger share of investments from outside Europe. Even if investments from EU13 countries play (on average) only a marginal role, there are some Eastern EU countries – such as Bulgaria, Croatia, Estonia, Latvia, Lithuania, Romania and Slovakia – which are more dependent on these type of intra-EU13 FDI, probably as part of intra-MNE rationalisation investment.

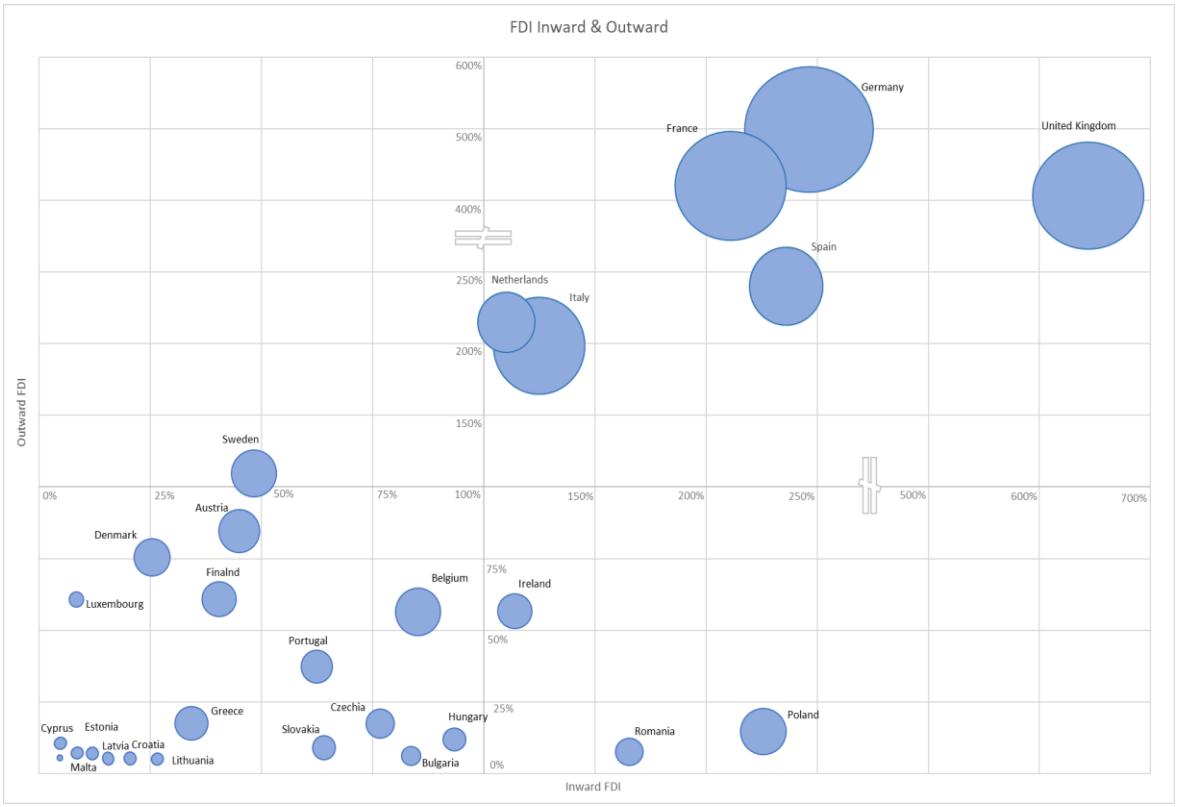
Table 8. Foreign Direct Investment – All Industries, 2003-2017

		All Industries FDI 2003-2017		
Classification	***COUNTRY***	Tot 2003-2017 Inward	Tot 2003-2017 Outward	Percentage inward/outward
Backward Integration	Bulgaria	68,765	3,876	1774%
Backward Integration	Denmark	20,662	118,599	17%
Backward Integration	Estonia	12,302	8,884	138%
Backward Integration	Hungary	80,144	17,061	470%
Backward Integration	Ireland	90,860	89,192	102%
Backward Integration	Lithuania	21,794	8,528	256%
Backward Integration	Luxembourg	7,969	96,690	8%
Backward Integration	Malta	3,722	2,448	152%
Backward Integration	Slovakia	58,400	3,485	1676%
Forward Integration	Austria	36,776	132,959	28%
Forward Integration	Finland	28,068	95,753	29%
Forward Integration	France	181,932	671,070	27%
Forward Integration	Germany	225,990	891,650	25%
Forward Integration	Netherlands	96,795	338,466	29%
Forward Integration	Poland	197,454	18,354	1076%
Forward Integration	Romania	161,227	3,640	4429%
Forward Integration	Sweden	39,859	171,527	23%
Forward Integration	United Kingdom	546,797	808,428	68%
High Integration	Belgium	66,912	86,931	77%
High Integration	Czechia	66,102	27,666	239%
High Integration	Slovenia	7,735	8,844	87%
Low Integration	Croatia	18,702	8,614	217%
Low Integration	Cyprus	4,201	17,919	23%
Low Integration	Greece	28,210	29,095	97%
Low Integration	Italy	109,791	312,803	35%
Low Integration	Latvia	17,079	5,755	297%
Low Integration	Portugal	53,621	52,346	102%
Low Integration	Spain	207,373	378,141	55%
	EU Average	87,830	157,454	413%

Note: total amount of inward and outward investments is expressed in millions of euros.

In terms of outward investments, on average at the European level, there is a prevalence of investments towards countries outside Europe (EU28 average 61% of total outward flows - Table 10) – possibly due to the offshoring strategies of the largest and most advanced European investors, that count for the bulk of such outward FDI – while intra-European investment outflows are fairly balanced between EU15 and EU13 countries as their destination (EU28 average share of intra-EU investments going to each group is 50%). Even if on average countries tend to invest more outside Europe than inside, Austria, Estonia, Hungary, Ireland and Lithuania target predominantly other European countries. Also for outward investments there is a strong interdependence among EU13 countries, with most of these countries investing in other EU13 countries: this may be seen again in the light of the rationalisation strategies of the largest MNEs located in the area. Even if outward FDI outside Europe is primarily mobilised by the most advanced European economies, some Central and Eastern European countries – such as Bulgaria, Slovakia and Slovenia – direct a significant share of their outward FDI outside Europe

Figure 12. Foreign Direct Investment & GDP - All Industries, 2003-2017



Note: cumulative value of inward (x-axis) and outward (y-axis) FDI normalised by the EU average (=100% at the origin of the axes) over the 2003-2017 period. The size of the circles is proportional to the countries' average total GDP (pps) over the same period.

Table 9. Foreign Direct Investment – EU28 Destination, 2003-2017

		EU28 DESTINATION								
	COUNTRY	FROM WORLD	EU28						FROM REST OF THE WORLD	
			FROM EU28		FROM EU13		FROM EU15			
Classification		Total Investment	Total Investment	Percentage from World	Total Investment	Percentage from EU28	Total Investment	Percentage from EU28	Total Investment	Percentage from World
Backward Integration	Bulgaria	68,765	40,859	59%	4,878	12%	35,981	88%	27,906	41%
Backward Integration	Denmark	20,662	10,275	50%	364	4%	9,911	96%	10,387	50%
Backward Integration	Estonia	12,302	9,297	76%	1,110	12%	8,187	88%	3,005	24%
Backward Integration	Hungary	80,144	48,936	61%	2,159	4%	46,777	96%	31,208	39%
Backward Integration	Ireland	90,860	34,778	38%	276	1%	34,502	99%	56,082	62%
Backward Integration	Lithuania	21,794	9,804	45%	2,204	22%	7,600	78%	11,990	55%
Backward Integration	Luxembourg	7,969	3,353	42%	417	12%	2,936	88%	4,616	58%
Backward Integration	Malta	3,722	2,203	59%	121	5%	2,082	95%	1,519	41%
Backward Integration	Slovakia	58,400	39,003	67%	3,421	9%	35,582	91%	19,397	33%
Forward Integration	Austria	36,776	24,295	66%	854	4%	23,441	96%	12,480	34%
Forward Integration	Finland	28,068	15,960	57%	1,208	8%	14,752	92%	12,108	43%
Forward Integration	France	181,932	101,655	56%	1,056	1%	100,599	99%	80,277	44%
Forward Integration	Germany	225,990	98,628	44%	3,594	4%	95,034	96%	127,362	56%
Forward Integration	Netherlands	96,795	43,098	45%	601	1%	42,497	99%	53,697	55%
Forward Integration	Poland	197,454	137,433	70%	5,233	4%	132,199	96%	60,021	30%
Forward Integration	Romania	161,227	123,774	77%	13,356	11%	110,418	89%	37,453	23%
Forward Integration	Sweden	39,859	21,509	54%	559	3%	20,950	97%	18,351	46%
Forward Integration	United Kingdom	546,797	213,222	39%	3,625	2%	209,597	98%	333,575	61%
High Integration	Belgium	66,912	35,076	52%	294	1%	34,782	99%	31,836	48%
High Integration	Czechia	66,102	42,650	65%	1,537	4%	41,112	96%	23,453	35%
High Integration	Slovenia	7,735	5,991	77%	340	6%	5,651	94%	1,744	23%
Low Integration	Croatia	18,702	14,318	77%	2,816	20%	11,502	80%	4,384	23%
Low Integration	Cyprus	4,201	2,332	56%	312	13%	2,020	87%	1,869	44%
Low Integration	Greece	28,210	20,325	72%	489	2%	19,836	98%	7,885	28%
Low Integration	Italy	109,791	61,529	56%	1,868	3%	59,661	97%	48,262	44%
Low Integration	Latvia	17,079	11,242	66%	4,181	37%	7,062	63%	5,836	34%
Low Integration	Portugal	53,621	42,251	79%	183	0%	42,068	100%	11,370	21%
Low Integration	Spain	207,373	136,163	66%	827	1%	135,335	99%	71,211	34%
	EU Average	87,830	48,213	60%	2,067	7%	46,146	93%	39,617	40%

Note: total amount of investments is expressed in millions of euros. The percentage reported in "FROM EU28" and "FROM REST OF THE WORLD" refers to the relative amount in comparison to total investment "FROM WORLD". The percentage reported in "FROM EU13" and "FROM EU15" refers to the relative amount in comparison to total investments "FROM EU28".

Table 10. Foreign Direct Investment – EU28 Source, 2003-2017

		EU28 SOURCE								
	COUNTRY	TO WORLD	EU28						TO REST OF THE WORLD	
			TO EU28		TO EU13		TO EU15			
Classification		Total Investment	Total Investment	Percentage to World	Total Investment	Percentage to EU28	Total Investment	Percentage to EU28	Total Investment	Percentage to World
Backward Integration	Bulgaria	3,876	1,474	38%	886	60%	588	40%	2,402	62%
Backward Integration	Denmark	118,599	58,198	49%	13,991	24%	44,207	76%	60,401	51%
Backward Integration	Estonia	8,884	5,770	65%	4,305	75%	1,465	25%	3,114	35%
Backward Integration	Hungary	17,061	11,559	68%	10,357	90%	1,202	10%	5,501	32%
Backward Integration	Ireland	89,192	51,142	57%	11,967	23%	39,174	77%	38,050	43%
Backward Integration	Lithuania	8,528	5,863	69%	5,313	91%	550	9%	2,665	31%
Backward Integration	Luxembourg	96,690	39,483	41%	9,085	23%	30,398	77%	57,207	59%
Backward Integration	Malta	2,448	1,819	74%	334	18%	1,485	82%	629	26%
Backward Integration	Slovakia	3,485	1,034	30%	884	85%	150	15%	2,451	70%
Forward Integration	Austria	132,959	70,855	53%	50,550	71%	20,304	29%	62,105	47%
Forward Integration	Finland	95,753	27,929	29%	12,969	46%	14,960	54%	67,823	71%
Forward Integration	France	671,070	183,264	27%	57,853	32%	125,411	68%	487,805	73%
Forward Integration	Germany	891,650	292,166	33%	111,606	38%	180,560	62%	599,485	67%
Forward Integration	Netherlands	338,466	99,073	29%	27,959	28%	71,114	72%	239,393	71%
Forward Integration	Poland	18,354	6,907	38%	3,592	52%	3,315	48%	11,447	62%
Forward Integration	Romania	3,640	1,316	36%	848	64%	467	36%	2,324	64%
Forward Integration	Sweden	171,527	80,547	47%	26,639	33%	53,908	67%	90,980	53%
Forward Integration	United Kingdom	808,428	155,281	19%	40,609	26%	114,672	74%	653,147	81%
High Integration	Belgium	86,931	28,884	33%	13,499	47%	15,385	53%	58,047	67%
High Integration	Czechia	27,666	12,235	44%	10,109	83%	2,126	17%	15,430	56%
High Integration	Slovenia	8,844	2,331	26%	1,613	69%	719	31%	6,512	74%
Low Integration	Croatia	8,614	515	6%	413	80%	101	20%	8,099	94%
Low Integration	Cyprus	17,919	4,982	28%	1,844	37%	3,138	63%	12,937	72%
Low Integration	Greece	29,095	11,156	38%	8,733	78%	2,423	22%	17,939	62%
Low Integration	Italy	312,803	68,396	22%	28,319	41%	40,077	59%	244,406	78%
Low Integration	Latvia	5,755	2,078	36%	1,168	56%	910	44%	3,677	64%
Low Integration	Portugal	52,346	17,934	34%	5,485	31%	12,450	69%	34,412	66%
Low Integration	Spain	378,141	107,768	28%	26,909	25%	80,860	75%	270,373	72%
	EU Average	157,454	48,213	39%	17,423	51%	30,790	49%	109,242	61%

Note: total amount of investments is expressed in millions of euros. The percentage reported in "TO EU28" and "TO REST OF THE WORLD" refers to the relative amount in comparison to total investment "TO WORLD". The percentage reported in "TO EU13" and "TO EU15" refers to the relative amount in comparison to total investments "FROM EU28".

Section 4. Key stylised facts on GVCs in Europe: the industry dimension

Section 4.1 Forward and Backward Linkages

Integration into GVCs provides opportunities for economic growth and development. The nature and extent of the opportunities that GVCs can offer differ across countries, regions within countries, and sectors. This section of the Report explores some aspects of GVC participation in Europe at the industry level, with a specific focus on three 'value-chain sensitive sectors' identified by the literature as Electronics, Automotive, and Apparel and Footwear[18] (Sturgeon and Memedovic, 2010; OECD, 2018)[19]. A short description of the GVC features of the selected industries is reported in the Box below.

Box 2 – The selected industries in GVCs

The computer and electronics industry has been one of the most important manufacturing sectors in the world, and one of those most iconic in exemplify global value chain and production networks (e.g. Sturgeon and Kawakami, 2011). The most important 'goods' part of the ICT paradigm, it is indeed associated with the general purpose nature of such cluster of technologies, therefore cutting horizontally across both manufacturing and services industries and providing crucial intermediate inputs to most of them. Often labelled as high-tech, its production processes can be fragmented across a range of high to low technology-intensive activities with large flows of intermediate inputs, creating over time opportunities for the division of labour in design (technical modularity), enabling firms to disintegrate the value chain across production stages and geographies, and rapidly involving over time new producers and consumers across developed and developing countries, particularly in Eastern and Southern Asia (e.g. Ernst, 2001, 2005; Gereffi, 2005).

The automotive industry has very different features from computer and electronics, being not as global as the latter and highly agglomerated at the subnational level with specialised clusters strongly connected mostly within national economies and macro-regions (e.g. Giuliani et al., 2005; Sturgeon et al., 2008), also for its high capital-intensity. Overall regarded as a medium-tech industry, in reality also in this case technology intensity varies a great deal between stages of production. Likewise, the industry displays very different intensity of intermediate input flows across, for example, design, final assembly, or manufacture of parts from textile interiors to tyres or electronics components, with functional specialisation driven by huge and highly powerful MNEs (Sturgeon, et al., 2008). As well described by Sturgeon and Van Biesebroeck (2011), "local, national, and regional value chains in the automotive industry are 'nested' within the global organisational structures and business relationships of the largest firms".

The textiles and apparel industry is one of the oldest, most globalised and leading export industries in the world, and organised in global production and trade networks since the mid-twentieth century (Gereffi et al., 2005). Due to its low fixed costs and technology-intensity, and high labour-intensive manufacturing processes, it has been characterised by the steady increase in offshore production towards different

[18] As reported in the *Appendix* (Table A.3) and in the figures and charts, these industries as classified in the TiVa Database are: Computer, electronic and optical products (D26); Motor vehicle, trailers and semi-trailers (D29); Textiles, wearing apparel, leather and related products (D13T15). However, for simplicity in the text we use: Electronics, Automotive, and Textiles.

[19] See https://www.oecd.org/industry/ind/tiva-2018-flyer.pdf

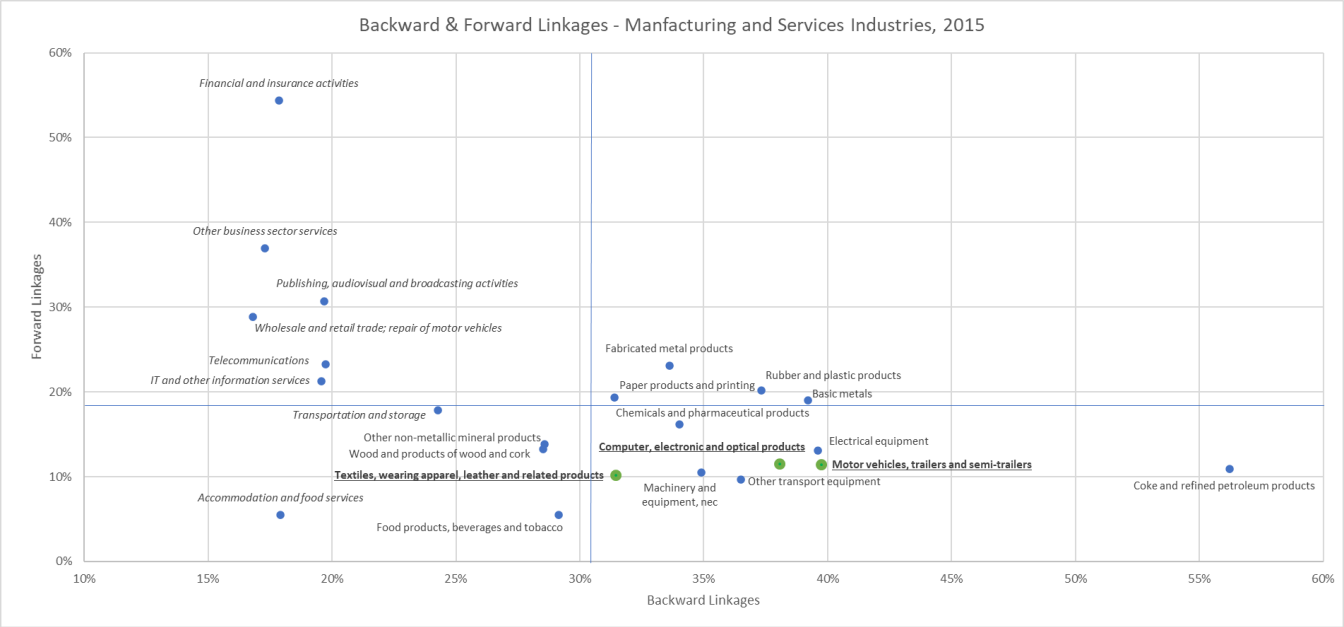
developing macro-regions over time, with retention of high-value activities (e.g., design, innovation, marketing, branding) in advanced countries, and a consolidation at the retail end of the value chain (Macchion et al., 2015; Casadei and Iammarino, 2020). The industry is defined as 'buyer-driven', and lead firms (e.g., retailers, marketers and branded manufacturers) have acted as strategic brokers in linking dispersed networks of overseas suppliers with product niches in final consumer markets (e.g. Gereffi and Memedovic, 2003). Since 2005, the gradual phasing out of the Multi-Fibre Arrangement – aimed at protecting European and US domestic industries – along with changes in host countries' labour costs, upgrading to higher value-added activities, and saturation of mature markets, have led to a rationalization and consolidation of GVCs through the development of longer-term relationships with a restricted number of more efficient and strategically located suppliers (Gereffi and Frederick, 2010). More recently, several trends like the growing importance of proximity to costumers, production control, flexibility, shorter lead times and skills, together with the increased automation of low value processes and the rising concern for environmental and ethical standards, have further challenged the competitive advantage of low-cost manufacturing suppliers, triggering a new reconfiguration of the textile and apparel value chain (e.g. Di Mauro et al., 2018).

As mentioned above in Section 3.1 of the Report, the analysis of backward and forward linkages using TiVa data suffers from some limitations also at the industry level, as these two measures are not fully symmetric. Whilst the backward indicator accounts for all foreign value added (i.e. imported intermediates) embodied in the gross exports of the specific industry in the country under observation, including both exports that meet the final demand in the recipient countries or are re-exported, forward linkages only consider domestic value added in the exports of the observed country-industry pair that is incorporated as intermediate inputs in the rest of the world's gross exports (disregarding those directly feed into final demand).

Figure 13 shows the distribution of industry-specific backward and forward linkages in 2015 for manufacturing and services industries for the EU28[20]. The different nature of GVC participation between service (in italics) and manufacturing sectors emerges clearly, with the former being characterized by larger shares of forward linkages. Services, including business and financial services and wholesale trade, show, on the one hand, very strong forward linkages, reflecting the fact that they are used as intermediate inputs in the exports of their destination economies; on the other hand, they display weak backward linkages as their production, particularly for business and financial services, uses limited foreign inputs. Conversely, the largest manufacturing industries tend to have sizable foreign inputs (backward linkages) in their exports abroad. This is reflected in the three selected industries, which show larger shares in backward linkages compared to the EU28 average (blue lines), but lower values in forward linkages. Within manufacturing, Electronics and Automotive show larger shares of backward linkages, while all three industries have smaller forward linkages compared to the rest of manufacturing. This is also confirmed when looking at the dynamics of manufacturing industries over time (Figure 14), all increasing their shares of backward linkages between 2005 and 2015, while

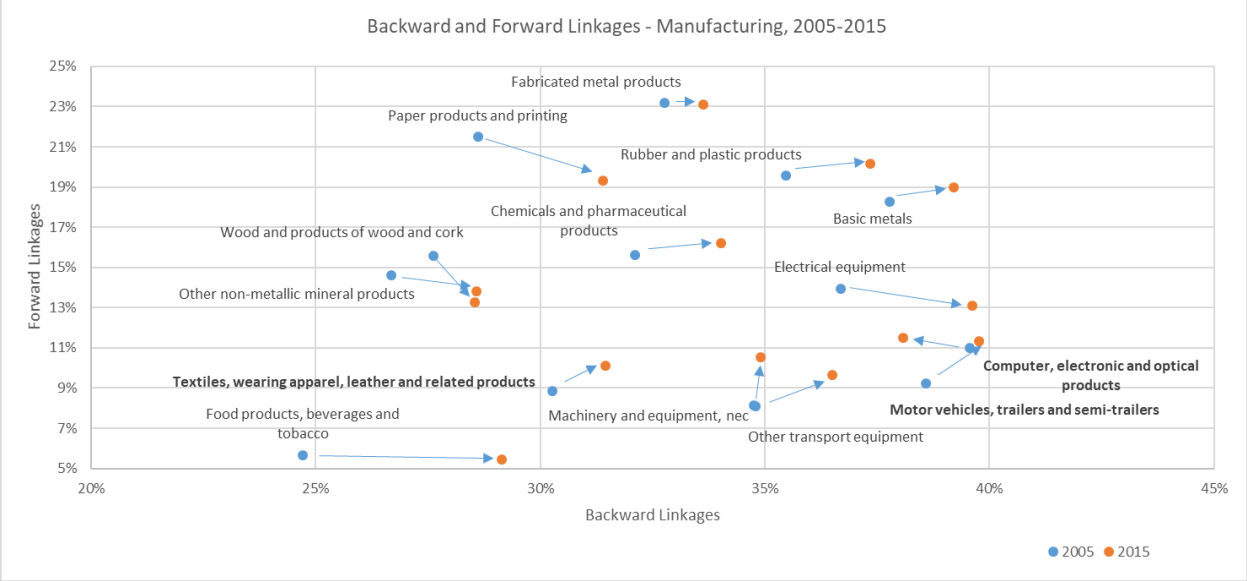
[20] The value for each industry is calculated as the EU28 average. To be noted that – consistently with Section 3.1 in the case of the macro-aggregates Manufacturing and Services – for both backward and forward linkages the source sector is the same as the one of origin.

Figure 13. Backward and Forward Linkages - Manufacturing and Services Industries, EU28 average, 2015



Note: Service industries are in Italics, while the 3 selected manufacturing industries are in bold, underscored, and with a green dot. EU average values are the blue lines. For both backward and forward linkages industry source and origin coincide.

Figure 14. Backward and Forward Linkages - Manufacturing, EU28 average, change 2005-2015



Note: Industries in bold are reported in the analysis. For both backward and forward linkages industry source and origin coincide. The arrows show the direction of change between 2005 (blue dot) to 2015 (orange dot) for each industry.

recording mixed changes in terms of forward linkages. On average in manufacturing backward linkages increased by 2% (from 34% to 36%), while forward linkages remained constant around 14%. Notably, Electronics differs from the rest of manufacturing as it shows a reduction in backward linkages (-1.5%) between 2005 and 2015, with a slight increase in forward linkages (+0.5%).

Given the large heterogeneity across countries and industries in backward and forward linkages, a country-industry analysis can provide further insights to the understanding of GVC participation in Europe (Table 11 and 12). In line with the descriptive statistics presented in Section 3, the countries in the ***forward GVC integration*** group are characterized by the largest shares of forward linkages and the lowest shares of backward linkages in all three industries under analysis, while the opposite occurs for the ***backward GVC integration*** group. Moreover, the sharp contrast between the two ***GVC high*** and ***low integration*** groups is evident also in the case of the three selected industries.

However, there are some important differences between countries within each group and industry. In Textiles, the largest shares of forward linkages are found in the Netherlands, Poland, Romania, and Sweden – in fact in the ***Forward GVC integration*** category – all above 12%, together with other Easter European countries such as Czechia (13%) and Slovenia (12%) – ***high GVC integration*** – and Hungary (12%) and Slovakia (12%) – ***backward GVC integration*** . Except for Austria (32%), all ***forward GVC integration*** have backward linkages in the Textile industry below the EU28 average, with the United Kingdom showing the lowest share (17%). In Electronics, more heterogeneous patterns seem to emerge within the groups: Netherlands and Poland show large shares of backward linkages (65% and 47%) and small shares of forward linkages (4% and 6%); the largest shares of the latter are recorded in Austria (17%) and Germany (18%). Similarly, in the Automotive sector Finland (14%), Poland (13%) and Romania (15%) all have forward linkages well above the EU28 average, while the United Kingdom shows very limited forward linkages (7.6%).

Figure 15-17 show the values in 2015 and the percentage point differences between 2005 and 2015 for all EU28 countries for each of the three industries under analysis. Between 2005 and 2015, France experienced a very large drop (-19%) of forward linkages in the Automotive sector, larger than any other reduction in the EU28 in any industry.

In the ***high GVC integration*** countries – where the generally high shares may be biased by the small size of the economy characterizing the group – shares are below the EU28 average for the backward linkages in Electronics for Belgium and Slovenia (36% both); Belgium and Czechia, in Automotive and Electronics respectively, have forward linkages (6.6%) well below the average, with Belgium showing the lowest among all countries.

The ***low GVC integration*** group also presents significant deviations from the mean: Croatia, for example, has forward linkages well above the average in both Electronics (17%) and Automotive (14%), while Portugal shows similar results for backward linkages in both industries (42% and 51%). On the contrary, Greece, Italy and Spain are found at the bottom of the distribution in both

backward and forward linkages in all three Industries; moreover, Italy and Spain also recorded the largest drops between 2005 and 2015 for backward linkages in Electronics (-6% and -10% respectively).

Finally, in the ***backward GVC integration*** group there are mainly Eastern European economies with large shares of backward linkages in all three industries. In Textiles, only Bulgaria (30%) and Lithuania (25) have lower backward linkages compared to the EU28 average, while significant shares of forward linkages are found in Hungary and Slovenia (12%). Electronics and Automotive in Lithuania (30% and 37%) and Denmark (20% and 31%) are relative weak in backward linkages, and for the latter most countries experienced a large drop in Electronics between 2005 and 2015, with Ireland showing the largest (-15%), followed by Bulgaria (-8%). In Automotive, instead, this group shows on average the largest share of forward linkages, increasing over time, among all four groups.

Table 11. Forward and Backward Linkages, Selected Manufacturing Industries – 2015 & Percentage Points Difference 2005-2015

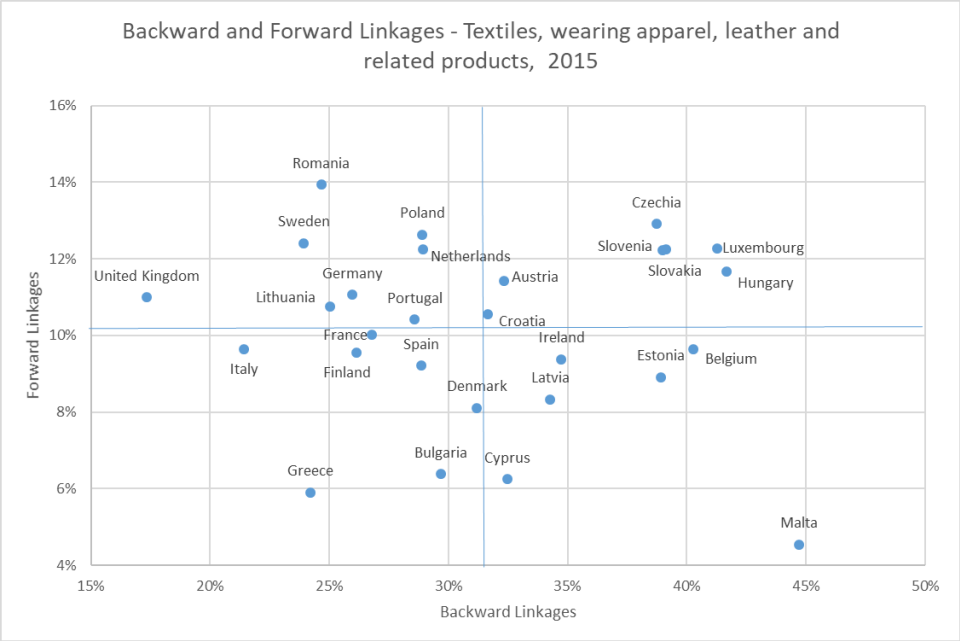
		Textiles, wearing apparel, leather and related products				Computer, electronic and optical products				Motor vehicles, trailers and semi-trailers			
Classification	***COUNTRY***	BL - 2015	FL - 2015	BL - % Points	FL - % Points	BL - 2015	FL - 2015	BL - % Points	FL - % Points	BL - 2015	FL - 2015	BL - % Points	FL - % Points
Backward Integration	Bulgaria	30%	6%	-1%	0%	42%	13%	-8%	3%	51%	11%	-4%	4%
Backward Integration	Denmark	31%	8%	3%	1%	20%	14%	-5%	0%	31%	14%	5%	3%
Backward Integration	Estonia	39%	9%	3%	1%	66%	3%	9%	-14%	46%	11%	4%	2%
Backward Integration	Hungary	42%	12%	2%	4%	64%	7%	-4%	3%	54%	12%	-1%	7%
Backward Integration	Ireland	35%	9%	1%	2%	39%	13%	-15%	6%	42%	11%	5%	0%
Backward Integration	Lithuania	25%	11%	3%	3%	30%	14%	-5%	6%	37%	13%	8%	0%
Backward Integration	Luxembourg	41%	12%	0%	2%	43%	11%	1%	1%	46%	14%	-6%	2%
Backward Integration	Malta	45%	5%	-2%	0%	66%	9%	-9%	0%	16%	15%	-10%	9%
Backward Integration	Slovakia	39%	12%	0%	1%	66%	4%	1%	-1%	60%	9%	-7%	5%
Forward Integration	Austria	32%	11%	3%	-1%	29%	17%	1%	-2%	41%	13%	-6%	5%
Forward Integration	Finland	26%	10%	2%	-4%	32%	13%	0%	1%	37%	14%	2%	2%
Forward Integration	France	27%	10%	1%	1%	24%	14%	-1%	0%	32%	11%	7%	-19%
Forward Integration	Germany	26%	11%	3%	0%	24%	18%	5%	0%	24%	12%	1%	2%
Forward Integration	Netherlands	29%	12%	3%	1%	65%	4%	24%	-3%	38%	11%	-1%	5%
Forward Integration	Poland	29%	13%	3%	4%	47%	6%	6%	-1%	39%	13%	0%	1%
Forward Integration	Romania	25%	14%	-12%	7%	34%	12%	-4%	-6%	35%	15%	-2%	4%
Forward Integration	Sweden	24%	12%	1%	-1%	21%	15%	-4%	1%	31%	11%	2%	5%
Forward Integration	United Kingdom	17%	11%	-2%	1%	25%	14%	-4%	1%	29%	8%	9%	1%
High Integration	Belgium	40%	10%	5%	0%	36%	14%	4%	1%	57%	7%	3%	3%
High Integration	Czechia	39%	13%	5%	1%	55%	7%	0%	1%	54%	10%	3%	5%
High Integration	Slovenia	39%	12%	-4%	3%	35%	14%	-1%	3%	46%	14%	-1%	2%
Low Integration	Croatia	32%	11%	4%	3%	26%	17%	2%	-1%	39%	14%	1%	1%
Low Integration	Cyprus	32%	6%	1%	1%	20%	17%	-27%	10%	38%	9%	6%	-4%
Low Integration	Greece	24%	6%	1%	1%	27%	13%	7%	1%	25%	12%	-1%	4%
Low Integration	Italy	21%	10%	0%	2%	26%	13%	-6%	2%	35%	9%	4%	3%
Low Integration	Latvia	34%	8%	6%	1%	34%	10%	6%	3%	37%	9%	10%	5%
Low Integration	Portugal	29%	10%	1%	3%	42%	7%	-5%	-1%	51%	8%	3%	2%
Low Integration	Spain	29%	9%	2%	0%	27%	12%	-10%	4%	40%	9%	-1%	2%
	EU Average	31%	10%	1%	1%	38%	11%	-1%	1%	40%	11%	1%	2%

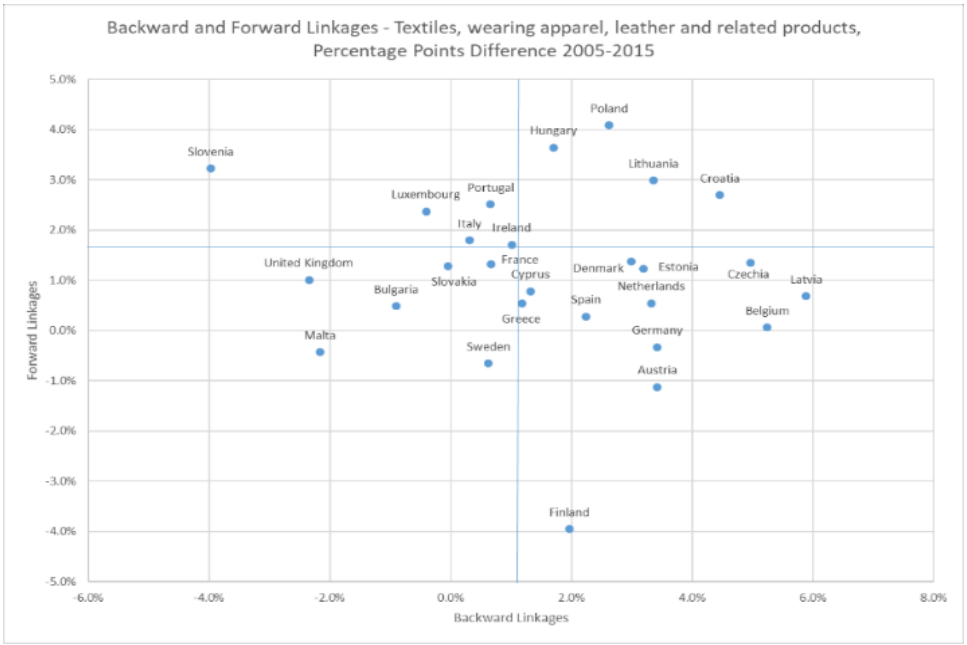
Note: cells with minimum values are in red, cells with median value in yellow, and cells with maximum value in green; all other cells are coloured proportionally.

Table 12. Forward and Backward Linkages, Selected Manufacturing Industries – Average by Group, 2015 & Percentage Points Difference 2005-2015

	Textiles, wearing apparel, leather and related products				Computer, electronic and optical products				Motor vehicles, trailers and semi-trailers			
Classification	BL - 2015	FL - 2015	BL - % Points	FL - % Points	BL - 2015	FL - 2015	BL - % Points	FL - % Points	BL - 2015	FL - 2015	BL - % Points	FL - % Points
Backward Integration	36%	9%	1%	2%	48%	10%	-4%	0%	42%	12%	-1%	4%
Forward Integration	26%	12%	0%	1%	33%	12%	3%	-1%	34%	12%	1%	1%
High Integration	39%	12%	2%	2%	42%	11%	1%	1%	52%	10%	2%	3%
Low Integration	29%	9%	2%	1%	29%	13%	-5%	2%	38%	10%	3%	2%

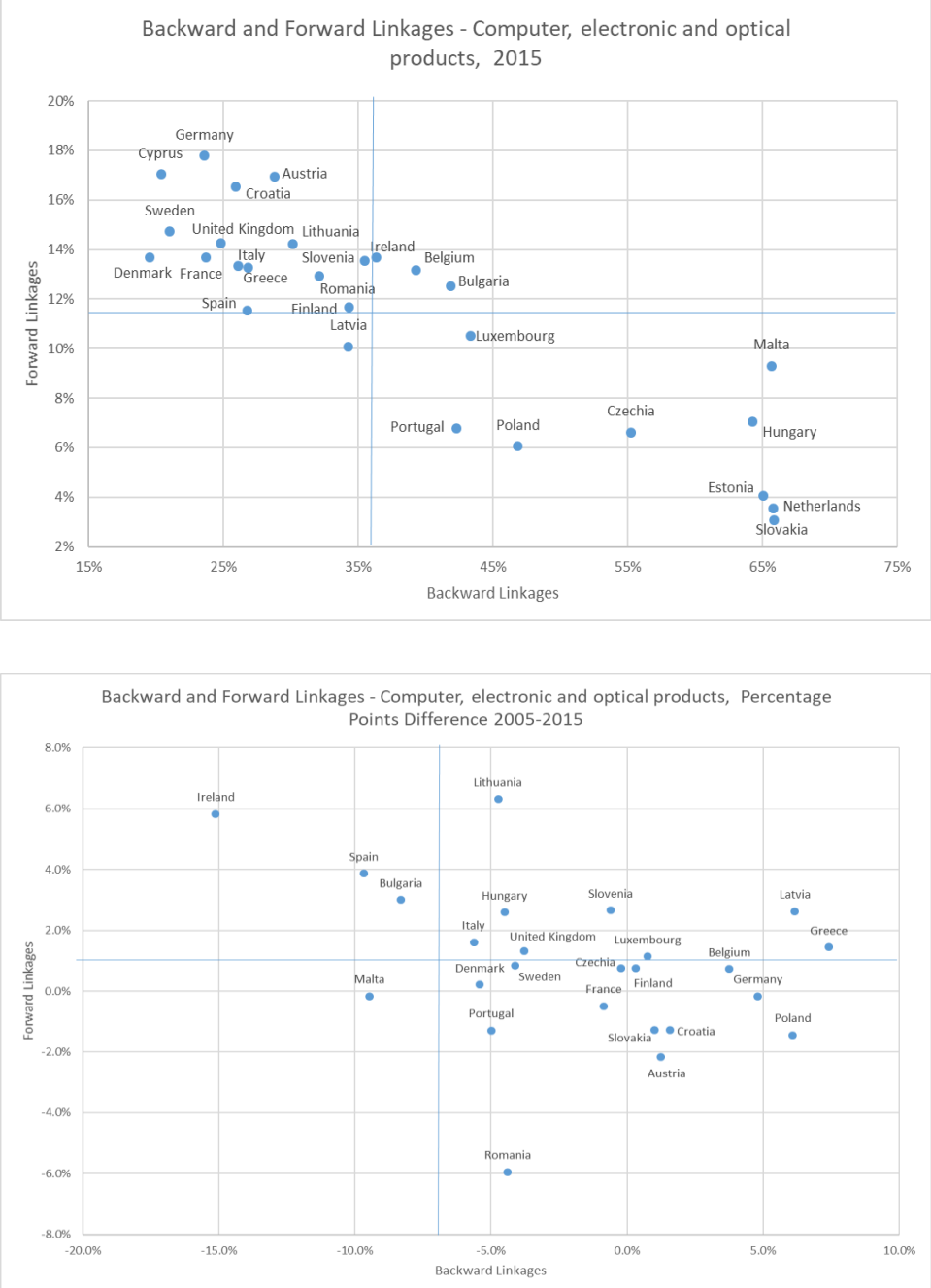
Figure 15. Backward and Forward Linkages - Textiles, wearing apparel, leather and related products, 2015 & Percentage Points Difference 2005-2015





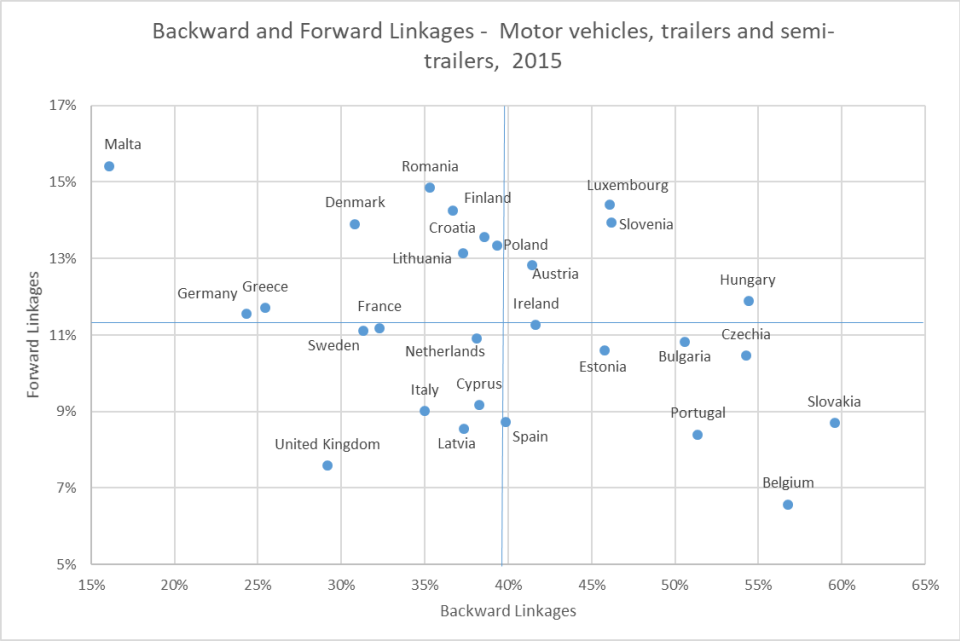
Note: blue lines identify the EU28 average.

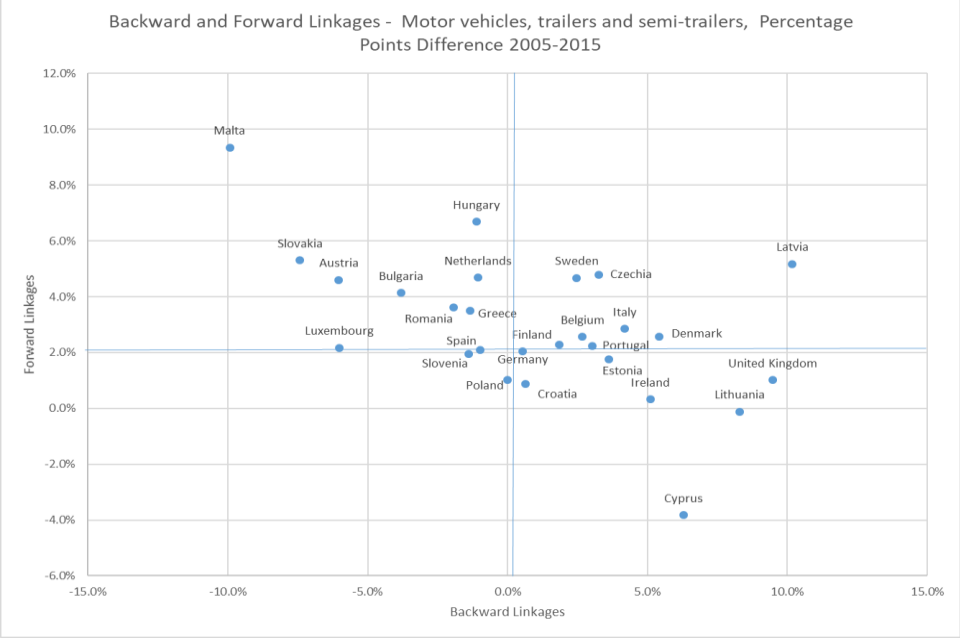
Figure 16. Backward and Forward Linkages - Computer, electronic and optical products, 2015 & Percentage Points Difference 2005-2015



Note: blue lines identify the EU28 average.

Figure 17. Backward and Forward Linkages - Motor vehicles, trailers and semi-trailers, 2015 & Percentage Points Difference 2005-2015





Note: blue lines identify the EU28 average.

Section 4.2 Composition of Total Value Added in Final Demand

As discussed in Section 3.2 the composition of total value added in final demand reveals how the value of final demand for goods and services consumed within a country is given by the sum of domestic value added (created in the focal country) and value added generated by manufacturing and service industries in other countries (both other Europe and rest of the World)[21]. In 2015 in all three selected industries – Automotive, Electronics and Textiles – most value added is generated outside the domestic economy (Table 13 and Table 14), with Textile showing the largest share of domestically created value added (31%), followed by Automotive (28%) and Electronics (25%)[22]. At the same time, in both Textile (39%) and Electronics (38%) the largest contribution is coming from the rest of the World – confirming the wide geographical dispersion of the division of labour in these two industries – while in Automotive most of the value added is generated within Europe (58%).

Looking more in detail to the Textiles industry, ***low GVC integration*** countries show, unsurprisingly, the largest domestic contribution (on average 35%), with Italy (67%) and Portugal (57%) clearly leading due to their strong comparative advantages in the industry. Value added from the rest of Europe (37%), highlights the strong continental integration of this group: in this respect, Croatia (48%) and Latvia (57%) are more dependent from the rest of European economies.

On the other hand, in more technology-intensive sectors such as Electronics and Automotive, the ***forward GVC integration*** group provides a relatively high domestic contribution (30% and 38% on average respectively). As expected, Germany generates by far the largest fraction of value added within its own economy in the Automotive sector (79%), followed by Sweden (56%) and Romania (57%). At the same time, in the same group, the value added received from other Europe is much more significant in the Automotive sector (53%) compared to Electronics (27%), where instead a primarily role is played the rest of the World (43%). The rest of Europe contributes to value added creation in Automotive particularly in smaller economies such as Austria (69%), Finland (77%) and Netherlands (70%).

The group ***high GVC integration*** is characterized by small-sized countries, and this is reflected in the composition of value added in their final demand. In Textiles and Electronics more than half of the total is created outside Europe, with the only exception for Belgium in Electronics (38%). On the contrary, in Automotive both Czechia and Slovenia receive larger shares from the rest of Europe (56%), while Belgium is more dependent on the rest of the World (52%).

The ***backward GVC integration*** group shows on average a fairly balanced distribution of value added generated domestically and internationally in both Textiles and Electronics, but with marked differences among countries. In Ireland, for example, the share of domestic value added is 8% in Textiles and 75% in Electronics, while the opposite is true for Bulgaria (72% and 7% respectively). As usual, the value added generated within the European area plays a major role in the Automotive sector.

[21] As in Section 3.2, also in this case in the data the source industry of value added is the same as the industry of final demand.
[22] EU28 averages in 2015.

Table 13. Composition of Value Added in Final Demand - Selected Manufacturing Industries, 2015

		Origin of Value Added in Final Demand - 2015								
		Textiles, wearing apparel, leather and related products			Computer, electronic and optical products			Motor vehicles, trailers and semi-trailers		
Classification	***COUNTRY***	Domestic VA	VA from Rest of Europe	VA from Rest of World	Domestic VA	VA from Rest of Europe	VA from Rest of World	Domestic VA	VA from Rest of Europe	VA from Rest of World
Backward Integration	Bulgaria	72%	18%	10%	7%	59%	34%	23%	26%	52%
Backward Integration	Denmark	21%	29%	50%	37%	40%	24%	10%	81%	9%
Backward Integration	Estonia	26%	30%	44%	7%	46%	47%	26%	55%	18%
Backward Integration	Hungary	22%	55%	23%	13%	40%	48%	33%	60%	7%
Backward Integration	Ireland	8%	40%	51%	75%	9%	16%	19%	60%	20%
Backward Integration	Lithuania	51%	32%	17%	14%	62%	24%	13%	80%	8%
Backward Integration	Luxembourg	59%	18%	23%	50%	21%	29%	44%	50%	6%
Backward Integration	Malta	28%	46%	26%	4%	52%	43%	29%	45%	26%
Backward Integration	Slovakia	17%	24%	59%	19%	51%	30%	29%	55%	16%
Forward Integration	Austria	21%	30%	49%	28%	31%	41%	20%	69%	10%
Forward Integration	Finland	29%	20%	51%	56%	14%	30%	12%	77%	11%
Forward Integration	France	27%	20%	53%	22%	19%	59%	30%	58%	12%
Forward Integration	Germany	28%	20%	52%	43%	12%	44%	79%	16%	5%
Forward Integration	Netherlands	23%	27%	50%	35%	18%	47%	22%	70%	9%
Forward Integration	Poland	29%	16%	54%	8%	25%	67%	39%	51%	10%
Forward Integration	Romania	59%	30%	11%	19%	51%	30%	57%	38%	5%
Forward Integration	Sweden	19%	27%	54%	33%	43%	23%	56%	39%	5%
Forward Integration	United Kingdom	30%	15%	54%	24%	27%	48%	27%	61%	12%
High Integration	Belgium	23%	26%	52%	23%	38%	38%	23%	26%	52%
High Integration	Czechia	17%	29%	54%	19%	20%	62%	30%	56%	14%
High Integration	Slovenia	21%	25%	55%	26%	25%	49%	28%	56%	15%
Low Integration	Croatia	36%	48%	16%	28%	50%	22%	9%	85%	6%
Low Integration	Cyprus	14%	62%	25%	19%	50%	32%	3%	74%	24%
Low Integration	Greece	23%	35%	42%	6%	38%	55%	6%	80%	14%
Low Integration	Italy	67%	10%	23%	36%	32%	31%	41%	48%	10%
Low Integration	Latvia	23%	57%	20%	32%	42%	26%	16%	80%	4%
Low Integration	Portugal	57%	29%	14%	9%	69%	22%	14%	80%	6%
Low Integration	Spain	28%	16%	56%	15%	36%	49%	37%	53%	10%
	EU Average	31%	30%	39%	25%	36%	38%	28%	58%	14%

Note: value added from Rest of Europe is the difference between Domestic VA and VA from EU28, while VA from Rest of the World is the difference between VA from World and VA from EU28. Cells with minimum values are in red, cells with median value in yellow, and cells with maximum value in green; all other cells are coloured proportionally.

Table 14. Composition of Value Added in Final Demand, Selected Manufacturing Industries – Average by Group, 2015

	Origin of Value Added in Final Demand - 2015								
	Textiles, wearing apparel, leather and related products			Computer, electronic and optical products			Motor vehicles, trailers and semi-trailers		
Classification	Domestic VA	VA from Rest of Europe	VA from Rest of World	Domestic VA	VA from Rest of Europe	VA from Rest of World	Domestic VA	VA from Rest of Europe	VA from Rest of World
Forward Integration	30%	23%	48%	30%	27%	43%	38%	53%	9%
High Integration	20%	26%	53%	23%	28%	50%	27%	46%	27%
Backward Integration	34%	32%	34%	25%	42%	33%	25%	57%	18%
Low Integration	35%	37%	28%	21%	45%	34%	18%	71%	11%

Note: value added from Rest of Europe is the difference between Domestic VA and VA from EU28, while VA from Rest of the World is the difference between VA from World and VA from EU28. Groups' values are the average of the countries' values within the group.

Section 5. Key stylised facts on GVCs' trends: regional dimension

Section 5.1 National Statistics and Regional Gini Coefficients

This Section descriptively links the analysis of the integration of national economies into GVCs with broad differences in their national and regional economic conditions. For this purpose, for each country group of GVC integration identified in Section 2 we look at a set of key indicators at the national level[23], complemented by Gini coefficients calculated for the same indicators on data at the sub-national level (NUTS1 and NUTS2, see Table A.5 in the *Appendix*)[24]. The key indicators used in the analysis, which refers to the years 2007 and 2015, are: a) gross domestic product per capita (GDP p.c. in PPS), as proxy for the overall level of economic development of the country, b) unemployment rate (i.e. percentage of unemployed population 15-74 year old on total labour force[25]), as a proxy for under-utilised human resources and skills in the economy; c) tertiary education (i.e. percentage of population 25-64 year old with tertiary education), as a proxy for skills' endowment; d) R&D intensity (i.e. expenditure in R&D as a share of the gross domestic product), as a proxy for the national innovation efforts; e) patent intensity (i.e. number of patents per million inhabitants), as a proxy for the technological capabilities of the economy. In order to capture the spatial distribution of these factors within each economy at the subnational level for each indicator we also computed the regional Gini coefficient, calculated within country for each variable of interest. When interpreting differences across economies in terms of their Gini coefficient, it is important to keep in mind the possible bias introduced by the size of the country, and thus by the number of subnational regions in which each national economy is divided[26]. However, the comparison of these indexes still offers some relevant descriptive insight on the association between different GVC groups and regional imbalances.

Table 15 shows that the ***forward GVC integration*** group comprises the most innovative countries – in terms of both patents and R&D expenditures. Poland and Romania are the exceptions, located at the bottom of the distribution for both measures of innovation, although showing a noticeable upward trajectory over time. Within this group there is a relatively high inter-regional dispersion of innovation activities as measured by the Gini coefficient.

Conversely, ***low GVC integration*** economies show low values of both patents and R&D, at the same time showing an overall stronger spatial concentration of innovative activities compared to other groups. Very modest improvements have characterized these countries over time: also for the main economic

[23] Data from Eurostat.

[24] NUTS2 are used for all countries, with the exception of Belgium, Germany and United Kingdom, where the NUTS1 level was used.

[25] Unemployed persons comprise persons aged 15 to 74 who were: (a) without work during the reference week, (b) currently available for work, (c) actively seeking work.

[26] Belgium, for example, has only 3 subnational regions, with the capital Brussels being often the outlier: its GDP per capita is affected by the narrow regional delimitation, which do not take into account factors such as commuting flows and the borders of the metropolitan area. Note that some EU country do not have subnational NUTS levels. See Table A.5 in the *Appendix* for information on the NUTS by country used in the Report.

indicators – GDP per capita, unemployment and tertiary education – the group displays relatively low values. Despite some heterogeneity among the countries, low values in GDP pc are also related to higher regional income inequality.

The ***high GVC integration*** countries show heterogenous levels of overall economic development but have in common relatively low levels of unemployment (at least until the Great Recession) and relatively high level of R&D expenditure. This is coupled with decreasing levels of subnational heterogeneity captured by the Gini indicator.

The ***backward GVC integration*** group shows a rather mixed picture in terms of GDP per capita. Two key features emerge, in contrast with the ***forward GVC integration*** group: relatively lower levels of unemployment, are coupled by equally low (with the obvious exception of Denmark) shared of R&D expenditure. Unfortunately, the lack of subnational data for some of these economies does not allow to provide a full picture of their subnational conditions. However, improvements in most national indicators seem to have occurred particularly in Bulgaria and Slovakia, where the level of regional disparities is also slightly decreasing.

Table 15. National Indicators

			National Statistics										Gini Coefficients									
			GDP pc		PATENTS - Pmh		R&D Expenditure		Unemployment		Tertiary Education		GDP		PATENTS - pmh		R&D Expenditure		Unemployment		Tertiary Education	
Classification	***COUNTRY***	**Nuts**	2007	2015	2007	2014	2007	2015	2007	2015	2007	2015	2007	2015	2007	2012	2007	2015	2007	2015	2007	2015
Backward Integration	Bulgaria	6	4,200	6,300	1.6	6.6	0.4%	1.0%	6.9%	9.2%	22.4%	27.5%	0.34	0.38	0.48	0.47	0.40	0.28	0.19	0.09	0.11	0.11
Backward Integration	Denmark	5	42,700	48,000	240.6	245.1	2.5%	2.9%	3.8%	6.3%	30.9%	36.6%	0.34	0.40	0.25	0.24	0.36	0.28	0.06	0.03	0.13	0.10
Backward Integration	Estonia*	1	12,100	15,700	21.0	18.4	1.1%	1.5%	4.6%	6.2%	33.3%	38.1%										
Backward Integration	Hungary	9	10,200	11,300	19.0	22.5	1.0%	1.4%	7.4%	6.8%	18.1%	24.2%	0.29	0.29	0.30	0.43	0.24	0.29	0.20	0.19	0.12	0.16
Backward Integration	Ireland	3	44,800	56,000	75.9	71.8	1.2%	1.2%	5.0%	10.0%	34.3%	44.5%	0.29	0.27	0.07	0.01	0.02	0.13	0.03	0.03	0.05	0.05
Backward Integration	Lithuania*	2	9,000	12,900	3.0	16.6	0.8%	1.0%	4.3%	9.1%	28.2%	38.7%										
Backward Integration	Luxembourg*	1	77,300	90,600	154.9	111.2	1.6%	1.3%	4.2%	6.5%	26.5%	41.1%										
Backward Integration	Malta*	1	14,200	21,700	16.8	12.5	0.6%	0.7%	6.5%	5.4%	12.4%	21.6%										
Backward Integration	Slovakia	4	10,400	14,600	7.2	9.4	0.5%	1.2%	11.2%	11.5%	14.4%	21.1%	0.12	0.10	0.43	0.28	0.27	0.19	0.24	0.18	0.18	0.15
Forward Integration	Austria	9	34,200	39,900	207.9	230.5	2.4%	3.1%	4.9%	5.7%	17.3%	30.6%	0.41	0.41	0.27	0.34	0.28	0.25	0.16	0.21	0.07	0.06
Forward Integration	Finland	5	35,300	38,300	242.0	341.7	3.4%	2.9%	6.9%	9.4%	36.4%	42.7%	0.42	0.44	0.34	0.25	0.31	0.27	0.13	0.05	0.11	0.12
Forward Integration	France**	22	30,300	33,000	135.8	138.7	2.0%	2.3%	8.0%	10.4%	26.6%	34.1%		0.57	0.43	0.37	0.30	0.31	0.12	0.09	0.08	0.10
Forward Integration	Germany	16	30,900	37,100	296.4	257.0	2.5%	3.1%	8.5%	4.6%	24.3%	27.6%	0.34	0.34	0.33	0.32	0.24	0.19	0.22	0.18	0.11	0.09
Forward Integration	Netherlands**	12	37,800	40,700	204.7	206.2	1.7%	2.0%	4.2%	6.9%	29.3%	35.3%		0.48	0.36	0.42	0.21	0.20	0.14	0.08	0.10	0.10
Forward Integration	Poland**	17	8,200	11,200	5.3	16.0	0.6%	1.0%	9.6%	7.5%	18.7%	27.7%		0.35	0.22	0.36	0.35	0.31	0.07	0.11	0.06	0.10
Forward Integration	Romania	8	6,100	8,100	1.5	5.1	0.5%	0.5%	6.4%	6.8%	12.0%	17.2%	0.25	0.29	0.50	0.55	0.37	0.29	0.15	0.20	0.17	0.15
Forward Integration	Sweden	8	39,000	46,300	312.6	350.4	3.3%	3.3%	6.1%	7.4%	31.3%	39.8%	0.42	0.45	0.31	0.33	0.28	0.25	0.06	0.07	0.09	0.07
Forward Integration	United Kingdom	12	36,700	40,100	92.2	83.6	1.6%	1.7%	5.3%	5.3%	32.0%	41.6%	0.34	0.37	0.34	0.30	0.25	0.21	0.10	0.11	0.08	0.07
High Integration	Belgium	3	32,400	36,600	147.9	137.7	1.8%	2.5%	7.5%	8.5%	32.1%	36.9%	0.45	0.45	0.29	0.30	0.10	0.07	0.26	0.23	0.06	0.04
High Integration	Czechia	8	13,400	16,000	18.5	25.7	1.3%	1.9%	5.3%	5.1%	13.7%	22.2%	0.18	0.20	0.31	0.32	0.28	0.26	0.24	0.19	0.18	0.17
High Integration	Slovenia*	2	17,400	18,800	59.8	65.5	1.4%	2.2%	4.9%	9.0%	22.2%	30.2%										
Low Integration	Croatia*	2	10,200	10,600	7.2	3.4	0.8%	0.8%	9.9%	16.1%	15.8%	22.7%										
Low Integration	Cyprus*	1	22,900	20,900	13.6	9.4	0.4%	0.5%	3.9%	15.0%	33.1%	40.5%										
Low Integration	Greece**	13	21,100	16,400	9.4	10.8	0.6%	1.0%	8.4%	24.9%	22.1%	29.1%	0.56	0.55	0.38	0.41	0.25	0.27	0.10	0.09	0.12	0.10
Low Integration	Italy	21	27,400	27,200	84.6	69.7	1.1%	1.3%	6.1%	11.9%	13.5%	17.6%	0.52	0.53	0.46	0.50	0.23	0.20	0.29	0.24	0.07	0.08
Low Integration	Latvia*	1	10,300	12,300	7.1	42.1	0.6%	0.6%	6.1%	9.9%	22.2%	31.6%										
Low Integration	Portugal	7	16,600	17,400	11.8	12.2	1.1%	1.2%	9.1%	12.6%	13.6%	22.9%	0.55	0.55	0.41	0.18	0.31	0.32	0.14	0.06	0.13	0.12
Low Integration	Spain	19	23,800	23,200	31.0	32.5	1.2%	1.2%	4.6%	6.2%	29.3%	35.1%	0.55	0.56	0.50	0.45	0.28	0.31	0.23	0.16	0.13	0.12
	EU28		26,100	29,100	117.56	111.97	1.77%	2.04%	7.20%	9.40%	23.8%	31.4%	0.38	0.40	0.35	0.34	0.27	0.24	0.16	0.13	0.11	0.10

Note: Eurostat Database. For countries with two or less NUTS regions Gini not provided. Cell colours: minimum values coloured red, median values are yellow, and maximum are green. All other cells are coloured proportionally. For GINI coefficients colours are reversed: reds for maximum, green for minimum and yellow for median values – all others coloured proportionally. Values are for EU28 for all variables as reported in the Eurostat Database, while Gini coefficients are average of all countries' values.

*Data for Gini coefficients not available because countries have 2 or less NUTS2 level information.

**Data for GDP not available before 2015 at the NUTS level.

Section 5.2 Sub-national patterns of internationalisation: Foreign Direct Investment and functional connectivity

The territorial patterns of innovation, employment and wealth associated with the heterogeneous GVC configurations of national economies are significantly differentiated. The descriptive statistics discussed in section 5.1 offer a broad-brushed picture of these dissimilarities across GVC participation models. In order to go more in-depth in the descriptive analysis of sub-national patterns of internationalisation, we have to narrow down the focus from full-encompassing GVC indicators – available only at the national level – to FDI statistics. Balancing the trade-off between completeness of information and geographical detail, FDI statistics can still provide relevant insights on sub-national GVC participation profiles.

Regional FDI statistics – as in the national FDI analysis – are based on fDiMarkets Database, covering cross-border greenfield investments for all countries and sectors worldwide between 2003 and 2017. fDiMarkets includes detailed information on the region where each investment project is located, as well as the location of the investing company. By geo-localising these investments it is possible to compute detailed regional-level statistics for both inward (investments made in the domestic economy from another country) and outward (investments made by domestic companies in a foreign economy) FDI flows. NUTS1 and NUTS2 regional classifications are selected, depending on the most meaningful units in each country.

Figure 18 shows the cumulative value (in million Euros) of inward (IFDI – left map) and outward (OFDI – right map) FDI to and from European regions[27] (flows have the entire World as origin/destination, therefore they include intra-Europe flows), while Figure 19 displays the same IFDI and OFDI regional data normalized by regional GDP[28].

A limited set of leading regions shows the capability to simultaneously attract and – through the internationalisation of local firms – generate new FDI. These regions mostly belong to countries in the ***forward GVC integration*** group. Figure 18 shows that capital city-regions have a predominant role in the spatial hierarchy of both inward investment flows and investing companies responsible for outward FDI. The metropolitan regions of London and Paris lead in this group, but also Amsterdam, Berlin and Stockholm have a prominent role jointly as FDI origins and destinations (together with Région de Bruxelles-Capitale in the ***high GVC integration*** group, in the first quintile for OFDI, and in the second for IFDI); Warsaw stands out for its FDI connectivity with respect to other central and eastern European capitals, but is more prominent in terms of passive internationalisation through inward FDI than others cities in the ***forward GVC integration*** category. In addition, within ***low GVC integration*** national economies, 'core' city-regions such as Barcelona, Madrid, Milan and Rome have also high levels of IFDI and OFDI. Capital city-regions within the ***backward GVC integration*** group show – with varying intensities –patterns of internationalisation particularly through inward FDI: in fact, the metropolitan

[27] NUTS2 are used for all countries for which data are available. NUTS1 are used for Belgium, Germany and United Kingdom. The distribution of FDI is divided in quantiles, with each colour showing a different quantile.

[28] For each NUTS the cumulative amount of FDI in the period 2003-2017 is divided by the average regional GDP in the period 2003-2017.

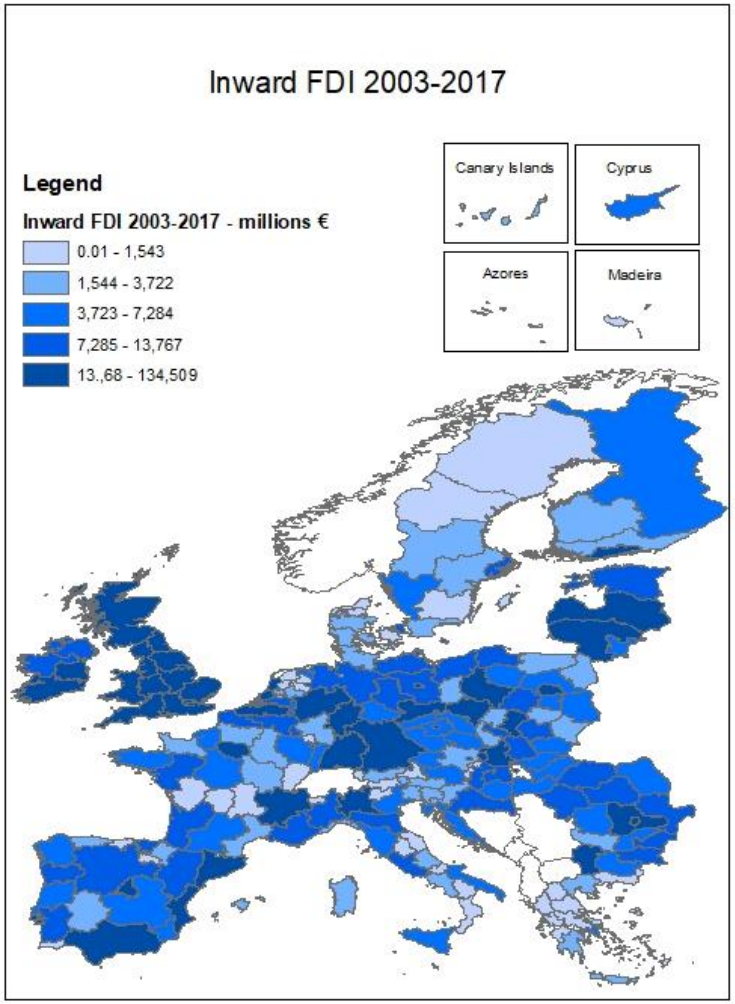
areas of Budapest and Sostines regionas (Vilnius) are in the second quantile for inward FDI, together with Kontinentalna Hrvatska (Zagreb) (***low GVC integration***) and Zahodna Slovenija (Ljubljana) (***high GVC integration***).

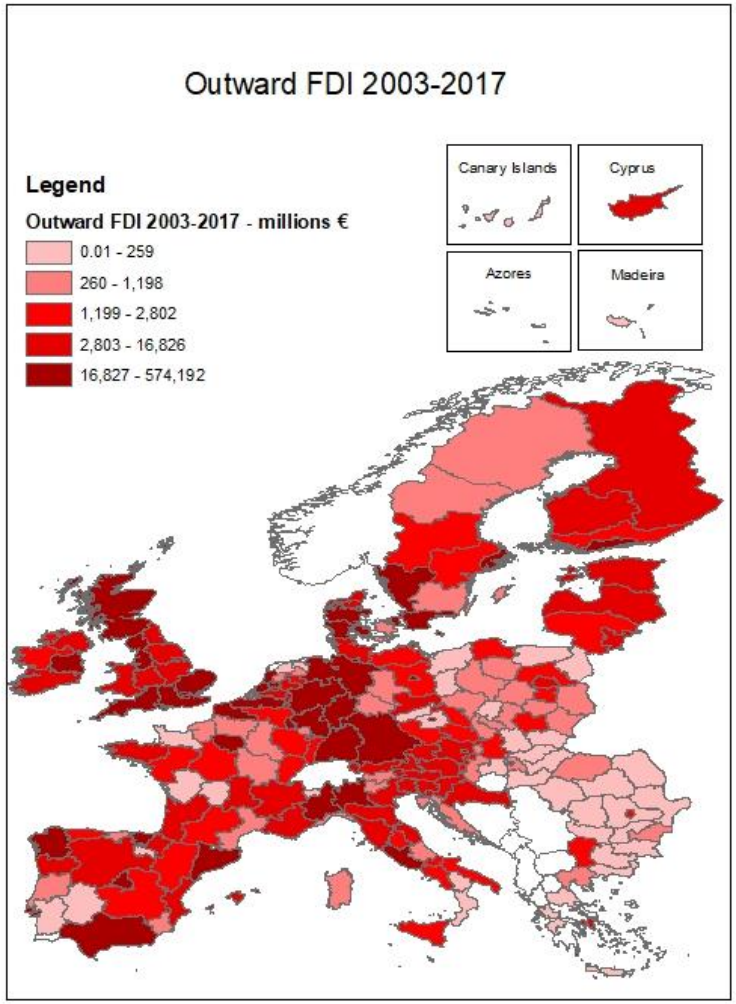
Leading industrial regions in Europe follow patterns and hierarchies symmetric to those of capital regions. Higher levels of both inward and outward FDI characterise advanced regions in the ***forward GVC integration*** economies such as Bayern, Baden-Württemberg, Hessen, Nordrhein-Westfalen, Niedersachsen and Rheinland-Pfalz (Germany), Zuid-Holland and Noord-Holland (the Netherlands), Sydsverige (Sweden), as well most UK regions in the South East England and Scotland, and Pomorskie and Malopolskie in Poland. Similarly, some key industrial regions in the ***low GVC integration*** countries display relatively high levels of both IFDI and OFDI: Piemonte (Italy), Cataluña, País Vasco, Galicia and Andalucia (Spain). Flanders (Belgium), in the ***high GVC integration*** category, follows similar patterns, whilst EU 13 industrial regions in the ***backward GVC integration*** country group mostly show internationalisation profiles skewed towards inward.

When FDI flows are normalised by regional GDP (Figure 19) the main geographical patterns highlighted above are magnified in particular with reference to the relevance of IFDI for EU-13 regions in ***GVA backward integration*** economies. In fact, besides most German regions (very large recipients of FDI in absolute terms) and Spain (relatively lower regional GDP), Central and Eastern European regions stand out for their large share of inward FDI on GDP. Examples are in Bulgaria (Yugoiztochen, Severen tsentralen, Yuzhen tsentralen, Yugozapaden) and Hungary (Közép-Dunántúl, Nyugat-Dunántúl), but also in Romania (Bucuresti – Ilfov, Sud – Muntenia, Sud-Est, Centru), in the ***forward GVC integration*** category.

The overall regional concentration of FDI within each national economy summarised by the Gini coefficients for cumulative FDI (Table 16) unveils that, within each GVC integration model group, different FDI spatial configurations are possible. Among both the GVC backward and forward integration groups we observe both low and high values of the Gini coefficient; outward FDI are generally more concentrated. Strong subnational concentration of both IFDI and OFDI is observed in some Western European countries – such as France, Netherlands, Italy, Spain and Denmark – while Eastern European countries seem to show more dispersion, at least as far as IFDI is concerned. Regional Gini coefficients have increased over time for both inward and outward investments in almost all EU28 countries.

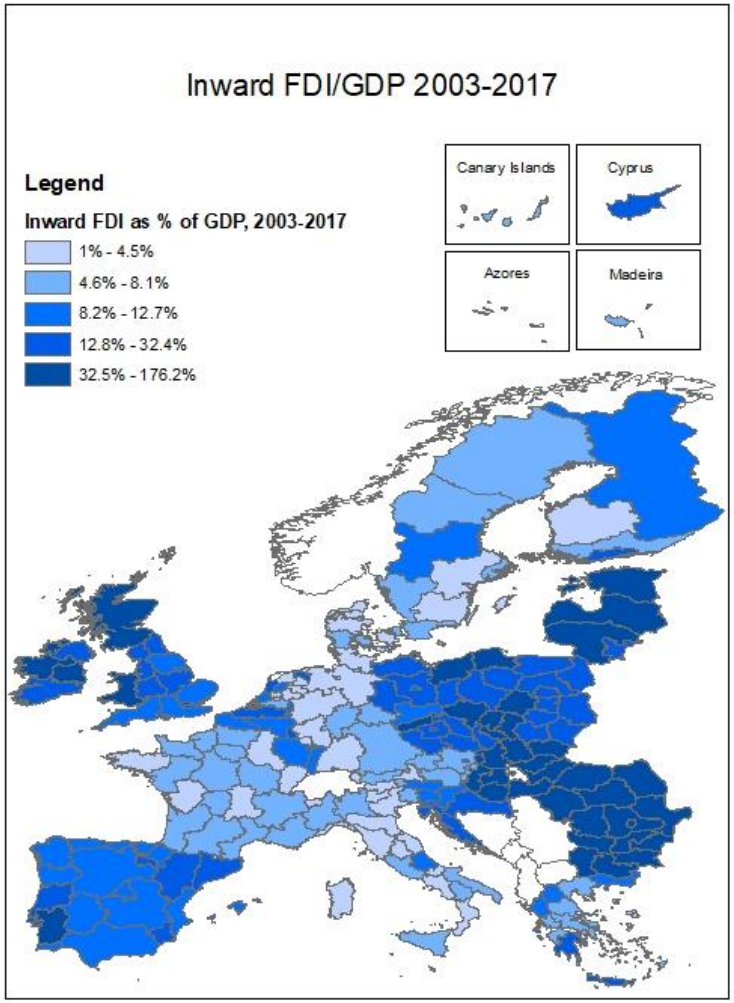
Figure 18. Inward & Outward Cumulative FDI by region, 2003-2017

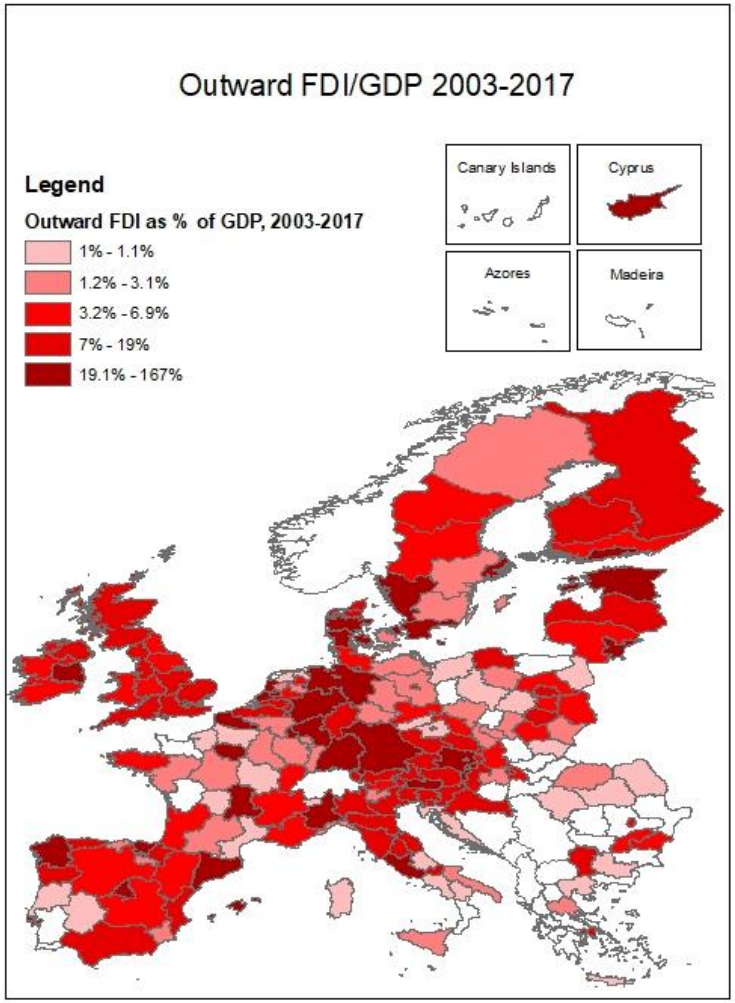




Note: classes are quintiles of the distribution of cumulative FDI.

Figure 19. Inward & Outward Cumulative FDI/GDP by region, 2003-2017





Note: in the legend classes are quintiles of the FDI distribution.

Table 16. Gini coefficients for Inward & Outward FDI

			Foreign Direct Investments - Gini Coefficients					
			INWARD	OUTWARD	INWARD		OUTWARD	
Classification	***COUNTRY***	**Nuts**	2003-2017	2003-2017	average 2003-2005	average 2015-2017	average 2003-2005	average 2015-2017
Backward Integration	Bulgaria	6	0.35	0.73	0.33	0.49	0.43	0.69
Backward Integration	Denmark	5	0.60	0.54	0.67	0.37	0.63	0.60
Backward Integration	Estonia*	1						
Backward Integration	Hungary	9	0.32	0.80	0.42	0.33	0.70	0.75
Backward Integration	Ireland	3	0.32	0.60	0.29	0.31	0.62	0.60
Backward Integration	Lithuania*	2						
Backward Integration	Luxembourg*	1						
Backward Integration	Malta*	1						
Backward Integration	Slovakia	4	0.23	0.47	0.31	0.40	0.22	0.12
Forward Integration	Austria	9	0.48	0.57	0.46	0.53	0.58	0.47
Forward Integration	Finland	5	0.40	0.71	0.24	0.41	0.62	0.63
Forward Integration	France	22	0.56	0.91	0.52	0.64	0.91	0.90
Forward Integration	Germany	16	0.41	0.68	0.43	0.53	0.69	0.69
Forward Integration	Netherlands	12	0.61	0.78	0.59	0.63	0.78	0.77
Forward Integration	Poland	17	0.46	0.59	0.54	0.47	0.31	0.63
Forward Integration	Romania	8	0.30	0.70	0.35	0.32	0.26	0.72
Forward Integration	Sweden	8	0.44	0.75	0.44	0.51	0.60	0.72
Forward Integration	United Kingdom	12	0.41	0.75	0.38	0.44	0.81	0.74
High Integration	Belgium	3	0.34	0.36	0.37	0.40	0.42	0.33
High Integration	Czechia	8	0.23	0.71	0.23	0.33	0.48	0.64
High Integration	Slovenia*	2						
Low Integration	Croatia	2	0.17	0.47	0.07	0.03	0.00	0.49
Low Integration	Cyprus*	1						
Low Integration	Greece	13	0.49	0.81	0.51	0.60	0.61	0.73
Low Integration	Italy	21	0.58	0.79	0.53	0.68	0.75	0.79
Low Integration	Latvia*	1						
Low Integration	Portugal	7	0.51	0.70	0.57	0.45	0.41	0.57
Low Integration	Spain	19	0.59	0.74	0.57	0.68	0.74	0.74
	EU28		0.42	0.67	0.42	0.46	0.55	0.63

Note: cell colours are reds for maximum vales, green for minimum and yellow for median – all others coloured proportionally.

* Gini coefficients not calculated as countries have 2 or less NUTS.

Section 5.3 Regional Analysis of FDI by GVC Function

As discussed in Section 3.2 we can leverage the functional nature of FDI projects in order to obtain some hints on the participation of regions in GVCs. By looking at the business function pursued by each investment (e.g. Production establishment vis-à-vis, for example, a Research and Development unit or a regional Head Quarter) we can associate each investment project with a particular stage of the Value Chain. The functional classification of inward and outward FDI flows makes it possible to organically link national-level GVC analysis with the sub-national geography of FDI.

Following this approach, in Table 17 greenfield FDI to and from European countries are subdivided according to the different stages of the value chain, or groups of functions, as classified by Crescenzi et al. (2014). Over the period 2003-2017 more than 60% of both IFDI and OFDI were in Production-related activities, followed by Sales (15% and 16% respectively), Headquarters (11% and 8% respectively), Logistic & Distribution (10% and 6% respectively), and Innovation (less than 4%). The distribution of FDI between business functions is very similar across groups of countries based on their GVC configurations, keeping in mind that ***forward GVC integration*** economies receive and send a total value of FDI significantly larger than the other three groups combined.

Figures 20-22 show IFDI and OFDI in and from European NUTS regions (from and to the World, including other Europe) in Headquarters, Innovation and Production. For each figure the left map shows the aggregate cumulative FDI value 2003-17 (expressed in € millions) at the NUTS level, while the right map is normalised by the regional GDP (average 2006-2017). Different colour identifies the classes, defined in terms of quantiles.

As shown in the maps below, the large majority of companies investing abroad through outward FDI in 'Headquarters' and 'Innovation' are located in the EU 15 (with or without a GDP normalization). These are the most advanced regions in the ***forward GVC integration*** countries in France, Germany, Netherlands and the United Kingdom, with the addition of a few key regions in Italy and Spain. In the first quantile of the distribution we find the capital city regions of ***forward GVC integration*** countries in the EU 13: Warsaw and Bucharest, as well Bratislava and Budapest for countries within the ***backward GVC integration***. Moreover, when taking into consideration the size of the regional economy – proxied by GDP – a number of Eastern regions, especially in Poland and Romania, are found as major attractors for inward FDI in both 'Headquarter' and 'Innovation' functions/GVC stages. Regions with simultaneously high inward and outward connectivity in these higher value added and technological/human capital intensity stages are the leading European regions in terms of GVCs. These regions not only occupy a primary position in terms of their centrality in FDI connectivity, but such a connectivity is also of a higher quality in terms of sophistication and likely value creation.

FDI in 'Production' activities show a more diversified distribution among EU28 regions. Even if major senders of FDI are still primarily located in Western Europe, the regions of Praha and Budapest are found in the first quantile of outward investments, with the latter also present among the top recipient of FDI

in production activities. Large recipient regions are also found in Bulgaria, Hungary, Poland, Romania and Slovakia.

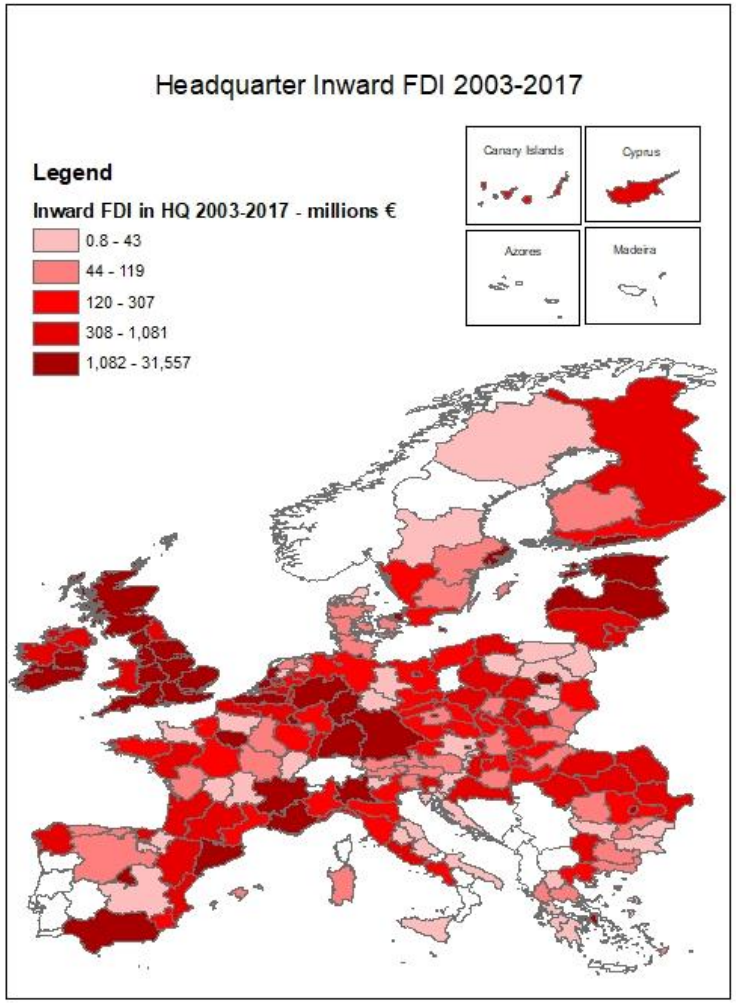
Table 17. IFDI and OFDI by FDI Function, 2003-2017

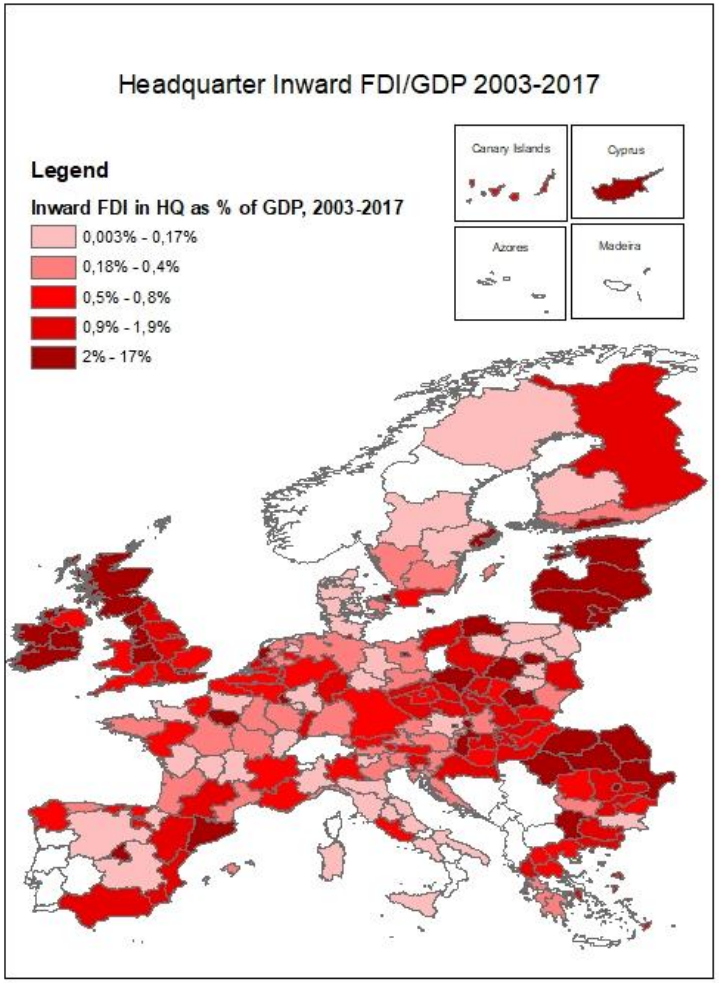
	EU 28 Destination		EU 28 Source	
	Tot 2003-2017	Share	Tot 2003-2017	Share
Headquarters	221,054	11%	336,189	8%
Innovation	81,053	4%	126,789	3%
Sales	313,263	15%	658,096	16%
Production	1,260,364	61%	2,791,880	67%
Logistics & Distribution	200,721	10%	269,458	6%

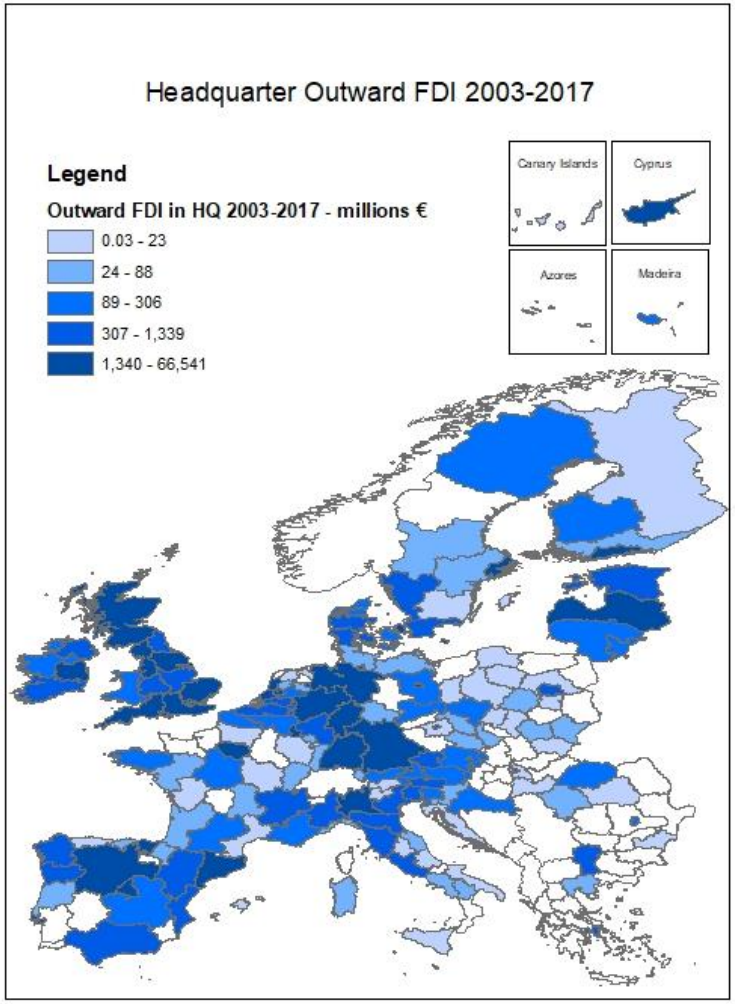
	EU 28 Destination		EU 28 Source	
	Tot 2003-2017	Share	Tot 2003-2017	Share
Backward Integration	388,084		265,230	
Headquarters	36,832	9%	38,295	14%
Innovation	17,080	4%	6,539	2%
Sales	52,393	14%	33,126	12%
Production	264,772	68%	156,575	59%
Logistics & Distribution	17,007	4%	30,694	12%
Forward Integration	1,585,304		2,408,896	
Headquarters	185,775	12%	189,371	8%
Innovation	61,885	4%	88,914	4%
Sales	229,494	14%	385,274	16%
Production	953,533	60%	1,585,026	66%
Logistics & Distribution	154,616	10%	160,312	7%
High Integration	154,287		94,153	
Headquarters	13,027	8%	6,508	7%
Innovation	6,424	4%	1,743	2%
Sales	19,794	13%	13,537	14%
Production	95,690	62%	67,838	72%
Logistics & Distribution	19,351	13%	4,527	5%
Low Integration	454,595		594,881	
Headquarters	39,267	9%	36,161	6%
Innovation	15,408	3%	4,757	1%
Sales	87,890	19%	97,251	16%
Production	253,387	56%	435,568	73%
Logistics & Distribution	58,642	13%	21,143	4%

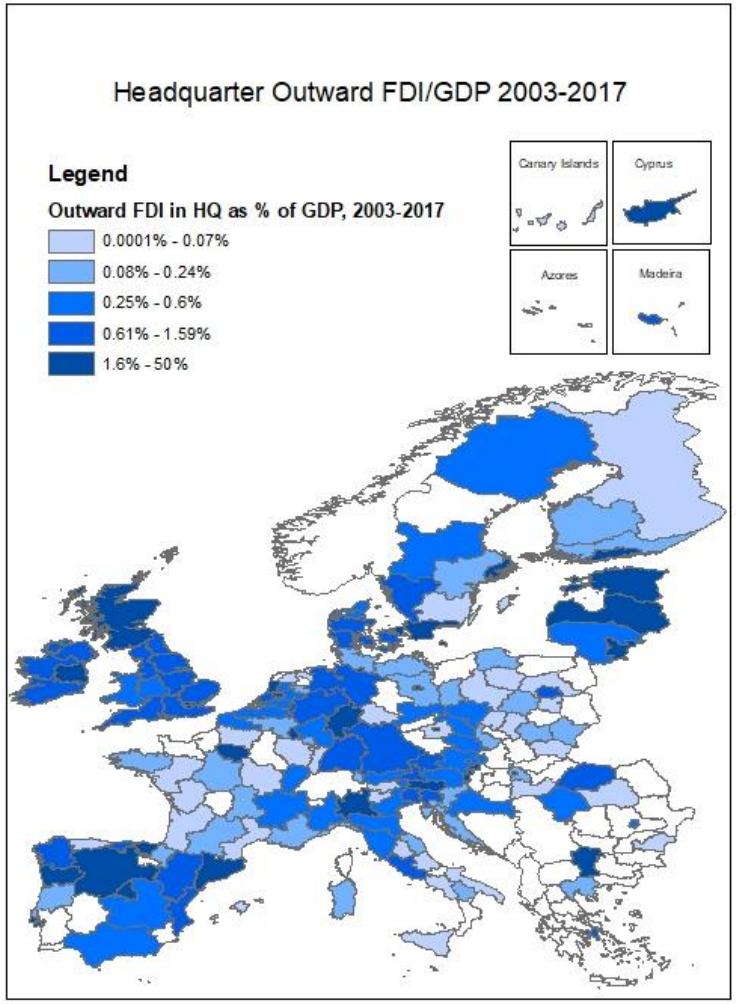
Note: total amount of inward and outward investments is expressed in millions of euros.

Figure 20. Inward & Outward Cumulative FDI and FDI/GDP in Headquarters, 2003-2017



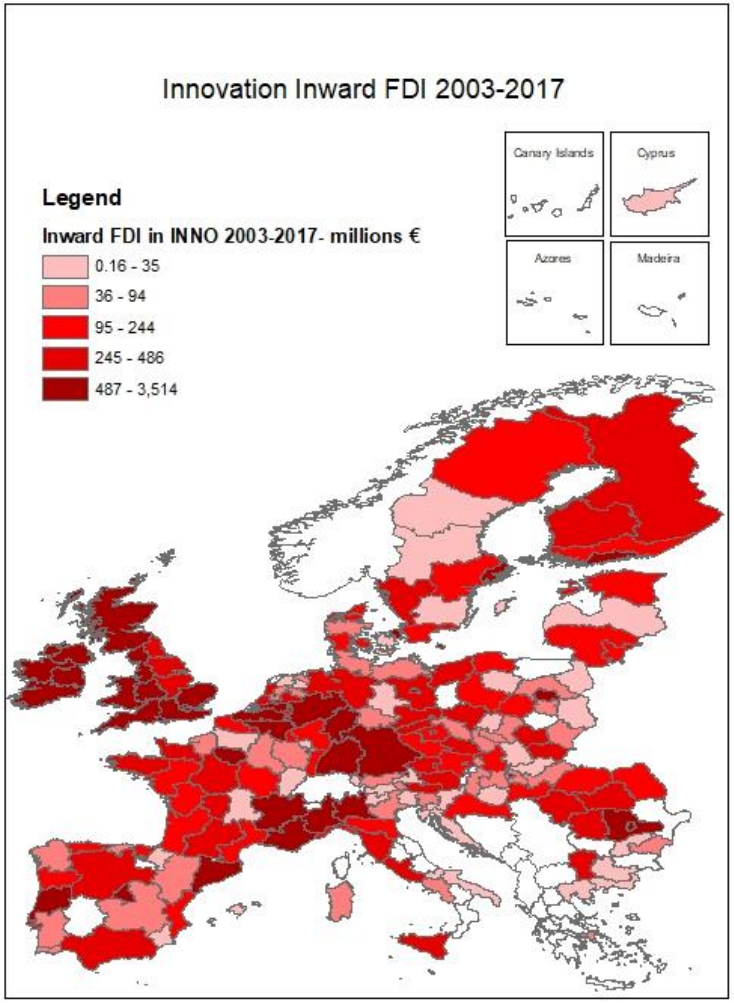


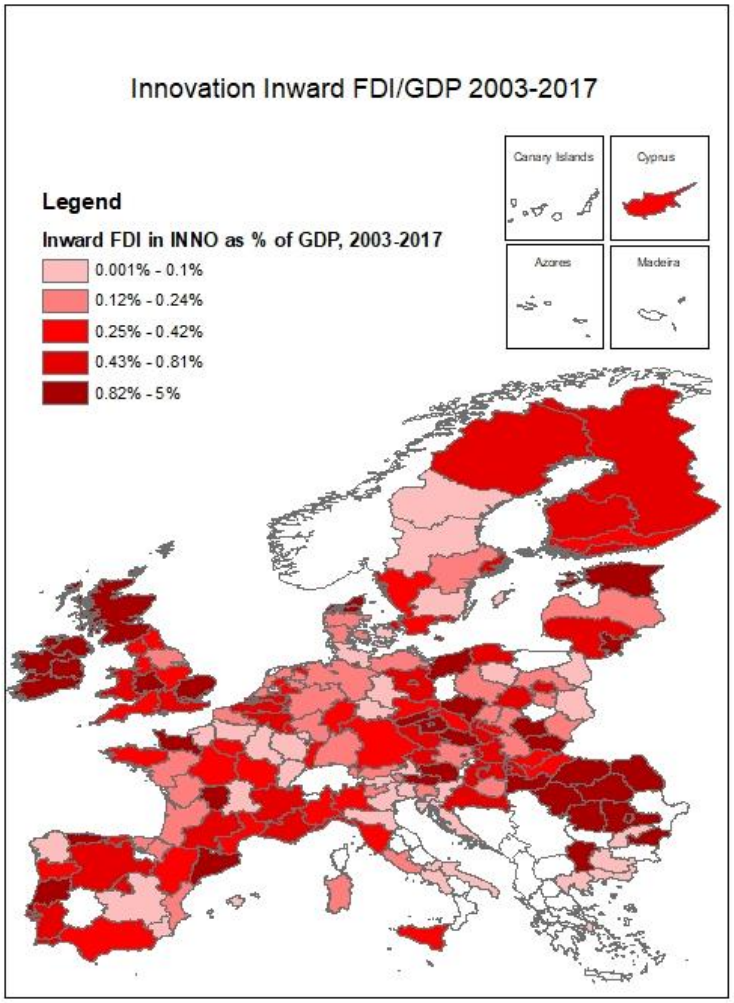


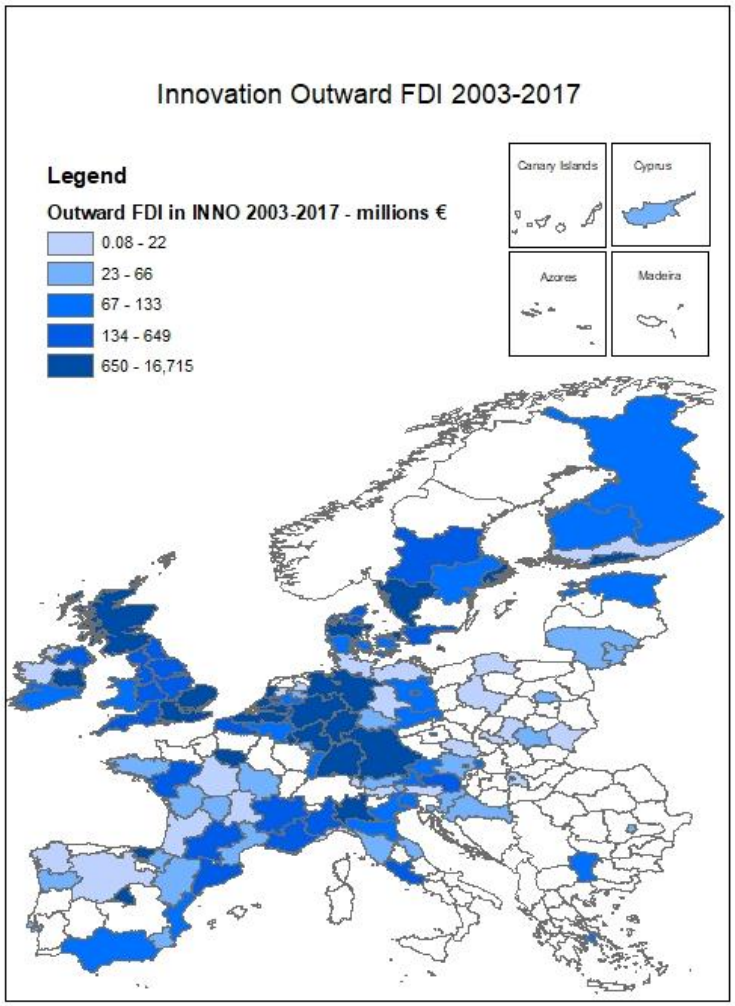


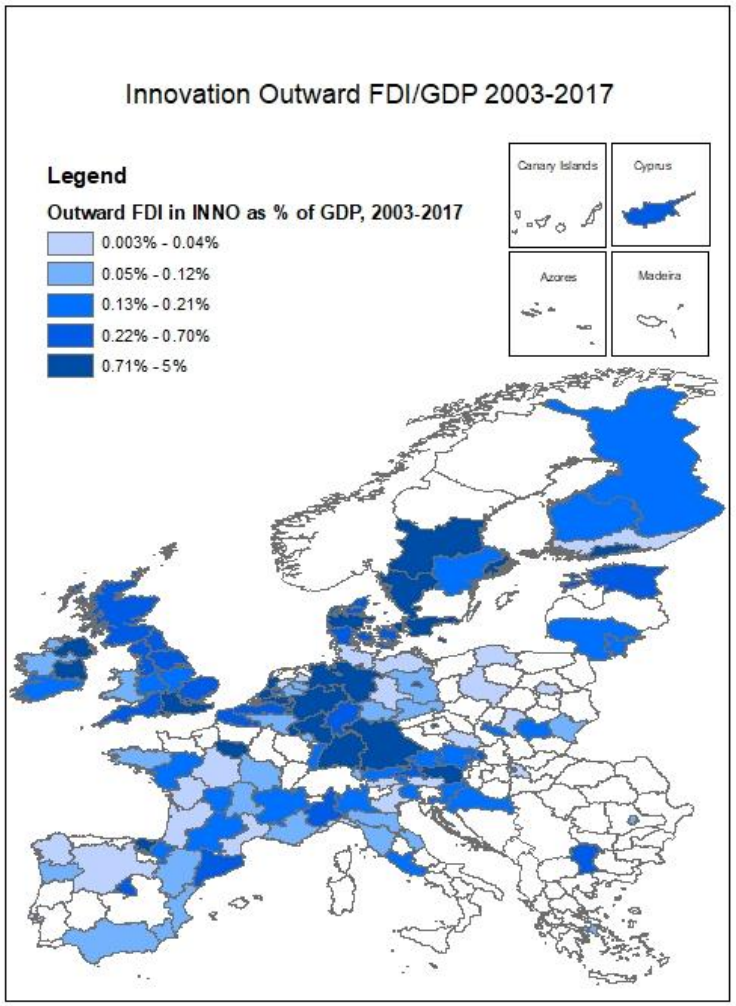
Note: in the legend classes are in quintiles of the FDI distribution.

Figure 21. Inward & Outward Cumulative FDI and FDI/GDP in Innovation, 2003-2017



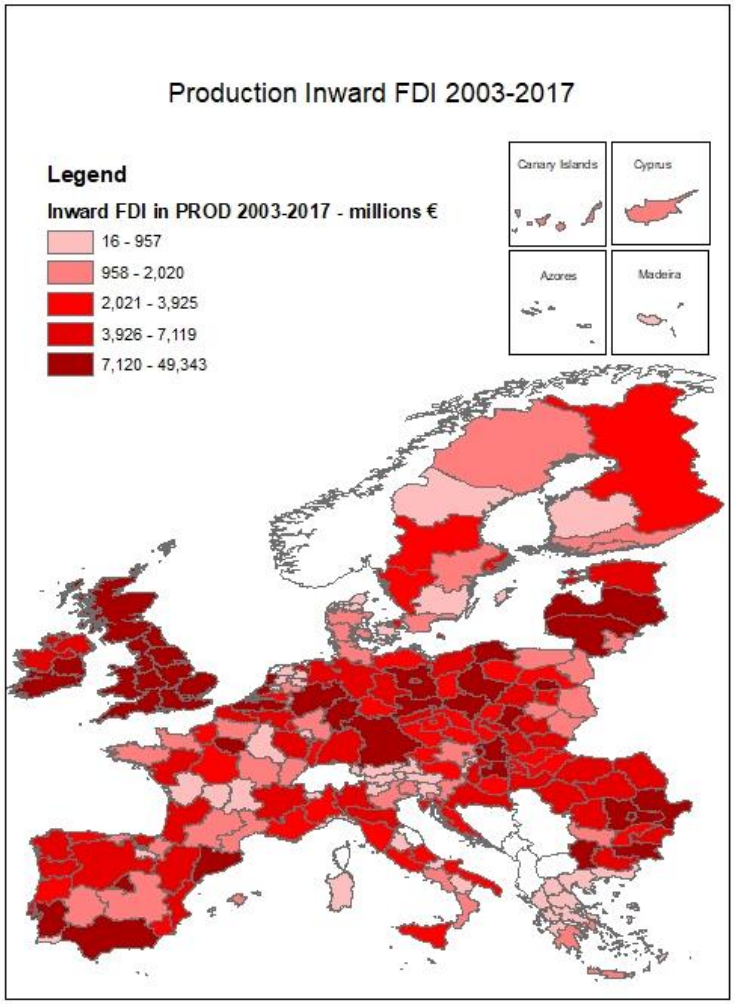


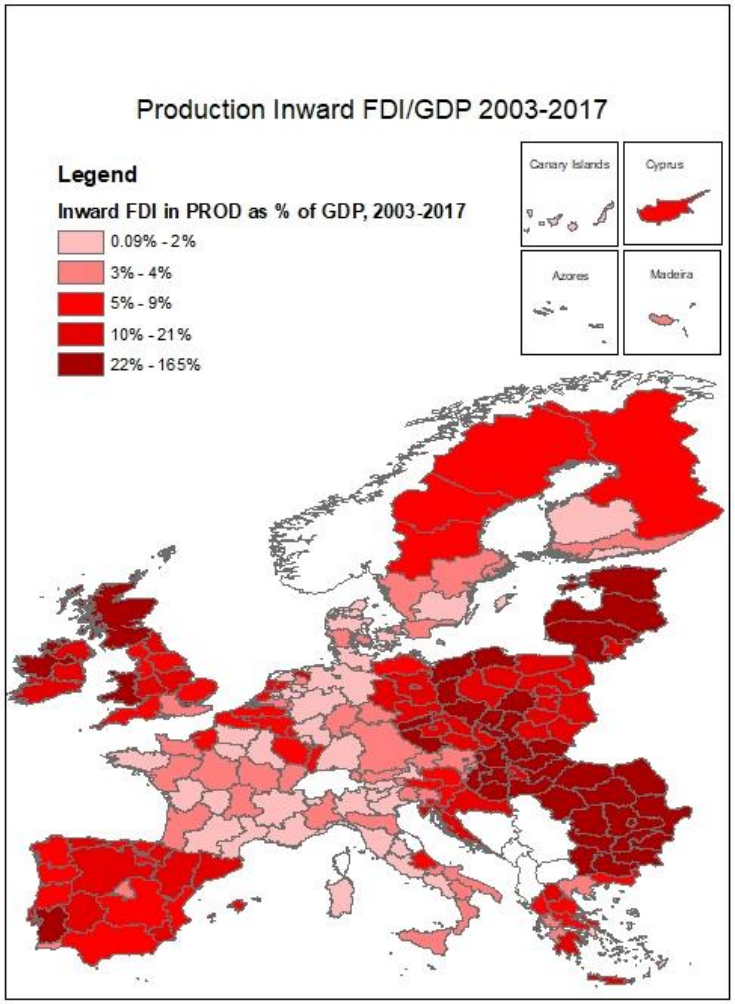


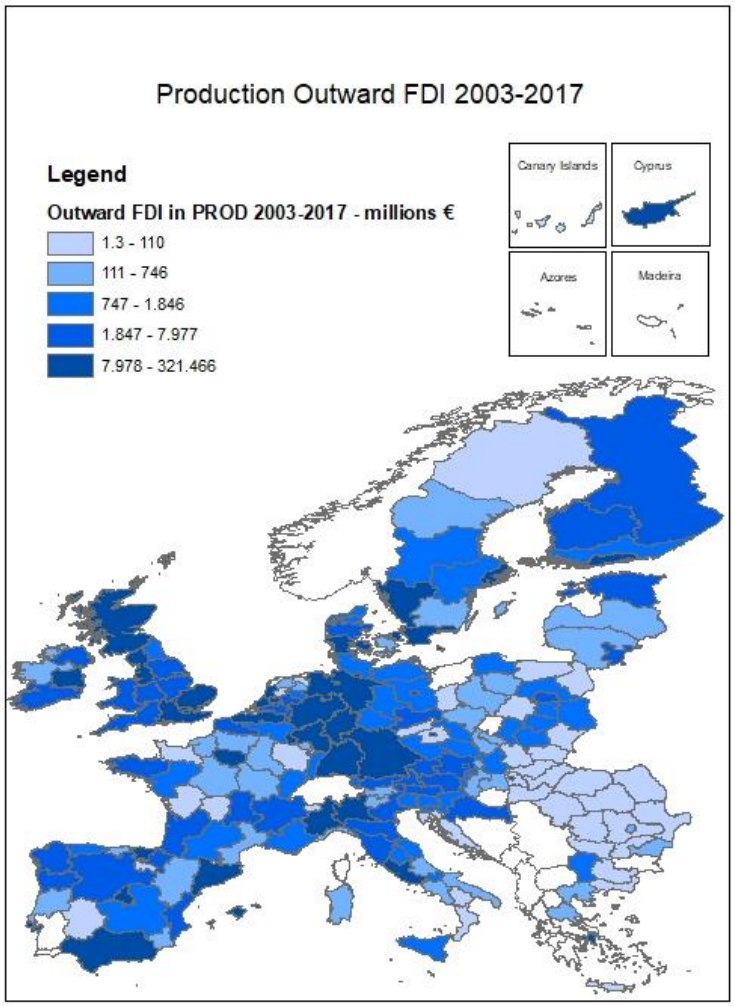


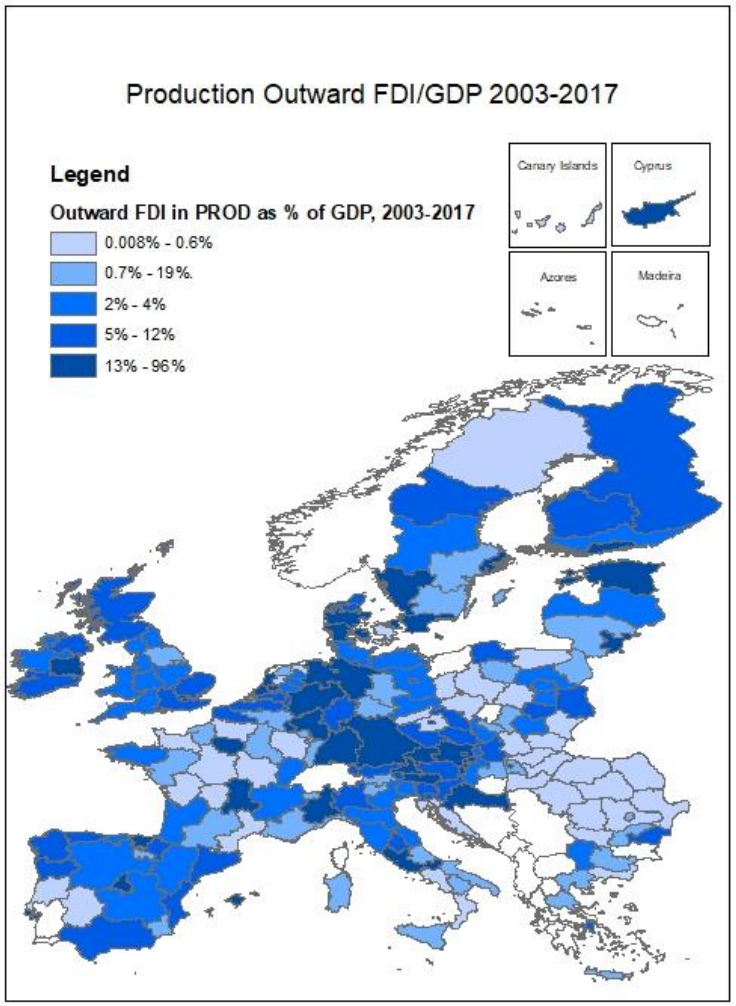
Note: in the legend classes are in quintiles of the FDI distributions.

Figure 22. Inward & Outward Cumulative FDI and FDI/GDP in Production, 2003-2017









Note: in the legend classes are in quintiles of the FDI distribution.

Section 5.4. Regional FDI patterns in GVC-sensitive sectors

The brief picture of the functional nature of FDI connectivity above provides insights on the different capacity of different types of regions to access higher value added activities through internationalisation. Additional information in this regard comes from considering the regional internationalisation patterns of the GVC-sensitive sectors identified in Section 4.1. The overall geography of employment in these sectors offers a bird's-eye view of the potential relevance of GVC-sensitive sectors in EU regions. Figure 23, 24, and 25 show the shares of employment in the selected sectors – computer, electronic and optical products; motor vehicles, trailers and semi-trailers; and textiles, wearing apparel, leather and related products[29] – for the EU28 regions[30]. The share of employment in each sector is expressed as a percentage of total manufacturing employment in 2017, with data obtained from Eurostat Regional Structure Business Statistics.

Employment in the automotive sector (Figure 23) is concentrated in the historical 'automotive regions' in Western Europe as well as in major production areas in Central and Eastern Europe. As highlighted in the map, in the first quintile of the employment share distribution (darkest shade of grey) there are regions that have played a major role in the progress of the automotive industry in Europe with historical national 'champions'. These are, for example, Baden-Württemberg, Bayern, Bremen, Hessen, Saarland and Sachsen in Germany, Île de France, Övre Norrland and Västsverige in Sweden, and the North East and West Midlands in the United Kingdom – among the ***forward GVC integration*** economies; Abruzzo, Basilicata, Molise, and Piemonte in Italy, and Aragón, Castilla y León, Comunidad Foral de Navarra in Spain – in the ***backward GVC integration*** group – as well the Région de Bruxelles-Capitale for Belgium in the ***high GVC integration*** category. At the same time, the delocalization of MNE production facilities in Central and Eastern Europe has supported automotive employment in Czechia regions of Jihozápad, Moravskoslezsko, Severovýchod, Severozápad, Střední Cechy, and in areas of Hungary (Közép-Dunántúl, Nyugat-Dunántúl, Észak-Magyarország), Romania (Centru, Nord-Vest, Sud – Muntenia, Vest), and Slovakia (Bratislavský kraj, Stredné Slovensko, Západné Slovensko). The relatively lower value addition of these automotive clusters, vis-à-vis EU-15 regions, is generally associated with high backward integration of the national economies[31].

The geography of employment in electronics shows an even stronger divide between Western and Central and Eastern Europe. Higher knowledge and skill intensity of this sector has fostered concentration in consolidated hubs in the most advanced ***forward GVC integration*** economies (Figure 24). Germany is by far the leading country with eight regions in the first quintile of the distribution (Baden-Württemberg, Bayern, Berlin, Hamburg, Hessen, Sachsen, Schleswig-Holstein, Thüringen), followed by the UK (East of England, Northern Ireland, Scotland, South East, South West). Relative high shares of employment in

[29] For simplicity in the text and in the title of the maps the sectors are renamed as automotive, electronics and textile. Data at sectoral level for TiVa indicator is based on the International Standard Industrial Classification, (ISIC Revision 4), while fDi-Markets uses North American Industry Classification System (NAICS) 2007.

[30] NUTS2 are used for all the countries, except for Belgium, Germany and United Kingdom where NUTS1 is used. In some French regions data for employment is missing due to the revision of the NUTS classification adopted in 2016. In the maps where the data is missing the corresponding region is marked in white.

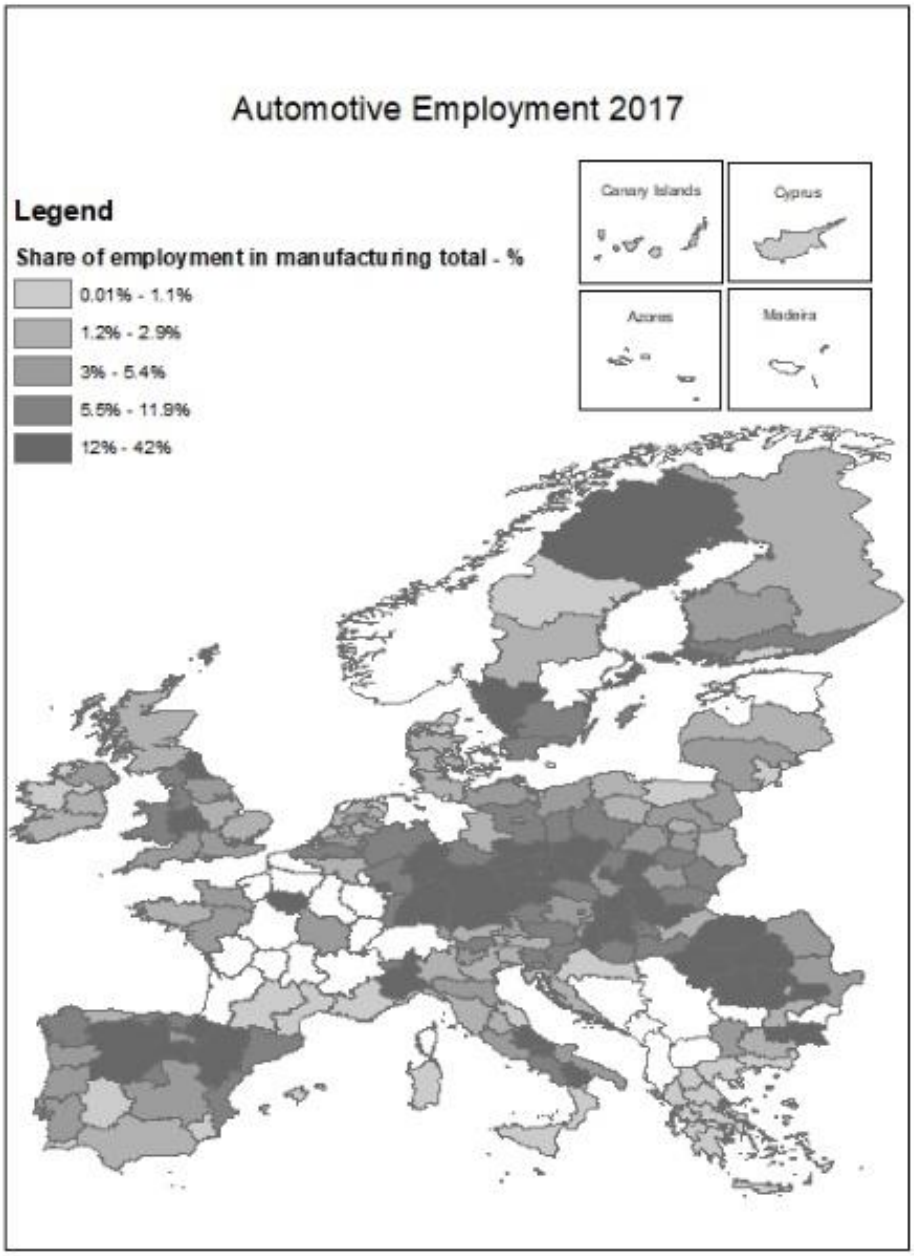
[31] See https://irp-cdn.multiscreensite.com/bcb8bbe3/files/uploaded/doc_1310.pdf

electronics also characterize selected regions in other forward integrated countries: Austria (Kärnten, Steiermark, Tirol), Finland (Åland, Helsinki-Uusimaa, Pohjois- ja Itä-Suomi) and the Netherlands (Gelderland, Noord-Brabant, Overijssel). In Eastern Europe the largest shares are found in two regions in Poland (Pomorskie and Warszawski stoleczny) also a ***forward GVC integration*** economy. Hungary is a key exception, being a backward integrated economy with seven regions in the first quintile of the electronics employment share distribution (Észak-Magyarország, Pest, Közép-Dunántúl, Budapest, Dél-Dunántúl, Észak-Alföld, Nyugat-Dunántúl)[32].

Fundamentally different is the European geography of the textile sector (Figure 25), where the regions with the largest shares of employment in this industry are mostly spread across Central and Eastern European countries and – in Western Europe – concentrated in very limited hubs with a longstanding historical tradition of typical products. In particular, Bulgaria, Lithuania, and Romania have all their regions in the first quintile of the distribution, highlighting the dependence their national economy from this sector. Historically, in some southern EU countries such as Italy (Toscana, Marche, Campania, Umbria, Puglia, Veneto, Abruzzo) and Spain (La Rioja, Comunidad Valenciana, Illes Balears, Castilla-la Mancha, Galicia), the textile industry has played a major role, and continues to be significant in terms of employment shares.

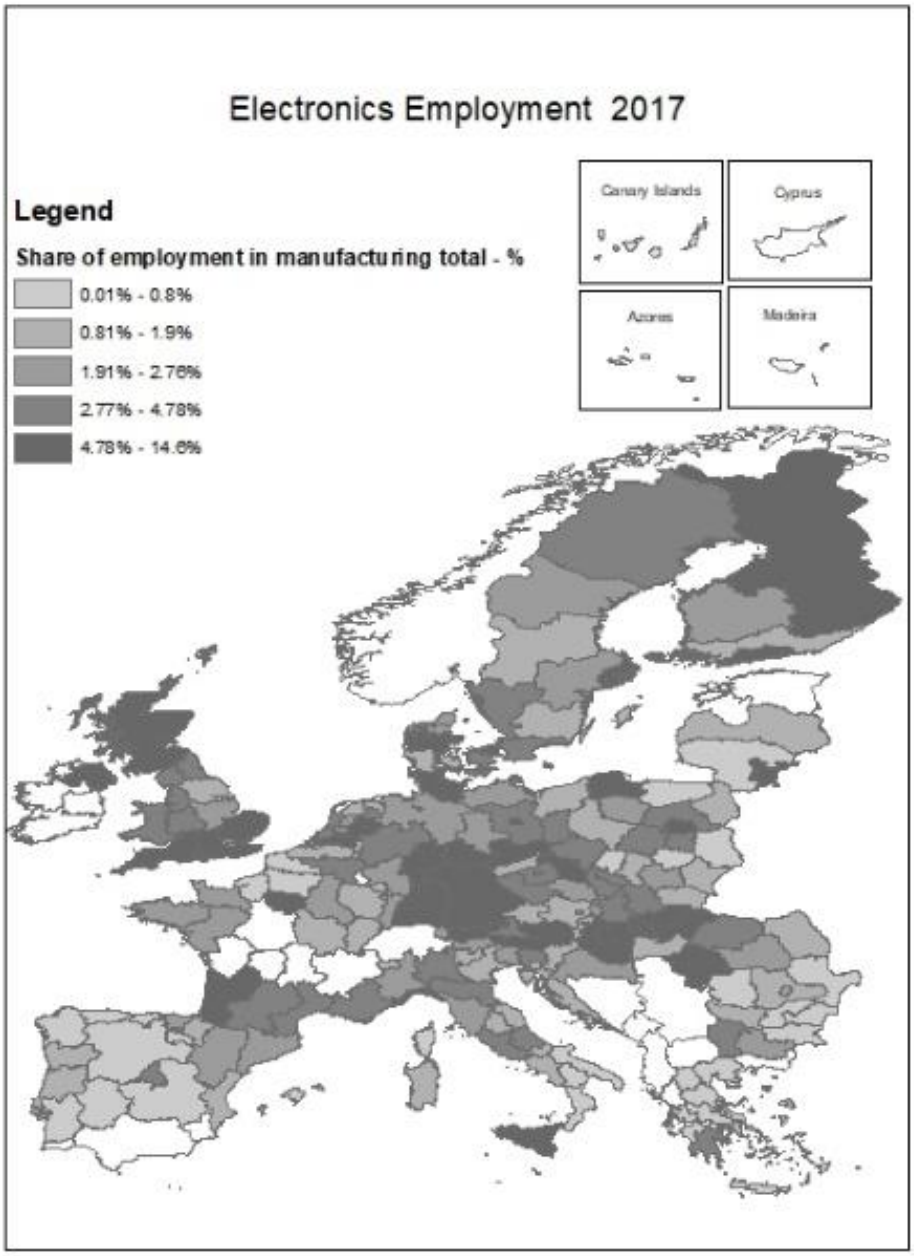
[32] "Hungary's exports and inward investment are more focused on manufacturing than services. The computer electronics and motor vehicles industries are Hungary's top exporting industries; both have high shares of value added produced by foreign-owned firms and high import content in their exports, an indicator of GVC integration." (OECD, 2017 available at http://www.oecd.org/investment/HUNGARY-trade-investment-statistical-country-note.pdf)

Figure 23. Employment in Automotive, 2017



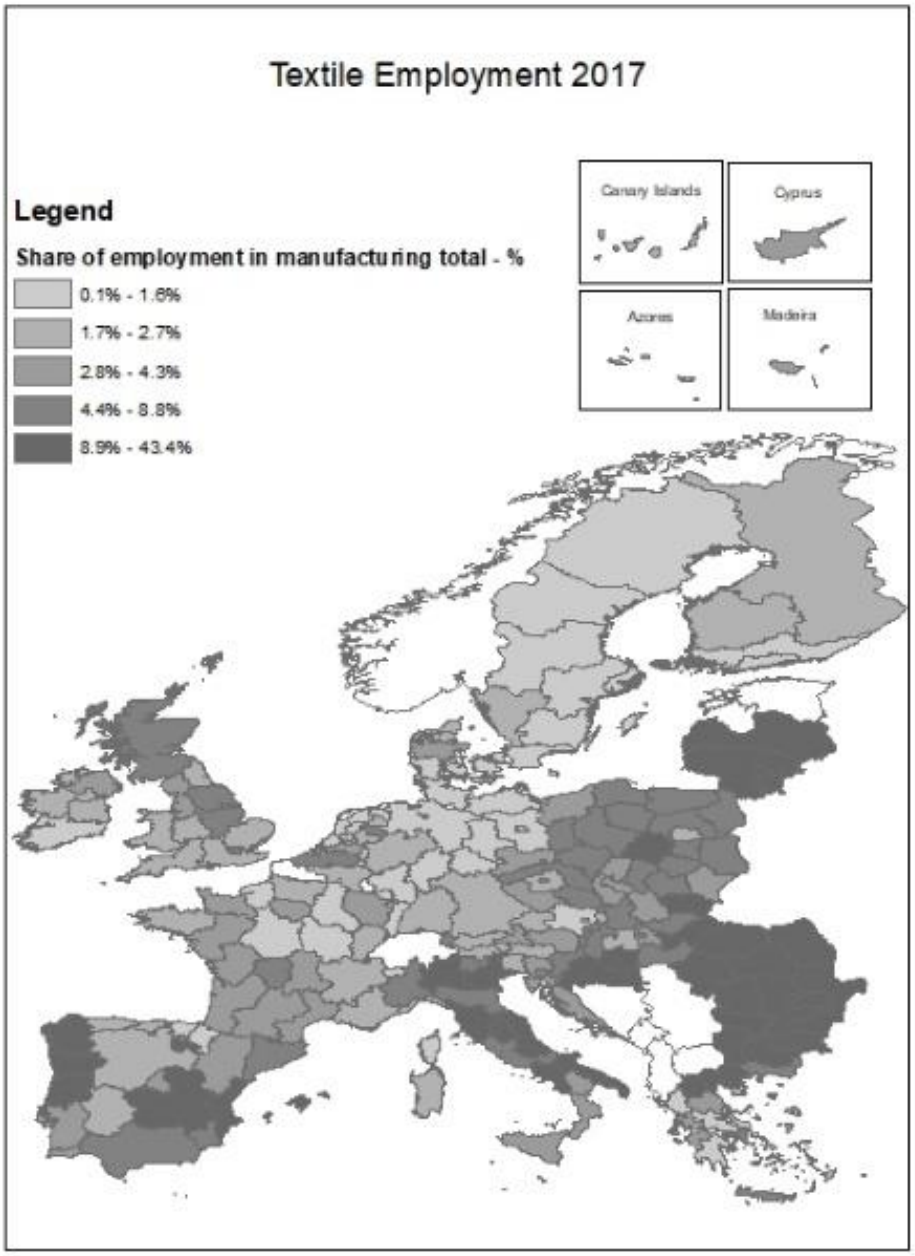
Note: in the legend classes are quintiles of the FDI distribution. For some French regions data for employment is missing due to the revision of the NUTS classification adopted in 2016. In the maps where data is missing the corresponding region is marked in white.

Figure 24. Employment in Electronics, 2017



Note: in the legend classes are quintiles of the FDI distribution. For some French regions data for employment is missing due to the revision of the NUTS classification adopted in 2016. In the maps where the data is missing the corresponding region is marked in white.

Figure 25. Employment in Textile, 2017



Note: in the legend classes are quintiles of the FDI distribution.

The geography of employment of GVC-sensitive sectors compounds the activity of purely domestic firms, domestic multinationals (i.e. domestic firms investing abroad) and foreign firms. Looking at the geography of inward and outward FDI in these same sectors adds further insights to the GVC participation of EU

regions. The spatial structure of FDI is therefore nested into the geography of regional employment discussed above.

Figures 26 to 28 highlight with colour the NUTS regions in the top quintile of the distribution of inward and outward FDI in the three selected GVC sensitive sectors – automotive, electronics and textile industries. The regions highlighted in blue and red are respectively the areas that have invested abroad and received the largest amounts of capital through FDI in each sector over the years 2003 to 2017. A limited number of higher order centres appears in the top quintile of the distribution of both inward and outward FDI in the three sectors. These belong to the GVC forward integration economies of the UK (South East England regions), France (Ile-de-France region) and Germany (Bayern, Nordrhein-Westfalen, North of Baden-Wurttemberg). Italy (Lombardia) and Spain (Madrid region) also play a key role in the low GVC integration group. The centrality of this limited set of regions in terms of both inward and outward investments in all selected GVC-sensitive sectors puts them at the top of the spatial hierarchy of value creation through internationalisation.

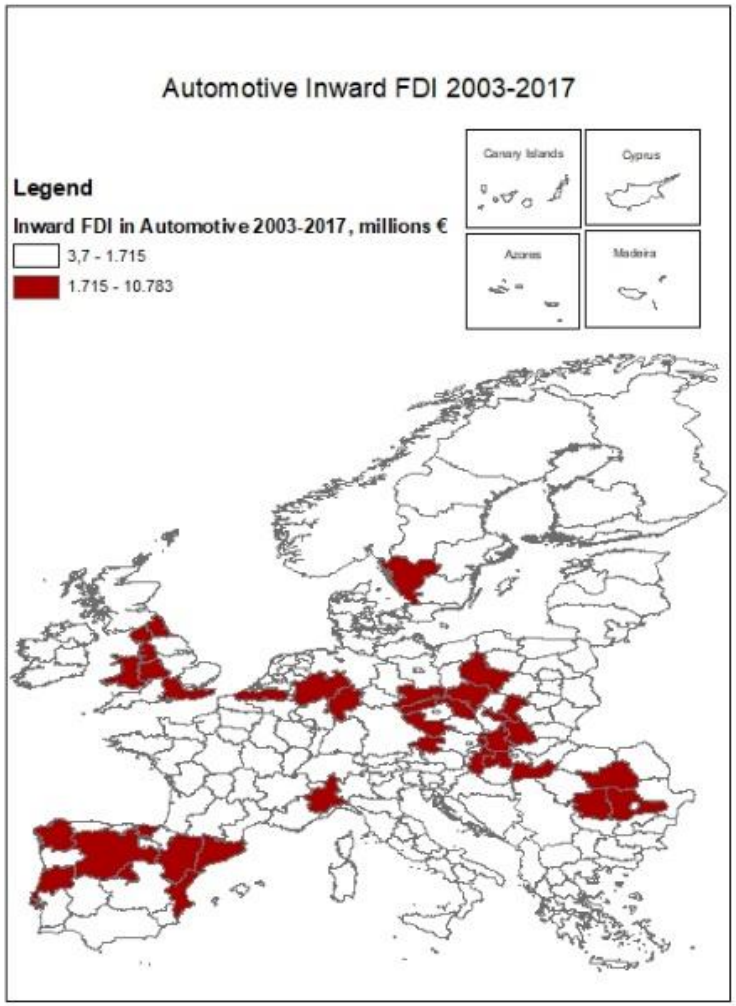
Beyond these centres of multiple specialisation, the maps show a circle of other key locations where domestic MNEs are located, controlling activities abroad through outward FDI in one or two specific GVC sensitive sector. The regions in the top quintile for outward FDI are mostly located in the forward GVC integration countries: Rhône-Alpes for textile and automotive, the area around Stockholm and Sydsverige for automotive and electronics, the region of Vlaams Gewest in Belgium for automotive and textile, Noord-Holland in Netherlands for electronics and textile industries, Oberösterreich, Salzburg, Steiermark and Wien for the three sectors. Outside this group of regions in the top quintile we can only find Midtjylland in Denmark for electronics and textile (relatively higher backward integration), Catalunya for electronics and textile, Galicia for textile, the Italian regions of Emilia-Romagna, Piemonte, Toscana, Umbria, and Veneto for textile.

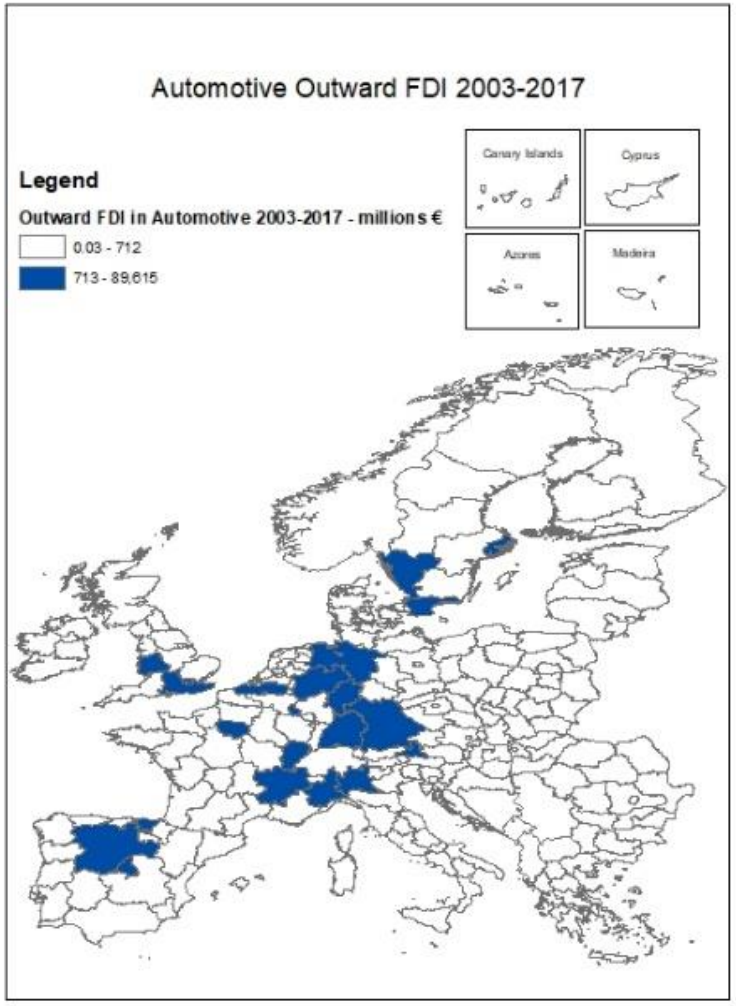
As noted above for general FDI, regions in Central and Eastern European Countries are not part of the group of top outward investors but some of them play a central role when it comes to FDI attraction in GVC-sensitive sectors. In Poland – forward GVC integration economy - Dolnośląskie is in the first quintile for all three sectors and the largest recipient of investment in electronics industry among all EU28 regions. Other Polish regions are in the top quintile for electronics and automotive industries: Kujawsko-Pomorskie, Łódzkie, Pomorskie, Śląskie, Wielkopolskie and Warszawski stołeczny. In Romania – in the same GVC group – some regions are part of the top quintile in the same sectors: Nord-Vest, Centru, Sud-Munteina, Sud-Vest Oltenia, Vest. In the backward GVC integration economies, regions in the top quintile can be identified in Slovakia (large attractor of investments in the electronics and automotive industries), with Western Slovakia being the second largest attractor of investments in electronics. Other large attractors of foreign direct investments in Eastern Europe are found in Hungary (Central Transdanubia, Southern Great Plain, Western Transdanubia).

A different story emerges for the textile industry: the large majority of inward FDI recipient regions belong to the most advanced and forward GVC integration economies such as Belgium (all regions), France (Rhône-Alpes, Provence-Alpes-Côte d'Azur) and the United Kingdom. In the GVC low integrated group we can identify Lazio and Toscana (Italy), and Andalucia (Spain). The nature of these inward investments is

fundamentally different from those in the other two GVC-sensitive sectors: these are mainly investments from other advanced economies (and from outside the EU) targeting global competence hubs where historical legacy, cutting-edge technologies and creativity/fashion overlap in a unique manner for what is normally a low-technology intensity sector.

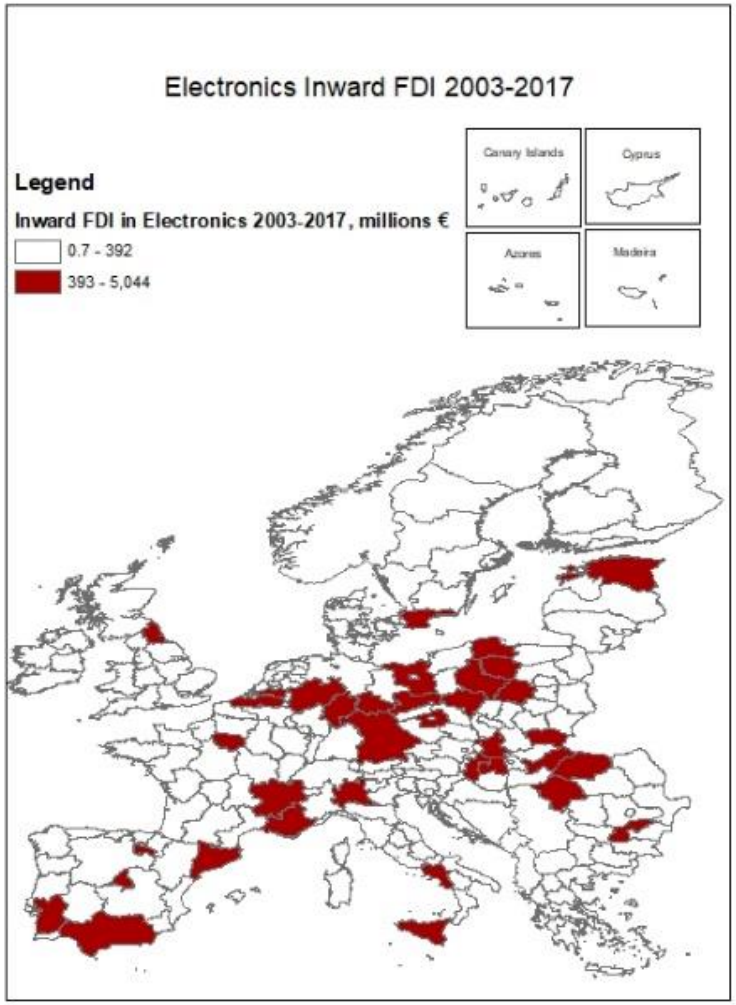
Figure 26. Inward & Outward FDI in the Automotive Sector, 2003-2017

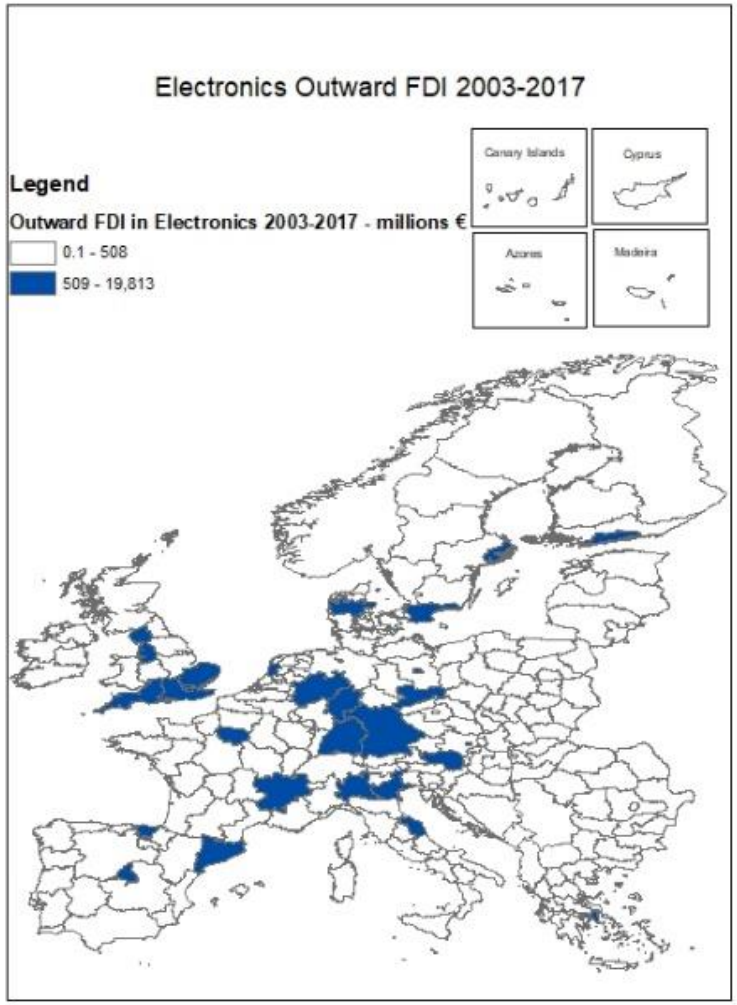




Note: in colours only NUTS in the first quintile of the distribution.

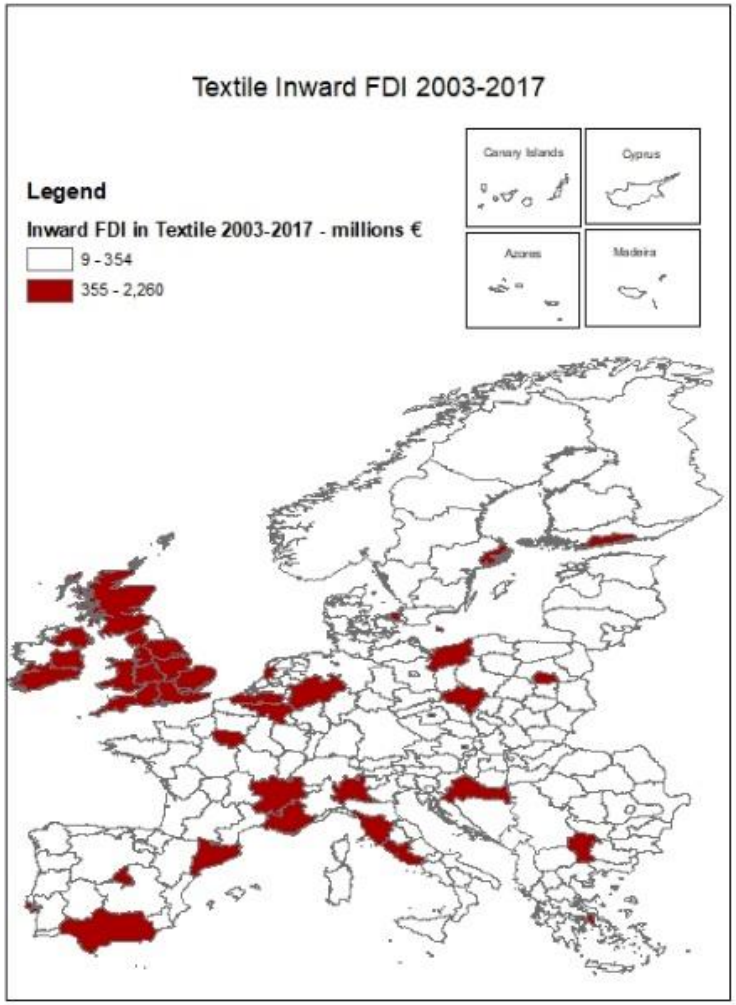
Figure 27. Inward & Outward FDI in the Electronics Sector, 2003-2017

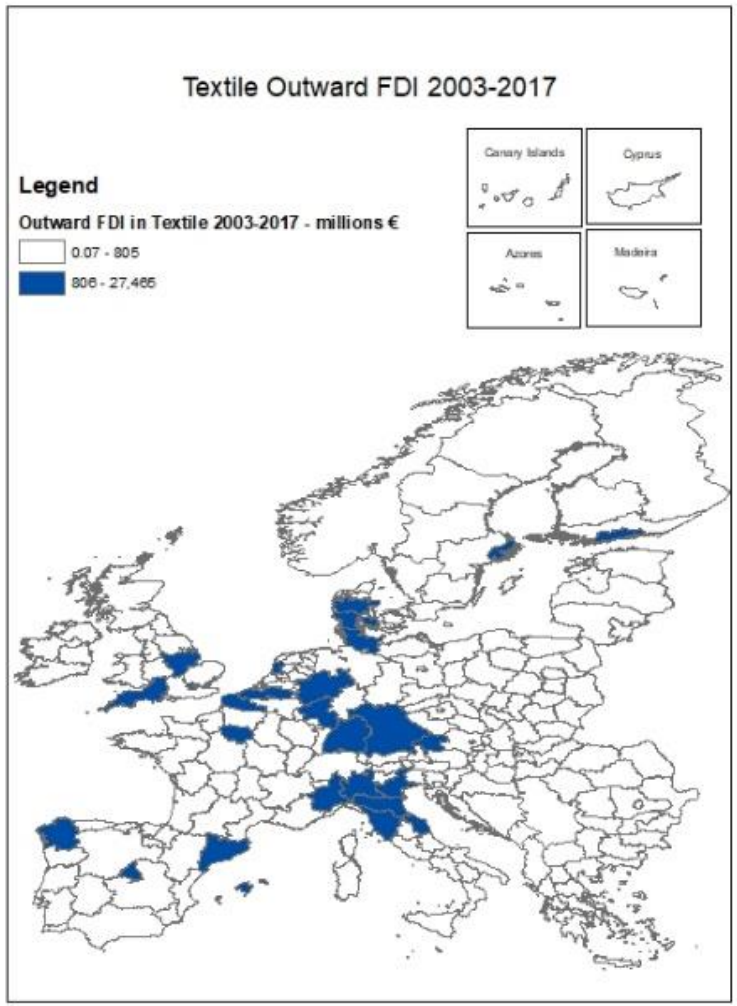




Note: in colours only NUTS in the first quintile of the distribution.

Figure 28. Inward & Outward FDI in the Textile Sector, 2003-2017





Note: in colours only NUTS in the first quintile of the distribution.

Section 6. Emerging issues

In this Section we first summarise some of the key features characterising our GVC-based country groups, and then highlight some key issues that emerge from the previous analysis.

High GVC Integration (Belgium, Czech Republic and Slovenia): these economies, notwithstanding their heterogeneous levels of overall economic development, have in common a relatively high integration in EU GVCs in terms of both backward and forward linkages. The group on average shows both the largest shares of foreign value added in their exports coming from other EU28, and the largest share of their value added going into other European countries' exports. Czechia and Slovenia, among all the Central and Eastern EU members, appear to be well integrated with EU15 countries in both forward and backward linkages. In line with the relatively small size of their economies, the group records domestic value added below the EU average, and foreign affiliates appear to source especially from abroad. Belgium and Czechia display attractiveness slightly below the EU average and even weaker outward internationalisation, although the region of Praha is one of the top investors in production functions.

Low GVC Integration (Southern European countries (Croatia, Cyprus, Greece, Italy, Portugal, and Spain) and Latvia): this group is overall less integrated in term of both backward and forward linkages and it is also more dependent on rest of the World in both backward and forward linkages. The group shows on average a weaker specialisation in technologically advanced products compared to other economies with similar domestic market size, at the same time displaying a strong specialisation in services such as tourism, which imply less GVC integration. Foreign affiliates rely more on domestic firms for intermediate inputs. One of the characterising features of the group is the very high subnational inequality, both in terms of GDPpc and innovation. The groups is highly differentiated in terms of FDI: Italy and Spain, the largest economies of the group, are above the European average for both OFDI and IFDI, with strong hot spots in the largest urban agglomerations, i.e. Barcelona, Madrid, Milan and Rome. Croatia, Cyprus, Greece and Latvia show smaller 'gravitational' forces in term of FDI, but exhibit relatively balanced patterns in terms of inflows and outflows when compared to the EU average.

Backward GVC Integration (Central and Easter members, Lithuania, Estonia, Slovak Republic, Hungary, Bulgaria – together with Ireland and Denmark, and Luxembourg and Malta): the overall position of this group is that of a net 'receiver' from the rest of the EU and – as far as the EU13 economies included are concerned – strongly influenced by the huge presence of EU15 MNEs located there and their intra-firm trade. Foreign affiliates appear to source intermediates especially from the rest of Europe. In terms of FDI, IFDI values are on average below the EU average, coupled with OFDI almost in line with the EU28 in the case of Denmark and Luxembourg, whilst Ireland is net FDI receiver. Some metropolitan region in Central and Eastern economies of the group, however, are rather attractive towards IFDI, as for instance Budapest in Hungay and Sostines regionas (Vilnius) in Lithuania.

Forward GVC Integration (Northern and Central Europe – Germany, Austria, Sweden, France, Finland, the United Kingdom, the Netherlands and Poland – as well as Romania): contrary to the previous group, the overall position of this category is that of a net 'sender'. Larger countries on average tend to display

lower backward linkages, as they source more domestically, and higher forward linkages, as they contribute more to other European economies. Germany contributes the most to EU13 countries' exports, at the same time recording the highest values of foreign value added in exports from that area, due to the large presence of German MNEs there located. Poland and Romania appear to be well integrated with EU15 countries in terms of both forward and backward linkages. The group includes the most innovative countries in Europe, with the exception of Poland and Romania, which are however increasing fast in their innovation indicators. The largest economies – France, Germany, and United Kingdom – together with the Netherlands (and the low GVC integrated Italy and Spain), are all above the European average both for OFDI and IFDI. Poland and Romania are FDI net receivers and particularly attractive to both 'Headquarter' and 'Innovation' functions/GVC stages – with relatively lower outward flows, whilst smaller economies like Austria, Sweden and Finland have inward FDI values below the EU average and outward FDI in line with the EU28. Capital city-regions – along with some of the leading European industrial cores – play a predominant role in the spatial hierarchy of both IFDI and OFDI: London and Paris lead this group but also Amsterdam, Berlin and Stockholm.

Some important issues need to be highlighted here, as crucial for thinking about the policy implications.

- Overall, **European integration generates strong patterns of intra-area interdependence**: the EU28 has on average a larger share of its value added in exports of other EU countries compared to the rest of the World; EU15 countries tend to have a larger share of their domestic VA in EU13 countries' exports, while EU13 tend to have higher shares in EU15 countries exports; in most of the EU28 economies, more than 70% of value added comes from domestic sources and from other European countries; most of EU13 economies invest in other EU13, possibly due to the rationalisation strategies of EU15 MNEs located there.

- The **involvement in continental GVCs is increasing over time**: 23 countries out of 28 record an increase in the role of foreign affiliates in gross value added creation and a simultaneous expansion in their role in international trade. This is especially relevant in Eastern Europe – Czechia, Hungary, Latvia, Poland, Romania, Slovakia, and Slovenia – where foreign-owned MNEs increased their shares above the European average for both GVA and trade, and foreign affiliates tend to buy intermediate inputs from other foreign affiliates co-located in the same economy, possibly for acquiring technology-intensive inputs.

- Although the GVC groups identified on the basis of TiVA indicators of backward and forward linkages show important regularities and patterns, they do not always align when considered in terms of the activities of MNEs and FDI flows. Despite the strong complementarity between trade and FDI, structural differences in the degree of openness, industrial composition and specialisation, agglomeration and urbanisation, regulations and other institutional factors – not least political and economic power concentration – are behind the **variety of national patterns in GVC integration both within and outside Europe** with respect to MNE operations and networks. In fact, the most advanced and internationalised EU15 economies – such as Germany, France, Ireland, Netherlands, and the UK – tend to receive more FDI from the rest of the World, and tend to invest relatively more towards extra-European countries, likely because of efficiency seeking offshoring strategies.

- Overall, **defining features characterise the process of internationalisation of Central and Eastern European economies**, where significant FDI attraction has not been matched by a corresponding process of domestic upgrading supportive of outward internationalisation of the local firms, at the same time however maintaining important cost advantages and levels of capabilities especially with respect to the low GVC integrated countries of Southern Europe.

- Importantly, **in terms of FDI connectivity, a limited number of higher order regions appear to dominate the European scene** for both total inward and outward FDI, and for FDI specific to the selected GVC-sensitive industries considered in this study. Most of this regional cores at the top of the spatial hirarchy of value creation through internationalisation belong to the forward GVC integrated economies of the UK (South East England regions), France (Ile-de-France region) and Germany (Bayern, Nordrhein-Westfalen, North of Baden-Wurttemberg). Italy (Lombardia) and Spain (Madrid region) also play a key role in the low integration group. Furthermore, the large majority of companies investing abroad through outward FDI in the most value added/technology/human capital-intensive GVC functions – such as 'Headquarters' and 'Innovation' – are in fact located in the same largest capital regions, with the addition of several Eastern European capital regions.

- Whilst the centralisation of political and economic power – as captured by the Headquarter functions in FDI – is certainly strongly concentrated in a few global city-regions such as London, Paris, Brussels, Amsterdam or Dublin, the complexity of GVC and production networks seem to offer a highly differentiated picture of regional connectivity, strongly dependent on sectoral specialisation, along with broader framework conditions and institutional factors not reported in the present analysis. The **relevance of the nexus sector-function-region in GVCs** shows that understanding the detailed structure and evolution of GVC and FDI networks, and identifying the potential for integration of cities and regions, must become a central reflection of future public policies. The analysis of the factors of disadvantage or decline that can hamper local economic development in the various European regional clubs cannot anymore disregard GVC integration (or lack of it), as it can act as a new form of 'non-spatial peripherality' that might persistently curb the development prospects of certain localities (Crescenzi, et al., 2017). Regional economic development strategies need to address this additional/alternative form of structural advantage/disadvantage in order to unlock local economic potential.

- **Data constraints are serious, particularly at the subnational level**. Starting with national level indicators it has become apparent how difficult it remains to capture the features and evolution of GVCs. The literature has developed significantly and has identified a number of key directions for future work by statistical offices, international organisations and researchers. TiVA indicators offer important insights for GVC analysis. However, the literature has not yet found an agreement on the best method to decompose bilateral trade flows and to capture countries' participation in GVCs. When moving to the sub-national regional level data constraints are even more stringent and existing research more limited. At the moment the most convincing approach to sketch the participation of regions in GVCs has been by leveraging FDI data and associate detailed business functions with GVC stages. However, as extensively shown in this report, GVCs and FDI are related

but not overlapping phenomena. This calls for the design and collection of more detailed regional indicators better harmonised with national indicators.

- **Active internationalisation and upgrading.** Even though connectivity entails bi-directional links – i.e. regions are simultaneously receivers and senders of FDI and Value Added – attractiveness to foreign capital has long been at the centre of policy attention whilst internationalisation through investment abroad has been disregarded, and sometimes purposely ignored, in regional development policy agendas. More generally the analysis of connectivity from the GVC standpoint calls for a shift of policy focus towards a wider set of factors that can support local upgrading.

Section 7. Conclusions

This Report has offered an overview of the key elements – based on academic literature and statistical data – to inform a broad policy framework for GVC-sensitive regional development policies. The Report has highlighted some key regularities and common features of the economies of the EU Member States based on their position in GVCs. These features have been linked with a diversity of regional configurations in terms of economic outcomes and sub-national internationalisation processes. This has allowed us to identify and discuss some key emerging issues to form the basis of an informed policy debate on how GVCs can be fully embraced in the design and implementation of regional policies in the EU (and beyond).

The Covid-19 pandemic has contributed to an unprecedented contraction of the global economy. The restrictions needed to limit the spread of Covid-19 (and its catastrophic death toll) have shocked both supply and demand drastically reducing output and employment in virtually all countries. This calls for a careful re-consideration of all available public policy options to support and relaunch economic growth and employment in a sustainable and equitable manner in all EU regions. And if a re-configuration of GVCs across the globe is highly likely, GVCs remain a key policy object for policy makers at all levels. At present – notwithstanding the proliferation of Covid-themed scholarly and policy papers – we can only speculate on the possible impacts of the pandemics on GVCs and on the national and sub-national consequences of this shock. A lot depends on the actual duration of the health crisis (and the associated restrictions), on the magnitude and persistence of global supply chain disruptions and, ultimately, on the capacity of governments to put in place coordinated global responses to both health and economic challenges. This calls for rigorous in-depth research – ideally based also on unconventional real time data sources – in order to assess the implications of the pandemic on all sectors of the economy, including its internationalisation through FDI and GVCs.

The recent 'Global Investment Competitiveness Report 2020' by the World Bank Group (2020, p.1) has highlighted that "more than two thirds of multinational investors in developing countries are reporting disruptions in supply chains, declines in revenues, and falls in production within months of the COVID-19 outbreak. The impacts are likely to intensify over time. FDI can ease the economic fallout of the coronavirus crisis and boost countries' economic resilience by continuing to create more and better-paid jobs, alleviating poverty, and boosting productivity." However, coordinated multi-level public policies are essential for GVCs and FDI to support recovery. Targeted interventions are crucial to rebuild investor confidence and to maintain the eco-system conditions needed for FDI retention. This is particularly relevant to less developed regions where resources are scarcer and local government quality is often lower. In this context Regional Investment Promotion Agencies – where sharpened in their mandate and focus and reinforced in their strategic capabilities (see Crescenzi et al. 2019)– could offer a viable and readily available tool to facilitate regions in leveraging global connectivity in their response to the economic challenges of Covid-19.

When considering the operationalisation of GVC concepts to guide regional policies on the ground, three key issues remain to be addressed.

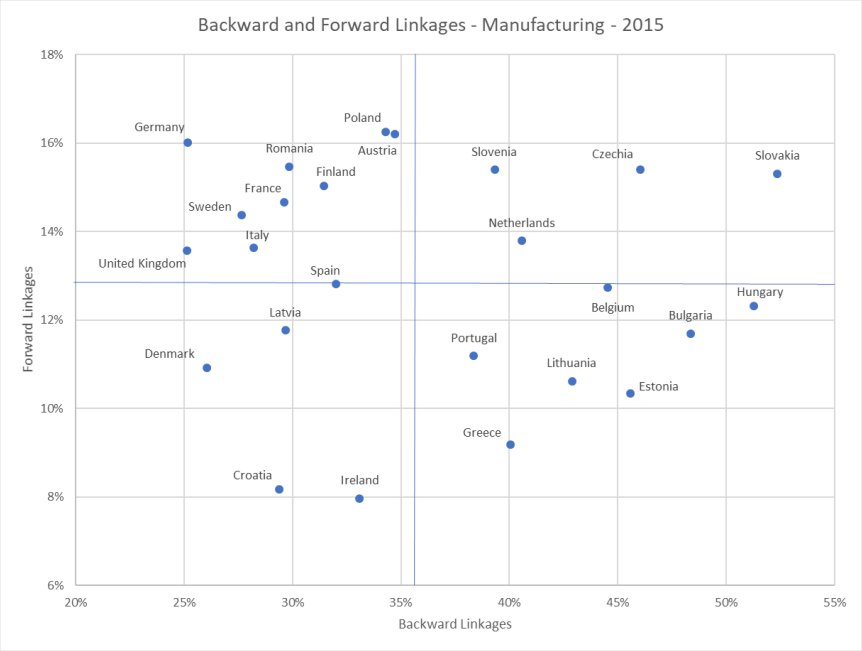
First more research is needed in order to better conceptualise the links between 'global' and 'local' value chains and the transmission channels linking GVCs and local actors, not only in terms of participation but also positioning and upgrading. Sound empirical evidence is also needed – both at the micro-level and at the wider regional level – in order to shed new light on the practical relevance of different transmission mechanisms and their geographical and sectoral heterogeneity.

Second, as highlighted in several sections of this Report, a quantum leap is needed in terms of data availability and design of suitable indicators in order to better characterise the participation and position of regions in GVCs as well as the local embeddedness of key GVC actors. Significant improvements have been recorded at the national level, but the sub-national level has remained virtually untouched. One possible avenue is certainly the extension and refinement of existing firm-level surveys to cover aspects of internationalisation and GVC participation. A few key survey questions – now consolidated in existing ad hoc academic surveys (currently with limited coverage and no regional stratification) – could offer very significant insights with a limited additional burden on respondents and impact on costs. Conversely, (more) open access to administrative data, for example on VAT transactions and/or import/export declarations (currently possible in a limited number of EU countries), could significantly improve our understanding of internationalisation processes and their (local) impacts. Further harmonisation of national and international I-O data to support GVC country and industry-specific studies is also a priority in this area together with the development of regional I-O data, currently available only for a few regions in the EU.

Third, when academic concepts, models and frameworks are used to shape public policies (and guide the use of public funds) robust evidence on 'what works in practice' is fundamentally needed. Solid counterfactual studies on the impact of different GVC/internationalisation policy tools are a necessary condition for evidence-based interventions in this complex (and for many aspects unexplored) area of regional policy.

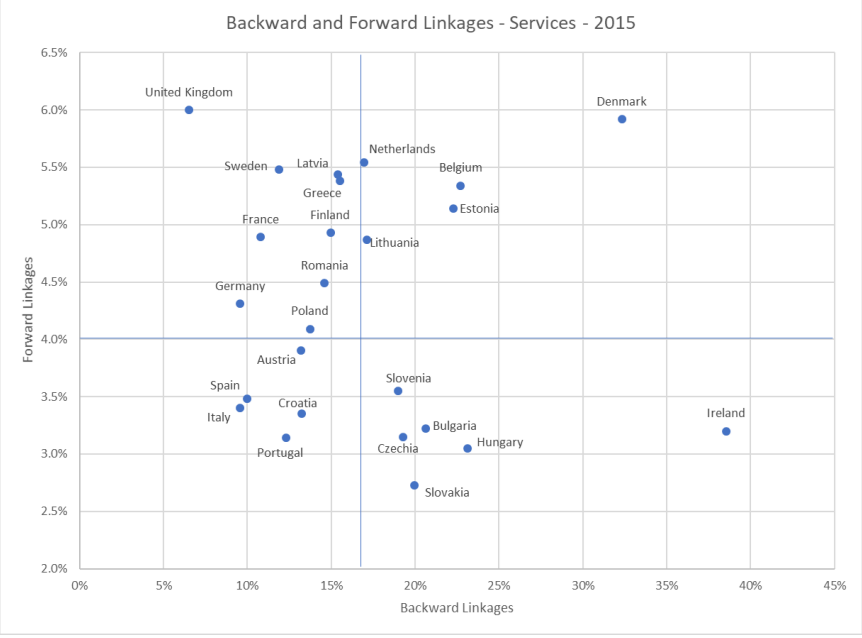
Appendix

Figure A. 1 Backward and Forward Linkages – Manufacturing, 2015



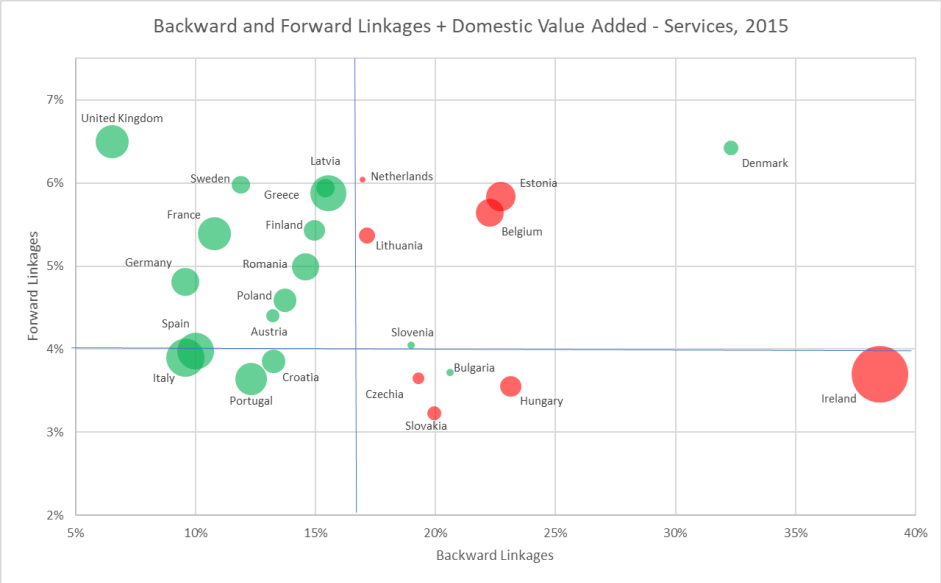
Notes: Manufacturing sector TiVa indicator code D10T33. Cyprus, Malta and Luxembourg are outliers, and excluded from the chart and the EU average values (blue lines).

Figure A. 2 Backward and Forward Linkages – Services, 2015



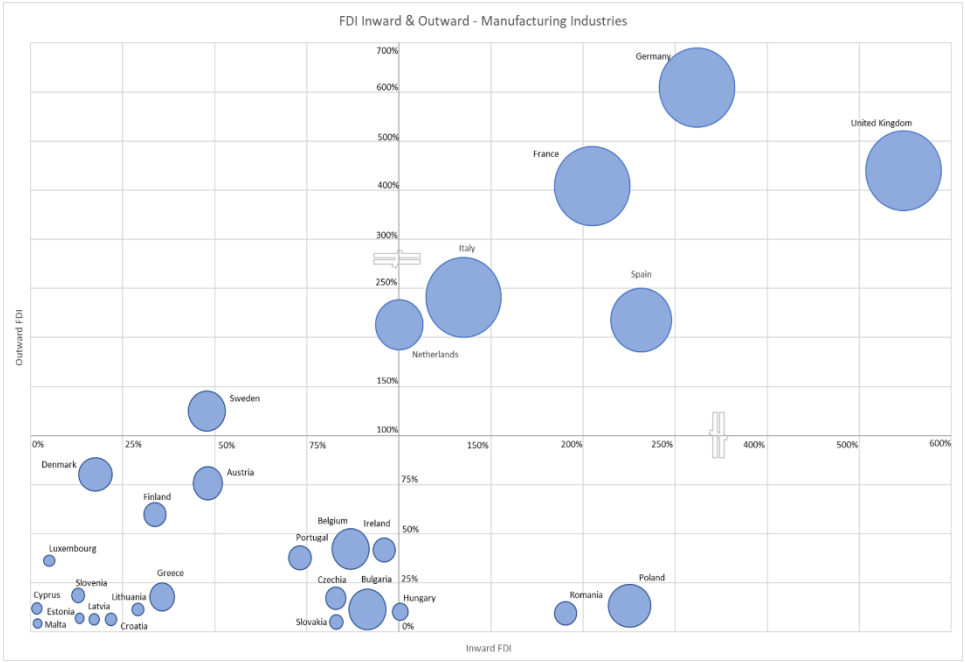
Notes: Service sector TiVa indicator code D45T98. Cyprus, Malta and Luxembourg are outliers, and excluded from the chart and EU average values (blue lines).

Figure A. 3 Backward and Forward Linkages + Domestic Value Added in Final Demand – Services, 2015



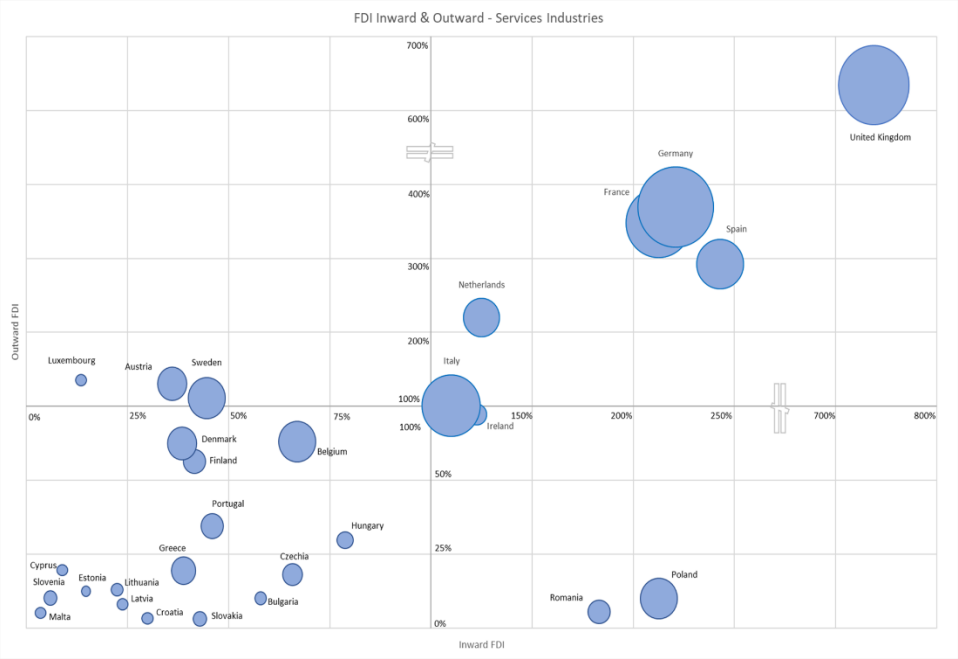
Note: the colour of the dots (red/green) represents the difference (negative/positive) of domestic value added in final demand from the EU average; the size of the dots illustrates the deviation from the average. Malta and Luxembourg are outliers and excluded from the figure and the EU average for backward and forward linkages (blue lines).

Figure A. 4 Foreign Direct Investment & GDP – Manufacturing, 2003-2017



Note: the cumulative value of inward (x-axis) and outward (y-axis) FDI normalised by the EU average (=100% at the origin of the axes) over the 2003-2017 period. The size of the dots is proportional the countries' average total nominal GDP (pps) over the same period.

Figure A. 5 Foreign Direct Investment & GDP – Services, 2003-2017



Note: the cumulative value of inward (x-axis) and outward (y-axis) FDI normalised by the EU average (=100% at the origin of the axes) over the 2003-2017 period. The size of the dots is proportional the countries' average total nominal GDP (pps) over the same period.

Table A. 1 Foreign Direct Investment – Manufacturing, 2003-2017

		Manufacturing Industries FDI 2003-2017		
Classification	***COUNTRY***	Tot 2003-2017 Inward	Tot 2003-2017 Outward	Percentage inward/outward
Backward Integration	Bulgaria	48,184	1,568	3072%
Backward Integration	Denmark	8,469	86,022	10%
Backward Integration	Estonia	6,752	4,162	162%
Backward Integration	Hungary	52,902	6,340	834%
Backward Integration	Ireland	47,521	46,969	101%
Backward Integration	Lithuania	14,450	3,068	471%
Backward Integration	Luxembourg	2,422	43,148	6%
Backward Integration	Malta	1,257	1,392	90%
Backward Integration	Slovakia	44,690	2,479	1803%
Forward Integration	Austria	23,118	80,430	29%
Forward Integration	Finland	15,250	66,024	23%
Forward Integration	France	106,849	505,772	21%
Forward Integration	Germany	147,935	716,124	21%
Forward Integration	Netherlands	52,636	234,028	22%
Forward Integration	Poland	124,046	12,541	989%
Forward Integration	Romania	96,998	1,676	5787%
Forward Integration	Sweden	24,628	122,278	20%
Forward Integration	United Kingdom	290,089	485,768	60%
High Integration	Belgium	46,007	46,152	100%
High Integration	Czechia	44,298	21,048	210%
High Integration	Slovenia	5,026	5,000	101%
Low Integration	Croatia	9,480	7,417	128%
Low Integration	Cyprus	1,175	11,879	10%
Low Integration	Greece	16,505	22,153	75%
Low Integration	Italy	70,911	264,887	27%
Low Integration	Latvia	8,687	2,320	374%
Low Integration	Portugal	38,085	38,630	99%
Low Integration	Spain	121,537	239,291	51%
	EU Average	52,497	109,949	525%

Note: total amount of inward and outward investments is expressed in millions of euros. cell colours are reds for maximum vales, green for minimum and yellow for median – all others coloured proportionally.

Table A. 2 Foreign Direct Investment – Services, 2003-2017

		Services Industries FDI 2003-2017		
Classification	***COUNTRY***	Tot 2003-2017 Inward	Tot 2003-2017 Outward	Percentage inward/outward
Backward Integration	Bulgaria	20,581	2,308	892%
Backward Integration	Denmark	12,192	32,577	37%
Backward Integration	Estonia	5,550	4,722	118%
Backward Integration	Hungary	27,242	10,721	254%
Backward Integration	Ireland	43,340	42,223	103%
Backward Integration	Lithuania	7,344	5,460	135%
Backward Integration	Luxembourg	5,547	53,542	10%
Backward Integration	Malta	2,466	1,055	234%
Backward Integration	Slovakia	13,709	1,006	1362%
Forward Integration	Austria	13,657	52,529	26%
Forward Integration	Finland	12,819	29,729	43%
Forward Integration	France	75,083	165,298	45%
Forward Integration	Germany	78,055	175,526	44%
Forward Integration	Netherlands	44,159	104,438	42%
Forward Integration	Poland	73,408	5,814	1263%
Forward Integration	Romania	64,229	1,964	3271%
Forward Integration	Sweden	15,232	49,249	31%
Forward Integration	United Kingdom	256,708	322,660	80%
High Integration	Belgium	20,905	40,779	51%
High Integration	Czechia	21,804	6,618	329%
High Integration	Slovenia	2,709	3,843	70%
Low Integration	Croatia	9,222	1,197	770%
Low Integration	Cyprus	3,027	6,040	50%
Low Integration	Greece	11,705	6,942	169%
Low Integration	Italy	38,881	47,916	81%
Low Integration	Latvia	8,392	3,434	244%
Low Integration	Portugal	15,536	13,716	113%
Low Integration	Spain	85,837	138,850	62%
	EU Average	35,333	47,506	355%

Note: total amount of inward and outward investments is expressed in millions of euros. cell colours are reds for maximum vales, green for minimum and yellow for median – all others coloured proportionally.

Table A. 3 List of Industries from TiVa database, Manufacturing and Services

Aggregation Industries	Industry Code	Industry Full Name
Manufacturing	D10T12	Food products, beverages and tobacco
	D13T15	Textiles, wearing apparel, leather and related products
	D16	Wood and products of wood and cork
	D17T18	Paper products and printing
	D19	Coke and refined petroleum products
	D20T21	Chemicals and pharmaceutical products
	D22	Rubber and plastic products
	D23	Other non-metallic mineral products
	D24	Basic metals
	D25	Fabricated metal products
	D26	Computer, electronic and optical products
	D27	Electrical equipment
	D28	Machinery and equipment, nec
	D29	Motor vehicles, trailers and semi-trailers
	D30	Other transport equipment
Services	D45T47	Wholesale and retail trade; repair of motor vehicles
	D49T53	Transportation and storage
	D55T56	Accommodation and food services
	D58T60	Publishing, audiovisual and broadcasting activities
	D61	Telecommunications
	D62T63	IT and other information services
	D64T66	Financial and insurance activities
	D68	Real estate activities
	D69T82	Other business sector services

Source: TiVa indicators. List of industries used in the sectoral analysis for manufacturing and services industries.

Table A. 4 Foreign Direct Investment by GVC Stage

Global Value Chain Stage	Business Activity
Headquarter	
	Business Services
	Headquarters
	Shared Services Centre
Research & Development	
	Design, Development & Testing
	Education & Training
	Research & Development
Production	
	Construction
	Electricity
	Extraction
	ICT & Internet Infrastructure
	Manufacturing

Note: classification based on Sturgeon (2008).

Table A. 5 NUTS Regions Information

Country	Nuts Level	Nuts	Nuts Name
Austria	2		
		AT11	Burgenland
		AT12	Niederösterreich
		AT13	Wien
		AT21	Kärnten
		AT22	Steiermark
		AT31	Oberösterreich
		AT32	Salzburg
		AT33	Tirol
		AT34	Vorarlberg
Belgium	1		
		BE1	Brussels
		BE2	Flanders
		BE3	Wallonia
Bulgaria	2		
		BG31	Severozapaden
		BG32	Severen tsentralen
		BG33	Severoiztochen
		BG34	Yugoiztochen
		BG41	Yugozapaden
		BG42	Yuzhen tsentralen
Cyprus	1		
		CY0	Kypros
Czechia	2		
		CZ01	Praha
		CZ02	Střední Čechy
		CZ03	Jihozápad
		CZ04	Severozápad
		CZ05	Severovýchod
		CZ06	Jihovýchod
		CZ07	Střední Morava
		CZ08	Moravskoslezsko
Germany	1		
		DE1	Baden-Württemberg
		DE2	Bayern
		DE3	Berlin
		DE4	Brandenburg
		DE5	Bremen
		DE6	Hamburg
		DE7	Hessen
		DE8	Mecklenburg-Vorpommern
		DE9	Niedersachsen
		DEA	Nordrhein-Westfalen
		DEB	Rheinland-Pfalz
		DEC	Saarland
		DED	Sachsen
		DEE	Sachsen-Anhalt
		DEF	Schleswig-Holstein
		DEG	Thüringen
Denmark	2		
		DK01	Hovedstaden
		DK02	Sjælland
		DK03	Syddanmark
		DK04	Midtjylland
		DK05	Nordjylland
Estonia	1		
		EE0	Eesti
Greece	2		
		EL30	Attiki
		EL41	Voreio Aigaio
		EL42	Notio Aigaio
		EL43	Kriti
		EL51	Anatoliki Makedonia, Thraki
		EL52	Kentriki Makedonia
		EL53	Dytiki Makedonia
		EL54	Ipeiros
		EL61	Thessalia
		EL62	Ionia Nisia
		EL63	Dytiki Ellada
		EL64	Sterea Ellada
		EL65	Peloponnisos
Spain	2		
		ES11	Galicia
		ES12	Principado de Asturias
		ES13	Cantabria
		ES21	País Vasco
		ES22	Comunidad Foral de Navarra
		ES23	La Rioja
		ES24	Aragón
		ES30	Comunidad de Madrid
		ES41	Castilla y León
		ES42	Castilla-la Mancha
		ES43	Extremadura
		ES51	Cataluña
		ES52	Comunidad Valenciana
		ES53	Illes Balears
		ES61	Andalucía
		ES62	Región de Murcia
		ES63	Ciudad Autónoma de Ceuta
		ES64	Ciudad Autónoma de Melilla
		ES70	Canarias
Finland	2		
		FI19	Länsi-Suomi
		FI1B	Helsinki-Uusimaa
		FI1C	Etelä-Suomi
		FI1D	Pohjois- ja Itä-Suomi
		FI20	Åland
France	2		
		FR10	Île de France
		FRB0	Centre - Val de Loire
		FRC1	Bourgogne
		FRC2	Franche-Comté
		FRD1	Basse-Normandie
		FRD2	Haute-Normandie
		FRE1	Nord-Pas-de-Calais
		FRE2	Picardie
		FRF1	Alsace
		FRF2	Champagne-Ardenne
		FRF3	Lorraine
		FRG0	Pays-de-la-Loire
		FRH0	Bretagne
		FRI1	Aquitaine
		FRI2	Limousin
		FRI3	Poitou-Charentes
France	2		
		FRJ1	Languedoc-Roussillon
		FRJ2	Midi-Pyrénées
		FRK1	Auvergne
		FRK2	Rhône-Alpes
		FRL0	Provence-Alpes-Côte d'Azur
Croatia	2		
		HR03	Jadranska Hrvatska
		HR04	Kontinentalna Hrvatska
Hungary	2		
		HU11	Budapest
		HU12	Pest
		HU21	Közép-Dunántúl
		HU22	Nyugat-Dunántúl
		HU23	Dél-Dunántúl
		HU31	Észak-Magyarország
		HU32	Észak-Alföld
		HU33	Dél-Alföld
Ireland	2		
		IE04	Northern and Western
		IE05	Southern
		IE06	Eastern and Midland
Italy	2		
		ITC1	Piemonte
		ITC2	Valle d'Aosta/Vallée d'Aoste
		ITC3	Liguria
		ITC4	Lombardia
		ITF1	Abruzzo
		ITF2	Molise
		ITF3	Campania
		ITF4	Puglia
		ITF5	Basilicata
		ITF6	Calabria
		ITG1	Sicilia
		ITG2	Sardegna
		ITH1	Provincia Autonoma di Bolzano/Bozen
		ITH2	Provincia Autonoma di Trento
		ITH3	Veneto
		ITH4	Friuli-Venezia Giulia
		ITH5	Emilia-Romagna
		ITI1	Toscana
		ITI2	Umbria
		ITI3	Marche
		ITI4	Lazio
Lithuania	2		
		LT01	Sostines regionas
		LT02	Vidurio ir vakaru Lietuvos regionas
Luxembourg	1		
		LU0	Luxembourg
Latvia	1		
		LV0	Latvija
Malta	1		
		MT0	Malta
Netherlands	2		
		NL11	Groningen
		NL12	Friesland
		NL13	Drenthe
Netherlands	2		
		NL21	Overijssel
		NL22	Gelderland
		NL23	Flevoland
		NL31	Utrecht
		NL32	Noord-Holland
		NL33	Zuid-Holland
		NL34	Zeeland
		NL41	Noord-Brabant
		NL42	Limburg
Poland	2		
		PL51	Dolnoslaskie
		PL52	Opolskie
		PL61	Kujawsko-Pomorskie
		PL62	Warminsko-Mazurskie
		PL63	Pomorskie
		PL71	Lódzkie
		PL72	Swietokrzyskie
		PL81	Lubelskie
		PL82	Podkarpackie
		PL84	Podlaskie
		PL91	Warszawski stoleczny
		PL92	Mazowiecki regionalny
Portugal	2		
		PT11	Norte
		PT15	Algarve
		PT16	Centro
		PT17	Área Metropolitana de Lisboa
		PT18	Alentejo
		PT20	Região Autónoma dos Açores
		PT30	Região Autónoma da Madeira
Romania	2		
		RO11	Nord-Vest
		RO12	Centru
		RO21	Nord-Est
		RO22	Sud-Est
		RO31	Sud - Muntenia
		RO32	Bucuresti - Ilfov
		RO41	Sud-Vest Oltenia
		RO42	Vest
Sweden	2		
		SE11	Stockholm
		SE12	Östra Mellansverige
		SE21	Småland med öarna
		SE22	Sydsverige
		SE23	Västsverige
		SE31	Norra Mellansverige
		SE32	Mellersta Norrland
		SE33	Övre Norrland
Slovenia	2		
		SI03	Vzhodna Slovenija
		SI04	Zahodna Slovenija
Slovakia	2		
		SK01	Bratislavský kraj
		SK02	Západné Slovensko
		SK03	Stredné Slovensko
		SK04	Východné Slovensko
United Kingdom	1		
		UKC	North East
		UKD	North West
		UKE	Yorkshire And The Humber
		UKF	East Midlands
		UKG	West Midlands
		UKH	East Of England
		UKI	London
		UKJ	South East
		UKK	South West
		UKL	Wales
		UKM	Scotland
		UKN	Northern Ireland

Notes: Extra territorial NUTS not present and not used in the analysis.

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