Papers in Regional Science 103 (2024) 100018

Contents lists available at ScienceDirect

Papers in Regional Science

journal homepage: www.sciencedirect.com/journal/papers-in-regional-science

Smile-and-go. Regional performance through global value chains in Europe

Roberta Capello*, Roberto Dellisanti

Politecnico di Milano, ABC Department, Milan, Italy

ARTICLE INFO

JEL Classifications:
F1
O18
R11

Keywords:
global value chains
regional growth
smile curve

ABSTRACT

By applying the smile curve concept to regional value added growth rather than to levels, the paper claims that local value-added growth increases when a region is specialised in scarce natural resources or scarce human skills within a GVC. Under these circumstances, in fact, the region can establish favourable terms-of-trade. The results obtained at European regional level clearly show that regions rich of high and scarce skills and natural resources are those gaining the most out of GVCs' participation, witnessing the existence of a "dynamic smile curve" and opening the issue of increasing regional inequalities in a period of global integration.

1. Introduction

The development of complex and dense Global Value Chains (GVCs) represents one of the distinguishing aspects of modern economies and significant surges in international exchanges have been meticulously documented. Particularly noteworthy is the extensive body of literature that has delved into the advantages accruing to nations as a result of heightened involvement in GVCs, especially in the post-1990 era (Gereffi et al., 2001). The World Bank estimates that a 1% increase of GVCs' participation leads to more than 1% increase in income levels (World Bank, 2020), and this seems true especially for developing areas (Pahl & Timmer, 2020). Despite the acknowledgement of the positive effects GVCs have for countries, these seem heterogeneous according to the development stage of the place and their growth trajectories (Jithin et al., 2023; Tian et al., 2022). In fact, in developed economies, GVCs improve the inputs' competitiveness, higher variety, and economies of scale (Baldwin & Lopez-Gonzalez, 2015); while, for developing ones, this facilitates industrial upgrading through learning externalities and technology spillovers (Ndubuisi & Owusu, 2021).

To the best of our knowledge, the regional effects of GVCs' participation in terms of growth have not been studied yet in great details. The aim of the paper is to investigate which regions gain the most from GVCs' participation in EU by highlighting the prevailing position regions assume in the chain. To reply to such question, the paper draws on the well-known literature on the smile curve developed at firm level, where the higher productivity gains obtained by GVCs' participation are associated with the capacity of firms (and nations) to offshore the low level production activities, and keep in house the pre- and post-production phases, characterised by higher value added. In our case, the smile curve is applied at aggregate (regional macroeconomic) level and is conceptually linked to value added growth rather than levels, suggesting that the GDP and productivity growth advantages are explained by the positioning of the region in the GVC. Local economies, in fact, experience value added increases when they are able to specialise in trade exploiting resources or skills that are scarce and therefore the region can exchange goods produced with such resources at more favourable terms of trade.

In the context of *value* chains, the gains, in fact, depend on the capacity to generate value added thanks to the participation to the international division of labour in a production network. In the literature, creation of value added has been linked to the kind of functions and tasks countries are capable to host (Meng et al., 2020), reflected in the type of jobs. This has led to the famous distinction between Headquarters- and Factory-economies, the former primarily hosting high-value functions, while the latter predominantly handling low-value added activities and jobs related to GVCs (Baldwin, 2016).

However, especially after the financial crisis (2008), people and governments are doubting about the true benefits of GVCs' participation, showing the existence of a "*Paradoxical Pair of Concerns*" (Baldwin & Ito, 2021). While most developed countries have reservations about the benefits of offshoring due to potential declines in productivity and employment, emerging nations are becoming more concerned about

* Correspondence to: Department of Architecture, Built environment, and Construction engineering (ABC), Politecnico di Milano, piazza L. da Vinci 32, Milano 20133, Italy.
E-mail address: roberta.capello@polimi.it (R. Capello).

https://doi.org/10.1016/j.pirs.2024.100018
Received 30 October 2023; Received in revised form 8 January 2024; Accepted 28 February 2024

receiving jobs with low value-added. These doubts on the benefits of global trade are heightened after COVID-19 pandemic and the Russian invasion of Ukraine that created unprecedented, sudden shocks in trade, and underlined once again the fragility of the international division of tasks.

The concerns over the negative side of GVCs' participation are presented in official documents of Institutions and Governments that launched slogans like the *manufacturing imperative* (Rodrik, 2011), highlighting the importance of an industrial revival. Examples in this respect are the *Open Strategic Autonomy* in EU, advocating an industrial autonomy in key sectors in the European Union while staying open to global trade and cooperation (Tocci, 2021), and the Obama's plan to relaunch manufacturing, expressing the need for the US economy of a relaunch in industrial employment and productivity (Obama, 2012).

In the field of international economics, the capacity of nations to participate in international trade is commonly described as their ability to establish favourable terms of trade by leveraging their relative comparative advantages. Nevertheless, tackling this issue becomes even more intricate at the regional (sub-national) level, given that the mechanisms that apply on an international scale may not necessarily apply at this lower level (Camagni, 2002). If this is the case, regions participate to global trade in a context of *absolute*, rather than comparative, advantage (Camagni, 2002) so that when they have no clear advantage to offer, they risk the exclusion from international trade, experiencing desertification, depopulation and economic downturn. Thus, translated at the regional level, the "*Paradoxical Pair of Concerns*" assumes an important meaning: strong regions in developed nations might register deindustrialization, resulting in job losses and decreased productivity (Camagni et al., 2022), while less developed areas of advanced countries may be either excluded from GVCs (low participation) or destined to low-level tasks, a paradox which reinforces spatial inequalities.

As mentioned above, the aim of the paper is to show which regions gain more or less through the participation to GVCs taking into consideration their positioning along the chain, exploiting the functional specialization embedded into the "smile curve" concept (Section 2), and translating it into a "dynamic smile curve concept" at the regional level (Section 3). An empirical framework is employed to validate the "dynamic smile curve" empirically (Section 4). The results obtained (Section 5) lead to important concluding messages on the dark side of GVCs, being sources of increasing regional inequalities (Section 6).

2. The Smile Curve approach and economic growth

2.1. Evolution and measurement of the Smile Curve concept

The concept of Smile Curve is not new in academic research. The Smile Curve was initially introduced in approximately 1992 by Stan Shih, the founder of Acer, a technology company based in Taiwan. According to Shih (1996), in the personal computer industry the highest value added to the product occurs at both ends of the value chain, rather than in the middle. Shih claimed that blind participation in every industry would result in the loss of corporate competitiveness without a clear understanding of "where's the beef?" (meaning, obviously, the profits or the value). Using his words, "if you enter the computer industry without understanding the smiling curve, you won't be able to smile" (Shih, 1996 p. 205). The curve takes the shape of a smile when plotted on a graph, with the horizontal axis representing the various stages of production or value creation, and the vertical axis indicating the value-added or profit margin at each stage (Mudambi, 2007, 2008). In this respect, the overused example of the iPhone value chain describes how Apple tries to position at the two extremes of the Smile (i.e. R&D, at the beginning of the chain, and marketing activities at the end) in the attempt to capture the production phases characterised by higher value added (Gereffi, 2019). The production phases in the middle of the chain are those generally offshored by firms, that in this way design their strategies so to upgrade through GVCs (Crescenzi & Harman, 2023; Gereffi, 1999).

The idea of the Smile Curve conceals the concept of positioning within GVCs, often referred to as the distance from either the final demand or the primary inputs (also called downstreamness and upstreamness, respectively). Firms tend to occupy a position on the smile according to their prevailing activity, but the underlying logic is that different positioning along the Smile Curve mirrors different functional specializations. In fact, high-level functions (e.g., R&D, marketing, management) are typical of the two ends, while low-level ones (e.g., production, standardised activities) are found in the middle. This stream of literature tried to estimate the relationship between the value added of firms and the upstreamness, finding that the results go in favour to the quadratic expectation (Rungi & Del Prete, 2018; Shin et al., 2012). In fact, firms specialised in R&D and marketing are significantly more productive compared to firms specialised in fabrication (de Vries et al., 2021) also thanks to the specialization in specific (high-value added) segments of the production process.

In recent years, the literature has endeavoured to outline the smile curve at an aggregate level using two main methods. The first one is based on project-specific data on greenfield FDIs, which encompasses not only the sector of the transaction but also the specific operational function the project fulfils. The aggregate database of the single information at firm level allows to construct the functional specialization of countries and industries in international production. Thanks to rich indicators, studies using this approach managed to determine how much an economy is specialised in production-related activities compared to knowledge-intensive ones, proxying the smile curve (Coveri & Zanfei, 2022; Stöllinger, 2021). The richness and granularity of the data related to functions enable a detailed analysis of the smile curve, through the mapping of the spatial distribution of different functions, even if one has to bear in mind that these choices are not random (McCann & Mudambi, 2005) and that these data represent only a portion of GVCs, failing indeed to capture the value created by local firms engaged in global trade.

At aggregate macroeconomic level, "firms' value chains intersect and overlap" (Baldwin & Ito, 2021, p. 1845) and understanding the stage within the chain is more complex. In fact, while at the firm, industry, or FDI level the linkage between GVCs and functional specialisation is straightforward, in an economy-wide perspective it is more difficult to identify the prevailing role an economy plays within GVCs. Only few attempts exist in this direction at the country level, trying to estimate the prevailing functions countries might have in GVCs. The most famous and relevant example is the dichotomy proposed by Richard Baldwin between Factory (hosting production) and Headquarters economies (hosting high-level functions, like R&D, marketing, and sales), with the former associated to the global South and the latter to the global North (Baldwin, 2016). Also in this case the logic used is to try to capture the value in the chain associated with different functional levels, but the *a-priori* are different.

The aggregate trade approach identifies the smile curve employing Input-Output (I-O) trade matrices, useful to determine functional specialization through the examination of the labour composition embedded in value-added exports (Johnson & Noguera, 2012; Timmer et al., 2019). This was accomplished by aligning specific occupations with corresponding business functions, for instance, categorising engineers and related professionals under the R&D function, and assemblers under the fabrication stage. This asymmetry in functions is particularly evident in the developing stage of countries that host diverse functions. As highlighted by Baldwin & Lopez-Gonzalez (2015, p. 1969), "the headquarter economies […] arrange the production networks" while "factory economies provide the labor". In fact, headquarters- and factory-economies embed different wage levels, different market power, and especially different functional levels (Baldwin, 2013), explaining the different advantages factory- and headquarter-economies obtain from their participation in GVCs.

2.2. A dynamic regional smile curve through favourable terms of trade

As already mentioned, the idea of the smile curve refers to *levels* of value added. In other words, different positioning along the smile curve is associated with different potential value capturing possibilities. However, the concept can be applied to the growth potential deriving from GVCs' participation and positioning. The scant literature in this respect is mostly at the firm level and it underlines how, thanks to GVCs' participation, firms find niches for upgrading (product, process, environmental quality,…) (De Marchi et al., 2013; Giuliani et al., 2005; Krishnan et al., 2023), to be more innovative (Ascani et al., 2020), and gain from finer niches of functional specialisation (Pleticha, 2021; Wang et al., 2017).

In the attempt to translate this reasoning at the aggregate macroeconomic level, the literature tried to understand how higher involvement in GVCs may support growth. UNCTAD described how there exists correlation between GDP *per capita* growth and GVCs' participation (UNCTAD, 2013), and their findings are corroborated also in more recent studies describing how a larger involvement in value chains supports economic development (Jangam & Rath, 2021). The mechanism through which GVCs' participation generates economic growth at the wider level was explained thanks to the fostering of investments (Krisztin & Piribauer, 2023), learning opportunities, new practices, and high-level skills. All this was made possible mainly by a favourable absorptive capacity of the area (Crescenzi & Harman, 2023) that allows to spread around the economy the effects of GVCs, focusing more on the context conditions rather than on the ways and forms of GVCs' participation.

If the translation of the Smile Curve concept on an economy-wide perspective is problematic at the country level, it is not simpler at the regional (sub-national) level. In this paper, we associate the capacity of a region to position on the two ends of the smile curve, where we expect that the region registers higher growth rates, thanks to the control it plays on the GVC. At the macroeconomic level, control is associated with economic power, enforced through a specific allocation of tasks (Camagni & Pompili, 1990). Economic power in GVCs, a concept that has been mainly detailed at the firm level (Dallas et al., 2019), manifests in situations where regions specialise in scarce and critical resources that can be either natural or skills, which are in limited supply relative to demand, and thus capable of generating extra profits and rents. These regions effectively exchange their resources at favourable terms of trade with other areas, securing a significant portion of the local value added generated in the process (Capello et al., 2023b). This also works in dynamic terms. These regions are the ones that, once an increase in trade flows takes place, capture the highest increase in value added and therefore register higher growth rates, through even scarcer resources and skills sold internationally at higher prices. These scarce resources are of two types. On the one hand, we refer to natural resources (e.g. mining, quarrying, and energy supply) which are typical of some sectors; on the other, we identify high-level skills resources that cross the whole manufacturing sector and characterise specific functions like pre- (e.g. R&D) and post-production (e.g. marketing and sales) phases.

The logic is graphically depicted in Fig. 1, where a *dynamic regional smile curve* is represented. Primary resources regions and headquarter regions, characterised respectively by a specialisation in scarce natural resources and in high-value added functions (both pre- and post-production activities) register a higher value-added growth rate when they participate in GVCs compared to regions merely specialised in production activities.

3. Measuring and mapping a dynamic smile curve at the EU regional level

In order to translate the concept of the dynamic smile curve into empirics, we develop a two-step procedure. We use first a sectoral logic,

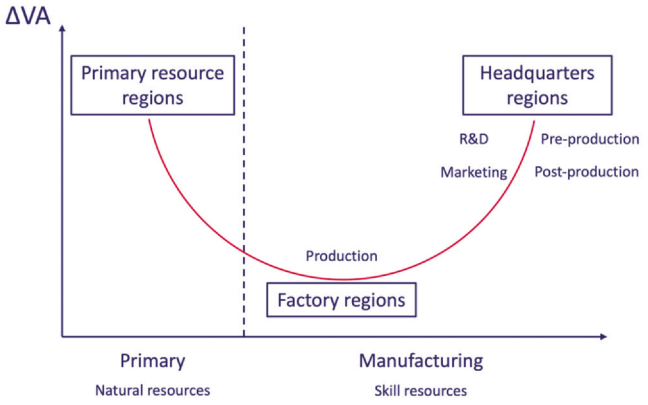

Fig. 1. a dynamic regional smile curve. *Source: authors' elaboration.*

in order to separate out those regions that are abundant in natural resources (such as energy commodities like oil, gas, coal, …) from the others. The remaining regions are distinguished according to the functions they host within the manufacturing sector, defined by Timmer et al. (2019) as "a set of tasks carried out by a particular occupational class of workers" (p. 2).

Empirically speaking, primary resources regions have been identified as those specialised in energy commodities (Table 1). The functional (or task) disaggregation within GVCs is not available in traditional Input-Output (I-O) matrices at the regional level (Thissen et al., 2018), that allow to exploit value-added trade information (Brakman & Van Marrewijk, 2017). A way applied in the literature to overcome such a limit is to apportion domestic value added of each country according to their share in terms of high or low-level activities, so to identify the functional specialisation of countries in trade (Baldwin & Robert-Nicoud, 2014; Timmer et al., 2019). This methodology is applied in this work at regional level (Table 1). The underlying principle is that headquarters are the *loci* where there is a concentration of managerial, research and development, and marketing functions, based on high-level skills, while factories focus on production and fabrication, whose tasks require low-level skills.

To correct for data quality on occupation (obtained from the Labour Force Survey) – a source extremely dependent on national definitions of occupations – it was compulsory to build the functional specialisation of the region as the occupational share in domestic value added in trade relative to the national average, with the inevitable result of the identification of high (or low) level functions in all countries (Table 1). In order to overcome this latter limit and be able to distinguish the real *European* Headquarters and Factory regions, an indicator of the regional wage share of value added with respect to the European level has been applied as an additional filtering indicator. High wages reflect scarce and rare skills, present in high-level functions, and highly selective in space, associated with headquarters. Low wages, on the contrary, attract operational and routine tasks, typical of factory activities (Table 1).

While this additional filter was enough to identify Factory economies, Headquarters economies required an additional indicator capturing the high control they exert on GVCs (Baldwin & Ito, 2021; Gereffi, 2014). At aggregate (regional) level, control can be measured through the presence of favourable terms of trade (Capello et al., 2023b). In other words, Headquarters regions contribute to the GVCs in a manner that exceeds their import-to-export (Table 1).[1]

[1] This condition is deliberately not imposed on factories, as the ability to generate favourable terms-of-trade can also conceptually exist for this category. Through process or product innovations, factories can in fact achieve favourable exchange conditions as well. The precise empirical measurement of the three regional roles, with a technical discussion on the sources and the indicators used is presented in Appendix A.

Table 1
Definitions and indicators by regional categories.

Regional categories	Primary resources regions	Factory regions	Headquarters regions
Definitions	Regions mostly trading natural resources	Labour-intensive regions mostly specialised in production	Knowledge-intensive regions mostly specialised in controlling functions
Indicators	Trade specialisation in primary resources	Higher than the national share of manufacturing domestic value added in exports over regional value added produced by low-level functions Lower than EU average wage share of value added	Higher than the national share of manufacturing domestic value added in exports over regional value added produced by high-level functions Higher than EU average wage share of value added Higher than EU average domestic value added in intermediate goods over foreigner value added

Table 2
Number of regions by GVCs' category.

Period	Primary resources regions	Factory	Headquarters	Other regions	Total
Crisis	56	43	42	106	247
Post-Crisis	56	39	43	109	247

Residually, other regions are those that do not fit none of the previous definitions, in that they do not have a clear role in GVCs, neither in terms of functional specialization in high- or low-skills nor in terms of specialisation in natural resources. Table 2 presents a simple count of regions for each GVCs role, showing a strong structural pattern of the phenomenon over time. Regions that do not belong to any particular category of the smile curve are less than a half, while it appears quite an equal distribution of regions among primary resources, factory and headquarter regions in Europe.

Fig. 2 maps regions according to the GVCs' categories they belong to, focusing on 2010, as Table 2 shows a stable trend. The map presents some interesting visual insights. First of all, the three categories of regions seem to follow different spatial patterns. Headquarters regions are typical of the strong Western areas, such as southern Germany, the

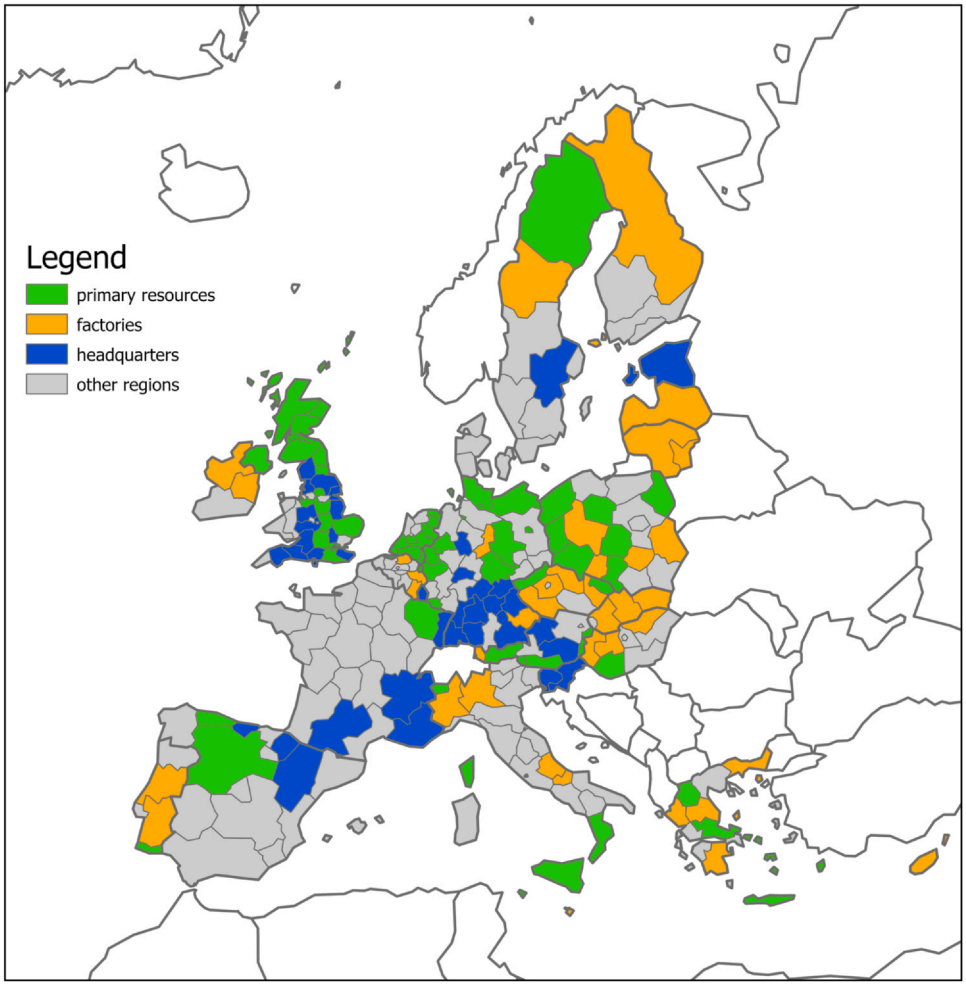

Fig. 2. Headquarters, factories, and primary resources regions (2010). *Source: authors' elaboration.*

influential manufacturing regions in Southern France like Haute-Garonne, where Airbus has its headquarters, or many historically leading manufacturing regions in the UK, such as the Manchester area or Lancashire. In the West, however, there are few regions that emerge with the role of factories. Among these, Lombardy and Piedmont in Italy stand out as historical productive regions, the latter for the automotive sector, as well as the Portuguese Central region where production facilities for many companies in various sectors (from agri-food to pharmaceuticals) are located. Eastern countries, instead, contain the highest number of Factory regions. Almost all Eastern countries have at least one Factory region, and this is due to both low wages and low-level functions tending to concentrate in the latest countries that joined the Union. Finally, the primary resources regions do not have such a clear distinction between East and West and are located in a more random manner throughout the continent. As expected, among these regions, we find those most dependent on natural resources (peat, coal, oil, or gas), which are rich in places like Scotland, Castilla y León, northern Sweden, Silesia, or Severozápad.[2]

The results shown in the map are in line with the traditional literature that claims that the smile curve links the positioning on the chain with the *level* of value added associated with a specific activity (e.g., marketing is associated with a higher value than production activities). In fact, in the case of the three groups of regions, activities with high-level functions typically imagined at the two ends of the chain are all absorbed by headquarters regions (pre- and post-production), as confirmed by the ANOVA analysis presented in Table 3. The difference of the (mean) value added in manufacturing by groups of regions (i.e. mean VA in the group of regions in the row minus the mean VA in the group of regions in the column) clearly show how the headquarters regions are associated with the highest level of manufacturing value added, and this is statistically significant for all differences.[3]

However, this paper sets an additional, more demanding, challenge. As mentioned before, the aim of the work is to understand who benefits from participation in GVCs in terms of economic growth, and the division into three groups aids us in this endeavour. Specifically, the hypothesis to be empirically tested is that the ability to leverage scarce resources (both natural resources and skills) enables different territories to grow through participation in GVCs. The *dynamic regional smile curve* illustrated in Fig. 1 describes how the presence of scarce natural resources, positioned very upstream in the value chain, along with all phases of production characterized by a high level of knowledge, allows for greater growth gains from GVCs' participation compared to mere production. By providing an explanation to the mechanisms of convergence or divergence between regions, this work represents a conceptual advancement in the literature.

The existence of a dynamic smile curve requires empirical validation, and it leads to the research questions that are the subject matter of the empirical analysis. Do regions benefit from a higher involvement into GVCs? Moreover, does a *dynamic smile curve* exist? These questions will be tested in Section 5, using the empirical framework and data presented in the next Section 4.

4. Empirical framework

4.1. Data and indicators

The lack of regional studies on GVCs' participation and its effects on local growth is partly justified by the scarcity of data on GVCs and on functions at this level of disaggregation. This limitation has been partly overcome, once trade in value added matrices at the regional level have been published (Thissen et al., 2018), allowing to exploit value-added trade information (Almazán-Gómez et al., 2023; Brakman & Van Marrewijk, 2017). The indicators built for this study take advantage from this source, i.e. the interregional I-O trade data contained in the EUREGIO database (Thissen et al., 2018) that merges WIOD data, regional economic accounts, and estimates of interregional trade flows, in order to detail the I-O trade linkages of European regions at NUTS2 level (Thissen et al., 2013).

This database covers all NUTS2 level for EU27 + UK, with the exception Bulgaria, Romania, not available at the regional level, and Croatia, not available in the database.[4] The main GVCs-related indicators employed in this work are participation and positioning, together with the regional classification in headquarters, factory, and primary resources regions.

At regional level, the *regional participation* in manufacturing GVCs is obtained combining indicators of backward and forward linkages from I-O matrices. A generic region *r*'s participation (*part*) is obtained as the sum of Foreign Value Added (*FVA*) and Domestic Value Added (*DVA*) in intermediate goods as a share of gross exports (*EXGR*). The former element captures the backward participation, i.e. the value of foreign inputs used for my exports; while the latter measures the extent of forward participation, i.e. the value that is domestically generated and exported into the chain as input for others. Since regions may participate to GVCs in both ways, this ratio proxies the intensity of involvement in GVCs, as follows (Eq. 1):

$$GVCs\ part_{r,man} = \frac{\sum_s FVA_{r,man,s} + \sum_s DVA^{interm}_{r,man,s}}{\sum_s EXGR_{r,man,s}} \quad (1)$$

where *man* indicates the manufacturing sector, *interm* refers to intermediate goods, *r* indicates a generic region, and *s* is another generic region, different from *r*. Summations over *s* indicate that variables are measured for all partners of region *r*. In Eq. (1) both forward and backward participation are considered together because the degree of regional involvement in GVCs depends on both determinants.

Foreign value added (FVA) and Domestic value added (DVA) are obtained using the EUREGIO I-O matrices, and applying the Koopman et al. (2014) decomposition to gross exports, capable to distinguish the different sources of value added.

For the *positioning* of each region within the manufacturing GVC, we first apply a traditional measure of *upstreamness*. In particular, we apply the one proposed by Antràs et al. (2012) as average distance from final use, calculated as follows (Eq. 2):

$$GVCs\ pos_{r,man} = \frac{F_{man}}{Y_{man}} + 2^*\frac{\sum_{j=1}^{N} d_{man,j}F_j}{Y_{man}} + 3^*\frac{\sum_{j=1}^{N}\sum_{k=1}^{N} d_{man,k}d_{man,j}F_j}{Y_{man}} + 4^*\frac{\sum_{j=1}^{N}\sum_{k=1}^{N}\sum_{l=1}^{N} d_{man,l}d_{l,k}d_{k,j}F_j}{Y_{man}} + \cdots \quad (2)$$

In Eq. (2), for each industry *i*, F_i represents the usage of gross output (Y_i) as a final good, while $d_{i,j}$ is the monetary value of sector *i*'s output needed to produce one unit of industry *j*'s output, in monetary value (Antràs et al., 2012). This measure is calculated for each region (*r*) of our database, with a focus on the manufacturing sector.

Larger values of position are associated with higher levels of upstreamness of a region. In other words, the higher the value of the indicator, the higher the level of upstreamness, i.e. a specific area is positioned at the initial phases of the GVCs, mostly focused on the use of intermediate inputs in its production processes rather than on

[2] Although based on different criteria, many of the regions falling in the category of Primary Resources are the same identified by the European Commission as EU coal, peat and oil shale regions (Alves Dias et al., 2021) supporting this reasoning.

[3] Since the Bartlett's Test for equality of variances among groups rejects the null hypothesis, the significance of the difference between groups was tested using the Thamane's T2 Test, which corrects for unequal variances.

[4] Slovenia and Lithuania are available at NUTS0 (country-level) but given their small size they are still included in the analysis.

Table 3
Tamhane's T2 pairwise multiple comparison tests of the manufacturing value added across different regional GVCs roles.

vs	Other regions	Primary resources regions	Factory regions
Primary resources regions	-1737.741**	-	-
Factory regions	-171.246	1566.495	-
Headquarter regions	3677.274**	5415.015***	3848.52§

*** p < 0.01, ** p < 0.05, * p < 0.1, § p < 0.15
Preliminary Bartlett's equal-variances test: $\chi^2(3) = 94.3715$; Prob > $\chi^2 = 0.000$

producing final goods.[5] However, GVCs positioning measure contains what has been defined as a "puzzling finding" (Antràs & Chor, 2018; Bolea et al., 2022), since some of the regions or nations at which the measure was applied turned out to be both upstream and downstream the international chain. To cope with this empirical issue, and to reflect our conceptual framework, in the model we substitute the continuous variable of positioning with a categorical one, constructed on the basis of the different functional and sectoral categories in which regions fall as represented in Fig. 1: other regions; primary resources regions; factory regions; headquarters regions.

4.2. Empirical model

With the aim of empirically testing the relationship between regions' participation in manufacturing GVCs and economic growth, this paper estimates the following regional growth model:

$$\Delta VA^{man}_{r,t;t-1} = f(GVCs\ part_{r,t-1}; GVCs\ pos_{r,t-1}; X_{r,t-1}; \varphi_r; \theta_t; \omega_{c,t}) + \varepsilon_{r,t} \quad (3)$$

where the dependent variable represents the compound annual growth rate of the regional manufacturing value added over the two periods considered $\Delta VA^{man}_{r,t;t-1}$, and $GVCs\ part_{r,t-1}$ and $GVCs\ pos_{r,t-1}$ are indicators respectively of regional participation and positioning in GVCs. *r* is a generic region, while *t-1* is the time at which the explanatory variables are measured, i.e. the beginning of each period and also the first year at which the value added growth is calculated, except for the GVCs-related data that refer to 2010 for the second period (post-crisis) since no more recent data are available through the EUREGIO database.[6] $X_{r,t-1}$ represents a set of control variables. In particular, these are urbanization economies, measured through rent values in the main city of the region (Capello et al., 2023a), wealth of the region (GDP *per capita*), innovativeness of the region (patents *per employee*), and human capital (share of secondary educated individuals). In a second stage, we estimate Eq. (3) substituting the upstreamness variable ($GVCs\ pos_{r,t-1}$) with the categorical one. Table 4 presents the descriptive statistics of the variables in the model.

The empirical model includes both regional (NUTS2) (φ_r) and period fixed effects (θ_t) and it is estimated over two periods, to separate out the effects of the financial crisis (2008–2012), when international trade collapsed, with the post-crisis (2013–2019) when it expanded again. Moreover, the model incorporates also country-by-period fixed effects ($\omega_{c,t}$) since this approach enables to capture country-specific, time-varying macroeconomic and policy shocks that may be correlated with economic performance and/or GVCs' participation and are shared among regions within a given country.

[5] These two indicators (GVCs participation and positioning) display a low correlation (Pearson coeff. Equal to 0.25). This is explained by the fact that positioning reflects the number of production phases that the industry's output must undergo before reaching its ultimate consumers (Ignatenko et al., 2019), and it is not dependent on the degree of involvement in GVCs.

[6] The selection of 2010 for GVCs-related variables in the second period is a second-best option. Ideally, 2013 would have been optimal, aligning with other controls, but it reflects data limitations on GVCs at the regional level. Nevertheless, considering that the financial crisis peaked in Europe right after Lehman Brothers' collapse in 2008 and an initial economic recovery occurred in 2010, 2010 serves as a reasonable compromise for this analysis.

5. Results

The results of the empirical analysis align with the rationale posed by the two research questions outlined in Section 3. The initial finding pertains to the contribution of participation in GVCs to regional economic growth. As evident from column (1) of Table 5, the coefficient for participation in manufacturing GVCs is positive and statistically significant. This implies that higher regional involvement in GVCs is associated with greater economic growth, in line with the favourable view of GVCs on economic dynamics.

Interestingly enough, by interacting a post-crisis period dummy with the participation variable, the results reveal a pronounced and statistically significant effect in the interaction coefficient, while the value associated with participation alone loses its significance. This outcome witnesses the cyclical nature of GVCs; in fact, results show how during periods of growth and economic expansion, participation in GVCs constitutes a development factor, and, conversely, when crises appear, GVCs reduce their positive effects on growth.

Columns (3) and (4) of Table 5 introduce another piece to the puzzle. Holding participation level constant, upstreamness is tested as a possible growth factor. Interestingly, the estimates show that the coefficient for upstreamness alone is not statistically significant (col. 3). What is interesting instead is that when included in quadratic form, a U-shaped effect emerges (col. 4). Specifically, the single term is negatively and significantly related to growth, while the squared term yields a positive and significant result, confirming the convexity of the parabola (U-shape).

In order to test the effect of participation at different levels of positioning in GVCs, the two indicators have been interacted (also in quadratic form) and, for sake of clarity, the marginal effects are depicted in Fig. 3.[7] The marginal effects show that a smile curve effect (i.e., quadratic) does indeed exist. They are significant up to less than the 50th percentile (dotted line in Fig. 3), and lose significance for regions with higher levels of upstreamness.

This result appears to suggest that the regions situated further downstream in the value production chain are the ones that capture the greatest economic growth value from participating in GVCs. This result may be due to the "puzzling finding" (Antràs & Chor, 2018), occurring when countries that seemed to be positioned upstream based on their production-staging proximity to final demand (upstreamness) are simultaneously positioned also downstream when assessed by their production-staging proximity to primary factors (downstreamness). Antràs & Chor (2018) assert that this "puzzling finding" arises from the fact that countries that distribute a disproportionate portion of their output directly to final consumers (thus appearing downstream in GVCs) tend to exhibit high value-added to gross output ratios, indicating a limited incorporation of intermediate inputs in their production process (thus appearing upstream in GVCs). Bolea et al. (2022) identified the "puzzling finding" also at the regional level, using the same database employed in this study, clearly suggesting that there is often an overlap between regions classified as upstream and downstream, generating confusion in the interpretation of the results.

[7] Table 7 in Appendix B presents the full table of results of the empirical models including interactions among variables. This result refers to column (1).

Table 4
Summary statistics of the variables in the model (average mean of the two periods: 2008–2012 and 2013–2019.

Variable	Obs.	Mean	Std. dev.	Min	Max	Source
Growth of GVA manufacturing	494	0.011	0.041	-0.113	0.303	Author's elaboration based on EUROSTAT data
Regional GVCs' participation in manufacturing	494	0.506	0.044	0.384	0.684	Author's elaboration based on EUREGIO data
GVCs' positioning in manufacturing	494	1.683	0.637	1.027	6.056	Author's elaboration based on EUREGIO data
Urban rent (ln)	494	7.534	0.575	5.515	9.738	Capello et al., (2023a)
GDP *per capita* (ln)	494	-3.750	0.484	-5.065	-2.392	Author's elaboration based on EUROSTAT data
Patents *per employee* (ln)	494	0.181	0.173	0.000	0.860	Author's elaboration based on EUROSTAT data
Secondary education (%)	494	47.046	14.479	11.100	79.500	Author's elaboration based on EUROSTAT data

Table 5
Regression results: the role of GVCs' participation and positioning.

Dep variable: Growth rate of manufacturing VA	(1)	(2)	(3)	(4)
GVCs' Participation	0.288*	0.055	0.294*	0.308*
	(0.165)	(0.175)	(0.169)	(0.171)
GVCs' Participation * Dummy post-crisis period		0.279***		
		(0.059)		
GVCs' Positioning			-0.007	-0.073*
			(0.015)	(0.040)
GVCs' Positioning^2				0.008**
				(0.004)
Land rent (ln)	0.010**	0.009*	0.010**	0.010**
	(0.005)	(0.005)	(0.005)	(0.005)
GDP *per capita* (ln)	-0.237***	-0.219***	-0.237***	-0.240***
	(0.028)	(0.026)	(0.028)	(0.028)
Patents *per employee* (ln)	0.111*	0.028	0.113*	0.099$
	(0.067)	(0.062)	(0.067)	(0.068)
Secondary education (%)	0.001*	0.001*	0.001*	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
Dummy post-crisis period	0.050***	-0.088***	0.050***	0.048***
	(0.004)	(0.029)	(0.004)	(0.005)
Constant	-0.145	1.732	-0.192	-0.361
	(1.518)	(1.431)	(1.518)	(1.525)
Observations	494	494	494	494
R-squared	0.665	0.697	0.666	0.669
Number of regions	247	247	247	247
Regional fixed effects	YES	YES	YES	YES
Country-by-period fixed effects	YES	YES	YES	YES

Robust standard errors in parentheses
*** p < 0.01, ** p < 0.05, * p < 0.1, § p < 0.15

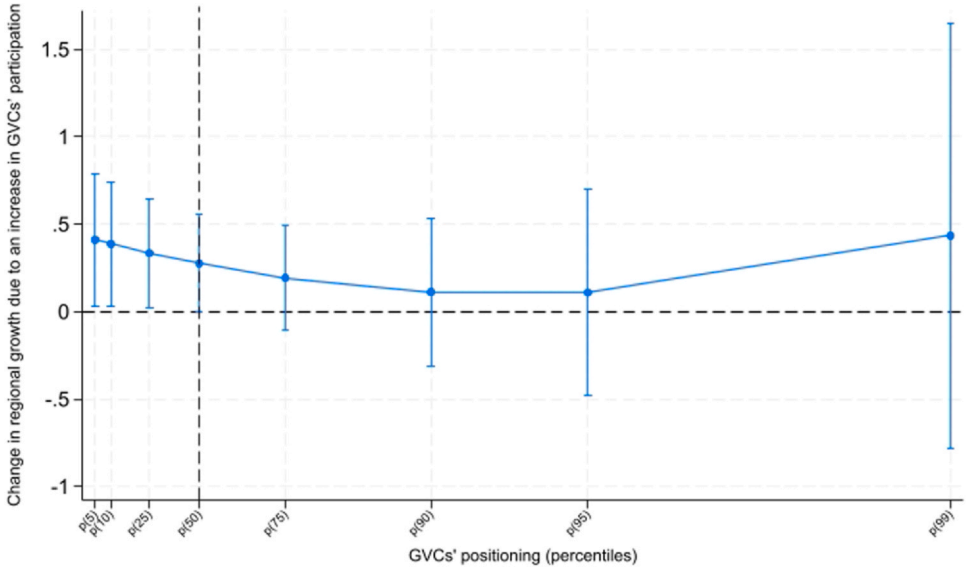

Fig. 3. Average marginal effects of GVCs' participation on regional growth at different percentiles of positioning.

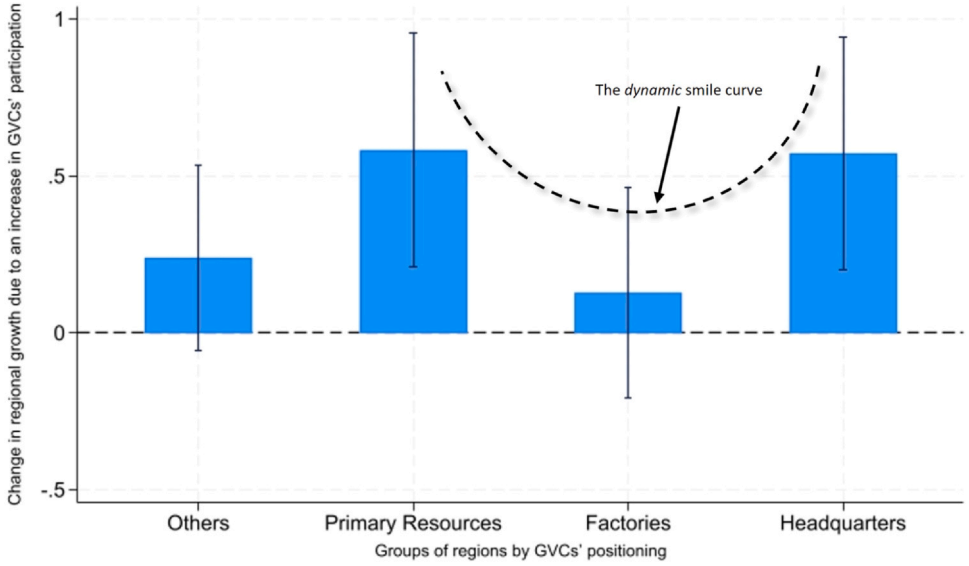

Fig. 4. Marginal effects of GVCs' participation on regional growth for different groups of regions.

Table 6
Pairwise Wald tests comparing marginal effects across GVCs roles of regions.

vs	Other regions	Primary resources regions	Factory regions
Primary Resources regions	0.344**	-	-
Factory regions	-0.111	-0.454**	-
Headquarter regions	0.333*	-0.011	0.444**

*** p < 0.01, ** p < 0.05, * p < 0.1

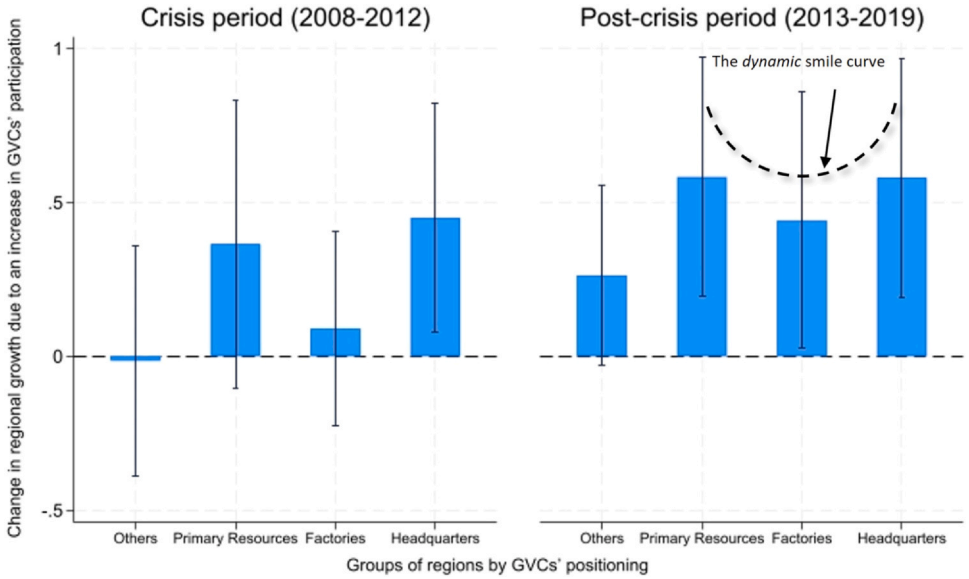

Fig. 5. Marginal effects of GVCs' participation on regional growth for different groups of regions and periods.

Our categorization of regions into Primary Resources, Factories, and Headquarters regions serves as a valuable way out this puzzling issue. In this logic, the prevailing regional role within manufacturing GVCs may serve as a good proxy of the positioning of regions in an aggregate scale perspective, coping with the issues posed by the "puzzling finding".

Fig. 4 shows the marginal effects of participation in manufacturing GVCs on economic growth for different groups of regions, based on their prevalent role.[8] The results that emerge are interesting and align with the expectations of Fig. 1. Specifically, the only regions that truly manage to grow through participation in GVCs are those that leverage their scarce resources, whether natural as in the case of primary resources,[9] or high-level skills such as headquarters. The other two types of regions, on the other hand, are unable to harness the chains to their advantage because they either do not stand out in a specific role (other regions) or are factories, areas defined based on the lowest-level functions where fabrication activities are concentrated.

[8] Marginal effects based on column (2) in Table 7 in Appendix B.

[9] This result is in line with the findings of Naudé et al. (2010) who showed the strong effect of specialization in the export of primary resources on growth.

Table 6 presents an additional information. By statistically comparing the marginal effects of the different groups of regions through a Wald test, it shows the statistical differences between groups of regions. Results indicate that Headquarters and Primary Resources regions exhibit similar behaviour, showing a statistically comparable marginal effect (a not-significant difference of −0.011) and a statistically significant difference with respect to the other two types of regions (a difference of 0.333 and 0.444, respectively). By the same token, Primary Resources regions show differences with the other regions and, more interestingly, with the Factory regions (a difference of 0.344 and 0.454, respectively).

Finally, since the financial crisis of 2008 represented a turning point in GVCs, leading to a contraction of global trade up to four times more intense than that of GDP (Bems et al., 2011) and a temporary decline in value production fragmentation (Los et al., 2015), we estimated the results in the two periods considered in the analysis. Fig. 5 separates out the marginal effects of GVCs' participation on regional growth also by period.[10] Interestingly enough, the dynamic smile curve clearly emerges in the post-crisis period. This is due to two reinforcing statistical results. On the one hand, the average statistically insignificant marginal effects of participation in GVCs in Factory regions turns out to be significant in the post crisis period. On the other, the average positive and significant result on participation in GVCs by Primary Resources regions is in fact driven by the effects in the post crisis period. These results reinforce the idea mentioned above that it is in periods of economic expansion that GVCs play their major role as sources of growth.[11]

6. Conclusions

This work contributes to the academic discourse on GVCs and their capacity to generate positive regional economic dynamics. Specifically, the innovative objective of this article was twofold. On one hand, we have provided a conceptual rationale for the significance of positioning within GVCs for economic growth: namely, areas abundant of scarce resources are able to extract the highest value from participation in GVCs, imposing favourable terms of trade. This holds especially in dynamic terms; when the involvement of a region in GVCs increases, the increasing demand of scarce resources that is generated in the GVC leads regions abundant in such precious resources to increase their prices, augmenting the value added they obtain from their participation in the chain. On the other hand, the paper elucidates and delineates this conceptual reasoning at a regional (sub-national) scale, a dimension largely overlooked in classical international trade literature. This enabled the mapping of diverse types of regions in Europe - i.e. headquarters, factory, and primary resources regions - which engage with GVCs in markedly distinct ways and consequently exhibit divergent growth trajectories.

The results of the empirical analysis demonstrate our expectations that the advantages of increased participation in GVCs for regions depend on the predominant role played within the chains. Regions' ability to harness limited resources, both in terms of natural endowments and skillsets, enables them to establish advantageous terms of trade and experience larger growth rates. Additionally, these outcomes are influenced by the broader economic context, and results show that the "dynamic smile curve" is obtained in periods of economic expansion rather than of crisis.

These findings, novel in the regional literature on GVCs, hold significant implications both in academic and policy realms, particularly concerning economic and regional inequalities. Indeed, the varying growth outcomes associated with different regional roles in GVCs can exacerbate pre-existing spatial disparities (Aguiar de Medeiros & Trebat, 2017). Income distribution within countries tends to worsen due to GVCs (Duarte et al., 2022), possibly also due to the reshuffling of workers in response to market demands (Rohit, 2023). Our results suggest that a similar situation is reflected at regional level. Strong regions, endowed of scarce skills and natural resources, are those that gain the most from GVCs' participation.

Our results add other two important messages. First of all, they remind us that during the crisis period GVCs were a source of limited growth particularly in heavily manufacturing-oriented regions, generating dissatisfaction and grievances, particularly among the working class (Colantone & Stanig, 2018). Secondly, they recall that in Europe, the areas designated as "Factory Europe" by Baldwin (Baldwin & Lopez-Gonzalez, 2015) are also the ones potentially facing the *middle-income trap* today (Diemer et al., 2022). Understanding the role these territories will play in the future GVCs will also shed light on whether and how a response to the development trap and discontent can be formulated (Cerqua et al., 2022; Di Matteo et al., 2022; Dijkstra et al., 2020; Rodríguez-Pose et al., 2023). These findings suggest that future research on these aspects should be carried out. Academic research should further delve into the connection between GVCs and inequalities, particularly at the regional level, and this is the subject matter of our research avenue.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Roberto Dellisanti reports financial support was provided by the Italian MUR. Roberta Capello reports financial support was provided by the Italian MUR. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

This work was financed by the European Union – Next Generation EU, Italian Ministry of University and Research (MUR), under the grant PRIN (Research Project of National Interest) number P2022KZS42 "The Impact of Global Value Chains on growth and inequalities: a regional perspective".

Appendices A. and B. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.pirs.2024.100018.

References

Aguiar de Medeiros, C., Trebat, N., 2017. Inequality and income distribution in global value chains. J. Econ. Issues *51* (2), 401–408. https://doi.org/10.1080/00213624.2017.1320916

Almazán-Gómez, M.Á., Llano, C., Pérez, J., Mandras, G., 2023. The European regions in the global value chains: new results with new data. Pap. Reg. Sci. https://doi.org/10.1111/pirs.12760

Alves Dias, P., Conte, A., Kanellopoulos, K., Kapetaki, Z., Mandras, G., Medarac, H., Nijs, W., Ruiz Castello, P., Somers, J., & Tarvydas, D. (2021). *Recent trends in EU coal, peat and oil shale regions* (Issue KJ-NA-30618-EN-N (online), KJ-NA-30618-EN-C (print)). Publications Office of the European Union. https://doi.org/10.2760/510714 (online).

Antràs, P., Chor, D., 2018. On the measurement of upstreamness and downstreamness in global value chains. In: Ing, L.Y., Yu, M. (Eds.), World Trade Evolution. Routledge, pp. 126–194. https://doi.org/10.4324/9781351061544-5

Antràs, P., Chor, D., Fally, T., Hillberry, R., 2012. Measuring the upstreamness of production and trade flows. Am. Econ. Rev. *102* (3), 412–416. https://doi.org/10.1257/aer.102.3.412

Ascani, A., Bettarelli, L., Resmini, L., Balland, P.-A., 2020. Global networks, local specialisation and regional patterns of innovation. Res. Policy *49* (8), 104031. https://doi.org/10.1016/j.respol.2020.104031

Baldwin, R., 2013. Global supply chains: Why they emerged, why they matter, and where they are going. In Global Value Chains in a Changing World. WTO, pp. 13–59. https://doi.org/10.30875/3c1b338a-en

[10] Marginal effects based on column (3) in Table 7 in Appendix B.

[11] These comparison between marginal effects by period are statistically confirmed in Appendix B, where we discuss the statistical difference of the effects through Wald tests distinguishing between the two sub-periods.

Baldwin, R., 2016. The Great Convergence. Harvard University Presshttps://doi.org/10.4159/9780674972667
Baldwin, R., Ito, T., 2021. The smile curve: evolving sources of value added in manufacturing. Can. J. Econ. /Rev. Can. D. 'économique *54* (4), 1842–1880. https://doi.org/10.1111/caje.12555
Baldwin, R., Lopez-Gonzalez, J., 2015. Supply-chain trade: a portrait of global patterns and several testable hypotheses. World Econ. *38* (11), 1682–1721. https://doi.org/10.1111/twec.12189
Baldwin, R., Robert-Nicoud, F., 2014. Trade-in-goods and trade-in-tasks: an integrating framework. J. Int. Econ. *92* (1), 51–62. https://doi.org/10.1016/j.jinteco.2013.10.002
Bems, R., Johnson, R.C., Yi, K.-M., 2011. Vertical linkages and the collapse of global trade. Am. Econ. Rev. *101* (3), 308–312. https://doi.org/10.1257/aer.101.3.308
Bolea, L., Duarte, R., Hewings, G.J.D., Jiménez, S., Sánchez-Chóliz, J., 2022. The role of regions in global value chains: an analysis for the European Union. Pap. Reg. Sci. *101* (4), 771–794. https://doi.org/10.1111/pirs.12674
Brakman, S., Van Marrewijk, C., 2017. A closer look at revealed comparative advantage: gross-versus value-added trade flows. Pap. Reg. Sci. *96* (1), 61–92. https://doi.org/10.1111/pirs.12208
Camagni, R., 2002. On the concept of territorial competitiveness: sound or misleading? Urban Stud. *39* (13), 2395–2411. https://doi.org/10.1080/0042098022000027022
Camagni, R., Capello, R., Perucca, G., 2022. Beyond productivity slowdown: quality, pricing and resource reallocation in regional competitiveness. Pap. Reg. Sci. 101 (6), 1307–1331. https://doi.org/10.1111/pirs.12696
Camagni, R., Pompili, T., 1990. Inter-regional and inter-urban economic power relations as command over local resources: the Italian case. In: Shachar, A., Oberg, S. (Eds.), The world economy and the spatial organisation of power. Gower, pp. 187–218.
Capello, R., Caragliu, A., Dellisanti, R., 2023a. Integrating digital and global transformations in forecasting regional growth: the MASST5 model. Spat. Econ. Anal. 1–28. https://doi.org/10.1080/17421772.2023.2278514
Capello, R., Dellisanti, R., Perucca, G., 2023b. At the territorial roots of global processes: heterogeneous modes of regional involvement in global value chains. Environ. Plan. A: Econ. Space. https://doi.org/10.1177/0308518×231211788
Cerqua, A., Letta, M., Federico, Z., 2022. The Italian Geography of Discontent. Scienze Regionali, Italian. J. Reg. Sci. *3*, 367–384. https://doi.org/10.14650/105121
Colantone, I., Stanig, P., 2018. Global competition and brexit. Am. Political Sci. Rev. *112* (2), 201–218. https://doi.org/10.1017/S0003055417000685
Coveri, A., Zanfei, A., 2022. Functional division of labour and value capture in global value chains: a new empirical assessment based on FDI data. Rev. Int. Political Econ. 1–28. https://doi.org/10.1080/09692290.2022.2152074
Crescenzi, R., Harman, O., 2023. Harnessing Global Value Chains for regional development. Routledgehttps://doi.org/10.4324/9781003356141
Dallas, M.P., Ponte, S., Sturgeon, T.J., 2019. Power in global value chains. Rev. Int. Political Econ. *26* (4), 666–694. https://doi.org/10.1080/09692290.2019.1608284
De Marchi, V., Di Maria, E., Micelli, S., 2013. Environmental strategies, upgrading and competitive advantage in global value chains. Bus. Strategy Environ. *22* (1), 62–72. https://doi.org/10.1002/bse.1738
de Vries, G., Jiang, A., Lemmers, O., Wei, S., 2021. Firm productivity and functional specialisation. World Econ. *44* (5), 1232–1260. https://doi.org/10.1111/twec.13055
Di Matteo, D., Ferrara, A.R., Mariotti, I., 2022. Place-Based Policies and Political Discontent: The Mediating Role of Local Spending Programmes. Scienze Regionali, Italian. J. Reg. Sci. *3*, 385–418. https://doi.org/10.14650/105122
Diemer, A., Iammarino, S., Rodríguez-Pose, A., Storper, M., 2022. The regional development trap in Europe. Econ. Geogr. *98* (5), 487–509. https://doi.org/10.1080/00130095.2022.2080655
Dijkstra, L., Poelman, H., Rodríguez-Pose, A., 2020. The geography of EU discontent. Reg. Stud. *54* (6), 737–753. https://doi.org/10.1080/00343404.2019.1654603
Duarte, R., Espinosa-Gracia, A., Jiménez, S., Sánchez-Chóliz, J., 2022. New insights on the relationship between the involvement of countries in global value chains, and intra- and inter-country inequalities. Struct. Change Econ. Dyn. *63*, 320–329. https://doi.org/10.1016/j.strueco.2022.11.001
Gereffi, G., 1999. International trade and industrial upgrading in the apparel commodity chain. J. Int. Econ. *48* (1), 37–70 https://doi.org/10.1016/S0022-1996(98)00075-0.
Gereffi, G., 2014. Global value chains in a post-Washington Consensus world. Rev. Int. Political Econ. *21* (1), 9–37. https://doi.org/10.1080/09692290.2012.756414
Gereffi, G., 2019. Economic upgrading in global value chains. In: Ponte, S., Gereffi, G., Raj-Reichert, G. (Eds.), Handbook on Global Value Chains. Edward Elgar Publishing. https://doi.org/10.4337/9781788113779.00022
Gereffi, G., Humphrey, J., Kaplinsky, R., Sturgeon, T., 2001. Introduction: globalisation, value chains and development. IDS Bull. *32* (3), 1–8.
Giuliani, E., Pietrobelli, C., Rabellotti, R., 2005. Upgrading in global value chains: lessons from latin american clusters. World Dev. *33* (4), 549–573. https://doi.org/10.1016/j.worlddev.2005.01.002
Ignatenko, A., Raei, F., & Mircheva, B. (2019). Global Value Chains: What are the Benefits and Why Do Countries Participate? (2019/18; IMF Working Papers).
Jangam, B.P., Rath, B.N., 2021. Do global value chains enhance or slog economic growth? Appl. Econ. *53* (36), 4148–4165. https://doi.org/10.1080/00036846.2021.1897076
Jithin, P., Ashraf, S., Umar, Z., 2023. Does global value chain participation induce economic growth? Evidence from panel threshold regression. Appl. Econ. *55* (24), 2788–2800. https://doi.org/10.1080/00036846.2022.2106032
Johnson, R.C., Noguera, G., 2012. Accounting for intermediates: production sharing and trade in value added. J. Int. Econ. *86* (2), 224–236. https://doi.org/10.1016/j.jinteco.2011.10.003
Koopman, R., Wang, Z., Wei, S.-J., 2014. Tracing value-added and double counting in gross exports. Am. Econ. Rev. *104* (2), 459–494. https://doi.org/10.1257/aer.104.2.459
Krishnan, A., De Marchi, V., Ponte, S., 2023. Environmental upgrading and downgrading in global value chains: a framework for analysis. Econ. Geogr. *99* (1), 25–50. https://doi.org/10.1080/00130095.2022.2100340
Krisztin, T., Piribauer, P., 2023. A joint spatial econometric model for regional FDI and output growth. Pap. Reg. Sci. *102* (1), 87–106. https://doi.org/10.1111/pirs.12714
Los, B., Timmer, M.P., de Vries, G.J., 2015. How global are global value chains? a new approach to measure international fragmentation. J. Reg. Sci. *55* (1), 66–92. https://doi.org/10.1111/jors.12121
McCann, P., Mudambi, R., 2005. Analytical differences in the economics of geography: the case of the multinational firm. Environ. Plan. A: Econ. Space *37* (10), 1857–1876. https://doi.org/10.1068/a37311
Meng, B., Ye, M., Wei, S., 2020. Measuring smile curves in global value chains. Oxf. Bull. Econ. Stat. *82* (5), 988–1016. https://doi.org/10.1111/obes.12364
Mudambi, R., 2007. Offshoring: economic geography and the multinational firm. J. Int. Bus. Stud. *38* (1), 206 http://www.jstor.org/stable/4540411.
Mudambi, R., 2008. Location, control and innovation in knowledge-intensive industries. J. Econ. Geogr. *8* (5), 699–725. https://doi.org/10.1093/jeg/lbn024
Naudé, W., Bosker, M., Matthee, M., 2010. Export specialisation and local economic growth. World Econ. *33* (4), 552–572. https://doi.org/10.1111/j.1467-9701.2009.01239.x
Ndubuisi, G., Owusu, S., 2021. How important is GVC participation to export upgrading? World Econ. *44* (10), 2887–2908. https://doi.org/10.1111/twec.13102
Obama, B. (2012). An America Built to Last. ⟨https://obamawhitehouse.archives.gov/sites/default/files/blueprint_for_an_america_built_to_last.pdf⟩.
Pahl, S., Timmer, M.P., 2020. Do global value chains enhance economic upgrading? A long view. J. Dev. Stud. *56* (9), 1683–1705. https://doi.org/10.1080/00220388.2019.1702159
Pleticha, P., 2021. Who benefits from global value chain participation? Does functional specialization matter? Struct. Change Econ. Dyn. *58*, 291–299. https://doi.org/10.1016/j.strueco.2021.06.005
Rodríguez-Pose, A., Terrero-Dávila, J., Lee, N., 2023. Left-behind versus unequal places: interpersonal inequality, economic decline and the rise of populism in the USA and Europe. J. Econ. Geogr. *23* (5), 951–977. https://doi.org/10.1093/jeg/lbad005
Rodrik, D. (2011). The Manufacturing Imperative. ⟨https://www.project-syndicate.org/commentary/the-manufacturing-imperative⟩.
Rohit, K., 2023. Global value chains and structural transformation: evidence from the developing world. Struct. Change Econ. Dyn. *66*, 285–299. https://doi.org/10.1016/j.strueco.2023.05.006
Rungi, A., Del Prete, D., 2018. The smile curve at the firm level: where value is added along supply chains. Econ. Lett. *164*, 38–42. https://doi.org/10.1016/j.econlet.2017.12.038
Shin, N., Kraemer, K.L., Dedrick, J., 2012. Value capture in the global electronics industry: empirical evidence for the "smiling curve" concept. Ind. Innov. *19* (2), 89–107. https://doi.org/10.1080/13662716.2012.650883
Stöllinger, R., 2021. Testing the smile curve: functional specialisation and value creation in GVCs. Struct. Change Econ. Dyn. *56*, 93–116. https://doi.org/10.1016/j.strueco.2020.10.002
Thissen, M., Diodato, D., & van Oort, F. (2013). Integration and Convergence in Regional Europe: European Regional Trade Flows from 2000 to 2010 (No. 1036; PBL Publication).
Thissen, M., Lankhuizen, M., van Oort, F., Los, B., & Diodato, D. (2018). EUREGIO: The construction of a global IO DATABASE with regional detail for Europe for 2000-2010 (No. 18-084/VI; Tinbergen Discussion Paper).
Tian, K., Dietzenbacher, E., Jong-A-Pin, R., 2022. Global value chain participation and its impact on industrial upgrading. World Econ. *45* (5), 1362–1385. https://doi.org/10.1111/twec.13209
Timmer, M.P., Miroudot, S., de Vries, G.J., 2019. Functional specialisation in trade. J. Econ. Geogr. *19* (1), 1–30. https://doi.org/10.1093/jeg/lby056
Tocci, N. (2021). European Strategic Autonomy: What It Is, Why We Need It, How to Achieve It.
UNCTAD. (2013). World Investment Report 2013 - Global Value Chains: investment and trade for development. ⟨https://unctad.org/system/files/official-document/wir2013_en.pdf⟩.
Wang, Z., Wei, S.-J., Yu, X., & Zhu, K. (2017). Measures of Participation in Global Value Chains and Global Business Cycles (No. 23222; NBER Working Papers). ⟨https://doi.org/10.3386/w23222⟩.
World Bank. (2020). Trading for Development in the Age of Global Value Chains. https://www.worldbank.org/en/publication/wdr2020.