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Abstract

This paper investigates the effects of a retreat from global economic integration on the European regional production network for the period 2000-2010. We find that production has become increasingly fragmented, although the degree of heterogeneity across regions is substantial. This heterogeneity is also present in the direct and indirect effects of three different deglobalisation scenarios that we simulate. Our results show that deglobalisation generates winners and losers. Specifically, two groups of regions emerge; regions that would benefit from a return to a less integrated world, and regions that would instead gain from a strengthening of the European production network.

Keywords: Reshoring, Global Value Chains, production networks, input-output, regional fragmentation, supply chains interruption.

JEL classification: D57, F16, F62, F66.

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1. Introduction

Following the Brexit, the US-China tensions, and the outbreak of the COVID-19 pandemic the world economy is retreating from global economic integration (Baldwin and Evenett, 2020; Irwin, 2020). Policymakers, business leaders, and the popular press are questioning whether global value chains (GVCs) have been stretched too far. In the academic debate it has been argued that reshaping GVCs, possibly making them shorter, more domestic, or more diversified, could improve production networks resilience (Gereffi, 2020). While there are conflicting views on this position (Miroudot, 2020), there is instead a widespread consensus that GVCs may undergo certain reconfigurations and shortening in the near de-globalised future (Antràs, 2021; Brakman et al., 2020; Kano and Oh, 2020). However, despite the debate on these issues is attracting a large and increasing attention there is exceedingly little empirical work on the economic implications of deglobalisation, and none that focuses on the network effects at a regional level. This paper aims to fill this gap.

In particular, we aim at analysing the potential impact of deglobalisation on European Union (EU) regional economies by addressing the following questions: How would EU regions be affected by the interruption of supply chains? What economic consequences would a return to less integrated trade have for EU regions? What effect would a shortening of extra-EU value chains have on EU regions?

To answer these questions, we here develop a scenario analysis in a global input-output framework using the EUREGIO database that includes data for 14 industries in 246 NUTS 2 regions of the EU-25, plus data at the country-level for the same 14 industries in Bulgaria, Romania and other 14 extra-EU trading partners, for a total of 41 countries. Specifically, we study the impact on EU regional economies of three different kind of deglobalisation scenarios characterised, respectively, by: (1) the end of foreign intermediate input flows; (2) a return to the past production schemes and trade patterns; (3) a Europeanisation of the GVCs.

Despite the definition of globalisation is multifaceted and complex (Livesey, 2018), it can be defined as the rise in international flows of intermediate goods and services (Feenstra and Hanson, 1996; Hummels et al., 1998). Hence, a natural way of modelling deglobalisation is to consider the case where there is a large reduction of intermediates. Therefore, borrowing from previous studies on the impact of trade restrictions (Chen et al. 2018; Eppinger et al. 2021; Giammetti et al., 2020b), in our first scenario we quantify the shares of EU regions value-added that would be at risk following a deglobalisation process in hypothetical situations where there is: (i) a complete interruption of imports and exports in intermediate inputs; (ii) a partial interruption involving only extra-EU countries, thus leaving the deliveries of inputs between EU regions unchanged; and (iii) a partial interruption involving only the deliveries between EU regions, leaving the input relationships with extra-EU countries unchanged.

In the second scenario, we aim at understanding how EU regional economies would respond if we could go back in time evaluating how the value-added in 2010 of such regions would change if production took place with the production schemes and trade patterns of 2000. In the debate on the backlash of globalisation, reference is often made to the sentiment of the so-called losers of hyper-globalisation or to a process of integration of world economies that has gone too far (Colantone et al., 2021). Hence, we here try to answer the question about what would happen if we could go back to a less globalised world with the same or similar characteristics of the past.

The third scenario addresses the issue of GVCs reshoring (Strange, 2020) by simulating the effects on EU regional economies (and extra-EU countries) of a hypothetical situation where the EU regions totally replace the intermediate inputs imported from extra-EU countries with the same intermediates from other EU countries. The reasons motivating this scenario are rooted in the debate about the opportunity and effects of shortening the value chains (see Di Stefano, 2021, for a review) and the European strategic autonomy (Tocci, 2021)—i.e., the deepening of the single market and the promotion of intra-EU value chains—that has been strengthened by the widespread disruptions to GVCs caused by the COVID-19 pandemic (OECD, 2020).

We model the three scenarios by employing the hypothetical extraction method and some of its extensions (Dietzenbacher and Lahr, 2013; Dietzenbacher et al., 2019) as this is a standard input-output tool widely used in the recent GVCs literature for studying how the value-added of a sector, a region, or a country, changes following the perturbation of the input requirements matrix (Los et al., 2017; Chen et al., 2018; Giammetti et al., 2020a; Giammetti et al., 2020b). Our approach is comprehensive and granular as it includes direct and indirect trade via GVCs and provides estimates of the impact of our deglobalisation scenarios at the industry level. Including GVCs and input-output connections allows us to evaluate the implications deglobalisation might have on third-party regions and countries. This approach has also the advantage of providing detailed information on the distributional effects of deglobalisation and to estimate its impact on EU regional economies without the need of assumptions on future prices, trade elasticities, and related international substitution patterns.

Two issues are worth discussing. First, regarding the methodology, we recognise that input-output linkages and indirect effects generated by the interruption of GVCs could also be studied employing other models such as the widely used new quantitative trade models (NQTMs). However, as such models need to be calibrated, the use of NQTMs to study the impact of deglobalisation would require assumptions on the strength of interregional and international substitution patterns as well as the use of trade elasticities. Hence, a shortcoming of these models in estimating the effects of large trade shocks may arise from the fact that such key parameters (that can heavily influence the outcome of the simulations) might not well describe behavioural changes following a trade policy shock, as they have been estimated in a pre-impact scenario characterised by (generally) limited variations in trade barriers (see for more on this point Chen et al., 2018).[1] While the standard input-output framework and the NQTMs have both pros and cons, we opted for the former approach because its simplicity and parsimony make it suitable for providing quick and reasonably accurate evaluations of the economic effects of different deglobalisation scenarios.

Second, we also acknowledge that the first and third scenario represent extreme cases of deglobalisation as they involve the complete interruption of value chains or the total replacement of intermediates with very large effects on trade flows. However, two points should be beard in mind in evaluating the results of these scenarios. One is that the aim of our analysis is not to accurately measure the losses from deglobalisation as nobody knows how exactly such a process could eventually take place. Rather, we are interested in understanding, other things equal, the degree of exposure and the possible heterogeneous distribution of gains and losses of deglobalisation across EU regional economies. Such results might be insightful for various reasons, including the political factors that could ultimately shape such a process.[2] Moreover, Dietzenbacher and Lahr (2013) have shown that there is basically no difference in results between the complete and the partial extraction when using the hypothetical extraction method to study distributional impacts. This means that the differences between the results in our first and third scenario and the ones obtained by considering intermediate cases where a share of intermediates (a half, a third or any other) is eliminated or replaced would be minor.

Before presenting the results of the scenario analysis, we describe the trends in international fragmentation of the EU regional production network over the period 2000-2010. The purpose of this study is to strengthen our research question. If most production in EU regions were bounded within domestic borders, a hypothetical future scenario of deglobalisation would be of less concern

[1] It should be acknowledged that also the input-output approach and the hypothetical extraction method show limitations. These models are basically accounting frameworks, rather than fully specified economic models. They start from exogenously given final demand and trace the value added generated at the various stages of production in an international input-output model without explicitly modelling the interaction of prices and quantities like in computable general equilibrium models and NQTMs. However, as shown by recent literature (see, among others, Los et al., 2017; Chen et al., 2018; Giammetti, 2020) they are nevertheless shown to be a powerful tool for impact analyses and for studying the direct and indirect effects of a shock affecting GVCs.

[2] While it goes beyond the aim of this paper to evaluate the losses generated by the lockdown policies implemented following the COVID-19 pandemic, it is nevertheless worth noting that the analysis developed here might provide some useful insights on short-term consequences of rare and extraordinary events that lead to sudden and large interruption of GVCs.

for citizens and policy-makers. However, in line with the results in the literature on production fragmentation (Los et al., 2015), we find that the EU regional production network has become increasingly fragmented since 2000. And, within this trend, we also find that intra-EU fragmentation is dominant in EU value chains, although the trend towards the fragmentation of production outside the EU shows a faster pattern. These findings help motivating our scenario analysis as they suggest that: (i) a shock generated by a deglobalisation process would rapidly spread directly and indirectly through GVCs across EU regions; (ii) the regions of our sample are asymmetrically exposed to the interruption of intra-EU and extra-EU GVCs.

The results of the scenario analysis show that the degree of exposure of EU regions to deglobalisation is highly heterogeneous but a clear pattern also emerges: neighbouring regions, even beyond national borders, exhibit similar exposure to deglobalisation. This suggests that gravity plays a key role in shaping trade flows and that neighbouring regions are likely to belong to the same value chains (Johnson and Noguera, 2012b). Notably, we unveil three main regional value chains: the Central-Eastern bloc, highly integrated within the interregional production network, the Northern bloc, mainly integrated with countries outside the EU, and the Southern bloc, less dependent on regional and global supply chains.

Moreover, in line with the standard trade theory which highlights the presence of winners and losers from globalisation, the findings of the second scenario suggest that a return to a less globalised world would also create winners, not just losers; and this evidence holds at the industry, region, and country level. This asymmetry is even more interesting when compared with the results of the third scenario showing that most of the top winner regions from a Europeanisation of GVCs are among the top losers from a return to a less integrated production network. In this sense, our results reveal the presence of two classes of regions that may have conflicting interests: some regions that would benefit from a return to the past when the fragmentation of production was more limited, and others that would instead gain from greater integration of EU production chains. The existence of such divergent interests is also important for the debate on the drivers of the so-called European discontent (Dijkstra et al., 2020; De Ruyter et al., 2021); more precisely, our findings might add new elements to the growing body of work suggesting that EU backlash is rooted in the reaction among citizens unable to reap benefits from increasingly globalised economies (Díaz-Lanchas et al., 2021; Hobolt, 2016; Lechler, 2019).

This paper is closely related to the literature investigating the economic effects of deglobalisation and GVCs reconfiguration. Some authors have argued that globalisation and deglobalisation are recurring phases of our economic system (James, 2017; van Bergeijk, 2018, 2019) and others have emphasized how the global pandemic is accelerating deglobalisation and structural changes that are already taking place (Livesey, 2018; Irwin, 2020; Antràs, 2021). And while the study of the economic effects associated with a process of deglobalisation appears to be of major importance, the empirical literature on deglobalisation is meagre and limited to few exceptions, such as Hillebrand (2010) and Eppinger et al. (2021). Hillebrand (2010) estimates the impact of a deglobalisation scenario on the world economy and concludes that a retreat from globalisation would have a profound negative impact on most countries and income groups. Most closely related to our work is Eppinger et al. (2021) who employ a quantitative trade model with multiple country-sectors and input-output linkages to simulate GVCs decoupling finding that its effect on welfare losses far exceeds any benefit from lower shock exposure.

Our analysis builds on the strand of literature using global input-output tables to link trade to value-added (Johnson and Noguera, 2012a; Koopman et al., 2014; Timmer et al., 2014) and it is closely related to the growing body of research adopting the input-output method of hypothetical extraction to evaluate the impact of GVCs disruptions and reconfigurations. In the latter strand of this literature, recent works has emphasised the role of input-output linkages and GVCs in amplifying the effects of protectionism and bilateral trade conflicts (Hubert, 2019) such as Brexit (Los et al., 2017; Chen et al., 2018; Giammetti, 2020; Giammetti et al. 2020a) and the US-China tensions (Wang and Hewings, 2020). However, most of these works differ from ours as they mainly develop country level analysis (exceptions are Los et al., 2017, and Chen et al., 2018) and do not specifically investigate the impact of deglobalisation.

Finally, our work is also related to the strand of the fast-growing literature studying how the disruptions to GVCs generated by lockdown policies and social distancing measures following the COVID-19 pandemic have affected the economy of selected countries and international trade. Specifically, close to our paper are those building on an input-output and GVCs framework (Bonadio et al., 2020; Guan et al., 2020; Mandel and Veetil, 2020; Pichler et al., 2020; Ferraresi et al., 2021; Reissl et al., 2021) and, especially, the studies adopting the hypothetical extraction method (Giammetti et al., 2020a; Haddad et al., 2020; Bonet-Morón et al., 2020; Sanguinet et al., 2021). Despite some common features, our paper distinguishes from the contributions in this literature along many dimensions, such as the multi-regional approach, the specific focus on deglobalisation and, more importantly, the counterfactual assessment of the costs and benefits of GVCs reconfigurations.

The rest of the paper is organised as follows. Section 2 outlines the methodology and data employed. Section 3 describes the fragmentation of EU regional production network. Sections 4, 5 and 6 present the results on the impact of the three deglobalisation scenarios. Section 7 concludes.

2. Methodology and Data

This section provides some intuitive insights of the multi-regional input-output framework, followed by a brief description of the methodologies used in the scenario analyses and the EUREGIO database. A more technical and detailed presentation of the methodologies employed (including a focus on the measurement of international fragmentation of value chains in a regional setting) is reported in the Online Appendix A.

Our methods are rooted in the input-output analysis introduced by Leontief (1936), the multiple regions extension made by Isard (1951) and Miller (1966), and the more recent studies on GVCs in an input-output framework inaugurated by Timmer et al. (2013) and Timmer et al. (2014). In all this literature the modelling of input-output structures of industries is central. The input-output structure of an industry includes the information about the amount and type of intermediate inputs needed to produce one unit of output. Based on the Leontief model extended to the linkages across industries, regions, and countries, one can trace the gross output in all stages of production that is needed to produce one unit of final demand.

For example, take the car production in Piemonte (Italy). Demand for Italian cars will in the first instance raise the output of Piemonte and the Italian car industry. But the assembly of an Italian car produced in Piemonte requires car parts and components that are produced by different sectors in different regions and countries such as steel, glass, plastic, rubber, but also energy, and various business services such as logistics, transport, marketing, and financial services. These intermediate goods and services need to be produced as well, thus raising output in the industries delivering them, say the financial services industry placed in Lombardia (Italy) and London (UK), the glass industry placed in Limburg (Netherlands), and the Chinese textile industry. In turn, this will raise output in sectors and regions delivering intermediates to these industries and so on. If we know the gross-output flows associated with a particular level of final demand, we can derive the value added by multiplying these flows with the value-added to the gross-output ratio for each industry (Timmer et al., 2013). By construction, the sum of value added across all industries involved in production will be equal to the value of the final demand.

More formally, by applying standard input-output methods to global input-output tables one can decompose value chains of final products that are identified by the last stage of production: a particular industry i located in a specific region/country r. Let us assume that the world economy consists of C countries, each of them includes a (variable) number of regions R, and each region is comprised of N industries. To decompose the value of a final product into value added contribution in any region and country in the world we can start with an equation that has been a standard tool in input-output analysis for over decades (see Miller and Blair, 2009):

$$\mathbf{v} = \hat{\mathbf{V}}(\mathbf{I} - \mathbf{A})^{-1}\mathbf{Fi}. \quad (1)$$

In this equation (see the Online Appendix A for details), $\mathbf{v}$ is a vector of which the typical element is the value added of industry i in region/country r. $\hat{\mathbf{V}}$ is a diagonal matrix, of which the typical element on the main diagonal, is the value-added over gross output ratio for each of the region/country-industries. $\mathbf{A}$ is the input requirements matrix, also known as the technical coefficients matrix, in which the typical element is the ratio of input supplied by i and bought by j over the gross output of sector j. $(\mathbf{I} - \mathbf{A})^{-1}$ is the well-known Leontief inverse, or multiplier matrix, in which its typical element gives the gross output of industry i in region/country r needed to produce one unit of final demand for the output of industry j in region/country s. Finally, $\mathbf{F}$ is the matrix of industry final demands, and $\mathbf{i}$ is the summation vector, i.e. a vector of all ones.

We employ the hypothetical extraction method and two of its extensions to modify the equation (1) and evaluate the impact of three different deglobalisation scenarios on EU regions. The hypothetical extraction method is a standard input-output tool widely used in the recent literature evaluating the impact of GVCs disruptions and reconfigurations (see among others Los et al., 2017, Chen et al., 2018; Giammetti, 2020).[3] In its standard version, the hypothetical extraction method considers the hypothetical situation in which a certain industry is no longer operational. Using the input-output framework, the hypothetical extraction method calculates the outputs in the entire economy that are necessary for the original final demands. The difference between the original outputs and the hypothetical extraction outputs (which are smaller than the original outputs) is a measure of the linkages of the deleted industry. This standard case can be easily generalised to study how the value-added of a sector, a region, or a country, changes following the zeroing (extraction) of one or more sectors from the input requirements matrix $\mathbf{A}$. This is exactly what we do in Section 4 to compute the exposure of EU regions to the complete interruption of intermediate input flows coming from and to foreign countries. It should be noted that this scenario, although highly stylized and extreme to a certain extent, is widely used as a benchmark scenario in both the input-output (Chen et al., 2018) and the NQTM (Eppinger et al., 2021) literature. Specifically, we

[3] A detailed mathematical exposition of the hypothetical extraction method and its extensions used in this paper is provided in the Online Appendix A. For insights and detail of this method, see also Miller and Lahr (2001), Los et al. (2016), Chen et al. (2018), Dietzenbacher et al. (2019), and Giammetti (2020). It is worth emphasizing that this method is flexible and can be extended and modified to answer different research questions. For example, Los et al. (2016) and Los and Timmer (2018) use the hypothetical extraction method to calculate different measures of trade in value-added. Giammetti et al. (2020b) use this method to unveil the key sectors in the EU production network.

follow most closely the methodology that Chen et al. (2018) and Giammetti et al. (2020b) implemented to study the degree to which EU regions and countries are exposed to the consequences of Brexit. In our experiment, we hypothesize that industries in EU regions stop importing and exporting intermediate inputs. Formally, this translates into the nullification of the matrix blocs of $\mathbf{A}$ relative to foreign import and export of inputs, such that the new matrix $\mathbf{A}^*$ consists of domestic matrix blocs and zero elsewhere. We also hypothesize two intermediate cases: (i) the case in which the interruption of intermediate flows involves only foreign countries, thus leaving the deliveries of inputs between EU regions unchanged; and (ii) the case in which the interruption of intermediate value chains involves only the deliveries between EU regions, leaving the input relationships with extra-EU countries unchanged. In the first case (i), the matrix blocs of $\mathbf{A}$ relating to import and export of inputs between EU regions and extra-EU countries are zeroed. Vice versa, in case (ii), are zeroed the matrix blocs of $\mathbf{A}$ relating the deliveries of inputs across EU regions. Once replaced $\mathbf{A}$ in equation (1) with the proper $\mathbf{A}^*$ we obtain the new value-added:

$$\mathbf{v}^* = \widehat{\mathbf{V}}(\mathbf{I} - \mathbf{A}^*)^{-1}\mathbf{Fi}. \quad (2)$$

The relative difference between the new value-added and the pre-extraction value-added represents the relative change in value-added and provides a quantitative indication about the dependency of EU regions to foreign intermediate inputs:

$$\mathbf{rCiVA} = \frac{\mathbf{v}^* - \mathbf{v}}{\mathbf{v}}. \quad (3)$$

More generally, this ratio ($\mathbf{rCiVA}$) might also be considered as an index bounded between 0 and 1 of the extent to which EU regions are exposed to interruption of foreign intermediate value chains.[4]

In the other two scenarios, we implement the same methodology and make use of a variant of equations (2) and (3). The difference lies in the modification of the input requirements matrix $\mathbf{A}$. In scenario 2 we ask ourselves what would happen if we could go back in time and resume the production schemes of the past. More precisely, leaving $\widehat{\mathbf{V}}$ and $\mathbf{F}$ fixed at the 2010 values (the last

[4] This index also provides indications of the likely resilience of EU regions to GVCs shocks. For recent empirical contributions on regional resilience see Brakman et al. (2015) and Gong et al. (2020). On the multifaced notion of regional resilience see Hassink (2010) and Hassink and Gong (2020).

year available), we investigate how the value-added would change if the matrix of the technical coefficients $\mathbf{A}$ were fixed at the year 2000:[5]

$$\mathbf{v}^* = \widehat{\mathbf{V}}_{\mathbf{2010}}(\mathbf{I} - \mathbf{A}_{\mathbf{2000}})^{-1}\mathbf{Fi}_{\mathbf{2010}}. \tag{4}$$

$$\mathbf{rCiVA} = \frac{\mathbf{v}^* - \mathbf{v}_{\mathbf{2010}}}{\mathbf{v}_{\mathbf{2010}}}. \tag{5}$$

Then, using equation (5), we analyse the relative change of value-added.

In scenario 3, we aim to enrich the debate on EU strategic autonomy and EU sovereignty. These concepts encompass a greater potential for independence, self-reliance and resilience in a wide range of fields—such as defence, trade, industrial policy, digital policy, economic and monetary policy, and health policy—following a series of events in recent years that have exposed Europe's vulnerability to external shocks. In scenario 3 we focus on the issues related to trade autonomy and the possibility of shortening GVCs. Specifically, we test the impact of a Europeanisation of GVCs by assuming that EU regions stop importing intermediates from non-EU countries and replace them with intermediates produced in Europe. To do so, we refer to the global extraction method (Dietzenbacher et al., 2019) used by Giammetti (2020) to study the effect of import substitution policy in a post-Brexit world. The global extraction method consists of replacing the extracted inputs with inputs from other sources. As an example, suppose the extra-EU glass industry is extracted. Car production in Piemonte requires textile inputs and imagine that 30 percent of them originate in extra-EU countries, 35 percent from Stuttgart, 15 percent from Île-de-France, and 20 percent from Greater Manchester. Since Piemonte can no longer buy inputs outside the EU, we assume that the imported textile inputs are all increased by the same percentage (in this case 42.9 percent), so that they add up to 100 percent again. Thus, the car industry in Piemonte now imports 50 percent from Stuttgart, 21 percent from Île-de-France, and 29 percent from Greater Manchester. Again, we indicate with $\mathbf{A}^*$ the new input requirements matrix and we use equation (2) to assess the impact of the Europeanisation of GVCs scenario. It should be noted that in the method applied the total input requirements remains fixed. Thus, the column sums of the pre- and post-generalized extraction $\mathbf{A}$ and $\mathbf{A}^*$ are equivalent.[6]

[5] Due to data limitations, we cannot go back to before 2000. However, this is an interesting year as it precedes the full introduction of the euro and the entry of China into the WTO.

[6] It is worth emphasizing that the effects of re-shoring and trade diversion could also be modelled with an NQTM. However, using such kind of models require making assumptions on key parameters such as trade elasticities. Therefore, we prefer a more conservative (admittedly crude) assumption, according to which the missing intermediate flows are allocated proportionally over the columns of the global input-output matrix.

Our analysis is based on the EUREGIO database that is the first time-series (annual, 2000-2010) of global input-output tables with information at regional level for the entire large trading bloc of the EU-25 countries (for a detailed description see Thissen et al., 2018).[7] Specifically, the database contains information for 14 industries in 246 NUTS 2 regions of the EU-25, and the same information at country-level for Bulgaria, Romania and other 14 extra-EU trading partners (i.e., Australia, Brazil, Canada, China, India, Indonesia, Japan, Korea, Mexico, Russia, Taiwan, Turkey, USA, and a macro-region called Rest of the World). We use the tables for the years 2000 and 2010 as the 2010 tables are the most recent available. However, Chen et al. (2018) and Timmer et al. (2016) argue that there has been a limited variation in the degree of international fragmentation of production since 2011, which implies that our results should not change following the use of more recent data.[8] Finally, another drawback of the EUREGIO database is related to the issue that the interregional trade flows have been estimated using transportation survey data for 2000, which imply that the results in some longitudinal analyses should be taken with caution (though this database is widely used also for multi-year analyses; see among others Brakman et al., 2021; Carrascal Incera et al., 2021; IJtsma and Los, 2020). However, our main findings should not be affected significantly by this shortcoming of the database since the analysis in the first and third scenarios only make use of the last available table, and it is not clear the potential distortions induced in the results of scenario 2 where we use the table of the year 2000 as a reference point for the input requirement matrix.[9]

3. The fragmentation of the European regional production network

This section leads the way to the scenario analysis by providing a description of the trends in international fragmentation of the EU regional production network over the period 2000-2010. We first document an increasing trend in the global fragmentation of EU regional production. This preliminary result is useful to show that due to the high fragmentation of production, investigations on the effects of deglobalisation on EU regions are needed. Then, we focus on the geography of

[7] The measurement of production fragmentation and the assessment of the direct and indirect impact of deglobalisation on EU regions require international input-output tables that cover EU regional economies and extra-EU economies.

[8] It is worth emphasizing that as this is pre-Brexit data one might doubt the results related to the UK and its trade linkages with EU regions. Nevertheless, at the time of writing, the exact nature of the post-Brexit UK-EU relationship and its impact on trade is not known and may be uncertain for a long period of time (Thissen et al., 2020). Hence, our results should not be influenced by Brexit's effects.

[9] While the analysis on fragmentation also employs the table of the year 2000, we remind that the results of this part are not among the main contributions of the paper and, however, the cited limitation of the database should not be of major importance in affecting such results.

fragmentation and answer the question to what extent the trends toward value chain fragmentation have occurred outside or within the EU.[10] Investigating this question is useful in raising awareness of the dependence of EU regions on extra-EU or intra-EU value chains, and thus to show that the kind of deglobalisation, from extra or intra-EU value chains, is not an irrelevant issue.[11] Finally, we investigate how global fragmentation tendencies have been more pronounced for some regions and industries than for others.

As surveyed in Johnson (2018), a wide set of measures have been provided to capture different aspects of GVC production and trade. Feenstra and Hanson (1999) were the first to introduce a measure of fragmentation in a macroeconomic setting. This measure is defined as the share of imports in total intermediate inputs in the manufacturing industry. Although this measure has the advantage of being straightforward and simple to compute, it has many drawbacks when used in analyses of international fragmentation. Therefore, we here refer to its generalised version developed by Los et al. (2015) as such measure of fragmentation allows us to decompose the value of a final product into the value-added shares generated in all regions and countries that contribute to its value chain, and to compute the contribution of foreign value-added to the production of EU regions. It should be noted that our contribution is distinguished from Los et al. (2015) as (i) we provide a multi-regional rather than a multi-country analysis, and (ii) we also consider value chains for services rather than focussing only on manufacturing.

Figure 1 displays the scatterplot of the Foreign Value-Added Shares in total Value-Added (FVASs) for EU regions industry in 2000 and 2010. All 14 industries and 246 regions-of-completion for which we have data have been included. We have 3,444 value chains. If fragmentation of production has remained constant over the period considered, the observations would have concentrated around the 45-degree line. However, Figure 1 shows that most of the observations (about the 80 percent) are well above the 45-degree line, reflecting an increase in fragmentation. This is especially clear if we compare the slope of the 45-degree line with the estimated slope of an Ordinary Least Squares (OLS) regression. The trend line indicates that the FVASs increased on average of about 40 percent over the period considered.

[10] It should be stressed that in this section we could have made a comparative analysis of the fragmentation of added value in one region and others in the same country. However, the in-depth investigation of the fragmentation of production in the EU regional production network is out of the scope of this paper, which is instead mainly devoted to the evaluation of the effects of deglobalisation.

[11] The triple analysis of the fragmentation at global, extra-EU and intra-EU level is strictly connected to the three sub-cases of scenario 1 in which we quantify the exposure of EU regions to an interruption of the value chains at a global, extra-EU and intra-EU level.

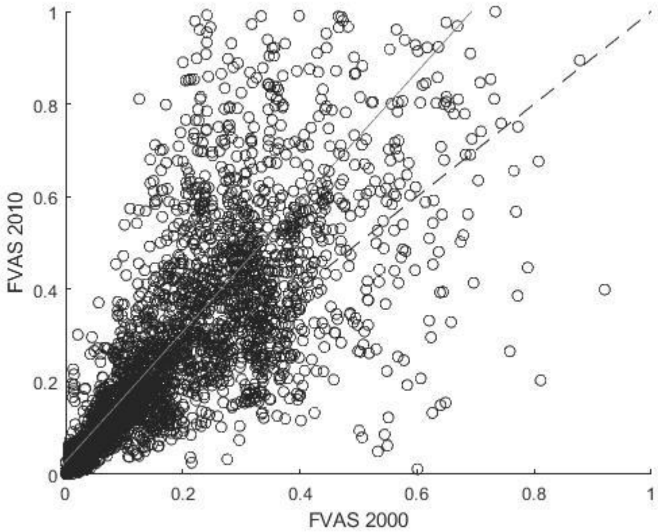

Figure 1. Foreign Value-Added Shares in total Value-Added (2000 and 2010).

This result is consistent with the literature emphasizing the increased density and fragmentation of the international production network (e.g., Henderson et al., 2002; Hummels et al., 2001; Johnson and Noguera, 2012a, 2012b; Timmer et al., 2014). However, such works have not clarified whether such fragmentation of production is mainly regional, taking place within neighboring countries, or mainly global, namely involving far away countries. The evidence in the related literature is mixed. Works based on case studies find that the activities required to build electronic products are increasingly dispersed around the globe (Dedrick et al., 2010), while the production chains of cars fragment both globally and regionally (Sturgeon et al., 2008). Based on econometric analysis and trade statistics, Johnson and Noguera (2012b) and Baldwin and Lopez-Gonzalez (2015) suggest that intraregional trade is more fragmentation-intensive than trade outside regions. This holds true also in the global input-output analysis provided by Los et al. (2015). The authors find that regional fragmentation is dominant in EU value chains, but they show that shares of value-added outside the EU are increasing the fastest, pointing toward faster global fragmentation. As shown in Figures 2a and 2b, our results for the EU regional production network corroborate the cross-country findings of Los et al. (2015).

The scatterplot in Figure 2a shows that extra-EU fragmentation involved more than 80 percent of EU regions' industries. Further, the extra-EU fragmentation of production increased by about 50 percent over the decade considered. This trend is more pronounced than for the shares of value-added sourced within the EU. By inspecting Figure 2b we find that about 73 percent of the observations are above the 45-degree line, and that production fragmentation within the EU regional network increased on average by about 30 percent during 2000-2010. However, the vast majority of observations related to extra-EU fragmentation clustered between 20 and 40 percent of FVASs, while the EU-FVASs are also significant on higher shares. This suggests that in absolute terms intra-EU fragmentation is still dominant in EU regional value chains, although the trend towards production fragmentation outside the EU shows a faster pattern.

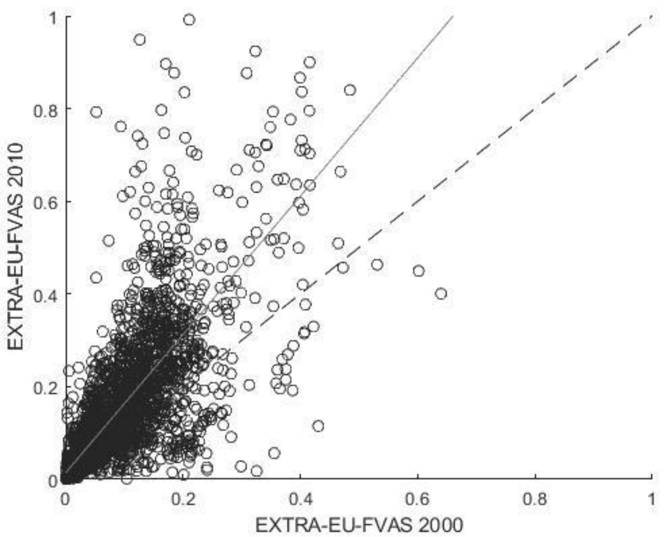

Figure 2a. Foreign Value-Added Shares from outside the EU network in total Value-Added (2000 vs. 2010).

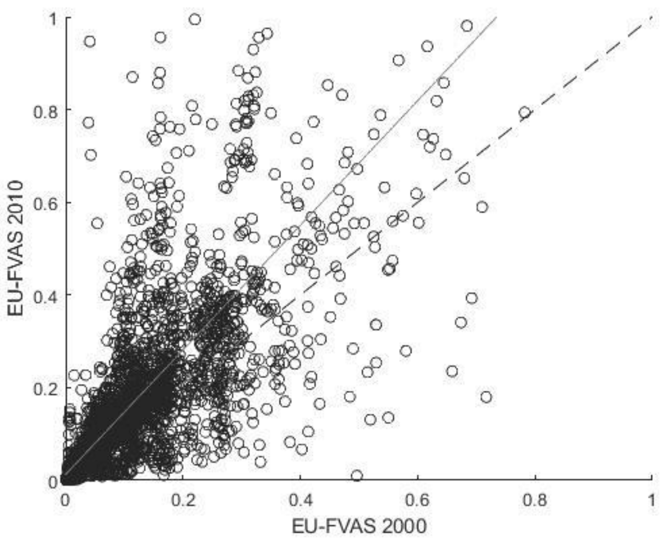

Figure 2b. Foreign Value-Added Shares from within the EU network in total Value-Added (2000 vs. 2010).

Having ascertained the trend towards fragmentation of production, it should be noted that within this trend there are considerable differences across regions. In Table 1 we report the top 30 regions ranked by respectively FVAS (columns 1-3), EU-FVAS (columns 4-6), and EXTRA-EU-FVAS (columns 7-9).

	Top 30 regions ranked by FVAS				Top 30 regions ranked by EU-FVAS				Top 30 regions ranked by EXTRA-EU-FVAS		
	(1)	(2)	(3)		(4)	(5)	(6)		(7)	(8)	(9)
	2000-2010				2000-2010				2000-2010		
CountryCode_Region	**FVAS**	EU-FVAS	EXTRA EU-FVAS	CountryCode_Region	FVAS	**EU-FVAS**	EXTRA EU-FVAS	CountryCode_Region	FVAS	EU-FVAS	**EXTRA EU-FVAS**
HUN_Kozep-Magyarorszag	8,5	5,0	3,5	LUX_LUX (G-D)	1,7	6,4	-4,7	MLT_MLT	5,6	-1,5	7,1
HUN_Nyugat-Dunantul	6,4	4,4	2,1	HUN_Kozep-Magyarorszag	8,5	5,0	3,5	IRL_Southern and Eastern	5,0	-0,4	5,4
HUN_Kozep-Dunantul	6,4	4,3	2,1	HUN_Nyugat-Dunantul	6,4	4,4	2,1	FIN_Aland	1,7	-3,1	4,9
HUN_eszak-Magyarorszag	5,7	3,9	1,8	HUN_Kozep-Dunantul	6,4	4,3	2,1	LTU_Lietuva	5,3	0,5	4,9
MLT_MLT	5,6	-1,5	7,1	HUN_Del-Alfold	5,5	4,3	1,2	IRL_Border Midlands	3,0	-1,6	4,6
HUN_Del-Alfold	5,5	4,3	1,2	HUN_eszak-Magyarorszag	5,7	3,9	1,8	FIN_Pohjois-Suomi	-6,0	-9,6	3,6
LTU_Lietuva	5,3	0,5	4,9	HUN_eszak-Alfold	5,3	3,8	1,5	FIN_Lansi-Suomi	-4,1	-7,7	3,6
DEU_Dresden	5,3	2,9	2,4	HUN_Del-Dunantul	4,7	3,8	0,9	HUN_Kozep-Magyarorszag	8,5	5,0	3,5
HUN_eszak-Alfold	5,3	3,8	1,5	NLD_Groningen	4,4	3,2	1,2	SWE_Västsverige	0,5	-2,9	3,4
IRL_Southern and Eastern	5,0	-0,4	5,4	NLD_Drenthe	3,4	3,0	0,5	SWE_Stockholm	1,2	-2,1	3,2
DEU_Thüringen	5,0	2,8	2,2	DEU_Dresden	5,3	2,9	2,4	POL_Mazowieckie	5,0	1,8	3,1
POL_Mazowieckie	5,0	1,8	3,1	DEU_Thüringen	5,0	2,8	2,2	SWE_Småland med oarna	0,8	-2,2	3,1
DEU_Dessau	4,9	2,5	2,4	DEU_Brandenburg - Nordost	4,8	2,7	2,1	FIN_Etela-Suomi	-3,3	-6,3	3,0
DEU_Brandenburg - Nordost	4,8	2,7	2,1	DEU_Dessau	4,9	2,5	2,4	SWE_ovre Norrland	1,2	-1,7	3,0
DEU_Magdeburg	4,7	2,4	2,2	DEU_Magdeburg	4,7	2,4	2,2	POL_Dolnoslaskie	3,8	0,9	2,9
HUN_Del-Dunantul	4,7	3,8	0,9	DEU_Leipzig	4,6	2,4	2,2	SWE_Sydsverige	0,0	-2,9	2,8
DEU_Leipzig	4,6	2,4	2,2	DEU_Brandenburg - Südwest	4,6	2,3	2,2	SWE_ostra Mellansverige	0,1	-2,5	2,6
DEU_Brandenburg - Südwest	4,6	2,3	2,2	DEU_Mecklenburg-Vorpommern	4,5	2,3	2,2	POL_Wielkopolskie	4,2	1,6	2,6
DEU_Mecklenburg-Vorpommern	4,5	2,3	2,2	DEU_Braunschweig	4,2	2,2	2,1	AUT_Vorarlberg	1,4	-1,1	2,5
NLD_Groningen	4,4	3,2	1,2	NLD_Friesland	3,0	2,2	0,8	DEU_Dessau	4,9	2,5	2,4
DEU_Braunschweig	4,2	2,2	2,1	DEU_Weser-Ems	4,0	2,1	1,8	DEU_Dresden	5,3	2,9	2,4
POL_Wielkopolskie	4,2	1,6	2,6	DEU_Halle	3,7	2,0	1,7	POL_Malopolskie	3,2	0,8	2,3
DEU_Tubingen	4,0	2,0	2,0	DEU_Hannover	3,9	2,0	1,9	POL_Podlaskie	3,4	1,0	2,3
DEU_Weser-Ems	4,0	2,1	1,8	DEU_Tubingen	4,0	2,0	2,0	POL_Pomorskie	3,3	1,0	2,3
DEU_Stuttgart	3,9	1,9	2,0	UK_South Western Scotland	3,0	2,0	1,1	POL_Lódzkie	3,2	0,9	2,3
DEU_Hannover	3,9	2,0	1,9	DEU_Dusseldorf	3,5	2,0	1,6	POL_Lubelskie	3,4	1,1	2,3
DEU_Berlin	3,8	1,7	2,1	DEU_Stuttgart	3,9	1,9	2,0	POL_Slaskie	3,1	0,9	2,3
POL_Dolnoslaskie	3,8	0,9	2,9	DEU_Unterfranken	3,6	1,9	1,7	AUT_Salzburg	1,0	-1,2	2,3
DEU_Halle	3,7	2,0	1,7	NLD_Zeeland	2,9	1,9	1,1	DEU_Magdeburg	4,7	2,4	2,2
DEU_Niederbayern	3,7	1,8	1,9	CZE_Stredni Cechy	1,1	1,8	-0,4	DEU_Thüringen	5,0	2,8	2,2

Table 1. Top 30 EU regions ranked by foreign fragmentation.

Columns 1-3 of Table 1 show that several regions in Hungary, Germany, and Poland, have experinced a significant increase in foreign value-added contributions to their production over the period considered. Columns 4-6 show that a larger share of the value in the chains of these regions was added within the EU. However, a significant share was also added outside the EU. The production chains of these regions fragment both globally and regionally. Considering the involvement of these regions in the production chains of the automotive industry, this finding sends us back to the case studies evidence in Sturgeon et al. (2008). Columns 7-9 show a different picture. The regions with a high contribution to value-added from outside the EU are mainly located in northern Europe. Interestingly, the negative values reported in column 8 indicate that most of these regions have partly replaced regional with global value chains.

These results can be partly explained by the fact that here we are considering simultaneously the fragmentation of value chains for goods and services. There are two relevant aspects to underline. First, while production systems of manufactures are highly prone to production fragmentation, a large part of the services sector is made up of small domestic companies that provide services directly to domestic consumers with limited (foreign) inputs (Timmer et al., 2013).[12] Second, while logistics and transportation costs may encourage the regional fragmentation of goods production (Johnson and Noguera, 2012b), the almost intangible nature of services makes their production fragmentable on a global scale at negligible cost (Fort, 2017). Therefore, in explaining the geography of fragmentation it is essential to take into account whether a region is specialised in producing services or has huge assembly plants. With this in mind, it is not surprising that the regions with a higher share of production fragmentation are the EU regions driven by the manufacturing industry, and especially the regions specialised in the automotive sector, where GVCs are very prominent (for more details on the main characteristics of industrial regions in Europe see Hoekstra, 2017). The productive structure of these regions is very connected to each other and therefore the fragmentation of production in these regions is mainly intra-EU. On the other hand, the regions specialised in services, located in small open economies (for example Ireland and Malta), and characterised by an underdeveloped manufacturing sector, tend to have a lower fragmentation of production which occurs mainly at the extra-EU level.

The significant fragmentation of the EU production network, together with the heterogeneous involvement of EU regions in GVCs at a regional or global level raise issues with important implications for the design of trade policies. The more a region is involved in global chains, the more are likely to be the losses from deglobalisation. Conversely, the more a region participates in regional chains, the more will be its resilience to deglobalisation and exposure to the interruption of EU chains.

4. The exposure of European regions to deglobalisation

In this section, we present the regional impact of intermediate value chains interruption. In particular, (i) we first evaluate the exposure of EU regions to the stop of intermediate input flows

[12] Although services are generally less produced through GVCs, the advent of digitalisation, as well as the process of specialization of companies on their core competencies, has led to a significant increase in the fragmentation of services production, especially in the financial and business activities sectors (De Backer and Miroudot, 2013).

coming from and to foreign countries; (ii) next, we assume that trade in intermediate inputs is stopped only with countries outside the EU; (iii) then, we test the impact of a stop to the deliveries of intermediate inputs within the EU production network; (iv) finally, we investigate to what extent regions and countries in EU are exposed to global or regional decoupling from GVCs.

(i) Figure 3 shows the regional value-added loss from a global interruption of intermediate flows.[13] The aggregate impact of this deglobalisation scenario on the EU production network would be higher than 15 percent of total value-added. This deglobalisation scenario would negatively affect the economies of all regions. However, there are sizeable differences across industries and regions. Among the most exposed activities there is the coke, petroleum, and chemicals industry located in different regions in the South-East of the UK, North-East of France, and North-West of Germany would lose almost one hundred percent of the value-added in this scenario. Particularly exposed are also the financial sectors located in the international capital hubs, Ireland and Luxembourg, as well as the agricultural sector in Inner London (UK) and in Hovedstadsreg (Denmark). On the other hand, there are industries that would hardly be affected by this hypothetical scenario; among such activities there is the hotels and restaurant industry in almost all Italian, Spanish and Greek regions would lose less than 0.1 percent. Not surprisingly, these countries are characterised by Mediterranean cuisine consisting of ingredients mostly sourced from local agriculture.

By grouping the 14 sectors of all regions, we find that the coke, petroleum, and chemicals industry would be the most affected losing around 44.2 percent of its value-added, followed by other manufacturing (37.0 percent), and electrical and transport equipment (35.5 percent). The least affected sectors would be instead construction (4.4 percent), hotels and restaurant (4.5 percent), and food and beverage (8.7 percent). The exposure of oil products to a stop in intermediate input flows is not surprising as most regions do not have access to domestic oil feedstock and need to rely on imported intermediates. Similarly, manufactured foodstuffs have relatively low foreign shares as most of the intermediates are sourced locally, which implies that these industries are relatively less exposed.

The distribution of losses among regions is very broad ranging from 6.1 (Bolzano, Italy) to 46.5 percent (Luxembourg) of the region's value-added. The largest value-added losses (higher than 20 percent) are incurred by rather small, highly integrated regions located in Ireland, Malta, Austria, Belgium, Hungary, the Netherlands, Czech Republic, Estonia, Finland, Lithuania, and in the South of Sweden. High losses are also recorded in several German regions, especially in the south

[13] The data used to construct Figure 3, as well as those for the subsequent Figures 4, 5, 7, and 9, are reported in Tables B.1–B.5 of the Online Appendix B.

(Darmstadt, Oberbayern, and Stuttgart would face a loss of 19 percent of value-added), in the south of Denmark, in some Polish regions, and in the South-Central of England. Conversely, the smallest losses are incurred by regions with low export and import shares and relatively small shares of intermediates in these trade flows such as many Greek, Italian, Spanish, France, and Portuguese regions. On closer inspection, the results in Figure 3 are consistent with those shown by Eppinger et al. (2021) according to which a complete shutting down of GVCs would have a negative impact on all countries of their sample.

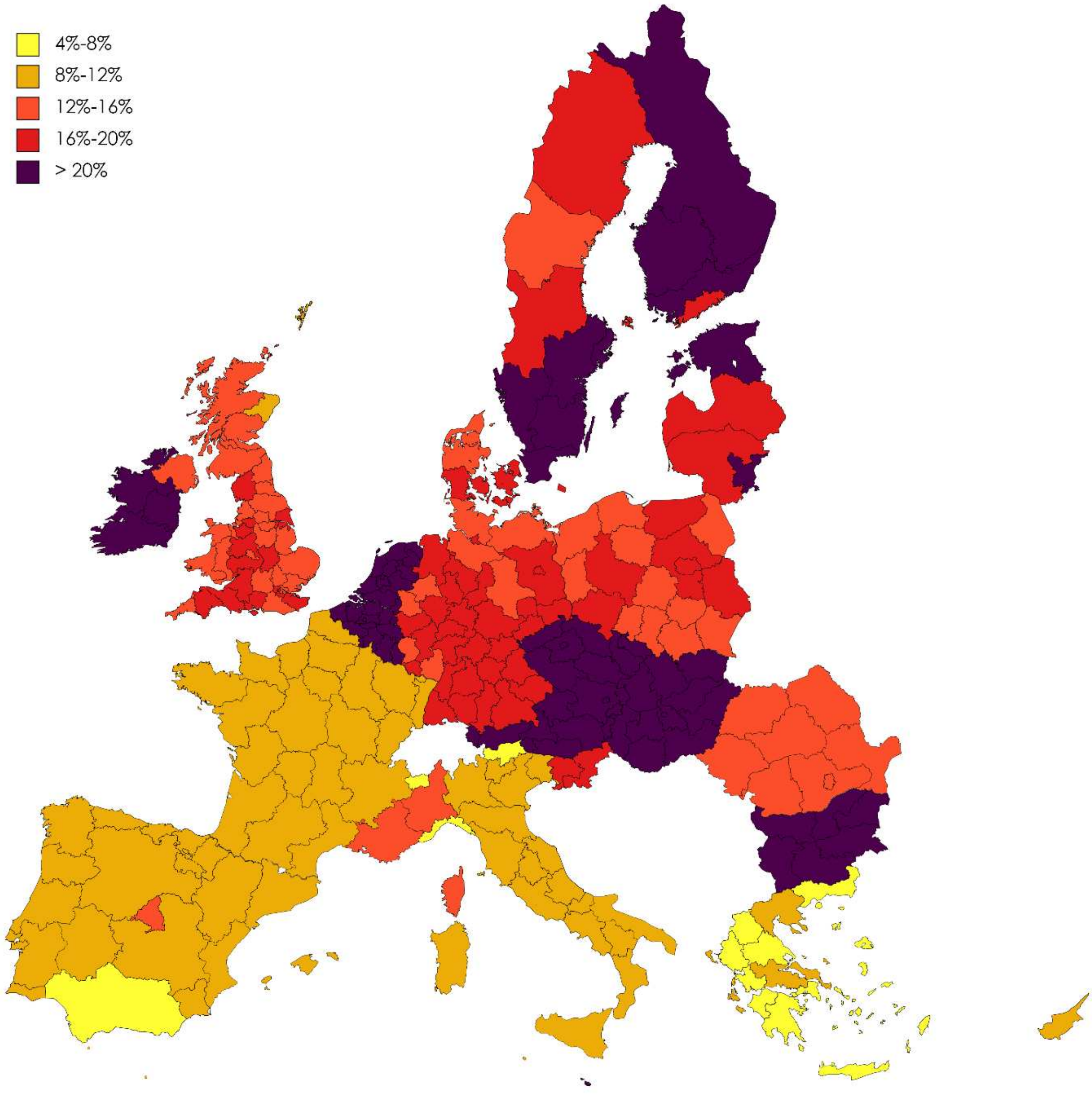

Figure 3. Regional losses in value-added shares from the total interruption of GVCs.

In particular, small highly integrated countries such as Luxembourg, Malta, or Ireland would be massive losers. The similarities with our findings are due to the fact that we analyse the same "world without GVCs" scenario with an approach that allows considering the indirect impacts due to input-output links and participation in GVCs. However, there are also some differences. Eppinger et al. (2021) include trade diversion in their model (we consider this hypothesis in scenario 3) and this greatly mitigates the impact on countries with developed domestic markets. Differently, in our scenario 1, we find that even large countries like Germany and the UK are at risk of deglobalisation. Furthermore, the country-level analysis by Eppinger et al. (2021) does not allow to study the heterogeneity of the impact within countries. This limits the emphasis on GVCs. Differently, in our paper, regions may show exposure to deglobalisation different to the country they belong to but similar to a neighbouring region placed in a neighbouring country. For example, Figure 3 shows that the degree of exposure for the regions Provence-Alpes-Côte d'Azur and Piemonte is similar ranging between 12-16 percent, but higher to their respective countries France and Italy.

(ii) The EU network without GVCs studied above serves as a clear benchmark, but it is highly stylized. We thus provide other two experiments. First, in Figure 4 we show the regional exposure to a zeroing of the flows of intermediates with countries outside the EU. This scenario would lead to an loss of 7.01 percent of total value-added. The most exposed industries are located in the northern regions. The coke, petroleum, and chemicals industry in Inner London (UK), the financial sector in Border Midlands and Western (IRE), and the electrical and transport equipment in Ita-Suomi (FIN), would lose more than 70 percent of value-added. The northern regions bear large losses, with Ireland, Finland, Sweden, Denmark, the Baltic countries, and some UK regions facing over 10 percent losses. Conversely, Central Europe appears less vulnerable to this scenario. For example, all the German regions highly impacted in the previous scenario now would face losses smaller than 7 percent. The same holds for Poland and the Czech Republic, while Hungary still faces significant losses of about 13 percent.

(iii) As a further exercise, we evaluate the impact of decoupling from EU GVCs. The interruption of the EU supply chains would entail an aggregate loss (about 8 percent) greater than the interruption of the extra-EU chains. However, as depicted in Figure 5, compared to the previous scenarios with losses spread across many regions, here the losses seem to be concentrated in the Central-Eastern regions. The losses in the German, Austrian, Belgian, Dutch, Hungarian, Czechoslovakian, and Slovakian regions account for 53.4 percent of total losses. Several regions in Belgium, the Netherlands, and the Czech Republic are exposed to almost 20 percent losses. Particularly hit also southern Germany, the powerhouse of EU manufacturing, especially in the automotive and machinery industry. If we exclude the Central-Eastern regions, all the other regions would face less than 10 percent losses.

It also worth noting that the degree of exposure of a region is similar to the neighbouring ones, beyond national borders, which suggests that gravity plays an important role and that neighbouring regions are likely to belong to the same value chains (Johnson and Noguera, 2012b). In accordance with the results shown in the previous section, Figures 3, 4, and 5 suggest the presence of three main regional value chains. The Central-Eastern bloc, highly integrated within the interregional production network, the Northern bloc, mainly integrated with countries outside the EU, and the Southern bloc, less dependent on regional and global supply chains.

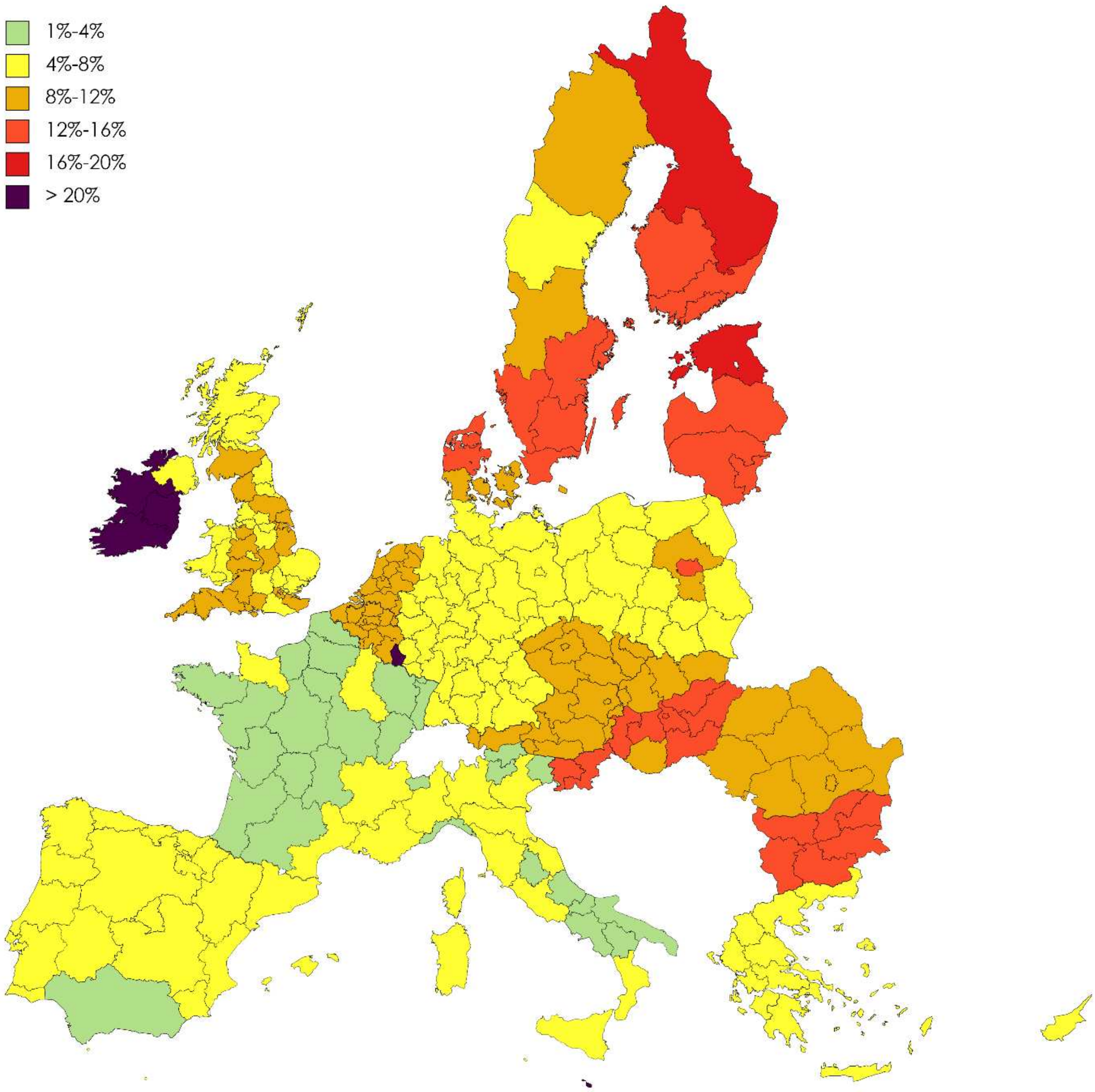

Figure 4. Regional losses in value-added shares from the interruption of extra-EU GVCs.

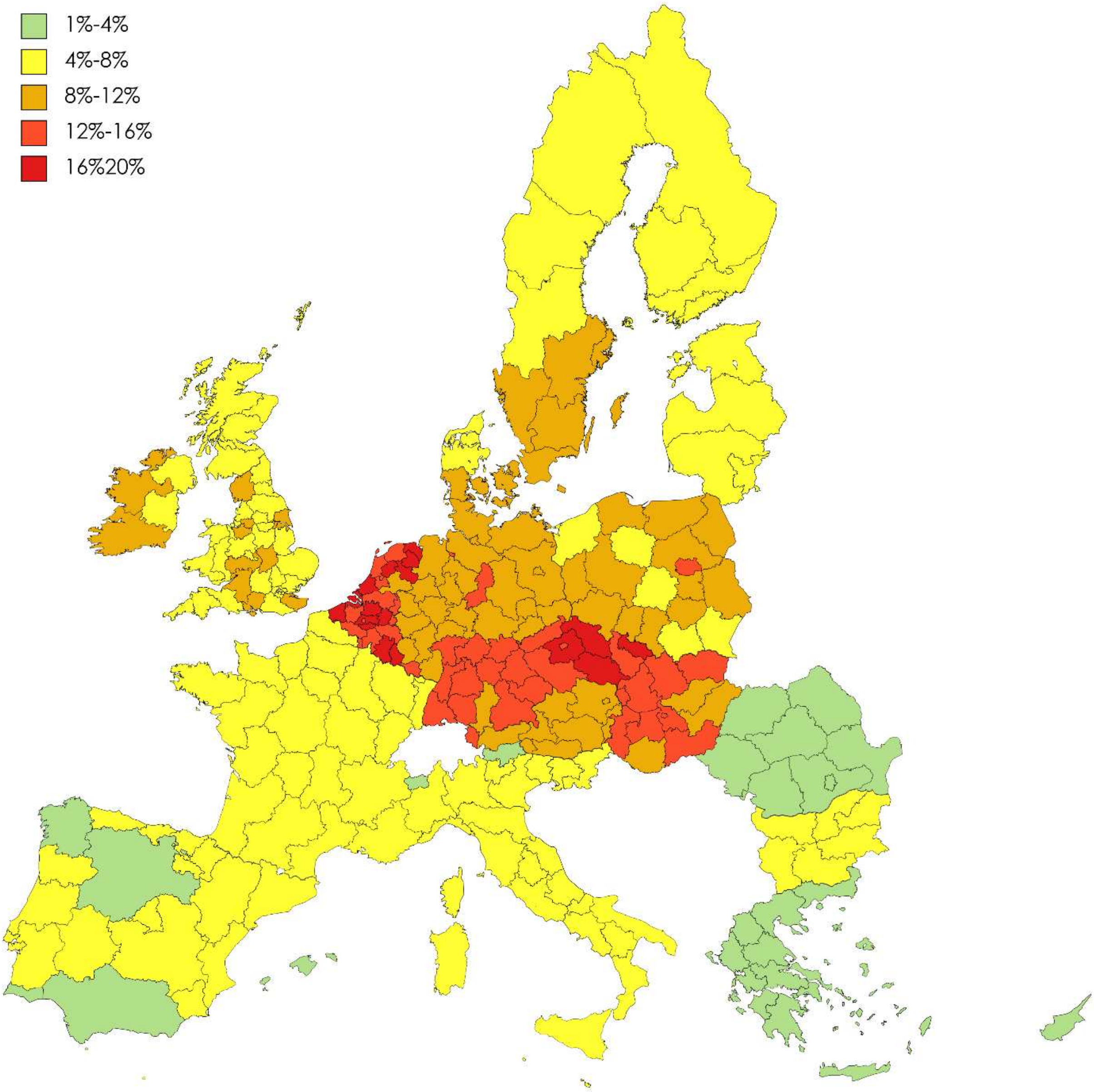

Figure 5. Regional losses in value-added shares from the interruption of EU GVCs.

(iv) This latter result is corroborated by the results in Figure 6 that shows the national levels of value-added losses due to the decoupling from Extra-EU and EU value chains. As can be seen, the regional differences are also reflected in the national levels of exposure. Countries with production processes fragmented mainly outside the EU, such as northern countries, are more vulnerable to an interruption of value chains with extra-EU countries. On the other hand, countries that mainly rely on interregional value chains, such as Germany and its trade satellites, are more exposed to a stop of regional value chains.

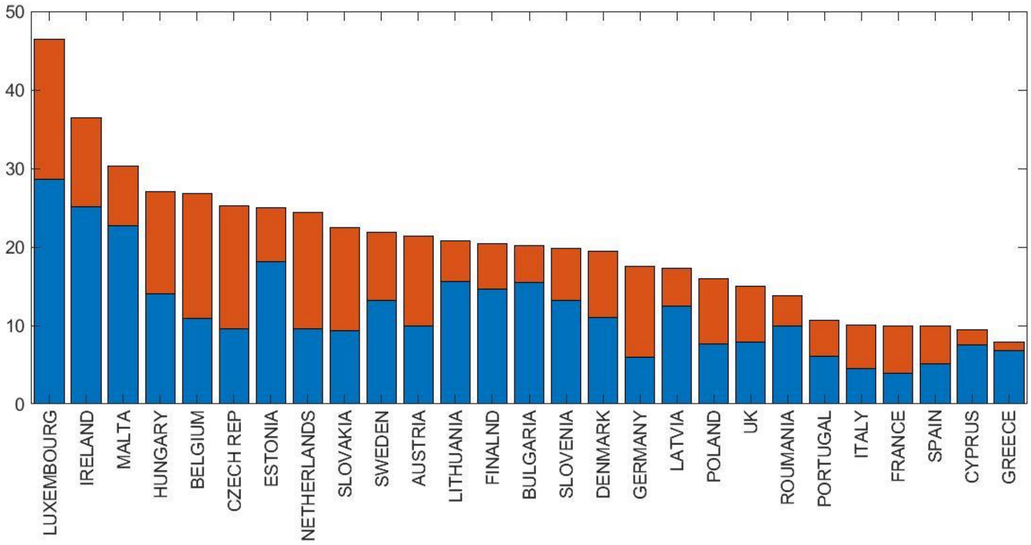

Figure 6. Country losses in value-added shares from the interruption of extra-EU and EU GVCs.

5. The economic implications of a return to a less integrated world

The extensive empirical literature on the globalisation-led growth nexus supports the view that the increase in international trade coincided with an increase in world GDP (see, among many others, Dreher, 2006). However, as shown in the literature on the backlash of globalisation (Colantone et al., 2021), the gains from international trade are unequally distributed and globalisation has created winners and losers.

In this section, we investigate if the same would hold true also for deglobalisation. Specifically, we aim to answer the following questions. What would be the economic impact of a return to a less integrated trade? Would the sign and degree of this impact be the same for all EU regions and countries in the world? To answer these questions, we test the impact on current value-added of a back to the past scenario in which the production and trade in intermediates take place according to the patterns of the past. More precisely, we draw on the literature on structural change in input-output systems (Sonis et al., 1996) and measure to what extent the value-added in 2010 would change if production took place with the input coefficients of 2000.

Our findings indicate that a return to the old production schemes and trade patterns would generate a global loss of about 3 percent of total value-added. However, while the world economy would shrink, the aggregate variation of the EU value-added would be positive, although the size of the change is small (around 0.3 percent).

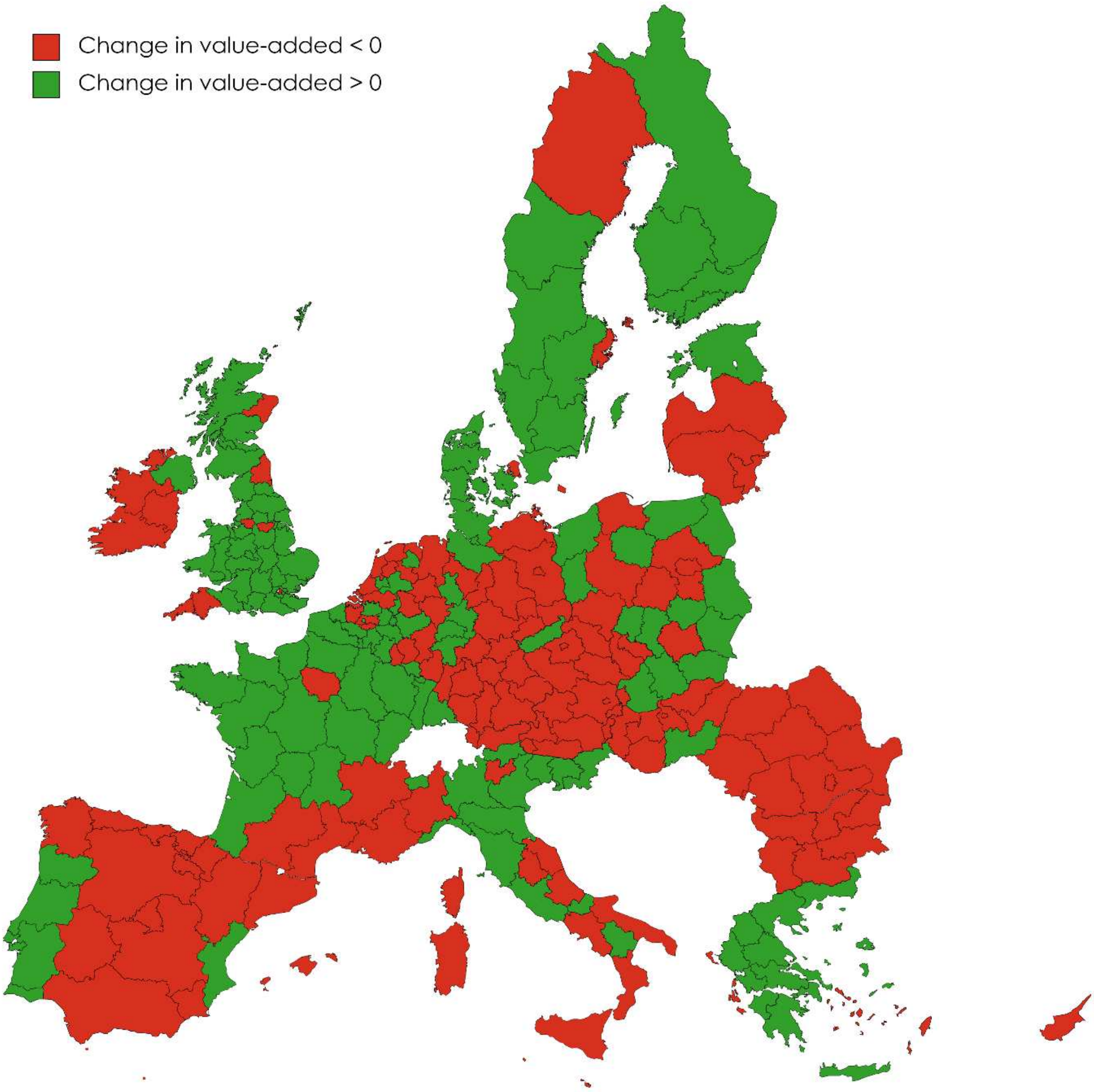

Figure 7. Regional change in value-added shares in the back to the past scenario.

This asymmetry is also found at the industry and regional level. While sectors such as textiles and leather (26.9 percent), agriculture (14.8 percent), electrical and transport equipment (12.8 percent) would gain from a return to the past, other sectors, as mining, quarrying, and energy (-8.2 percent), real estate and business activities (-7.1 percent), and construction (-1.4 percent), would suffer significant losses. Figure 7 displays the regional change in value-added shares in the back to the past scenario for the EU regions in the form of a map. The grey regions are those that would suffer a reduction in value-added, whereas the white regions would experience a positive change in value-added. As we can see, there are sizable differences across regions and within the same countries. Ireland, and almost all regions in Spain, Germany, and Central-Eastern Europe, would suffer output losses. Conversely, with the only exception of Inner London, and a few regions in the West-South and in the Centre-North, all regions in UK would gain from a back to the past scenario.[14] A similar pattern emerges in Denmark, Estonia, Finland, Greece, Portugal, and Sweden. Italy and France show mixed results. The less industrialised southern regions of both countries might have benefited

Top 30 regions ranked by negative change in value-added		Top 30 regions ranked by positive change in value-added	
	(1) Change in value-added		(2) Change in value-added
CountryCode_Region		CountryCode_Region	
ESP_Pais Vasco	-36,1	ESP_Comunidad Valenciana	54,0
HUN_Kozep-Magyarorszag	-16,0	GRC_Peloponnisos	24,4
NLD_Groningen	-11,4	FIN_Ita-Suomi	18,8
ESP_Comunidad de Madrid	-11,0	GRC_Kentriki Makedonia	14,6
CZE_Praha	-11,0	GRC_Sterea Ellada	13,9
IRE_Border Midlands	-11,0	GRC_Ipeiros	13,4
POL_Mazowieckie	-11,0	GRC_Thessalia	11,6
IRE_Southern and Eastern	-10,5	UK_Outer London	11,6
MLT_MLT	-10,5	ITA_Lombardia	11,5
DEU_Dessau	-8,5	UK_Bedfordshire Hertfordshire	11,1
BEL_Prov. Brabant Wallon	-8,3	UK_West Midlands	10,0
LTU_Lietuva	-8,1	UK_South Western Scotland	9,5
ITA_Campania	-8,1	UK_East Wales	9,3
ESP_Region de Murcia	-8,0	SWE_Småland med oarna	9,0
NLD_Flevoland	-7,6	GRC_Dytiki Ellada	9,0
ESP_Cataluna	-7,4	UK_Surrey East and West Sussex	8,4
DEU_Magdeburg	-6,9	UK_Herefordshire Worcestershire	8,2
CZE_Stredni Cechy	-6,8	UK_West Wales and The Valleys	8,0
DEU_Brandenburg - Nordost	-6,7	ITA_Veneto	7,7
POL_Dolnoslaskie	-6,3	UK_Kent	7,6
CZE_Jihovychod	-6,0	ITA_Emilia-Romagna	7,5
NLD_Zeeland	-5,9	FIN_Lansi-Suomi	7,0
ESP_La Rioja	-5,9	SWE_Sydsverige	6,9
DEU_Thüringen	-5,8	SWE_Norra Mellansverige	6,8
DEU_Leipzig	-5,7	GRC_Voreio Aigaio	6,8
ITA_Sardegna	-5,7	UK_Lancashire	6,7
ESP_Galicia	-5,6	UK_Tees Valley and Durham	6,6
DEU_Brandenburg - Südwest	-5,5	SVK_Východne Slovensko	6,4
DEU_Dusseldorf	-5,4	FIN_Etela-Suomi	6,2
DEU_Dresden	-5,1	GRC_Kriti	5,8

Table 2. Top 30 regions ranked by negative and positive change in value-added.

[14] This result is also interesting for the Brexit debate.

from the delivery of intermediate inputs from international trade; therefore, a back to the past scenario could have negative effects on production. Conversely, the more industrialised northern regions of these countries might have suffered international competition, especially in manufacturing, and may gain from a return to the past.

The map in Figure 7 does not allow us to distinguish the degree of the impact of the back to the past scenario. Hence, in Table 2 we show the top 30 regions classified according to the negative (column 1) and positive (column 2) changes in value-added.[15] An indication about the asymmetry of the impact that a return to the past would have on EU economies is provided by the first row of columns 1 and 2. As we can see, Spain simultaneously hosts the most negatively (Pais Vasco) and positively (Comunidad Valenciana) affected regions. The largest reductions in value-added take place in some Spanish regions (especially the territories around Barcelona and Madrid), and the regions located along the Central-Eastern axis, from the Netherlands to Hungary via Germany, Poland, and the Czech Republic. Conversely, the regions showing the larger positive change in value-added are located in the UK, Greece, Northern Italy, Finland, and Sweden.[16]

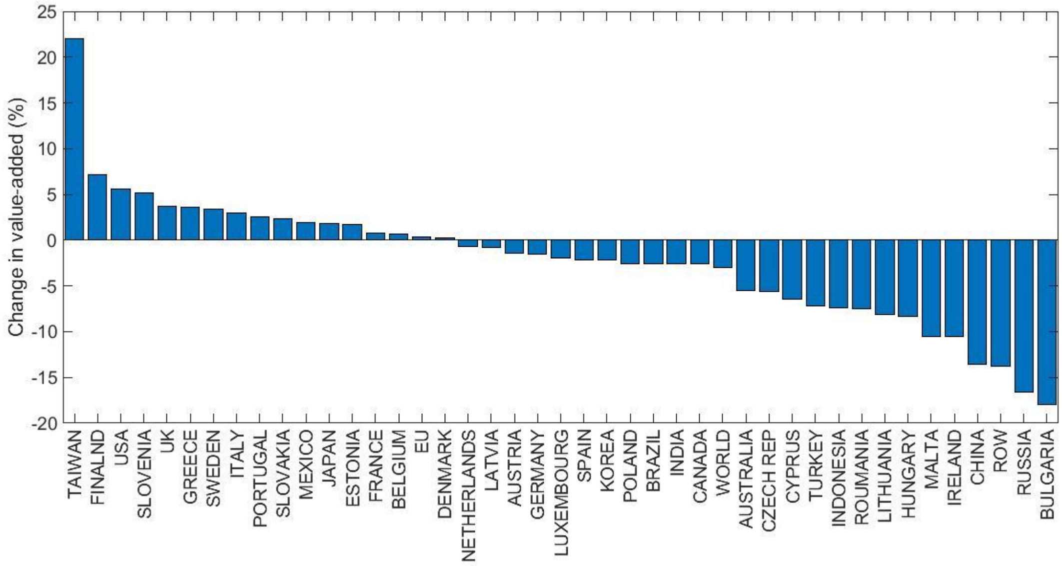

Figure 8. Country change in value-added shares in the back to the past scenario.

[15] The results for all regions are reported in Table B.4 of the Online Appendix B.

[16] By inspecting the region-sector level, we find an asymmetric impact also within sectors and regions. For example, the positive change recorded by the EU textiles and leather sector comes at the expense of a big loss (close to 30 percent) suffered by the same Chinese industry. Further, while at the region-sector level the largest value-added losses (higher than 60 percent) are incurred by the coke, petroleum, and chemicals industry in Praha (CZE), Dusseldorf (DEU), Lodzkie (POL), and Pais Vasco (ESP), at the aggregate level this sector would gain about 5 percent of value-added. The same is true if we look at the losses and gains of industries within the regions. For example, Pais Vasco would lose 36.1 percent of its value-added. However, in this region the agriculture and textiles and leather sectors would gain more than 20 percent of value-added.

Our findings suggest that a scenario of deglobalisation intended as a return to the past, would create winners and losers. This evidence holds at the industry, region, and country level. To have a better understanding of the winners and losers from deglobalisation at the aggregate level, Figure 8 show the change in value-added by countries. As we can see, the main losers from deglobalisation are the countries that largely benefited from trade openness, namely export led economies, such as Germany, and emerging countries as China. On the other hand, among the main winners from deglobalisation we find many strong and developed economies such as the US, the UK, Italy, Japan, and France. It should be noted that our results could also be read in reverse. The winners from deglobalisation are likely to be the losers from globalisation. In this sense, our findings seem to be in line with the backlash against globalisation and the surge of nationalism that has recently occurred in these countries (see the Trump's protectionist agenda in US, the vote for Brexit in the UK, and the rise of nationalist parties in France and Italy).

6. The case for GVCs Europeanisation

In this section, we employ the global hypothetical extraction method (Dietzenbacher et al., 2019; Giammetti, 2020) to investigate the economic impact of a GVCs Europeanisation. Specifically, we assume that EU regions totally replace the intermediate inputs imported from extra-EU countries with the same intermediate inputs from other EU countries. We do not allow for domestic import substitution.[17] This means that EU regions replace extra-EU intermediates exclusively with goods and services produced in regions of other EU countries. This assumption is in line with the 'love of variety' theory (Bernard et al., 2007) and the conventional Ricardo-Heckscher-Ohlin 'gains from trade' theory.

Our findings indicate that replacing extra-EU GVCs with intra-EU GVCs would have almost no impact on the world economy (0.1 percent). This is not surprising since according to the global hypothetical extraction method, what EU regions gain from import substitution is lost by non-EU countries that stop exporting intermediates to Europe. Therefore, rather than looking at the aggregate impact, it is more interesting to study how these losses and gains are distributed between EU regions and non-EU countries. The distribution of losses and gains indicates, to some extent, which regions would benefit most from a strengthening of the EU production network and which extra-EU countries would suffer most from a Europeanisation of EU GVCs.

[17] We follow closely the standard global hypothetical extraction method developed in Dietzenbacher et al. (2019) that does not allow the substitution of imported intermediate inputs with domestic goods and services. However, allowing for such substitution (as in Giammetti, 2020) does not change our results (details are available upon request).

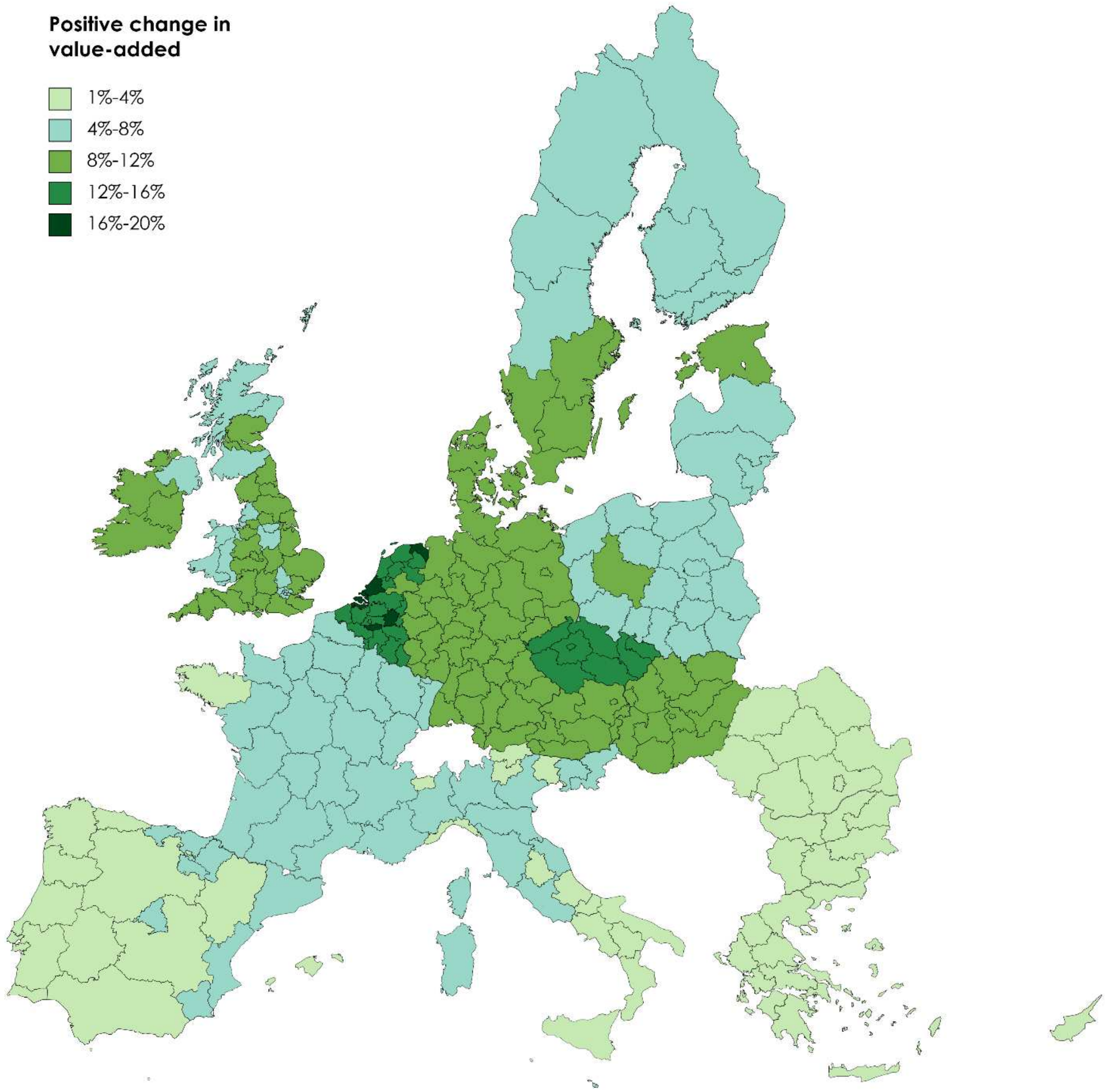

Figure 9. Positive regional change in value-added shares in the GVCs Europeanisation scenario.

Figure 9 shows the positive change in value-added that would occur in the EU regions following the Europeanisation of EU production chains. The regions that in relative terms would mostly benefit from a strengthening of the EU chains are located in Central-Eastern Europe (especially in the Netherlands, Belgium, and the Czech Republic), in some regions of the Scandinavian Peninsula (Estonia, Denmark, and the South of Sweden), in Ireland, and in the UK. In relative terms, southern Europe, France, Poland, Finland, and the remaining Baltic countries appear to be less affected by a Europeanisation of value chains. Interestingly, most of the top winner regions in this scenario are among the top losers of the back to the past scenario. In this sense, our results suggest the presence of two classes of regions with conflicting interests: those that would benefit from a return to the past, when the fragmentation of production was more limited, and the others that would instead gain from a greater integration of EU production chains. A special case is represented by the UK. As we have seen in the previous section, almost all regions of the UK would benefit from a return to past production patterns; and this result could partly explain the discontent that resulted in the Brexit vote. However, as shown in Figure 9, most UK regions would see an increase of their value-added by more than 12 percent following a strengthening of input-output relationships within the EU production network. Therefore, according to our results, the Brexit vote may not have been the most cost-effective solution for the UK.

The bar graph in Figure 10 displays the country change in value-added that occurs as a result of the Europeanisation of GVCs. As we can see, the differences at regional level from a strengthening of the EU production network also appear at the national one. Germany and its neighbours would experience an increase of value-added of more than 10 percent. The effect for Ireland, the UK, and Scandinavia would also be quite positive, while the change in value-added would not exceed 5 percent for the other EU countries. It is also worth noting that, outside the EU, Russia appears to be very affected by a GVCs Europeanisation with a negative change in value-added of about 13 percent. All the other countries would suffer limited losses in value-added ranging from 0.6 (Japan) to 3.0 percent (Turkey).

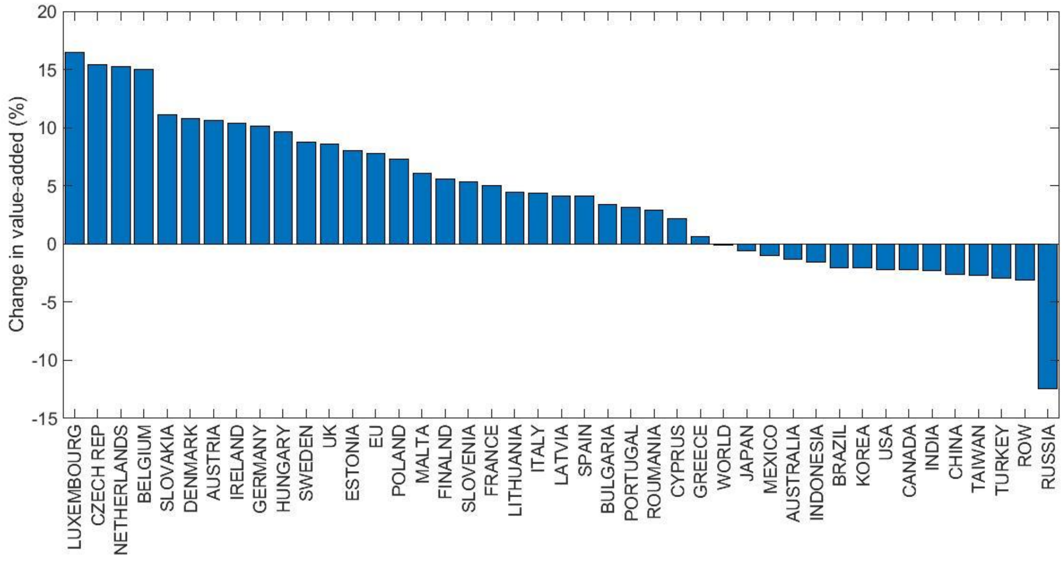

Figure 10. Country change in value-added shares in the GVCs Europeanisation scenario.

7. Conclusion

This paper contributes to the debate on changing geographies of value chains and production networks in a deglobalised world by studying the impact of three different kind of deglobalisation scenarios on EU regional economies. Using an input-output approach in a GVCs framework, we have first supported the relevance of our research question by showing that EU regional production network has become increasingly fragmented since 2000 and that such fragmentation has occurred mainly at EU level, although the trend towards production fragmentation outside the EU shows a faster pattern.

The results of our scenario analysis have shown that the degree of exposure to deglobalisation is similar in neighbouring regions beyond national borders and identified three main regional value chains. The Central-Eastern bloc, highly integrated within the interregional production network, the Northern bloc, mainly integrated with countries outside the EU, and the Southern bloc, that is less dependent on regional and global supply chains.

We also found that deglobalisation might generate winners and losers. The simulation of a scenario involving a return of productions and trade patterns scheme to the year 2000 reveals an asymmetric impact on industries, regions, and countries. In aggregate terms, the main losers from deglobalisation are the countries that largely benefited from trade openness, namely export led economies and emerging countries such as Germany and China, respectively. On the other hand, among the main winners from deglobalisation, we found many strong and developed economies such as the US, the UK, Italy, Japan, and France. Moreover, our analysis highlighted the presence of two categories of regions that may have conflicting interests, namely regions that would benefit from a return to the past when the fragmentation of production was more limited, and others that would instead gain from the Europeanisation of GVCs.

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Online Appendix A

A.1. The C-country, R-region, N-sector input-output model

This section introduces a global input-output model with C countries, R regions, and N sectors. Suppose the world economy consists of C countries which in turn consist of a (variable) number of regions R, and each of which is comprised of N industries. Sectors in all regions and countries exchange intermediate goods and services with each other and deliver final products to consumers in all regions in all countries. The structure of such a global economy can be captured by a global input-output table as presented in a stylized way in Figure A.1.

The rows of the table give the total dollar value of deliveries of output from a particular industry in each region in a given country to another industry for intermediate use (block matrices labelled **Z**), or to final users (block matrices labelled **F**), either within the same region, to another region in the same country, to another region in other EU countries or to extra-EU countries.[1]

The **Z** block matrices are the core of an input-output table. In the stylized Figure A.2.1, the **Z** blocks on the main diagonal (shaded) include input-output connections within the economies grouped in the block. For example, the $\mathbf{Z}^{rr}$ block is an $N \times N$ matrix consisting of intra-region deliveries, i.e., it includes sectoral input-output flows that take place in the same focal region.

	Focal Region in EU	Other regions in country of focal region	Regions in other EU countries	Countries outside the EU	Focal Region in EU	Other regions in country of focal region	Regions in other EU countries	Countries outside the EU	Gross output
Focal Region in EU	$\mathbf{Z}^{rr}$	$\mathbf{Z}^{rc}$	$\mathbf{Z}^{re}$	$\mathbf{Z}^{ro}$	$\mathbf{f}^{rr}$	$\mathbf{F}^{rc}$	$\mathbf{F}^{re}$	$\mathbf{F}^{ro}$	$\mathbf{x}^{r}$
Other regions in country of focal region	$\mathbf{Z}^{cr}$	$\mathbf{Z}^{cc}$	$\mathbf{Z}^{ce}$	$\mathbf{Z}^{co}$	$\mathbf{f}^{cr}$	$\mathbf{F}^{cc}$	$\mathbf{F}^{ce}$	$\mathbf{F}^{co}$	$\mathbf{x}^{c}$
Regions in other EU countries	$\mathbf{Z}^{er}$	$\mathbf{Z}^{ec}$	$\mathbf{Z}^{ee}$	$\mathbf{Z}^{eo}$	$\mathbf{f}^{er}$	$\mathbf{F}^{ec}$	$\mathbf{F}^{ee}$	$\mathbf{F}^{eo}$	$\mathbf{x}^{e}$
Countries outside the EU	$\mathbf{Z}^{or}$	$\mathbf{Z}^{oc}$	$\mathbf{Z}^{oe}$	$\mathbf{Z}^{oo}$	$\mathbf{f}^{or}$	$\mathbf{F}^{oc}$	$\mathbf{F}^{oe}$	$\mathbf{F}^{oo}$	$\mathbf{x}^{o}$
Value added	$\mathbf{v}^{r\prime}$	$\mathbf{v}^{c\prime}$	$\mathbf{v}^{e\prime}$	$\mathbf{v}^{o\prime}$					
Gross output	$\mathbf{x}^{r\prime}$	$\mathbf{x}^{c\prime}$	$\mathbf{x}^{e\prime}$	$\mathbf{x}^{o\prime}$					

Figure A.1. A global input-output table with regional details

[1] Matrices are indicated by bold capitals, vectors by bold lowercases and scalars by italic lowercases. Diagonal matrices are indicated by a hat over the vector containing the elements on the main diagonal. Primes indicate transposition.

$\mathbf{Z}^{cc}$ has $N(Rc - 1)$ rows and $N(Rc - 1)$ columns. This matrix block includes input-output connections between industries in other regions of the country of which r is a part, to industries in other regions than r in the same country. If, for example, r refers to Piemonte, $\mathbf{Z}^{cc}$ contains deliveries of industries in Lombardia to industries in Lombardia itself, but also to industries in Toscana. Since in our scenario analysis we distinguish between the consequences of a de-globalisation from intra and extra-EU value chains, we split the set of countries to which the focal region r does not belong to (regions in) other EU countries, and extra-EU countries. In $\mathbf{Z}^{ee}$ are included all the transactions between industries in regions of EU countries to which r does not belong. Continuing our example for Piemonte, this matrix provides quantitative information about the values of intermediate input flows between Groningen (a region in a different EU country) and Stuttgart (also a region in an EU country other than Italy), among many other flows. Finally, $\mathbf{Z}^{oo}$ contains the values of all transactions between industries in countries that do not belong to the EU.

The off-diagonal blocks within $\mathbf{Z}$ refer to bilateral trade in intermediate inputs between industries in different types of geographical entities. These block matrices can contain input sales by industries in the focal region r to industries placed in other regions of the same country ($\mathbf{Z}^{rc}$), as well as they might indicate the value of intermediate input sales by industries in the focal region r to industries placed in other EU regions ($\mathbf{Z}^{re}$), or they might contain flows in the opposite direction, for example intermediate inputs imports of the focal region r from extra-EU countries ($\mathbf{Z}^{or}$).

The matrices and vectors in the block labelled $\mathbf{F}$ have a similar interpretation in terms of the regions and countries involved but refer to deliveries of final products. Specifically, the $\mathbf{F}$ block matrices contain data of final demand for the output of each producing industry that is demand of nonindustry consumers such as households and government. Final demand is the demand for goods, which are not used to produce other goods (as opposed to intermediate demand). In our analysis, we do not distinguish between final uses, as a consequence of which consumption demand by households, government consumption, gross fixed capital formation and changes in inventories for the output of industries in regions and countries have been aggregated into single numbers. This explain why final demand as exerted in region r is represented by column vectors $\mathbf{f}^{r}$, rather than by matrices with multiple columns.

The fundamental accounting identity of any input–output table is that total use of output in a row equals total output of the same industry as indicated by the sum of inputs in the respective column in the left-hand part of the table. The columns indicate the amounts of intermediate inputs needed for production; hence, they are informative about the technology of production. What remains between total output and total intermediate inputs is value added ($\mathbf{v}$), that is the direct contribution of the factors of production to output.

Let **Z** be the transaction matrix, **F** be the matrix of industry final demands, and **x** the vector of industry gross output. The accounting equations are given as $\mathbf{x} = \mathbf{Zi} + \mathbf{Fi}$, where $\mathbf{i}$ is the summation vector, i.e. a vector of all ones. Define the direct input coefficients as the ratio of input supplied by i and bought by j over the gross output of sector j as $a_{ij} = z_{ij}/x_j$, which is the typical element of the economy's direct requirements matrix **A**, also known as the technical coefficients matrix. We know $\mathbf{A} = \mathbf{Z}\hat{\mathbf{x}}^{-1}$, where the circumflex or hat denotes a diagonal matrix, in this case values on the diagonal are elements of the vector **x**. Thus, we can substitute $\mathbf{Ax} = \mathbf{Zi}$ in the accounting equations to get $\mathbf{x} = \mathbf{Ax} + \mathbf{Fi}$. Solving for **x** yields:

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{Fi} = \mathbf{LFi} \tag{A.1}$$

where $\mathbf{I}$ is the identity matrix and $\mathbf{L} \equiv (\mathbf{I} - \mathbf{A})^{-1}$ is the Leontief inverse or multiplier matrix, which makes clear the direct and indirect dependence of each of gross outputs on the values of each of the final demand. In order to relate equation (1) to the value-added of each region/country, we pre-multiply equation (1) by the value-added coefficients diagonal matrix $\hat{\mathbf{V}}$, i.e. in which an arbitrary element on the main diagonal is $v_j^s = v_j^s/x_j^s$. Here, v_j^s denotes the value added, subscript j denotes the industry and superscript s identifies the region/country. This leads to the vector:

$$\mathbf{v} = \hat{\mathbf{V}}(\mathbf{I} - \mathbf{A})^{-1}\mathbf{Fi} = \mathbf{LFi}\,. \tag{A.2}$$

We start from this equation to compute the impact of our three deglobalisation scenarios.

A.2. First scenario: The end of intermediate flows

In this scenario we are interested in the extent to which value-added of EU regions is exposed to deglobalisation. Specifically, we ask what would happen if industries in EU regions stop importing and exporting intermediate inputs. To answer this question, we employ a modified version of the standard hypothetical extraction method.

Typically, this technique is used to estimate the importance of a sector i. The procedure consists of deleting the i-th row and column of the input–output matrix **A**, and then using the Leontief model, to compute the reduced outputs obtained when i=0 and compare with total output before extraction (see Miller and Lahr, 2001, and Dietzenbacher and Lahr, 2013, for insights and extensions). Therefore, extracting industry i requires that the i-th row and column of the **A** matrix are set equal to zero. We define this matrix by $\mathbf{A}^*$. Thus, the estimated new vector of sector value-added will be:

$$\mathbf{v} = \widehat{\mathbf{V}}(\mathbf{I} - \mathbf{A}^*)^{-1}\mathbf{Fi} = \mathbf{LFi}\,. \tag{A.3}$$

However, Chen et al. (2018) show that this general case can be easily extended to a multi-region input–output framework with C countries R regions and N production sectors to quantify the effect of global value chains (GVCs) interruption on value-added, as induced by hypothetically extracting trade flows between regions/countries. In our first scenario we build on Chen et al. (2018) and simulate the impact of deglobalisation by zeroing the imports and exports of intermediate inputs.

We employ the EUREGIO database that includes data for 14 industries in 246 NUTS 2 regions of the EU-25, plus data at the country-level for the same 14 industries in Bulgaria, Romania and other 14 extra-EU trading partners, for a total of 41 countries. Using partitioned matrices, the coefficient matrix $\mathbf{A}$ can be presented in summary as:

$$\mathbf{A} = \begin{bmatrix} \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{E}_1^1\mathrm{R}} & \mathbf{A}^{\mathrm{E}_1^1\mathrm{O}} \\ \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{E}_1^2\mathrm{R}} & \mathbf{A}^{\mathrm{E}_1^2\mathrm{O}} \\ \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{R}} & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{O}} \\ \mathbf{A}^{\mathrm{R}\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{R}\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{R}\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{RR}} & \mathbf{A}^{\mathrm{RO}} \\ \mathbf{A}^{\mathrm{O}\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{O}\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{O}\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{OR}} & \mathbf{A}^{\mathrm{OO}} \end{bmatrix} \tag{A.4}$$

where E stands for EU-25 countries, R for rest of EU (Bulgaria and Romania), and O for extra-EU. The blocks are divided by regions (superscripts) and countries (subscripts).

Extracting intermediate trade flows from and to EU regions requires that the matrices relative to imports and exports of inputs are replaced by matrices of appropriate dimension filled with zeros, such that the new matrix $\mathbf{A}^{*'}$ consists of domestic matrix blocs and zero elsewhere:

$$\mathbf{A}^{*'} = \begin{bmatrix} \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_1^2} & \cdots & 0 & 0 & 0 \\ \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_1^2} & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_{25}^{246}} & 0 & 0 \\ 0 & 0 & \cdots & 0 & \mathbf{A}^{\mathrm{RR}} & 0 \\ 0 & 0 & \cdots & 0 & 0 & \mathbf{A}^{\mathrm{OO}} \end{bmatrix} \tag{A.5}$$

To study the impact of a complete deglobalisation of value chains, we use this matrix in equation (A.3) and estimate the new vector of sector value-added. As explained in Giammetti et al. (2020) the relative change before and after extraction $(\mathbf{v}^* - \mathbf{v})/\mathbf{v}$ can be considered as a measure of the exposure of a sector, a region or a country to shocks involving GVCs. Here we use this measure to study the extent to which EU regions are exposed to a complete deglobalisation of value-chains.

We extend the general case of a complete interruption of GVCs to study the impact of a partial interruption. Specifically, we hypothesize two intermediate cases: (i) the case in which the interruption of intermediate flows involves only foreign countries, thus leaving the deliveries of inputs between EU regions unchanged; and (ii) the case in which the interruption of intermediate value chains involves only the deliveries between EU regions, leaving the input relationships with extra-EU countries unchanged.

In the first case (i), the matrix blocks of **A** relating to import and export of inputs between EU regions and extra-EU countries are zeroed:

$$\mathbf{A}^{*''} = \begin{bmatrix} \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{E}_1^1\mathrm{R}} & 0 \\ \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{E}_1^2\mathrm{R}} & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{R}} & 0 \\ \mathbf{A}^{\mathrm{R}\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{R}\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{R}\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{RR}} & 0 \\ 0 & 0 & \cdots & 0 & 0 & \mathbf{A}^{\mathrm{OO}} \end{bmatrix} \tag{A.6}$$

In case (ii), are zeroed the matrix blocks of **A** relating the deliveries of inputs across EU regions.

$$\mathbf{A}^{*'''} = \begin{bmatrix} \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_1^2} & \cdots & 0 & 0 & \mathbf{A}^{\mathrm{E}_1^1\mathrm{O}} \\ \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_1^2} & \cdots & 0 & 0 & \mathbf{A}^{\mathrm{E}_1^2\mathrm{O}} \\ \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_{25}^{246}} & 0 & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{O}} \\ 0 & 0 & \cdots & 0 & \mathbf{A}^{\mathrm{RR}} & \mathbf{A}^{\mathrm{RO}} \\ \mathbf{A}^{\mathrm{O}\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{O}\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{O}\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{OR}} & \mathbf{A}^{\mathrm{OO}} \end{bmatrix} \tag{A.7}$$

Again, we us $\mathbf{A}^{*''}$ and $\mathbf{A}^{*'''}$ in equation (A.3) to compute the new value-added and then the relative change with the pre-shock value-added.

A.3. Second scenario: A return to the past production schemes and trade patterns

In the second scenario we study the economic implication of a return to a less integrated world economy. Specifically, we evaluate how the value-added in 2010 of EU regions would change if production took place with the production schemes and trade patterns of 2000. To do so we build on the literature on structural change in input-output systems (Sonis et al., 1996) and on the method applied in the first scenario.

The input requirements matrix $\mathbf{A}$ gives a quantitative description of the world production structure. However, this is not only determined by technological input requirements, but also by interregional and international trade patterns. Therefore, a simple way to verify how the value-added would change if the production schemes went back in time is to calculate the value-added at time t using the matrix of the technical coefficients at time $t-n$. Here, we leave at the 2010 the value-added coefficient matrix ($\widehat{\mathbf{V}}$) and the final demand matrix ($\mathbf{F}$), while we fix at the 2000 the technical coefficient matrix $\mathbf{A}^{\#}$:

$$\mathbf{A}^{\#}=\begin{bmatrix} \mathbf{A_{2000}}^{\mathrm{E_1^1E_1^1}} & \mathbf{A_{2000}}^{\mathrm{E_1^1E_1^2}} & \cdots & \mathbf{A_{2000}}^{\mathrm{E_1^1E_{25}^{246}}} & \mathbf{A_{2000}}^{\mathrm{E_1^1R}} & \mathbf{A_{2000}}^{\mathrm{E_1^1O}} \\ \mathbf{A_{2000}}^{\mathrm{E_1^2E_1^1}} & \mathbf{A_{2000}}^{\mathrm{E_1^2E_1^2}} & \cdots & \mathbf{A_{2000}}^{\mathrm{E_1^2E_{25}^{246}}} & \mathbf{A_{2000}}^{\mathrm{E_1^2R}} & \mathbf{A_{2000}}^{\mathrm{E_1^2O}} \\ \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ \mathbf{A_{2000}}^{\mathrm{E_{25}^{246}E_1^1}} & \mathbf{A_{2000}}^{\mathrm{E_{25}^{246}E_1^2}} & \cdots & \mathbf{A_{2000}}^{\mathrm{E_{25}^{246}E_{25}^{246}}} & \mathbf{A_{2000}}^{\mathrm{E_{25}^{246}R}} & \mathbf{A_{2000}}^{\mathrm{E_{25}^{246}O}} \\ \mathbf{A_{2000}}^{\mathrm{RE_1^1}} & \mathbf{A_{2000}}^{\mathrm{RE_1^2}} & \cdots & \mathbf{A_{2000}}^{\mathrm{RE_{25}^{246}}} & \mathbf{A_{2000}}^{\mathrm{RR}} & \mathbf{A_{2000}}^{\mathrm{RO}} \\ \mathbf{A_{2000}}^{\mathrm{OE_1^1}} & \mathbf{A_{2000}}^{\mathrm{OE_1^2}} & \cdots & \mathbf{A_{2000}}^{\mathrm{OE_{25}^{246}}} & \mathbf{A_{2000}}^{\mathrm{OR}} & \mathbf{A_{2000}}^{\mathrm{OO}} \end{bmatrix} \quad \text{(A.8)}$$

Then we use equation (A.3) to compute the value-added generated with the technical coefficient matrix $\mathbf{A}^{\#}$.

A.2.4. Third scenario: The Europeanisation of global value chains

Dietzenbacher et al. (2019) have recently developed a global multicountry version of the hypothetical extraction method, the so-called global extraction method (GEM). Giammetti (2020) employ an extended version of this method to simulate trade diversion in a post-Brexit world. In the third scenario we build on these contributions to simulate the impact of a GVCs Europeanisation (i.e. a regionalisation of GVCs) on EU regional economies and extra-EU countries. Specifically, we study the impact of a hypothetic future world in which the EU regions totally replace the intermediate inputs imported from extra-EU countries with the same intermediate inputs from other EU countries.

When performing the hypothetical extraction method, it is important that other things remain unchanged in order to single out the impact of the extraction. It is therefore assumed that, at the national level, the remaining industries still receive the inputs they need, i.e. the inputs requirements delivered by the extracted industry are met by additional imports in the post-extraction situation. For this reason, according to Dietzenbacher et al. (2019) performing the hypothetical extraction method at the global level is problematic, as the assumption to import the required inputs from outside 'the system' is no longer possible. To overcome this drawback, the GEM suggests allocating the missing flows proportionally over the columns of the global input-output matrix.

We adopt this strategy by zeroing the intermediary imports from extra-EU countries and reallocating them proportionally over the intra-EU intermediary input flows of the respective EU regions, not allowing for domestic import substitution. This method requires that the matrices relative to imports of inputs sourced in extra-EU countries are replaced by matrices of appropriate dimension filled with zeros and that the flows of intermediate imports sourced in intra-EU countries are proportionally expanded, as follows:

$$\mathbf{A}^{\dagger} = \begin{bmatrix} \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_1^1} & \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_1^{2+}} & \cdots & \mathbf{A}^{\mathrm{E}_1^1\mathrm{E}_{25}^{246+}} & \mathbf{A}^{\mathrm{E}_1^1\mathrm{R}^+} & \mathbf{A}^{\mathrm{E}_1^1\mathrm{O}} \\ \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_1^{1+}} & \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_1^2} & \cdots & \mathbf{A}^{\mathrm{E}_1^2\mathrm{E}_{25}^{246+}} & \mathbf{A}^{\mathrm{E}_1^2\mathrm{R}^+} & \mathbf{A}^{\mathrm{E}_1^2\mathrm{O}} \\ \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_1^{1+}} & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_1^{2+}} & \cdots & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{E}_{25}^{246}} & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{R}^+} & \mathbf{A}^{\mathrm{E}_{25}^{246}\mathrm{O}} \\ \mathbf{A}^{\mathrm{RE}_1^{1+}} & \mathbf{A}^{\mathrm{RE}_1^{2+}} & \cdots & \mathbf{A}^{\mathrm{RE}_{25}^{246+}} & \mathbf{A}^{\mathrm{RR}} & \mathbf{A}^{\mathrm{RO}} \\ 0 & 0 & \cdots & 0 & 0 & \mathbf{A}^{\mathrm{OO}} \end{bmatrix} \tag{A.9}$$

As in the GEM, we assume that the matrix of technology coefficients remains fixed, i.e. column sums of the pre- and post-generalized extraction are equivalent. We use this new coefficient matrix to calculate the new value-added as defined by equation (A.3).

A.5. Measuring the fragmentation of production with input-output tools

In Section 3 we present a description of the trends in international fragmentation of the EU regional production network over the period 2000-2010. Specifically, we define the value chain of final goods and services produced in the EU production network as the set of all value-adding activities that are needed in their production. Then, we compute the international fragmentation as the share of foreign value-added in the value of final products. Finally, we study the geography of this fragmentation by splitting the foreign value-added into value-added within EU regions and value-added outside the EU.

We use the methodology presented in Los et al. (2015) in a multiregional setting. To decompose the value of a final product into value added contribution in any region and country in the world we start with equation (A.3).

This calculation allows us to decompose value chains of final products that are identified by the last stage of production: a particular industry i located in a specific region/country j, denoted by (i,j).

Define the final output value of a product (i,j) by $\mathrm{FINO}(i,j)$ and the value-added by region/country k in its production by $\mathrm{VA}(k)(i,j)$. The vector v includes the matching $\mathrm{VA}(k)(i,j)$ levels for each (i,j) such that:

$$\mathrm{FINO}(i,j) = \textstyle\sum_{\boldsymbol{k}} \mathrm{VA}(k)(i,j). \tag{A.10}$$

If we sum the contributions over all regions/countries, we obtain the final output value of (i,j).

Los et al. (2015) define their measure of foreign value added (FVA) as all value-added outside the country of completion j:

$$\mathrm{FVA}(i,j) = \textstyle\sum_{\boldsymbol{k}\neq \mathrm{j}} \mathrm{VA}(k)(i,j) = \mathrm{FINO}(i,j) - \mathrm{VA}(j)(i,j). \tag{A.11}$$

Then, to measure the relevance of foreign value-added in the generation of the value-added of (i,j), we can express it as a share of all value-added in the production of (i,j):

$$\mathrm{FVAS}(i,j) = \mathrm{FVA}(i,j) / \ \mathrm{FINO}(i,j). \tag{A.12}$$

This share corresponds to the measure we employed to describe the global fragmentation of production of EU regions.

In the second part of Section 3 we decompose $\mathrm{FVAS}(i,j)$ into the value-added share of EU regions/countries and the remaining value-added share that is added outside the EU. This further decomposition can be easily computed by splitting FVA as defined in equation (A.11) into EU-FVA and extra-EU-FVA. EU-FVA in the value of product i with region/country j as country of completion is defined as the value-added contribution of the EU minus the contribution of the country itself:

$$\text{EU-FVA}(i,j) = \sum_{k\in region\ of\ j} \text{VA}(k)(i,j) - \text{VA}(j)(i,j), \quad \text{(A.13)}$$

$$\text{EU-FVAS}(i,j) = \text{EU-FVA}(i,j) / \text{FINO}(i,j). \quad \text{(A.14)}$$

The share of EU-FVA in the value chain of (i,j) indicates to what extent the production of (i,j) is fragmented within EU value chains.

Along the same lines, we measure extra-EU fragmentation as the value-added contribution of all countries outside the EU, as follows:

$$\text{Extra-EU-FVA}(i,j) = \sum_{k\in outside\ region\ of\ j} \text{VA}(k)(i,j) \quad \text{(A.15)}$$

and

$$\text{Extra-EU-FVAS}(i,j) = \text{Extra-EU-FVA}(i,j) / \text{FINO}(i,j). \quad \text{(A.16)}$$

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Online Appendix B

Table B.1. Output losses due to a total interruption of GVCs (Figure 3)

CODE	COUNTRY_REGION	Output Losses (percentage)
AT11	AUSTRIA_Burgenland	20.01
AT12	AUSTRIA_Niederosterreich	21.12
AT13	AUSTRIA_Wien	20.83
AT21	AUSTRIA_Karnten	21.46
AT22	AUSTRIA_Steiermark	21.17
AT31	AUSTRIA_Oberosterreich	21.97
AT32	AUSTRIA_Salzburg	21.38
AT33	AUSTRIA_Tirol	22.01
AT34	AUSTRIA_Vorarlberg	23.21
BE10	BELGIUM_Region de Bruxelles	24.88
BE21	BELGIUM_Prov. Antwerpen	29.03
BE22	BELGIUM_Prov. Limburg (B)	28.64
BE23	BELGIUM_Prov. Oost-Vlaanderen	25.14
BE24	BELGIUM_Prov. Vlaams Brabant	27.36
BE25	BELGIUM_Prov. West-Vlaanderen	27.91
BE31	BELGIUM_Prov. Brabant Wallon	29.58
BE32	BELGIUM_Prov. Hainaut	24.45
BE33	BELGIUM_Prov. Liege	27.01
BE34	BELGIUM_Prov. Luxembourg (B)	26.92
BE35	BELGIUM_Prov. Namur	25.40
CZ01	CZECH REPUBLIC_Praha	24.21
CZ02	CZECH REPUBLIC_Stredni Cechy	26.28
CZ03	CZECH REPUBLIC_Jihozapad	25.47
CZ04	CZECH REPUBLIC_Severozapad	24.49
CZ05	CZECH REPUBLIC_Severovychod	25.86
CZ06	CZECH REPUBLIC_Jihovychod	25.53
CZ07	CZECH REPUBLIC_Stredni Morava	25.30
CZ08	CZECH REPUBLIC_Moravskoslezko	26.00
DE11	GERMANY_Stuttgart	19.88
DE12	GERMANY_Karlsruhe	18.91
DE13	GERMANY_Freiburg	18.09
DE14	GERMANY_Tubingen	18.83
DE21	GERMANY_Oberbayern	19.49
DE22	GERMANY_Niederbayern	18.05
DE23	GERMANY_Oberpfalz	18.55
DE24	GERMANY_Oberfranken	17.55
DE25	GERMANY_Mittelfranken	18.13
DE26	GERMANY_Unterfranken	18.20
DE27	GERMANY_Schwaben	17.89
DE30	GERMANY_Berlin	17.67
DE40	GERMANY_Brandenburg - Nordost	16.95
DE50	GERMANY_Bremen	18.44

DE60	GERMANY_Hamburg	16.22
DE71	GERMANY_Darmstadt	19.39
DE72	GERMANY_Giessen	17.49
DE73	GERMANY_Kassel	17.44
DE80	GERMANY_Mecklenburg-Vorpommern	15.89
DE91	GERMANY_Braunschweig	18.70
DE92	GERMANY_Hannover	17.56
DE93	GERMANY_Luneburg	14.72
DE94	GERMANY_Weser-Ems	17.29
DEA1	GERMANY_Dusseldorf	15.53
DEA2	GERMANY_Koln	16.01
DEA3	GERMANY_Munster	15.55
DEA4	GERMANY_Detmold	17.88
DEA5	GERMANY_Arnsberg	16.08
DEB1	GERMANY_Koblenz	16.76
DEB2	GERMANY_Trier	15.42
DEB3	GERMANY_Rheinhessen-Pfalz	15.96
DEC0	GERMANY_Saarland	18.35
DED2	GERMANY_Chemnitz	16.33
DED4	GERMANY_Dresden	18.17
DED5	GERMANY_Leipzig	16.30
DEE0	GERMANY_Sachsen-Anhalt	15.64
DEF0	GERMANY_Schleswig-Holstein	15.47
DEG0	GERMANY_Thüringen	17.18
DK01	DENMARK_Hovedstadsreg	19.27
DK02	DENMARK_Ost for Storebælt	19.01
DK03	DENMARK_West_for_Storebelt	19.60
EE00	ESTONIA_Eesti	24.95
ES11	SPAIN_Galicia	8.74
ES12	SPAIN_Principado de Asturias	9.08
ES13	SPAIN_Cantabria	10.25
ES21	SPAIN_Pais Vasco	11.46
ES22	SPAIN_Foral de Navarra	10.65
ES23	SPAIN_La Rioja	10.62
ES24	SPAIN_Aragon	10.06
ES30	SPAIN_Comunidad de Madrid	12.12
ES41	SPAIN_Castilla y Leon	8.28
ES42	SPAIN_Castilla-la Mancha	9.28
ES43	SPAIN_Extremadura	9.81
ES51	SPAIN_Cataluna	11.19
ES52	SPAIN_Comunidad Valenciana	9.89
ES53	SPAIN_Illes Balears	8.32
ES61	SPAIN_Andalucia	6.46
ES62	SPAIN_Region de Murcia	10.50
ES63	SPAIN_Ceuta (ES)	9.25
ES64	SPAIN_Melilla (ES)	9.72
ES70	SPAIN_Canarias_ES	7.68
FI19	FINALND_Ita-Suomi	22.00
FI1B	FINALND_Etela-Suomi	19.25
FI1C	FINALND_Lansi-Suomi	21.12

FI1D	FINALND_Pohjois-Suomi	23.57
FI20	FINALND_Aland	19.33
FR10	FRANCE_Ile de France	9.17
FRF2	FRANCE_Champagne-Ardenne	11.33
FRE2	FRANCE_Picardie	9.26
FRD2	FRANCE_Haute-Normandie	11.48
FRB0	FRANCE_Centre	9.60
FRD1	FRANCE_Basse-Normandie	10.79
FRC1	FRANCE_Bourgogne	9.76
FRE1	FRANCE_Nord - Pas-de-Calais	9.55
FRF2	FRANCE_Lorraine	9.12
FRF1	FRANCE_Alsace	10.40
FRC2	FRANCE_Franche-Comte	10.34
FRG0	FRANCE_Pays de la Loire	10.04
FRH0	FRANCE_Bretagne	8.69
FRI3	FRANCE_Poitou-Charentes	9.65
FRI1	FRANCE_Aquitaine	8.91
FRJ2	FRANCE_Midi-Pyrenees	9.53
FRI2	FRANCE_Limousin	10.19
FRK2	FRANCE_Rhone-Alpes	11.84
FRK1	FRANCE_Auvergne	11.01
FRJ1	FRANCE_Languedoc-Roussillon	10.15
FRL0	FRANCE_Provence-Alpes-Cote d Azur	12.04
FRM0	FRANCE_Corse	12.71
EL30	GREECE_Anatoliki Makedonia Thraki	7.52
EL41	GREECE_Kentriki Makedonia	7.06
EL42	GREECE_Dytiki Makedonia	7.17
EL43	GREECE_Thessalia	6.71
EL51	GREECE_Ipeiros	6.63
EL52	GREECE_Ionia Nisia	8.03
EL53	GREECE_Dytiki Ellada	6.63
EL54	GREECE_Sterea Ellada	6.67
EL61	GREECE_Peloponnisos	7.15
EL62	GREECE_Attiki	8.67
EL63	GREECE_Voreio Aigaio	7.04
EL64	GREECE_Notio Aigaio	8.37
EL65	GREECE_Kriti	7.60
HU11	HUNGARY_Kozep-Magyarorszag	29.07
HU21	HUNGARY_Kozep-Dunantul	26.45
HU22	HUNGARY_Nyugat-Dunantul	26.91
HU23	HUNGARY_Del-Dunantul	23.16
HU31	HUNGARY_eszak-Magyarorszag	24.32
HU32	HUNGARY_eszak-Alfold	24.09
HU33	HUNGARY_Del-Alfold	24.25
IE04	IRELAND_Border Midlands	31.97
IE05	IRELAND_Southern and Eastern	37.38
ITC1	ITALY_Piemonte	12.31
ITC2	ITALY_Valle dAosta Vallee dAoste	7.47
ITC3	ITALY_Liguria	7.46
ITC4	ITALY_Lombardia	10.80

ITH1	ITALY_Bolzano-Bozen	6.13
ITH2	ITALY_Provincia Autonoma Trento	8.16
ITH3	ITALY_Veneto	10.37
ITH4	ITALY_Friuli-Venezia Giulia	8.97
ITH5	ITALY_Emilia-Romagna	10.21
ITI1	ITALY_Toscana	10.18
ITI2	ITALY_Umbria	8.59
ITI3	ITALY_Marche	9.71
ITI4	ITALY_Lazio	10.07
ITF1	ITALY_Abruzzo	8.56
ITF2	ITALY_Molise	8.09
ITF3	ITALY_Campania	8.94
ITF4	ITALY_Puglia	8.67
ITF5	ITALY_Basilicata	8.22
ITF6	ITALY_Calabria	10.03
ITG1	ITALY_Sicilia	9.96
ITG2	ITALY_Sardegna	10.76
LT01	LITHUANIA_Lietuva	20.84
LU00	LUXEMBOURG_Luxembourg (Grand-D)	46.49
LV00	LATVIA_Latvija	17.29
MT00	MALTA_Malta	30.25
NL11	NETHERLANDS_Groningen	28.97
NL12	NETHERLANDS_Friesland	24.27
NL13	NETHERLANDS_Drenthe	25.28
NL21	NETHERLANDS_Overijssel	25.30
NL22	NETHERLANDS_Gelderland	20.31
NL23	NETHERLANDS_Flevoland	26.90
NL31	NETHERLANDS_Utrecht	20.92
NL32	NETHERLANDS_Noord-Holland	23.46
NL33	NETHERLANDS_Zuid-Holland	27.07
NL34	NETHERLANDS_Zeeland	27.78
NL41	NETHERLANDS_Noord-Brabant	24.47
NL42	NETHERLANDS_Limburg (NL)	22.73
PL71	POLAND_Lódzkie	15.04
PL92	POLAND_Mazowieckie	17.00
PL21	POLAND_Malopolskie	15.16
PL22	POLAND_Slaskie	15.70
PL81	POLAND_Lubelskie	16.08
PL82	POLAND_Podkarpackie	15.13
PL72	POLAND_Swietokrzyskie	15.79
PL84	POLAND_Podlaskie	15.85
PL41	POLAND_Wielkopolskie	16.65
PL42	POLAND_Zachodniopomorskie	14.63
PL43	POLAND_Lubuskie	15.68
PL51	POLAND_Dolnoslaskie	16.01
PL52	POLAND_Opolskie	15.68
PL61	POLAND_Kujawsko-Pomorskie	14.97
PL62	POLAND_Warminsko-Mazurskie	16.17
PL63	POLAND_Pomorskie	15.58
PT11	PORTUGAL_Norte	10.48

PT15	PORTUGAL_Algarve	9.90
PT16	PORTUGAL_Centro (PT)	10.63
PT17	PORTUGAL_Lisboa	10.73
PT18	PORTUGAL_Alentejo	10.94
SE11	SWEDEN_Stockholm	22.17
SE12	SWEDEN_ostra Mellansverige	21.12
SE22	SWEDEN_Sydsverige	22.91
SE31	SWEDEN_Norra Mellansverige	16.53
SE32	SWEDEN_Mellersta Norrland	12.28
SE33	SWEDEN_ovre Norrland	18.77
SE21	SWEDEN_Småland med oarna	23.85
SE23	SWEDEN_Västsverige	25.62
SI03	SLOVENIA_Slovenija	19.77
SK01	SLOVAKIA_Bratislavský kraj	24.30
SK02	SLOVAKIA_Zapadne Slovensko	22.63
SK03	SLOVAKIA_Stredne Slovensko	21.13
SK04	SLOVAKIA_Východne Slovensko	20.91
UKC1	UK_Tees Valley and Durham	14.62
UKC2	UK_Northumberland Tyne and Wear	14.65
UKD1	UK_Cumbria	17.26
UKD3	UK_Cheshire	16.10
UKD4	UK_Greater Manchester	14.56
UKD6	UK_Lancashire	16.97
UKD7	UK_Merseyside	13.61
UKE1	UK_East Riding, North Lincolnshire	17.29
UKE2	UK_North Yorkshire	15.89
UKE3	UK_South Yorkshire	14.32
UKE4	UK_West Yorkshire	14.76
UKF1	UK_Derbyshire and Nottinghamshire	14.45
UKF2	UK_Leicestershire Rutland	17.90
UKF3	UK_Lincolnshire	15.54
UKG1	UK_Herefordshire Worcestershire	16.84
UKG2	UK_Shropshire and Staffordshire	16.64
UKG3	UK_West Midlands	15.00
UKH1	UK_East Anglia	14.48
UKH2	UK_Bedfordshire Hertfordshire	13.58
UKH3	UK_Essex	14.39
UKI4	UK_Inner London	14.60
UKI5	UK_Outer London	12.37
UKJ1	UK_Berkshire Bucks Oxfordshire	15.18
UKJ2	UK_Surrey East and West Sussex	14.14
UKJ3	UK_Hampshire and Isle of Wight	18.34
UKJ4	UK_Kent	16.56
UKK1	UK_Gloucestershire Wiltshire	19.57
UKK2	UK_Dorset and Somerset	16.34
UKK3	UK_Cornwall and Isles of Scilly	15.83
UKK4	UK_Devon	16.29
UKL1	UK_West Wales and The Valleys	13.63
UKL2	UK_East Wales	13.08
UKM5	UK_North Eastern Scotland	10.72

UKM7	UK_Eastern Scotland	12.59
UKM8	UK_South Western Scotland	15.24
UKM6	UK_Highlands and Islands	12.42
UKN0	UK_Northern Ireland	14.36

Table B.2. Output losses due to an interruption of extra-EU GVCs (Figure 4)

CODE	COUNTRY_REGION	Output Losses (percentage)
AT11	AUSTRIA_Burgenland	9.35
AT12	AUSTRIA_Niederosterreich	9.59
AT13	AUSTRIA_Wien	9.81
AT21	AUSTRIA_Karnten	9.93
AT22	AUSTRIA_Steiermark	9.67
AT31	AUSTRIA_Oberosterreich	10.27
AT32	AUSTRIA_Salzburg	9.91
AT33	AUSTRIA_Tirol	10.41
AT34	AUSTRIA_Vorarlberg	10.33
BE10	BELGIUM_Region de Bruxelles	11.16
BE21	BELGIUM_Prov. Antwerpen	11.70
BE22	BELGIUM_Prov. Limburg (B)	11.26
BE23	BELGIUM_Prov. Oost-Vlaanderen	10.11
BE24	BELGIUM_Prov. Vlaams Brabant	10.68
BE25	BELGIUM_Prov. West-Vlaanderen	10.93
BE31	BELGIUM_Prov. Brabant Wallon	11.92
BE32	BELGIUM_Prov. Hainaut	9.68
BE33	BELGIUM_Prov. Liege	11.03
BE34	BELGIUM_Prov. Luxembourg (B)	10.41
BE35	BELGIUM_Prov. Namur	10.88
CZ01	CZECH REPUBLIC_Praha	9.63
CZ02	CZECH REPUBLIC_Stredni Cechy	9.68
CZ03	CZECH REPUBLIC_Jihozapad	9.49
CZ04	CZECH REPUBLIC_Severozapad	9.10
CZ05	CZECH REPUBLIC_Severovychod	9.55
CZ06	CZECH REPUBLIC_Jihovychod	9.53
CZ07	CZECH REPUBLIC_Stredni Morava	9.32
CZ08	CZECH REPUBLIC_Moravskoslezko	9.66
DE11	GERMANY_Stuttgart	6.85
DE12	GERMANY_Karlsruhe	6.38
DE13	GERMANY_Freiburg	5.95
DE14	GERMANY_Tubingen	6.27
DE21	GERMANY_Oberbayern	6.89
DE22	GERMANY_Niederbayern	5.93
DE23	GERMANY_Oberpfalz	5.96
DE24	GERMANY_Oberfranken	5.55
DE25	GERMANY_Mittelfranken	5.85
DE26	GERMANY_Unterfranken	5.94
DE27	GERMANY_Schwaben	5.91
DE30	GERMANY_Berlin	6.75
DE40	GERMANY_Brandenburg - Nordost	6.17
DE50	GERMANY_Bremen	6.05
DE60	GERMANY_Hamburg	5.65
DE71	GERMANY_Darmstadt	7.02
DE72	GERMANY_Giessen	5.66

DE73	GERMANY_Kassel	5.76
DE80	GERMANY_Mecklenburg-Vorpommern	6.03
DE91	GERMANY_Braunschweig	6.25
DE92	GERMANY_Hannover	6.02
DE93	GERMANY_Luneburg	5.11
DE94	GERMANY_Weser-Ems	5.94
DEA1	GERMANY_Dusseldorf	4.89
DEA2	GERMANY_Koln	5.26
DEA3	GERMANY_Munster	5.19
DEA4	GERMANY_Detmold	6.01
DEA5	GERMANY_Arnsberg	5.08
DEB1	GERMANY_Koblenz	5.63
DEB2	GERMANY_Trier	5.24
DEB3	GERMANY_Rheinhessen-Pfalz	5.19
DEC0	GERMANY_Saarland	5.86
DED2	GERMANY_Chemnitz	5.81
DED4	GERMANY_Dresden	6.44
DED5	GERMANY_Leipzig	6.09
DEE0	GERMANY_Sachsen-Anhalt	5.49
DEF0	GERMANY_Schleswig-Holstein	5.02
DEG0	GERMANY_Thüringen	6.01
DK01	DENMARK_Hovedstadsreg	11.06
DK02	DENMARK_Ost for Storebælt	10.65
DK03	DENMARK_West_for_Storebelt	11.04
EE00	ESTONIA_Eesti	18.13
ES11	SPAIN_Galicia	4.84
ES12	SPAIN_Principado de Asturias	4.68
ES13	SPAIN_Cantabria	5.37
ES21	SPAIN_Pais Vasco	6.16
ES22	SPAIN_Foral de Navarra	5.68
ES23	SPAIN_La Rioja	5.52
ES24	SPAIN_Aragon	5.50
ES30	SPAIN_Comunidad de Madrid	6.40
ES41	SPAIN_Castilla y Leon	4.42
ES42	SPAIN_Castilla-la Mancha	5.01
ES43	SPAIN_Extremadura	5.56
ES51	SPAIN_Cataluna	5.72
ES52	SPAIN_Comunidad Valenciana	4.85
ES53	SPAIN_Illes Balears	4.70
ES61	SPAIN_Andalucia	3.20
ES62	SPAIN_Region de Murcia	5.51
ES63	SPAIN_Ceuta (ES)	5.64
ES64	SPAIN_Melilla (ES)	5.72
ES70	SPAIN_Canarias_ES	4.27
FI19	FINALND_Ita-Suomi	15.85
FI1B	FINALND_Etela-Suomi	13.78
FI1C	FINALND_Lansi-Suomi	15.27
FI1D	FINALND_Pohjois-Suomi	16.68
FI20	FINALND_Aland	14.00
FR10	FRANCE_Ile de France	3.66

FRF2	FRANCE_Champagne-Ardenne	4.02
FRE2	FRANCE_Picardie	3.28
FRD2	FRANCE_Haute-Normandie	3.89
FRB0	FRANCE_Centre	3.52
FRD1	FRANCE_Basse-Normandie	4.02
FRC1	FRANCE_Bourgogne	3.35
FRE1	FRANCE_Nord - Pas-de-Calais	3.80
FRF2	FRANCE_Lorraine	3.41
FRF1	FRANCE_Alsace	3.65
FRC2	FRANCE_Franche-Comte	3.49
FRG0	FRANCE_Pays de la Loire	3.85
FRH0	FRANCE_Bretagne	3.44
FRI3	FRANCE_Poitou-Charentes	3.77
FRI1	FRANCE_Aquitaine	3.40
FRJ2	FRANCE_Midi-Pyrenees	3.66
FRI2	FRANCE_Limousin	3.59
FRK2	FRANCE_Rhone-Alpes	4.72
FRK1	FRANCE_Auvergne	3.72
FRJ1	FRANCE_Languedoc-Roussillon	4.41
FRL0	FRANCE_Provence-Alpes-Cote d Azur	5.38
FRM0	FRANCE_Corse	5.89
EL30	GREECE_Anatoliki Makedonia Thraki	6.44
EL41	GREECE_Kentriki Makedonia	5.97
EL42	GREECE_Dytiki Makedonia	6.07
EL43	GREECE_Thessalia	5.79
EL51	GREECE_Ipeiros	5.55
EL52	GREECE_Ionia Nisia	6.80
EL53	GREECE_Dytiki Ellada	5.73
EL54	GREECE_Sterea Ellada	5.68
EL61	GREECE_Peloponnisos	5.99
EL62	GREECE_Attiki	7.50
EL63	GREECE_Voreio Aigaio	5.74
EL64	GREECE_Notio Aigaio	7.13
EL65	GREECE_Kriti	6.50
HU11	HUNGARY_Kozep-Magyarorszag	15.52
HU21	HUNGARY_Kozep-Dunantul	13.30
HU22	HUNGARY_Nyugat-Dunantul	13.28
HU23	HUNGARY_Del-Dunantul	11.43
HU31	HUNGARY_eszak-Magyarorszag	12.51
HU32	HUNGARY_eszak-Alfold	12.45
HU33	HUNGARY_Del-Alfold	12.12
IE04	IRELAND_Border Midlands	22.01
IE05	IRELAND_Southern and Eastern	25.85
ITC1	ITALY_Piemonte	5.68
ITC2	ITALY_Valle dAosta Vallee dAoste	3.58
ITC3	ITALY_Liguria	3.37
ITC4	ITALY_Lombardia	4.66
ITH1	ITALY_Bolzano-Bozen	2.78
ITH2	ITALY_Provincia Autonoma Trento	3.53
ITH3	ITALY_Veneto	4.39

ITH4	ITALY_Friuli-Venezia Giulia	3.85
ITH5	ITALY_Emilia-Romagna	4.27
ITI1	ITALY_Toscana	4.54
ITI2	ITALY_Umbria	3.89
ITI3	ITALY_Marche	4.27
ITI4	ITALY_Lazio	4.56
ITF1	ITALY_Abruzzo	3.68
ITF2	ITALY_Molise	3.44
ITF3	ITALY_Campania	3.98
ITF4	ITALY_Puglia	3.82
ITF5	ITALY_Basilicata	3.75
ITF6	ITALY_Calabria	4.92
ITG1	ITALY_Sicilia	5.00
ITG2	ITALY_Sardegna	5.22
LT01	LITHUANIA_Lietuva	15.58
LU00	LUXEMBOURG_Luxembourg (Grand-D)	28.59
LV00	LATVIA_Latvija	12.43
MT00	MALTA_Malta	22.73
NL11	NETHERLANDS_Groningen	11.21
NL12	NETHERLANDS_Friesland	9.49
NL13	NETHERLANDS_Drenthe	9.11
NL21	NETHERLANDS_Overijssel	9.26
NL22	NETHERLANDS_Gelderland	8.48
NL23	NETHERLANDS_Flevoland	9.86
NL31	NETHERLANDS_Utrecht	8.64
NL32	NETHERLANDS_Noord-Holland	9.49
NL33	NETHERLANDS_Zuid-Holland	10.42
NL34	NETHERLANDS_Zeeland	10.56
NL41	NETHERLANDS_Noord-Brabant	9.81
NL42	NETHERLANDS_Limburg (NL)	8.84
PL71	POLAND_Lódzkie	7.23
PL92	POLAND_Mazowieckie	8.36
PL21	POLAND_Malopolskie	7.42
PL22	POLAND_Slaskie	7.55
PL81	POLAND_Lubelskie	7.79
PL82	POLAND_Podkarpackie	7.45
PL72	POLAND_Swietokrzyskie	7.52
PL84	POLAND_Podlaskie	7.72
PL41	POLAND_Wielkopolskie	7.84
PL42	POLAND_Zachodniopomorskie	6.78
PL43	POLAND_Lubuskie	7.22
PL51	POLAND_Dolnoslaskie	7.99
PL52	POLAND_Opolskie	7.15
PL61	POLAND_Kujawsko-Pomorskie	7.06
PL62	POLAND_Warminsko-Mazurskie	7.70
PL63	POLAND_Pomorskie	7.46
PT11	PORTUGAL_Norte	5.99
PT15	PORTUGAL_Algarve	6.07
PT16	PORTUGAL_Centro (PT)	5.99
PT17	PORTUGAL_Lisboa	6.25

PT18	PORTUGAL_Alentejo	6.39
SE11	SWEDEN_Stockholm	13.99
SE12	SWEDEN_ostra Mellansverige	12.15
SE22	SWEDEN_Sydsverige	13.64
SE31	SWEDEN_Norra Mellansverige	9.96
SE32	SWEDEN_Mellersta Norrland	6.97
SE33	SWEDEN_ovre Norrland	11.32
SE21	SWEDEN_Småland med oarna	13.69
SE23	SWEDEN_Västsverige	15.37
SI03	SLOVENIA_Slovenija	13.15
SK01	SLOVAKIA_Bratislavský kraj	10.57
SK02	SLOVAKIA_Zapadne Slovensko	9.13
SK03	SLOVAKIA_Stredne Slovensko	8.66
SK04	SLOVAKIA_Východne Slovensko	8.45
UKC1	UK_Tees Valley and Durham	7.59
UKC2	UK_Northumberland Tyne and Wear	7.47
UKD1	UK_Cumbria	8.08
UKD3	UK_Cheshire	7.79
UKD4	UK_Greater Manchester	7.76
UKD6	UK_Lancashire	8.44
UKD7	UK_Merseyside	7.54
UKE1	UK_East Riding, North Lincolnshire	8.36
UKE2	UK_North Yorkshire	8.26
UKE3	UK_South Yorkshire	7.28
UKE4	UK_West Yorkshire	7.58
UKF1	UK_Derbyshire and Nottinghamshire	7.53
UKF2	UK_Leicestershire Rutland	9.26
UKF3	UK_Lincolnshire	8.27
UKG1	UK_Herefordshire Worcestershire	8.68
UKG2	UK_Shropshire and Staffordshire	8.77
UKG3	UK_West Midlands	7.53
UKH1	UK_East Anglia	7.59
UKH2	UK_Bedfordshire Hertfordshire	6.98
UKH3	UK_Essex	7.18
UKI4	UK_Inner London	8.38
UKI5	UK_Outer London	6.33
UKJ1	UK_Berkshire Bucks Oxfordshire	7.84
UKJ2	UK_Surrey East and West Sussex	7.27
UKJ3	UK_Hampshire and Isle of Wight	9.89
UKJ4	UK_Kent	8.51
UKK1	UK_Gloucestershire Wiltshire	10.64
UKK2	UK_Dorset and Somerset	8.66
UKK3	UK_Cornwall and Isles of Scilly	8.68
UKK4	UK_Devon	8.77
UKL1	UK_West Wales and The Valleys	6.75
UKL2	UK_East Wales	6.16
UKM5	UK_North Eastern Scotland	4.92
UKM7	UK_Eastern Scotland	5.98
UKM8	UK_South Western Scotland	7.84
UKM6	UK_Highlands and Islands	6.50

UKN0	UK_Northern Ireland	7.73

Table B.3. Output losses due to an interruption of EU GVCs (Figure 5)

CODE	COUNTRY_REGION	Output Losses (percentage)
AT11	AUSTRIA_Burgenland	10.66
AT12	AUSTRIA_Niederosterreich	11.53
AT13	AUSTRIA_Wien	11.03
AT21	AUSTRIA_Karnten	11.53
AT22	AUSTRIA_Steiermark	11.50
AT31	AUSTRIA_Oberosterreich	11.70
AT32	AUSTRIA_Salzburg	11.48
AT33	AUSTRIA_Tirol	11.60
AT34	AUSTRIA_Vorarlberg	12.87
BE10	BELGIUM_Region de Bruxelles	13.73
BE21	BELGIUM_Prov. Antwerpen	17.33
BE22	BELGIUM_Prov. Limburg (B)	17.38
BE23	BELGIUM_Prov. Oost-Vlaanderen	15.04
BE24	BELGIUM_Prov. Vlaams Brabant	16.68
BE25	BELGIUM_Prov. West-Vlaanderen	16.97
BE31	BELGIUM_Prov. Brabant Wallon	17.66
BE32	BELGIUM_Prov. Hainaut	14.78
BE33	BELGIUM_Prov. Liege	15.98
BE34	BELGIUM_Prov. Luxembourg (B)	16.50
BE35	BELGIUM_Prov. Namur	14.52
CZ01	CZECH REPUBLIC_Praha	14.59
CZ02	CZECH REPUBLIC_Stredni Cechy	16.60
CZ03	CZECH REPUBLIC_Jihozapad	15.98
CZ04	CZECH REPUBLIC_Severozapad	15.39
CZ05	CZECH REPUBLIC_Severovychod	16.31
CZ06	CZECH REPUBLIC_Jihovychod	16.01
CZ07	CZECH REPUBLIC_Stredni Morava	15.98
CZ08	CZECH REPUBLIC_Moravskoslezko	16.35
DE11	GERMANY_Stuttgart	13.02
DE12	GERMANY_Karlsruhe	12.54
DE13	GERMANY_Freiburg	12.14
DE14	GERMANY_Tubingen	12.56
DE21	GERMANY_Oberbayern	12.60
DE22	GERMANY_Niederbayern	12.12
DE23	GERMANY_Oberpfalz	12.59
DE24	GERMANY_Oberfranken	12.00
DE25	GERMANY_Mittelfranken	12.27
DE26	GERMANY_Unterfranken	12.25
DE27	GERMANY_Schwaben	11.98
DE30	GERMANY_Berlin	10.91
DE40	GERMANY_Brandenburg - Nordost	10.79
DE50	GERMANY_Bremen	12.39
DE60	GERMANY_Hamburg	10.58
DE71	GERMANY_Darmstadt	12.37
DE72	GERMANY_Giessen	11.83

DE73	GERMANY_Kassel	11.69
DE80	GERMANY_Mecklenburg-Vorpommern	9.86
DE91	GERMANY_Braunschweig	12.45
DE92	GERMANY_Hannover	11.55
DE93	GERMANY_Luneburg	9.60
DE94	GERMANY_Weser-Ems	11.34
DEA1	GERMANY_Dusseldorf	10.63
DEA2	GERMANY_Koln	10.75
DEA3	GERMANY_Munster	10.36
DEA4	GERMANY_Detmold	11.86
DEA5	GERMANY_Arnsberg	10.99
DEB1	GERMANY_Koblenz	11.13
DEB2	GERMANY_Trier	10.18
DEB3	GERMANY_Rheinhessen-Pfalz	10.77
DEC0	GERMANY_Saarland	12.49
DED2	GERMANY_Chemnitz	10.52
DED4	GERMANY_Dresden	11.73
DED5	GERMANY_Leipzig	10.22
DEE0	GERMANY_Sachsen-Anhalt	10.14
DEF0	GERMANY_Schleswig-Holstein	10.44
DEG0	GERMANY_Thüringen	11.16
DK01	DENMARK_Hovedstadsreg	8.21
DK02	DENMARK_Ost for Storebælt	8.36
DK03	DENMARK_West_for_Storebelt	8.56
EE00	ESTONIA_Eesti	6.82
ES11	SPAIN_Galicia	3.91
ES12	SPAIN_Principado de Asturias	4.40
ES13	SPAIN_Cantabria	4.88
ES21	SPAIN_Pais Vasco	5.30
ES22	SPAIN_Foral de Navarra	4.97
ES23	SPAIN_La Rioja	5.10
ES24	SPAIN_Aragon	4.56
ES30	SPAIN_Comunidad de Madrid	5.72
ES41	SPAIN_Castilla y Leon	3.86
ES42	SPAIN_Castilla-la Mancha	4.27
ES43	SPAIN_Extremadura	4.25
ES51	SPAIN_Cataluna	5.48
ES52	SPAIN_Comunidad Valenciana	5.04
ES53	SPAIN_Illes Balears	3.62
ES61	SPAIN_Andalucia	3.25
ES62	SPAIN_Region de Murcia	4.99
ES63	SPAIN_Ceuta (ES)	3.61
ES64	SPAIN_Melilla (ES)	4.00
ES70	SPAIN_Canarias_ES	3.41
FI19	FINALND_Ita-Suomi	6.15
FI1B	FINALND_Etela-Suomi	5.47
FI1C	FINALND_Lansi-Suomi	5.84
FI1D	FINALND_Pohjois-Suomi	6.88
FI20	FINALND_Aland	5.33
FR10	FRANCE_Ile de France	5.50

FRF2	FRANCE_Champagne-Ardenne	7.30
FRE2	FRANCE_Picardie	5.98
FRD2	FRANCE_Haute-Normandie	7.59
FRB0	FRANCE_Centre	6.07
FRD1	FRANCE_Basse-Normandie	6.77
FRC1	FRANCE_Bourgogne	6.41
FRE1	FRANCE_Nord - Pas-de-Calais	5.75
FRF2	FRANCE_Lorraine	5.71
FRF1	FRANCE_Alsace	6.75
FRC2	FRANCE_Franche-Comte	6.84
FRG0	FRANCE_Pays de la Loire	6.19
FRH0	FRANCE_Bretagne	5.25
FRI3	FRANCE_Poitou-Charentes	5.88
FRI1	FRANCE_Aquitaine	5.51
FRJ2	FRANCE_Midi-Pyrenees	5.87
FRI2	FRANCE_Limousin	6.61
FRK2	FRANCE_Rhone-Alpes	7.12
FRK1	FRANCE_Auvergne	7.29
FRJ1	FRANCE_Languedoc-Roussillon	5.74
FRL0	FRANCE_Provence-Alpes-Cote d Azur	6.66
FRM0	FRANCE_Corse	6.82
EL30	GREECE_Anatoliki Makedonia Thraki	1.08
EL41	GREECE_Kentriki Makedonia	1.08
EL42	GREECE_Dytiki Makedonia	1.09
EL43	GREECE_Thessalia	0.92
EL51	GREECE_Ipeiros	1.08
EL52	GREECE_Ionia Nisia	1.23
EL53	GREECE_Dytiki Ellada	0.90
EL54	GREECE_Sterea Ellada	0.99
EL61	GREECE_Peloponnisos	1.16
EL62	GREECE_Attiki	1.17
EL63	GREECE_Voreio Aigaio	1.30
EL64	GREECE_Notio Aigaio	1.24
EL65	GREECE_Kriti	1.10
HU11	HUNGARY_Kozep-Magyarorszag	13.55
HU21	HUNGARY_Kozep-Dunantul	13.15
HU22	HUNGARY_Nyugat-Dunantul	13.63
HU23	HUNGARY_Del-Dunantul	11.73
HU31	HUNGARY_eszak-Magyarorszag	11.81
HU32	HUNGARY_eszak-Alfold	11.64
HU33	HUNGARY_Del-Alfold	12.13
IE04	IRELAND_Border Midlands	9.96
IE05	IRELAND_Southern and Eastern	11.54
ITC1	ITALY_Piemonte	6.63
ITC2	ITALY_Valle dAosta Vallee dAoste	3.89
ITC3	ITALY_Liguria	4.09
ITC4	ITALY_Lombardia	6.14
ITH1	ITALY_Bolzano-Bozen	3.34
ITH2	ITALY_Provincia Autonoma Trento	4.63
ITH3	ITALY_Veneto	5.98

ITH4	ITALY_Friuli-Venezia Giulia	5.13
ITH5	ITALY_Emilia-Romagna	5.94
ITI1	ITALY_Toscana	5.64
ITI2	ITALY_Umbria	4.70
ITI3	ITALY_Marche	5.44
ITI4	ITALY_Lazio	5.51
ITF1	ITALY_Abruzzo	4.88
ITF2	ITALY_Molise	4.66
ITF3	ITALY_Campania	4.97
ITF4	ITALY_Puglia	4.84
ITF5	ITALY_Basilicata	4.47
ITF6	ITALY_Calabria	5.11
ITG1	ITALY_Sicilia	4.96
ITG2	ITALY_Sardegna	5.55
LT01	LITHUANIA_Lietuva	5.26
LU00	LUXEMBOURG_Luxembourg (Grand-D)	17.90
LV00	LATVIA_Latvija	4.86
MT00	MALTA_Malta	7.52
NL11	NETHERLANDS_Groningen	17.76
NL12	NETHERLANDS_Friesland	14.78
NL13	NETHERLANDS_Drenthe	16.17
NL21	NETHERLANDS_Overijssel	16.04
NL22	NETHERLANDS_Gelderland	11.83
NL23	NETHERLANDS_Flevoland	17.05
NL31	NETHERLANDS_Utrecht	12.27
NL32	NETHERLANDS_Noord-Holland	13.97
NL33	NETHERLANDS_Zuid-Holland	16.65
NL34	NETHERLANDS_Zeeland	17.22
NL41	NETHERLANDS_Noord-Brabant	14.66
NL42	NETHERLANDS_Limburg (NL)	13.90
PL71	POLAND_Lódzkie	7.81
PL92	POLAND_Mazowieckie	8.63
PL21	POLAND_Malopolskie	7.74
PL22	POLAND_Slaskie	8.14
PL81	POLAND_Lubelskie	8.29
PL82	POLAND_Podkarpackie	7.68
PL72	POLAND_Swietokrzyskie	8.26
PL84	POLAND_Podlaskie	8.13
PL41	POLAND_Wielkopolskie	8.81
PL42	POLAND_Zachodniopomorskie	7.85
PL43	POLAND_Lubuskie	8.47
PL51	POLAND_Dolnoslaskie	8.02
PL52	POLAND_Opolskie	8.53
PL61	POLAND_Kujawsko-Pomorskie	7.91
PL62	POLAND_Warminsko-Mazurskie	8.47
PL63	POLAND_Pomorskie	8.12
PT11	PORTUGAL_Norte	4.48
PT15	PORTUGAL_Algarve	3.82
PT16	PORTUGAL_Centro (PT)	4.64
PT17	PORTUGAL_Lisboa	4.47

PT18	PORTUGAL_Alentejo	4.55
SE11	SWEDEN_Stockholm	8.18
SE12	SWEDEN_ostra Mellansverige	8.97
SE22	SWEDEN_Sydsverige	9.27
SE31	SWEDEN_Norra Mellansverige	6.57
SE32	SWEDEN_Mellersta Norrland	5.31
SE33	SWEDEN_ovre Norrland	7.45
SE21	SWEDEN_Småland med oarna	10.16
SE23	SWEDEN_Västsverige	10.25
SI03	SLOVENIA_Slovenija	6.62
SK01	SLOVAKIA_Bratislavský kraj	13.73
SK02	SLOVAKIA_Zapadne Slovensko	13.49
SK03	SLOVAKIA_Stredne Slovensko	12.48
SK04	SLOVAKIA_Východne Slovensko	12.46
UKC1	UK_Tees Valley and Durham	7.03
UKC2	UK_Northumberland Tyne and Wear	7.18
UKD1	UK_Cumbria	9.18
UKD3	UK_Cheshire	8.31
UKD4	UK_Greater Manchester	6.80
UKD6	UK_Lancashire	8.53
UKD7	UK_Merseyside	6.08
UKE1	UK_East Riding, North Lincolnshire	8.93
UKE2	UK_North Yorkshire	7.62
UKE3	UK_South Yorkshire	7.04
UKE4	UK_West Yorkshire	7.18
UKF1	UK_Derbyshire and Nottinghamshire	6.93
UKF2	UK_Leicestershire Rutland	8.64
UKF3	UK_Lincolnshire	7.27
UKG1	UK_Herefordshire Worcestershire	8.16
UKG2	UK_Shropshire and Staffordshire	7.88
UKG3	UK_West Midlands	7.47
UKH1	UK_East Anglia	6.89
UKH2	UK_Bedfordshire Hertfordshire	6.60
UKH3	UK_Essex	7.22
UKI4	UK_Inner London	6.22
UKI5	UK_Outer London	6.04
UKJ1	UK_Berkshire Bucks Oxfordshire	7.34
UKJ2	UK_Surrey East and West Sussex	6.87
UKJ3	UK_Hampshire and Isle of Wight	8.45
UKJ4	UK_Kent	8.05
UKK1	UK_Gloucestershire Wiltshire	8.93
UKK2	UK_Dorset and Somerset	7.68
UKK3	UK_Cornwall and Isles of Scilly	7.15
UKK4	UK_Devon	7.52
UKL1	UK_West Wales and The Valleys	6.88
UKL2	UK_East Wales	6.91
UKM5	UK_North Eastern Scotland	5.79
UKM7	UK_Eastern Scotland	6.61
UKM8	UK_South Western Scotland	7.40
UKM6	UK_Highlands and Islands	5.93

UKN0	UK_Northern Ireland	6.62

Table B.4. Regional change in value-added shares in the back to the past scenario (Figure 7)

CODE	COUNTRY_REGION	Change in Value-Added (percentage)
AT11	AUSTRIA_Burgenland	-0.56
AT12	AUSTRIA_Niederosterreich	-1.06
AT13	AUSTRIA_Wien	-1.50
AT21	AUSTRIA_Karnten	-1.01
AT22	AUSTRIA_Steiermark	-0.71
AT31	AUSTRIA_Oberosterreich	-1.77
AT32	AUSTRIA_Salzburg	-2.50
AT33	AUSTRIA_Tirol	-1.03
AT34	AUSTRIA_Vorarlberg	-3.94
BE10	BELGIUM_Region de Bruxelles	1.54
BE21	BELGIUM_Prov. Antwerpen	1.92
BE22	BELGIUM_Prov. Limburg (B)	0.55
BE23	BELGIUM_Prov. Oost-Vlaanderen	-1.32
BE24	BELGIUM_Prov. Vlaams Brabant	-0.95
BE25	BELGIUM_Prov. West-Vlaanderen	2.34
BE31	BELGIUM_Prov. Brabant Wallon	-8.31
BE32	BELGIUM_Prov. Hainaut	3.09
BE33	BELGIUM_Prov. Liege	0.99
BE34	BELGIUM_Prov. Luxembourg (B)	1.56
BE35	BELGIUM_Prov. Namur	0.01
CZ01	CZECH REPUBLIC_Praha	-11.01
CZ02	CZECH REPUBLIC_Stredni Cechy	-6.78
CZ03	CZECH REPUBLIC_Jihozapad	-3.70
CZ04	CZECH REPUBLIC_Severozapad	1.33
CZ05	CZECH REPUBLIC_Severovychod	-1.02
CZ06	CZECH REPUBLIC_Jihovychod	-5.97
CZ07	CZECH REPUBLIC_Stredni Morava	-4.23
CZ08	CZECH REPUBLIC_Moravskoslezko	-5.07
DE11	GERMANY_Stuttgart	-1.22
DE12	GERMANY_Karlsruhe	-0.84
DE13	GERMANY_Freiburg	0.54
DE14	GERMANY_Tubingen	-3.02
DE21	GERMANY_Oberbayern	-0.71
DE22	GERMANY_Niederbayern	-5.07
DE23	GERMANY_Oberpfalz	-2.73
DE24	GERMANY_Oberfranken	-1.45
DE25	GERMANY_Mittelfranken	-0.81
DE26	GERMANY_Unterfranken	-1.20
DE27	GERMANY_Schwaben	-2.67
DE30	GERMANY_Berlin	-3.81
DE40	GERMANY_Brandenburg - Nordost	-5.97
DE50	GERMANY_Bremen	-1.08
DE60	GERMANY_Hamburg	3.01
DE71	GERMANY_Darmstadt	2.02

DE72	GERMANY_Giessen	0.83
DE73	GERMANY_Kassel	1.13
DE80	GERMANY_Mecklenburg-Vorpommern	-3.85
DE91	GERMANY_Braunschweig	-1.59
DE92	GERMANY_Hannover	-2.91
DE93	GERMANY_Luneburg	0.17
DE94	GERMANY_Weser-Ems	-2.38
DEA1	GERMANY_Dusseldorf	-5.41
DEA2	GERMANY_Koln	0.90
DEA3	GERMANY_Munster	-3.23
DEA4	GERMANY_Detmold	1.14
DEA5	GERMANY_Arnsberg	-0.25
DEB1	GERMANY_Koblenz	-1.84
DEB2	GERMANY_Trier	-0.29
DEB3	GERMANY_Rheinhessen-Pfalz	-0.85
DEC0	GERMANY_Saarland	0.10
DED2	GERMANY_Chemnitz	-3.63
DED4	GERMANY_Dresden	-5.10
DED5	GERMANY_Leipzig	-5.73
DEE0	GERMANY_Sachsen-Anhalt	-4.16
DEF0	GERMANY_Schleswig-Holstein	0.75
DEG0	GERMANY_Thüringen	-5.82
DK01	DENMARK_Hovedstadsreg	-1.05
DK02	DENMARK_Ost for Storebælt	0.86
DK03	DENMARK_West_for_Storebelt	1.22
EE00	ESTONIA_Eesti	1.75
ES11	SPAIN_Galicia	-5.63
ES12	SPAIN_Principado de Asturias	-3.36
ES13	SPAIN_Cantabria	-1.65
ES21	SPAIN_Pais Vasco	-36.11
ES22	SPAIN_Foral de Navarra	-3.29
ES23	SPAIN_La Rioja	-5.88
ES24	SPAIN_Aragon	-4.02
ES30	SPAIN_Comunidad de Madrid	-11.01
ES41	SPAIN_Castilla y Leon	-2.93
ES42	SPAIN_Castilla-la Mancha	-4.73
ES43	SPAIN_Extremadura	-1.88
ES51	SPAIN_Cataluna	-7.36
ES52	SPAIN_Comunidad Valenciana	53.96
ES53	SPAIN_Illes Balears	-5.09
ES61	SPAIN_Andalucia	-1.72
ES62	SPAIN_Region de Murcia	-8.05
ES63	SPAIN_Ceuta (ES)	-3.33
ES64	SPAIN_Melilla (ES)	-2.03
ES70	SPAIN_Canarias_ES	-4.71
FI19	FINALND_Ita-Suomi	18.78
FI1B	FINALND_Etela-Suomi	6.22
FI1C	FINALND_Lansi-Suomi	7.03
FI1D	FINALND_Pohjois-Suomi	3.30
FI20	FINALND_Aland	-2.15

FR10	FRANCE_Ile de France	-0.15
FRF2	FRANCE_Champagne-Ardenne	4.17
FRE2	FRANCE_Picardie	3.30
FRD2	FRANCE_Haute-Normandie	2.66
FRB0	FRANCE_Centre	2.61
FRD1	FRANCE_Basse-Normandie	2.55
FRC1	FRANCE_Bourgogne	3.65
FRE1	FRANCE_Nord - Pas-de-Calais	1.86
FRF2	FRANCE_Lorraine	5.32
FRF1	FRANCE_Alsace	2.46
FRC2	FRANCE_Franche-Comte	5.30
FRG0	FRANCE_Pays de la Loire	0.31
FRH0	FRANCE_Bretagne	2.02
FRI3	FRANCE_Poitou-Charentes	1.67
FRI1	FRANCE_Aquitaine	0.63
FRJ2	FRANCE_Midi-Pyrenees	-0.03
FRI2	FRANCE_Limousin	3.82
FRK2	FRANCE_Rhone-Alpes	-0.71
FRK1	FRANCE_Auvergne	2.49
FRJ1	FRANCE_Languedoc-Roussillon	-0.76
FRL0	FRANCE_Provence-Alpes-Cote d Azur	-2.04
FRM0	FRANCE_Corse	-2.28
EL30	GREECE_Anatoliki Makedonia Thraki	5.22
EL41	GREECE_Kentriki Makedonia	14.59
EL42	GREECE_Dytiki Makedonia	-4.22
EL43	GREECE_Thessalia	11.65
EL51	GREECE_Ipeiros	13.44
EL52	GREECE_Ionia Nisia	2.47
EL53	GREECE_Dytiki Ellada	8.96
EL54	GREECE_Sterea Ellada	13.85
EL61	GREECE_Peloponnisos	24.44
EL62	GREECE_Attiki	-3.99
EL63	GREECE_Voreio Aigaio	6.78
EL64	GREECE_Notio Aigaio	1.10
EL65	GREECE_Kriti	5.79
HU11	HUNGARY_Kozep-Magyarorszag	-15.97
HU21	HUNGARY_Kozep-Dunantul	-3.01
HU22	HUNGARY_Nyugat-Dunantul	-2.39
HU23	HUNGARY_Del-Dunantul	-0.10
HU31	HUNGARY_eszak-Magyarorszag	-1.00
HU32	HUNGARY_eszak-Alfold	-1.27
HU33	HUNGARY_Del-Alfold	1.95
IE04	IRELAND_Border Midlands	-10.96
IE05	IRELAND_Southern and Eastern	-10.50
ITC1	ITALY_Piemonte	-1.94
ITC2	ITALY_Valle dAosta Vallee dAoste	1.33
ITC3	ITALY_Liguria	1.48
ITC4	ITALY_Lombardia	11.53
ITH1	ITALY_Bolzano-Bozen	0.50
ITH2	ITALY_Provincia Autonoma Trento	-0.35

ITH3	ITALY_Veneto	7.70
ITH4	ITALY_Friuli-Venezia Giulia	1.19
ITH5	ITALY_Emilia-Romagna	7.52
ITI1	ITALY_Toscana	2.27
ITI2	ITALY_Umbria	-0.52
ITI3	ITALY_Marche	-1.56
ITI4	ITALY_Lazio	1.77
ITF1	ITALY_Abruzzo	-4.06
ITF2	ITALY_Molise	0.68
ITF3	ITALY_Campania	-8.05
ITF4	ITALY_Puglia	-5.07
ITF5	ITALY_Basilicata	0.31
ITF6	ITALY_Calabria	-3.16
ITG1	ITALY_Sicilia	-2.70
ITG2	ITALY_Sardegna	-5.66
LT01	LITHUANIA_Lietuva	-8.13
LU00	LUXEMBOURG_Luxembourg (Grand-D)	-1.95
LV00	LATVIA_Latvija	-0.77
MT00	MALTA_Malta	-10.49
NL11	NETHERLANDS_Groningen	-11.40
NL12	NETHERLANDS_Friesland	-0.61
NL13	NETHERLANDS_Drenthe	1.08
NL21	NETHERLANDS_Overijssel	-2.52
NL22	NETHERLANDS_Gelderland	1.27
NL23	NETHERLANDS_Flevoland	-7.57
NL31	NETHERLANDS_Utrecht	3.20
NL32	NETHERLANDS_Noord-Holland	-0.50
NL33	NETHERLANDS_Zuid-Holland	-0.04
NL34	NETHERLANDS_Zeeland	-5.88
NL41	NETHERLANDS_Noord-Brabant	-0.79
NL42	NETHERLANDS_Limburg (NL)	1.75
PL71	POLAND_Lódzkie	-0.64
PL92	POLAND_Mazowieckie	-10.95
PL21	POLAND_Malopolskie	-2.61
PL22	POLAND_Slaskie	1.65
PL81	POLAND_Lubelskie	3.99
PL82	POLAND_Podkarpackie	1.82
PL72	POLAND_Swietokrzyskie	2.65
PL84	POLAND_Podlaskie	1.56
PL41	POLAND_Wielkopolskie	-2.32
PL42	POLAND_Zachodniopomorskie	3.86
PL43	POLAND_Lubuskie	0.82
PL51	POLAND_Dolnoslaskie	-6.33
PL52	POLAND_Opolskie	3.17
PL61	POLAND_Kujawsko-Pomorskie	2.42
PL62	POLAND_Warminsko-Mazurskie	3.60
PL63	POLAND_Pomorskie	-1.37
PT11	PORTUGAL_Norte	3.49
PT15	PORTUGAL_Algarve	1.25
PT16	PORTUGAL_Centro (PT)	1.91

PT17	PORTUGAL_Lisboa	1.87
PT18	PORTUGAL_Alentejo	5.15
SE11	SWEDEN_Stockholm	-0.76
SE12	SWEDEN_ostra Mellansverige	4.06
SE22	SWEDEN_Sydsverige	6.86
SE31	SWEDEN_Norra Mellansverige	6.83
SE32	SWEDEN_Mellersta Norrland	2.66
SE33	SWEDEN_ovre Norrland	-1.58
SE21	SWEDEN_Småland med oarna	8.99
SE23	SWEDEN_Västsverige	5.20
SI03	SLOVENIA_Slovenija	5.12
SK01	SLOVAKIA_Bratislavský kraj	-2.83
SK02	SLOVAKIA_Zapadne Slovensko	3.57
SK03	SLOVAKIA_Stredne Slovensko	3.54
SK04	SLOVAKIA_Východne Slovensko	6.37
UKC1	UK_Tees Valley and Durham	6.61
UKC2	UK_Northumberland Tyne and Wear	-0.43
UKD1	UK_Cumbria	3.16
UKD3	UK_Cheshire	-0.64
UKD4	UK_Greater Manchester	2.07
UKD6	UK_Lancashire	6.66
UKD7	UK_Merseyside	1.34
UKE1	UK_East Riding, North Lincolnshire	2.50
UKE2	UK_North Yorkshire	3.25
UKE3	UK_South Yorkshire	-0.38
UKE4	UK_West Yorkshire	3.41
UKF1	UK_Derbyshire and Nottinghamshire	3.88
UKF2	UK_Leicestershire Rutland	3.40
UKF3	UK_Lincolnshire	0.86
UKG1	UK_Herefordshire Worcestershire	8.18
UKG2	UK_Shropshire and Staffordshire	4.58
UKG3	UK_West Midlands	10.04
UKH1	UK_East Anglia	2.80
UKH2	UK_Bedfordshire Hertfordshire	11.09
UKH3	UK_Essex	4.48
UKI4	UK_Inner London	-4.75
UKI5	UK_Outer London	11.58
UKJ1	UK_Berkshire Bucks Oxfordshire	5.56
UKJ2	UK_Surrey East and West Sussex	8.40
UKJ3	UK_Hampshire and Isle of Wight	1.03
UKJ4	UK_Kent	7.64
UKK1	UK_Gloucestershire Wiltshire	1.69
UKK2	UK_Dorset and Somerset	3.93
UKK3	UK_Cornwall and Isles of Scilly	-3.02
UKK4	UK_Devon	-1.15
UKL1	UK_West Wales and The Valleys	8.01
UKL2	UK_East Wales	9.32
UKM5	UK_North Eastern Scotland	-1.49
UKM7	UK_Eastern Scotland	5.78
UKM8	UK_South Western Scotland	9.46

UKM6	UK_Highlands and Islands	1.47
UKN0	UK_Northern Ireland	4.97

Table B.5. Positive regional change in value-added shares in the GVCs Europeanisation scenario (Figure 9)

CODE	COUNTRY_REGION	Output Gains (percentage)
AT11	AUSTRIA_Burgenland	9.74
AT12	AUSTRIA_Niederosterreich	10.56
AT13	AUSTRIA_Wien	10.39
AT21	AUSTRIA_Karnten	10.64
AT22	AUSTRIA_Steiermark	10.53
AT31	AUSTRIA_Oberosterreich	10.73
AT32	AUSTRIA_Salzburg	10.64
AT33	AUSTRIA_Tirol	10.47
AT34	AUSTRIA_Vorarlberg	11.85
BE10	BELGIUM_Region de Bruxelles	12.51
BE21	BELGIUM_Prov. Antwerpen	16.27
BE22	BELGIUM_Prov. Limburg (B)	17.11
BE23	BELGIUM_Prov. Oost-Vlaanderen	13.71
BE24	BELGIUM_Prov. Vlaams Brabant	15.92
BE25	BELGIUM_Prov. West-Vlaanderen	16.47
BE31	BELGIUM_Prov. Brabant Wallon	17.53
BE32	BELGIUM_Prov. Hainaut	13.52
BE33	BELGIUM_Prov. Liege	15.66
BE34	BELGIUM_Prov. Luxembourg (B)	16.43
BE35	BELGIUM_Prov. Namur	14.33
CZ01	CZECH REPUBLIC_Praha	14.10
CZ02	CZECH REPUBLIC_Stredni Cechy	16.34
CZ03	CZECH REPUBLIC_Jihozapad	15.75
CZ04	CZECH REPUBLIC_Severozapad	15.32
CZ05	CZECH REPUBLIC_Severovychod	16.07
CZ06	CZECH REPUBLIC_Jihovychod	15.73
CZ07	CZECH REPUBLIC_Stredni Morava	15.71
CZ08	CZECH REPUBLIC_Moravskoslezko	16.15
DE11	GERMANY_Stuttgart	11.80
DE12	GERMANY_Karlsruhe	11.28
DE13	GERMANY_Freiburg	10.92
DE14	GERMANY_Tubingen	11.36
DE21	GERMANY_Oberbayern	11.14
DE22	GERMANY_Niederbayern	10.69
DE23	GERMANY_Oberpfalz	11.27
DE24	GERMANY_Oberfranken	10.72
DE25	GERMANY_Mittelfranken	11.03
DE26	GERMANY_Unterfranken	10.89
DE27	GERMANY_Schwaben	10.91
DE30	GERMANY_Berlin	9.64
DE40	GERMANY_Brandenburg - Nordost	9.66
DE50	GERMANY_Bremen	10.94
DE60	GERMANY_Hamburg	9.07
DE71	GERMANY_Darmstadt	11.34

DE72	GERMANY_Giessen	10.57
DE73	GERMANY_Kassel	10.48
DE80	GERMANY_Mecklenburg-Vorpommern	8.61
DE91	GERMANY_Braunschweig	11.26
DE92	GERMANY_Hannover	10.41
DE93	GERMANY_Luneburg	8.69
DE94	GERMANY_Weser-Ems	10.23
DEA1	GERMANY_Dusseldorf	8.63
DEA2	GERMANY_Koln	8.76
DEA3	GERMANY_Munster	8.59
DEA4	GERMANY_Detmold	10.60
DEA5	GERMANY_Arnsberg	9.10
DEB1	GERMANY_Koblenz	9.85
DEB2	GERMANY_Trier	9.14
DEB3	GERMANY_Rheinhessen-Pfalz	9.18
DEC0	GERMANY_Saarland	10.76
DED2	GERMANY_Chemnitz	9.42
DED4	GERMANY_Dresden	10.37
DED5	GERMANY_Leipzig	9.03
DEE0	GERMANY_Sachsen-Anhalt	8.88
DEF0	GERMANY_Schleswig-Holstein	8.67
DEG0	GERMANY_Thüringen	9.89
DK01	DENMARK_Hovedstadsreg	10.83
DK02	DENMARK_Ost for Storebælt	10.69
DK03	DENMARK_West_for_Storebelt	10.79
EE00	ESTONIA_Eesti	8.00
ES11	SPAIN_Galicia	3.20
ES12	SPAIN_Principado de Asturias	3.90
ES13	SPAIN_Cantabria	4.29
ES21	SPAIN_Pais Vasco	4.44
ES22	SPAIN_Foral de Navarra	4.21
ES23	SPAIN_La Rioja	4.42
ES24	SPAIN_Aragon	3.90
ES30	SPAIN_Comunidad de Madrid	5.12
ES41	SPAIN_Castilla y Leon	3.36
ES42	SPAIN_Castilla-la Mancha	3.65
ES43	SPAIN_Extremadura	3.55
ES51	SPAIN_Cataluna	4.97
ES52	SPAIN_Comunidad Valenciana	4.37
ES53	SPAIN_Illes Balears	3.09
ES61	SPAIN_Andalucia	2.60
ES62	SPAIN_Region de Murcia	4.21
ES63	SPAIN_Ceuta (ES)	3.50
ES64	SPAIN_Melilla (ES)	3.70
ES70	SPAIN_Canarias_ES	2.90
FI19	FINALND_Ita-Suomi	5.98
FI1B	FINALND_Etela-Suomi	5.33
FI1C	FINALND_Lansi-Suomi	5.56
FI1D	FINALND_Pohjois-Suomi	6.90
FI20	FINALND_Aland	5.13

FR10	FRANCE_Ile de France	4.47
FRF2	FRANCE_Champagne-Ardenne	6.89
FRE2	FRANCE_Picardie	4.77
FRD2	FRANCE_Haute-Normandie	6.95
FRB0	FRANCE_Centre	4.69
FRD1	FRANCE_Basse-Normandie	6.11
FRC1	FRANCE_Bourgogne	4.98
FRE1	FRANCE_Nord - Pas-de-Calais	4.71
FRF2	FRANCE_Lorraine	4.62
FRF1	FRANCE_Alsace	5.31
FRC2	FRANCE_Franche-Comte	5.16
FRG0	FRANCE_Pays de la Loire	4.93
FRH0	FRANCE_Bretagne	3.96
FRI3	FRANCE_Poitou-Charentes	4.65
FRI1	FRANCE_Aquitaine	4.15
FRJ2	FRANCE_Midi-Pyrenees	4.42
FRI2	FRANCE_Limousin	5.53
FRK2	FRANCE_Rhone-Alpes	5.94
FRK1	FRANCE_Auvergne	7.30
FRJ1	FRANCE_Languedoc-Roussillon	5.55
FRL0	FRANCE_Provence-Alpes-Cote d Azur	6.25
FRM0	FRANCE_Corse	6.93
EL30	GREECE_Anatoliki Makedonia Thraki	0.61
EL41	GREECE_Kentriki Makedonia	0.67
EL42	GREECE_Dytiki Makedonia	0.60
EL43	GREECE_Thessalia	0.47
EL51	GREECE_Ipeiros	0.68
EL52	GREECE_Ionia Nisia	0.70
EL53	GREECE_Dytiki Ellada	0.46
EL54	GREECE_Sterea Ellada	0.56
EL61	GREECE_Peloponnisos	0.74
EL62	GREECE_Attiki	0.65
EL63	GREECE_Voreio Aigaio	0.87
EL64	GREECE_Notio Aigaio	0.64
EL65	GREECE_Kriti	0.62
HU11	HUNGARY_Kozep-Magyarorszag	9.88
HU21	HUNGARY_Kozep-Dunantul	10.29
HU22	HUNGARY_Nyugat-Dunantul	10.73
HU23	HUNGARY_Del-Dunantul	8.68
HU31	HUNGARY_eszak-Magyarorszag	9.04
HU32	HUNGARY_eszak-Alfold	8.41
HU33	HUNGARY_Del-Alfold	8.90
IE04	IRELAND_Border Midlands	9.22
IE05	IRELAND_Southern and Eastern	10.61
ITC1	ITALY_Piemonte	5.10
ITC2	ITALY_Valle dAosta Vallee dAoste	3.09
ITC3	ITALY_Liguria	3.25
ITC4	ITALY_Lombardia	4.78
ITH1	ITALY_Bolzano-Bozen	2.74
ITH2	ITALY_Provincia Autonoma Trento	3.78

ITH3	ITALY_Veneto	4.58
ITH4	ITALY_Friuli-Venezia Giulia	4.09
ITH5	ITALY_Emilia-Romagna	4.51
ITI1	ITALY_Toscana	4.46
ITI2	ITALY_Umbria	3.75
ITI3	ITALY_Marche	4.33
ITI4	ITALY_Lazio	4.40
ITF1	ITALY_Abruzzo	3.86
ITF2	ITALY_Molise	3.73
ITF3	ITALY_Campania	3.92
ITF4	ITALY_Puglia	3.88
ITF5	ITALY_Basilicata	3.48
ITF6	ITALY_Calabria	3.83
ITG1	ITALY_Sicilia	3.78
ITG2	ITALY_Sardegna	4.18
LT01	LITHUANIA_Lietuva	4.45
LU00	LUXEMBOURG_Luxembourg (Grand-D)	16.49
LV00	LATVIA_Latvija	4.16
MT00	MALTA_Malta	6.08
NL11	NETHERLANDS_Groningen	17.42
NL12	NETHERLANDS_Friesland	12.91
NL13	NETHERLANDS_Drenthe	14.96
NL21	NETHERLANDS_Overijssel	16.30
NL22	NETHERLANDS_Gelderland	11.58
NL23	NETHERLANDS_Flevoland	15.93
NL31	NETHERLANDS_Utrecht	12.67
NL32	NETHERLANDS_Noord-Holland	14.84
NL33	NETHERLANDS_Zuid-Holland	17.82
NL34	NETHERLANDS_Zeeland	17.47
NL41	NETHERLANDS_Noord-Brabant	15.76
NL42	NETHERLANDS_Limburg (NL)	13.52
PL71	POLAND_Lódzkie	6.75
PL92	POLAND_Mazowieckie	7.61
PL21	POLAND_Malopolskie	6.73
PL22	POLAND_Slaskie	7.15
PL81	POLAND_Lubelskie	7.69
PL82	POLAND_Podkarpackie	6.62
PL72	POLAND_Swietokrzyskie	7.74
PL84	POLAND_Podlaskie	7.51
PL41	POLAND_Wielkopolskie	8.13
PL42	POLAND_Zachodniopomorskie	7.08
PL43	POLAND_Lubuskie	7.68
PL51	POLAND_Dolnoslaskie	6.85
PL52	POLAND_Opolskie	7.94
PL61	POLAND_Kujawsko-Pomorskie	6.96
PL62	POLAND_Warminsko-Mazurskie	7.94
PL63	POLAND_Pomorskie	7.15
PT11	PORTUGAL_Norte	3.11
PT15	PORTUGAL_Algarve	2.90
PT16	PORTUGAL_Centro (PT)	3.11

PT17	PORTUGAL_Lisboa	3.28
PT18	PORTUGAL_Alentejo	3.18
SE11	SWEDEN_Stockholm	8.34
SE12	SWEDEN_ostra Mellansverige	9.32
SE22	SWEDEN_Sydsverige	9.32
SE31	SWEDEN_Norra Mellansverige	6.54
SE32	SWEDEN_Mellersta Norrland	5.64
SE33	SWEDEN_ovre Norrland	7.26
SE21	SWEDEN_Småland med oarna	10.43
SE23	SWEDEN_Västsverige	9.86
SI03	SLOVENIA_Slovenija	5.31
SK01	SLOVAKIA_Bratislavský kraj	11.73
SK02	SLOVAKIA_Zapadne Slovensko	11.34
SK03	SLOVAKIA_Stredne Slovensko	10.42
SK04	SLOVAKIA_Východne Slovensko	10.55
UKC1	UK_Tees Valley and Durham	8.63
UKC2	UK_Northumberland Tyne and Wear	8.42
UKD1	UK_Cumbria	10.49
UKD3	UK_Cheshire	10.14
UKD4	UK_Greater Manchester	7.15
UKD6	UK_Lancashire	10.16
UKD7	UK_Merseyside	6.69
UKE1	UK_East Riding, North Lincolnshire	10.71
UKE2	UK_North Yorkshire	9.01
UKE3	UK_South Yorkshire	7.64
UKE4	UK_West Yorkshire	8.43
UKF1	UK_Derbyshire and Nottinghamshire	7.83
UKF2	UK_Leicestershire Rutland	10.53
UKF3	UK_Lincolnshire	8.20
UKG1	UK_Herefordshire Worcestershire	9.52
UKG2	UK_Shropshire and Staffordshire	9.09
UKG3	UK_West Midlands	8.68
UKH1	UK_East Anglia	8.10
UKH2	UK_Bedfordshire Hertfordshire	7.73
UKH3	UK_Essex	8.10
UKI4	UK_Inner London	8.58
UKI5	UK_Outer London	7.85
UKJ1	UK_Berkshire Bucks Oxfordshire	8.47
UKJ2	UK_Surrey East and West Sussex	8.35
UKJ3	UK_Hampshire and Isle of Wight	10.16
UKJ4	UK_Kent	9.75
UKK1	UK_Gloucestershire Wiltshire	10.73
UKK2	UK_Dorset and Somerset	8.67
UKK3	UK_Cornwall and Isles of Scilly	8.43
UKK4	UK_Devon	8.59
UKL1	UK_West Wales and The Valleys	7.99
UKL2	UK_East Wales	7.96
UKM5	UK_North Eastern Scotland	6.96
UKM7	UK_Eastern Scotland	8.02
UKM8	UK_South Western Scotland	9.22

UKM6	UK_Highlands and Islands	7.84
UKN0	UK_Northern Ireland	7.97