Disembedded Openness: Inequalities in European Economic Integration at the Sectoral Level

Balazs Vedres[1] · Carl Nordlund[1,2,3]

Abstract The process of European integration resulted in a marked increase in transnational economic flows, yet regional inequalities along many developmental indicators remain. We analyze the unevenness of European economies with respect to the embedding of export sectors in upstream domestic flows and their dependency on dominant export partners. We use the WIOD dataset of sectoral flows for the period of 1995–2011 for 24 European countries. We found that East European economies were significantly more likely to experience increasing unevenness and dependency with increasing openness, while core countries of Europe managed to decrease their unevenness but increased their openness. Nevertheless, by analyzing the trajectories of changes for each country, we see that East European countries are also experiencing a turning point, either switching to a path similar to the core or to a retrograde path with decreasing openness. We analyze our data using pooled time series models and case studies of country trajectories.

Keywords Economic integration · Network science · Political economy · World system

Introduction

The economic integration of EU member states is a central element of the European project, where the standardization of regulations, a customs union, and the removal of institutional barriers were designed to facilitate the emergence of a larger coherent European economic unit (Balassa 1962). According to these expectations, a high degree of economic integration will eventually erase the preferentiality of economic

✉ Balazs Vedres
vedresb@ceu.edu

1 Center for Network Science, Central European University, Budapest, Hungary

2 Institute for Analytical Sociology, Linköping University, Linköping, Sweden

3 Department of Economic History, Lund University, Lund, Sweden

exchange (along lines of nationality, language, tradition). Flows will reflect, it is assumed, only the rationalities of space, quality, and cost.

The European process of economic integration did result in an increase of flows, according to analyses of bilateral trade data and other aggregate indicators at the national and regional levels (Hoen 2002; Bergstrand 2008).[1] This is particularly evident for the new Eastern countries: with the removal of tariff and non-tariff barriers liberating the movement of goods, capital, and services, coupled with the prescribed institutional and regulatory harmonization, flows increased greatly between the economies of the older European core and the new East European member states. East European economies were not only connected to core markets, but sectors from the East became integrated into European-wide production structures as well.

However, the European project is not only about the economic benefits of increasing flows—better economies of scale, employment, and higher profits. From the perspective of broader developmental concerns, increased economic transnationalism might preserve or even amplify deeper inequalities. While European economies are becoming increasingly integrated with increased transnational flows, gaps in welfare, wages, factor costs, and value-added productivity that separate the East from the West seem to persist.

One interpretation takes the lack of convergence to be a transient phenomenon, akin to a Kuznets-curve of economic integration where "close integration is good, but a limited move towards integration might hurt" (Krugman 1991:89). A second interpretation for gaps in developmental indicators is that these stem from durable core-periphery relations. According to this view, economic integration is not a source of increasing equality, but rather the cause of structural and sectoral imbalances. As integration increases, economies on the periphery are locked into vertical trade, foreign-dominated consumer markets, and low value-added positions in the global production chains (e.g., Oman and Wignaraja 1991; So 1990). According to the more recent version of this argument, adjusted to the growing centrality of global value chains (GVC) in the new Eastern member states, a new type of dependent market economy (DME) has emerged in these countries with the headquarters of the multinational firms capitalizing on the cheap and highly skilled Eastern labor and, keeping the positions of firms from these countries at the low value-added end of the production chains. Finally, according to a third interpretation, discussed in the introduction to the special issue, the new member states dramatically differ from each other in the form and strengths of domestic developmental agency and in the capacity of domestic public and private actors to shape developmental paths (Bohle and Greskovits 2012; Bruszt et al. 2015). Based on this third approach, one would expect diverging developmental pathways among the Eastern member states. Empirical research thus far has not produced decisive evidence on the developmental effects of the spread of region-wide production chains in Europe for any of the above the arguments.

We fill this gap in this paper. Instead of measuring underdevelopment as just a singular dimension of "not there yet," it is more fruitful to analyze pathways—

---

[1] Although there is an overall agreement of the trade-creating effects of economic integration, particularly with respect to the European case (e.g., Bergstrand 2008), conceptualizing and measuring such an effect is not a trivial exercise. Whether comparing intra- and extra-area trade or extrapolated pre-integration data with actual post-integration observations, such ex-post assessments, similar to pre-integration assessments of would-be effects, are inherently difficult (Balassa 1967).

divergent and path dependent processes of institution building and economic development—that European peripheries took (Bohle and Greskovits 2012). Beyond aggregate statistics and overall correlations, we also analyze trajectories of European economies to find evidence for convergence, divergence, or durable regional inequality.

A key form of inequality in economic integration stems from the way in which transnationally integrated economic activity is embedded domestically. A risk seen in increased transnational flows is the production of disembedding (Scott 1997), where transnationalization takes the form of "cathedrals in the desert" (Hardy 1998): places of transnational production increasingly disconnected from domestic structures. Research about the diverse ways in which the automotive industry became integrated in the European peripheries indicate that the depth of domestic embedding of manufacturing sectors, such as transport equipment manufacturing, is a key factor in the success of economic integration (Bruszt et al. 2015). Even if institutional structures are congruent, incongruent supply structures in Eastern Europe might block the success of transnational integration (Greskovits 2005).

Such disembedding can lead to sustained underdevelopment by preventing material benefits from transnational participation from reaching a wider part of the economy. If an economy relies on export sectors that are disembedded from domestic sectoral flows, the benefits of increased exports will be limited to the export sectors themselves, leading to stagnation in other sectors and resulting in problems of economic dualism (e.g., Singer 1970). Disembedding can be detrimental by blocking ties of learning, both of know-how related to production processes and knowledge about market opportunities (Maya-Ambia 2011). It might leave an economy vulnerable to capital flight (as production facilities in disembedded sectors might be more easy to relocate), and it might also lead to the strong bargaining position of industries in transnationally embedded sectors (by, for example, credible threats of relocation).

In this article, we analyze the process of European economic integration along two main dimensions: economic openness and the domestic embedding of transnationalized production. We also analyze the degree of trade partner concentration of export-oriented sectors. Our empirical approach is based on input-output tables of economic sectors. Our basic unit of analysis is a European economic sector. Based on the World Input-Output Data (WIOD) project, we use data on flows among 816 sectors (34 sectors in each of 24 national economies) over the period of 1995–2011. We develop three metrics: transnational openness, unevenness in the domestic upstream embedding of export sectors, and dependency on dominant export partners. We relate the openness of European economies to their unevenness in terms of sectoral embedding to identify how increasing openness is related to unevenness. Our analysis operates at three levels: at the level of particular sectors, national economies, and larger regions.

Our first measure—transnational openness—captures, for each country, the ratio between inter-sectoral value flows that cross the national borders and those that are domestic. Not surprisingly, the results from our dataset reflect previous assessments: although the starting points differ, the national industrial sectors in Europe are becoming increasingly more connected with sectors in other countries.[2]

---

[2] Whereas "economic integration" typically refers to the institutional and regulatory processes towards (and state of) the creation of a common market (e.g., Balassa 1962), our usage of the term refers explicitly to cross-border economic exchange.

Our second measure is upstream domestic embedding (defined at the level of sectors), and the uneven distribution of this embedding (defined at the level of a national economy). This measure captures the difference between a sector's share of total exports and its share as user of intermediate domestic inputs. It allows us to identify sectors that are significant exporters but are weakly embedded in domestic upstream flows. Coupling this with the share of sectoral imports allows us to identify sectors that are cathedrals in the desert and, through the distributional variance of these values, to see the overall unevenness of a national economy.

Looking beyond domestic production structures, our third metric captures sectoral export dependency in terms of foreign partner concentration of sectors. Primarily associated with dependency theory and related studies on the developmental effects of partner concentration (e.g., Galtung 1971; Dominguez 1971; Berman 1974; Chan 1982), the topology of international patterns of exchange and would-be monopolistic-oligopsonic patterns of exchange are equally relevant to understand market access (e.g., Condliffe 1950:816; Bauer 1954:103; Meier and Baldwin 1957:332), configurations of global commodity/value chains (Wallerstein and Hopkins 2000 [1986]; Porter 1985; Gereffi and Korzeniewicz 1994), and the interplay between such topologies and development (e.g., Appelbaum et al. 1994:188; Heintz 2006; see Nordlund 2010:151ff). To allow for the differences in relative sizes between countries, our measure captures the percentage-point difference between the largest and second largest shares of outflows for each sector in each country and year. We apply this metric on those industrial sectors identified as having significant transnational openness (i.e., our first metric).

Our findings indicate that between 1995 and 2011, openness increased almost monotonically in all three regions: the core, the GIPS (Greece, Ireland, Portugal, and Spain), and the East. (note: the GIPS are referred to as Europe's southern periphery in other papers in this special issue.) There is, however, a difference between the three regions in terms of unevenness: increasing openness was paired with decreasing unevenness in the core, while more openness meant more unevenness in the East. The GIPS region was highly diverse in this respect. Dependency shows a similar pattern: increasing openness in the East was related to an increase in dependency, while in the West and GIPS countries dependency is not a function of openness.

The relationship between openness and dependency shows a very similar pattern to the relationship between openness and unevenness. For the core countries, there is no evidence for increasing dependency as their economies are becoming more open, while countries in the East show a significant trend: more openness means an increase in sectoral dependency on foreign export target sectors. The GIPS region shows a similar trend to the Eastern region, but this trend is not statistically significant.

Beyond estimating the correlation among variables of openness, unevenness, and dependency, we also analyzed the amount of change (trajectories of temporal volatility) that each country experienced. Such trajectories in the East experienced larger changes than in the core. At the level of national economies, we found that it was only the core where economies were able to increase openness and decrease unevenness at the same time. Trajectories for economies in the GIPS and Eastern regions were much more volatile. We found two distinct kinds of trajectories in the East: turning point and retrograde trajectories. Turning point trajectories were able to reverse the trend of jointly increasing openness and unevenness, and switch onto a path where unevenness decreases with further increase of openness. Retrograde trajectories showed a decrease

Table 1 General layout of a national input-output table (from Timmer 2012, p. 63)

	Sector			Final use		Total
	c1	..	cN			
Sector c1						
..	Intermediate use (Z)			Domestic final use (DFU)	Exports (E)	Total output
cN						
	Imports (I)			Imports final use (IFU)		
	Value added					
	Total output					

in unevenness only when openness also decreased. Trajectories in the GIPS region showed the most volatility of all, but in very diverse directions. Greece experienced a dramatic increase in unevenness with hardly any change in openness, while Ireland shows the opposite pattern—a drastic increase in openness with a modest increase in unevenness.

We analyze two cases from each of the three regions—Germany and France from the core, Greece and Ireland from the GIPS region, and Hungary and Estonia from the East. The case studies highlight the usefulness of using upstream domestic embedding as a dimension to identify sectors that are most related to developmental outcomes in a national economy.

World Input-Output Data

An input-output table records directional valued flows between (and within) industrial sectors or product groups. Derived from national supply-use tables that capture the supply of domestically produced and imported goods and services and their intermediate use, domestic final consumption, and exports, a national input-output table is usually a balanced account, where the data on intra- and inter-sectoral flows (Z) is supplemented with imports for intermediate (I) and final use (IFU), exports (E), domestic final use (DFU), and various value-added categories; see Table 1.

Apart from the input-output tables produced by national statistical agencies, there are several data providers that compile and disseminate standardized national input-output data—such as OECD, Eurostat, and World Bank. As mentioned earlier, the data used in this chapter are taken from the WIOD database, which merges national input-output data with bilateral trade flow statistics (Timmer 2012; Dietzenbacher et al. 2013; Timmer et al. 2015). It contains annual input-output data for 34 sectors between 1995 and 2011 for 40 countries (including a virtual Rest-of-World country), out of which 27 are EU member states as of 2012.[3]

Analysis of transnationalization typically relies on international trade data that are recorded at the level of national economies. The use of multi-regional input-output

---

[3] WIOD uses a sectoral nomenclature comprising 35 sectors, but as there are no data on intermediate flows for the "private households with employed persons" sector, this sector is excluded in our analyses.

data, such as WIOD, allows for a decomposition of national economies into their constituent sectors. This results in a more complex network: for example, trade flows for Europe can be depicted as a network of 24 economies. (Croatia, Cyprus, Luxemburg, and Malta are excluded from our analysis of the 28 EU countries because of their missing data, small size, and uniqueness.) European economic flows can also be depicted as flows among 816 sectors (34 for each of the 24 countries). This network opens the possibility of addressing inequalities between economies stemming from the structure of flows within and outside countries at the sectoral level.

Our article uses these data to connect domestic sectoral flows (or the absence of domestic flows) to outside flows to sectors in other countries in order to compare openness of the economy and the domestic upstream embeddedness of export sectors. As our questions are concerned with the state of the pan-European production structures, our analysis focuses on the intermediate use sections of the national input-output tables (Z in Table 1) as well as the vector of cross-border exports (E) and imports (I). Covering annual domestic intra- and inter-sectoral flows, final domestic use as well as exports and imports for 34 sectors between 1995 and 2011, the data cover 24 EU countries that we have separated into three subsets: core (Austria, Belgium, Germany, Denmark, Finland, France, Great Britain, Italy, the Netherlands, Sweden), GIPS (Greece, Ireland, Portugal, Spain), and the East (Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia).

Measuring Openness and Unevenness

We develop two measures: an aggregate index of openness that captures the extent that a country's economic sectors are embedded in the international economy, and a measure of upstream domestic embeddedness at the sectoral as well as aggregate level of a country. The notation we use in our formulas below refers to the input-output schematic provided in Table 1.

Openness

The first aspect of a national economy that we want to capture is to what extent its sectors are embedded/interconnected with the outside (non-domestic) economy. From the perspective of an individual economic sector within a country, we would like to know to what extent this sector engages in exchange with other sectors and final uses within the national borders vis-à-vis sectors and final users outside the country, as such capturing the "neutrality" of national borders.

Among the different metrics that exist for capturing this aspect and their categorization into measures of trade volumes and trade restrictions (see Yanikkaya 2003), we are interested in the former type of measuring the openness of an economy. One, if not the most, common metric is the aptly called openness index, which simply reflects the share of total imports and exports divided by GDP. However, as our focus is on the level of economic sectors and the flows to and from these, we replace the GDP denominator in the more traditional openness index with the sum of domestic sectoral flows, whether for intermediate input to other sectors or for final domestic use and consumption. This also implies that our metrics are self-contained, only using data as

obtained from the national input-output tables. As our interest lies in the connectivity between different sectors and as intra-sectoral flows reasonably could depend on the fragmentation and size of industrial units and companies within a sector, we consistently exclude intra-sectoral flows from this, as well as the other, metrics in our study.[4]

With reference to the various parts of the national input-output tables (see Table 1), we apply a measure of economic integration—openness—as follows:

$$\text{Openness} = \left(\sum_{i}^{N} (e_i + i_i) + \sum \text{IFU} \right) \Big/ \left(\sum_{i}^{N} \sum_{j,j \neq i}^{N} z_{i,j} + \sum \text{DFU} \right)$$

The openness for a particular country and year is thus calculated by summing all exports and imports, whether for intermediate or final use, and subsequently dividing this by the sum of all domestic intermediate and final use flows.

Sectoral Upstream Domestic Embeddedness

Whereas the above metric captures the extent to which a national economy and its economic sectors are embedded in international production structures, the usefulness of the openness index proposed above is to capture a state of economic integration at an aggregate level. Supplementing this, we propose a metric that captures the interplay between the exports of a sector and the degree of its sourcing of domestic intermediate inputs. We operationalize this index of upstream domestic embeddedness (UDE) for a sector by first calculating the share of total inter-sectoral[5] domestic inputs that feeds this particular sector, subsequently subtracting the share of total exports for this sector, thus yielding the percentage-point difference between shares of domestic inter-sectoral inputs vis-à-vis foreign exports.[6]

$$\text{UDE}_i = \frac{\sum_{j}^{n} z_{j,i}}{\sum_{j}^{n} \sum_{k,k \neq j}^{n} z_{j,k}} - \frac{e_i}{\sum E}$$

The UDE of a sector is thus calculated as the difference between two terms: the first is the share from domestic upstream flows (the sum of all domestic inflows to a sector from all other domestic sectors, divided by the total sum of all inter-sectoral domestic intermediate flows). The second term is the share from all exports (exports from this sector divided by the sum of all exports).

A sector with a negative UDE value means that its share of total exports exceeds its share as a receiver of domestically produced inputs, whereas a positive UDE value

---

[4] The magnitude of intra-sectoral flows might be influenced strongly by concentration of firm sizes. If a sector is represented by few or only one large firm, intra-firm flows might not get reported to statistical agencies.
[5] Similar to the openness index and based on the same reasons, we have chosen to exclude the intra-sectoral flows in the diagonal of the input-output tables.
[6] A corresponding index for downstream domestic embeddedness is conceivable, i.e., where a sector's share of domestic inter-sectoral output is contrasted with its share of imports. In agreement with the contemporary literature on international political economy, testing such a corresponding downstream index in our analysis, we found find that the most interesting findings stemmed from looking at exports vis-à-vis domestic inputs, i.e., reflecting where most of the contemporary literature on international political economy and world-system analysis puts its focus.

indicates the inverse relationship. We can thus expect that the economic sectors that are inherently oriented to the domestic intermediate and final consumption markets (e.g., construction, utilities, retail sectors, education) have positive UDE metrics. Whereas a negative UDE value indeed indicates a sector whose significance as an exporter exceeds its share of total domestic inputs, a better understanding of the particularities of such a sector has to take foreign sectoral imports into account as well. If its share of imports is relatively low, its high share of total export values (i.e., negative UDE values) would reflect a value-producing sector that is in need of relatively few intermediate inputs, whether domestic or foreign. A sector with low (negative) upstream domestic embeddedness with a relatively high share of foreign inputs would characterize a sector that merely acts as a link to transnational production structures, where such a position in global value chains evidently is not dependent on, or results in fewer, domestic inter-sectoral upstream linkages. To capture this distinction, the country-sector profiles we provide in our case studies below combine the UDE metrics with sectoral shares of total exports and imports.

Unevenness

Although a near-zero UDE value reflects a balance between a sector's share of exports and share of total domestic inter-sectoral inputs, it is to be expected that the UDE values for the more domestically oriented economic sectors are positive across all the board. Similarly, we can expect certain sector-specific biases in the negative UDE values that we find for more export-oriented sectors.[7]

Acknowledging such sector-specific characteristics and incorporating the sectoral variance we can expect from this, the aggregate (country-wide) measure of integrational unevenness that we propose captures this variance as the sum-of-squares of the sectoral UDE values.

$$\text{Unevenness} = \sum_{i}^{N} \text{UDE}_i{}^2$$

Figure 1 depicts an economy consisting of four domestic sectors with domestic inter-sectoral flows as well as imports and exports to the different sectors. Excluded from this figure are intra-sectoral flows as well as domestic value-added and flows for domestic final use. The openness measure for this example is exactly equal to one (there are 200 domestic flows and 200 outside flows). With an aggregate (country-wide) UDE value of .236, the corresponding sectoral UDE values are found next to the example IO table.

In this example, the upstream domestic embeddedness of sector C2 can be interpreted as "balanced." With half of total inter-sectoral inflows going to C2, this is matched by half of all exports originating from C2. Sector C4 reflects a domestically oriented sector: lacking exports, the domestic intermediate inflows result in a positive UDE index. Finally, sectors C1 and C3 have negative UDE values, implying that their significance as exporters exceed their significance as destinations for domestic inputs.

---

[7] Although a benchmark approach could be used here, i.e., determining an average sectoral domestic/foreign ratio using all countries and years and subsequently adjusting the UDE metric to this benchmark, we preferred allowing for these inherent sectoral properties to shine through in our results, especially as our interest lies in longitudinal change.
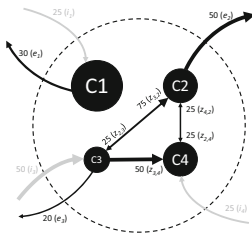
	C1	C2	C3	C4	Export (E)	UDE
C1	-	0	0	0	30	-0.300
C2	0	-	25	25	50	0.000
C3	0	75	-	50	20	-0.075
C4	0	25	0	-	0	0.375
Import (I)	25	0	50	25		

Fig. 1 Example for calculating upstream domestic embedding

Whereas C1 in our example lacks domestic upstream ties altogether, C3 does have upstream domestic linkages. Whereas the domestic inputs to C3 represent 1/8 of all domestic inter-sectoral inflows, its share of total exports is slightly higher (1/5).

Whereas C1 in this example constitutes an enclave sector—a cathedral in the desert—the above example demonstrates the necessity of also looking at sectoral imports for drawing such conclusions. As ¼ of all sectoral imports go to sector C1, this indeed indicates a sector obtaining intermediate inputs from foreign, rather than domestic, sources. Similarly, foreign intermediate inputs to C3 are twice that of domestic inputs, which also has to be taken into account when interpreting the state of the sector. However, if the sectoral imports to C1 were to be zero in our example, the interpretation of its role in international production structures would be somewhat different. It could then possibly indicate a resource node at the top of the global streams of production or simply a self-sustained "cornucopian" sector that produces and exports value without needing any significant inputs, domestic or foreign.

Dependency

Whereas our previous metrics examine the intermediate (inter-sectoral) flows within a national economy, our dependency metric measures sectoral export partner concentration. A national economy is more highly constrained if its exports are concentrated. We measure concentration by the relative size of the first and second largest export partner sector, where size is measured as the proportion of exports leaving the source sector. If, for example, a sector exports to ten partners, 10% of all exports to each, then our dependency variable equals zero. This variable also equals zero if a given sector exports to two partners, 50% of all exports to each. In both of these situations, our source sector can avoid being dependent on a dominant target sector by having equal size alternative partner sectors to ship to. If, however, a sector exports 50% of its output to one target sector, and the second target sector takes up only 10% of exports (and the remaining 40% of exports goes to partners with even smaller shares), then this sector is dependent on a major target partner. We calculate dependency of a national economy as the mean of sector dependencies. Sectoral dependency is measured as the difference between the largest and second largest normalized export element:

$$\text{Dependency} = \frac{\sum_{i=1}^{n}\left(e'_{ij(n)} - e'_{ij(n-1)}\right)}{n}, \text{ where } e'_{ij} = \frac{e_{ij}}{\sum_{j=1}^{n} e_{ij}}$$

where j denotes all foreign sectors in every foreign economy.

Openness and Unevenness at the Regional Level

The openness of European economies has increased considerably from the mid-1990s to the end of the first decade of the 2000s. Figure 2 shows the trends of our sectoral openness score by three regions. All three regions—the European core, the GIPS countries on the Western and Southern periphery, and countries in the East—followed the same basic trajectory. From an openness score of about 1 in 1995 (where the size of exports plus imports is the same as the amount of domestic inter-sectors flows), all three regions reached an openness score of about 1.5 by 2011 (with outside flows 50% larger than domestic flows). The two peripheral regions (GIPS and East) were slightly more open throughout, and the 2009 crisis shows up as a drop in the openness of all regions, but the overall trend is increasing openness.

While there is no difference in openness across regions, is there a difference in unevenness? Our hypothesis is that it is not the extent of openness that distinguishes the European core from its peripheries, but the domestic embedding of export sectors. In other words, it is the core that has the capacity to benefit from this increased openness through the indirect increase in demand for the outputs of sectors feeding the export sectors.

How much does an increase in openness go together with an increase in unevenness? To estimate the overall relationship, we pool our country-year observations, where each country-year data point has a value for openness and also a value for unevenness. This pooled time series dataset consists of 408 observations: one for each of the 17 years for the 24 countries. We use these pooled data to estimate a simple regression slope for each of the three regions. The results are visualized in Fig. 3.

The first panel of Fig. 3 shows all three regions. A group of outlier data points with high unevenness and relatively low openness stands out: these are data points for Greece—the most extreme case of unevenness in terms of the lack of upstream domestic embedding of export sectors. Another group of outlier data points is to the right: with less extreme values of unevenness, but very high values of openness. These points represent Ireland: one of the most open national economies in the world. (We
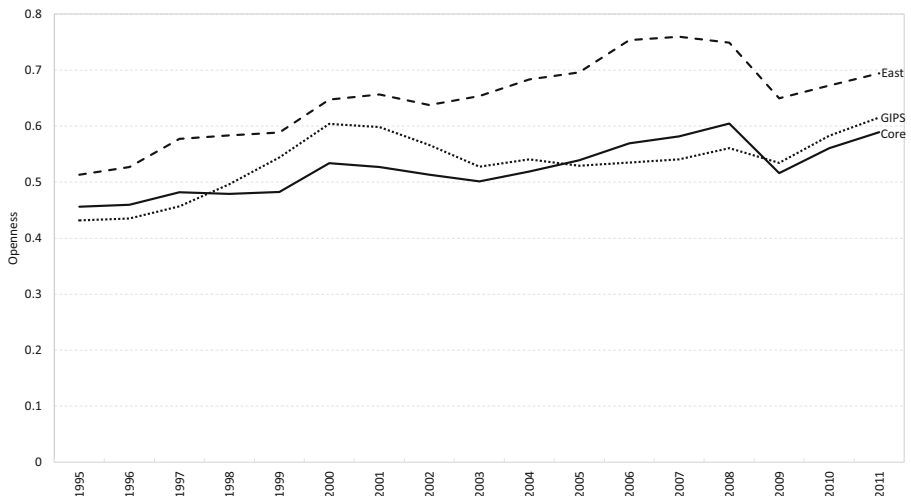

Fig. 2 Mean openness of sectoral flows for three European regions between 1995 and 2011

Panel 1: all three regions   Panel 2: Core and East regions
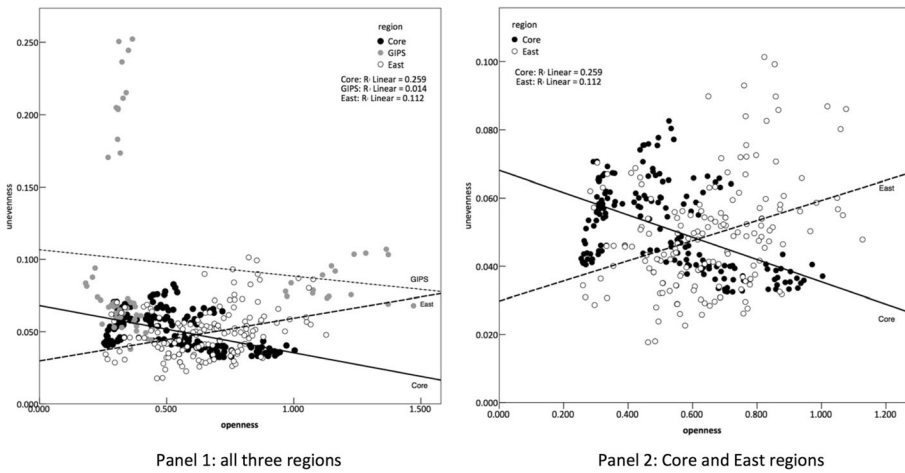
Fig. 3 Openness and unevenness by regions, with bivariate linear regression predicted values. Panel 1: all three regions and Panel 2: core and East regions

will discuss the trajectory of Greece and Ireland in detail later.) The regression slopes vary: for the core and GIPS region the slope is negative: more openness results in less unevenness. The predicted line for the East has a positive slope: more openness means more unevenness here. The second panel only shows the core and Eastern data points. At higher levels of openness (above .80), the difference between the unevenness of core and Eastern economies becomes dramatic. However, there is considerable scattering in the data, and the variance of unevenness explained by openness is 26% for the best fitting region (the core).

To test the statistical significance of the difference in the way openness is related to unevenness across the three regions we study, we employ a pooled time series regression model. The dependent variable is unevenness; the independent variables represent regions, the varying slopes of openness within regions and controls. The first variable that we include is openness to control for an overall slope between openness and unevenness. We control for a simple trend in unevenness by including a year variable, which is equal to one for 1995, and goes to 17. We include an interaction between year and openness to test for a changing overall relationship between openness and unevenness. We add the total size of sectoral flows to represent the size of the economy. Larger economies might be less uneven, and for small economies unevenness might be a greater risk. We include binary indicators for the three regions—the model includes GIPS and Eastern regions as predictors, and the core region as the omitted category. We then include interactions between the region indicators and openness, which are the variables that we are really interested in. We include GIPS × openness and East × openness interactions, where the core is again the omitted category. We ran an ordinary least squares model, but computed one-sided p values using a permutation test.[8]

---

[8] Permutations tests for the p values of coefficients are especially appropriate since the observations are not drawn as a sample from a large population, but represent all cases (all the country years in the period we consider) (Good 2006).

The model shown in panel a of Table 2 indicates that overall openness is negatively related with unevenness. There is a significant time trend: unevenness increases with time for the entire set of European economies. We did not find evidence for a changing relationship between openness and unevenness with time (the interaction between time and openness is not significant). Turning to regions, the initial level of unevenness in the East is below both the level of unevenness in the core and in the GIPS countries. (This finding is confirmed by a simple analysis of variance for unevenness across regions; with $p < .050$.) Our pooled time series model indicates that the relationship between openness in the East is significantly different from the same relationship in the core region. In the Eastern region, more openness means more unevenness, at the $p = .000$ level of significance. We visualize the predicted levels of unevenness by region on panel b of Table 2. This marginal effects plot shows the predicted values of unevenness at various levels of openness by region, while all other variables are kept constant at their mean values. The positive relationship between openness and unevenness is specific to the East region only. The differences between the regions in the way openness relates to unevenness are not due to the overall trend of increasing openness, or

Table 2 Pooled time series regression model predicting unevenness

Independents:	Unevenness * 100		
	B	beta	p-value
Intercept	7.656		.052
Openness	-4.420	-.327	.010
Year	0.168	.253	.001
Year * Openness	-0.161	-.201	.119
Size	-0.486	-.219	.001
Region			
GIPS	2.054	.235	.002
East	-5.709	-.863	.000
Region interactions			
GIPS * Openness	3.741	.291	.019
East * Openness	8.280	.867	.000
N	408		
Adj. R-square	.336		
F	26.815		
p-value	.000		
Replications	10 000		
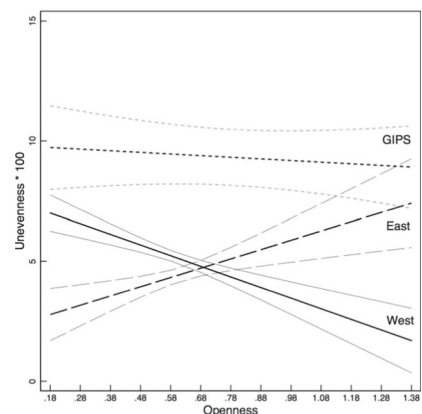
a: regression coefficients   b: marginal effects plot

the size of economies, or simple random noise. National economies in the East are becoming more uneven with increasing openness compared to core economies.
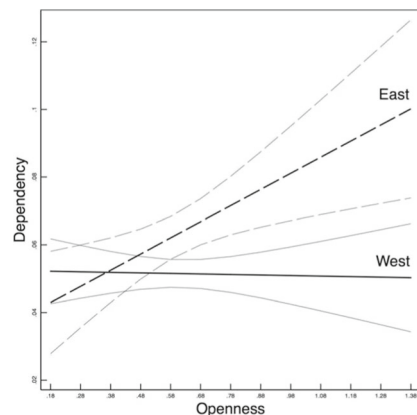
Openness and Dependency

After showing evidence for the regional differences in how openness is related to unevenness, we analyze similar relationships regarding dependency. As economies in the East are becoming more uneven, are they also becoming more dependent as well? To answer this question, we constructed the same regression model that we used for unevenness. The dependent variable here is dependency—the mean difference between the largest and second largest export partner for domestic sectors. The independent variables are the same: openness, year, an interaction term between openness and year, the overall size of the economy, and indicators of the three regions, plus interactions between region and openness. Again, standard errors are estimated by a permutation test.

As the first panel of Table 3 shows, dependency of an economy is positively related to its openness. Dependency increases with time, but the impact of

Table 3 Pooled time series regression model predicting dependency

Independents:	Dependency * 100		
	B	beta	p-value
Intercept	1.532		.110
Openness	4.441	.301	.001
Year	0.493	.677	.000
Year * Openness	-0.511	-.582	.000
Size	-0.699	-.288	.000
Region			
GIPS	-.227	-.024	.425
East	-1.808	-.250	.107
Region interactions			
GIPS * Openness	2.138	.152	.140
East * Openness	4.923	.471	.013
N	408		
Adj. R-square	.281		
F	29.980		
p-value	.000		
Replications	10 000		

a: regression coefficients   b: marginal effects plot

openness on dependency is mitigated with time. Larger economies are less dependent on average. Regional difference is only manifested in the added impact of openness on dependency in the East. The second panel of Table 3 shows the differences in how openness is related to dependency, by regions. For clarity, the GIPS region is omitted (it falls between the fitted lines of East and West). The marginal effects plot—keeping all independent variables but openness constant at their means—shows that there is no significant relationship between openness and dependency in the West, while in the East, increase in openness goes together with increase in dependency. The GIPS region shows a pattern that is in between the core and East. The trend in the GIPS region is similar to the East—more openness goes together with more dependency. This trend is not statistically significant ($p = .140$), but the sign is positive.

Openness and Unevenness by Countries

After analyzing openness and unevenness at the level of regions, now we analyze this relationship at the level of national economies. Openness increases in all three regions, and openness related differently to unevenness within regions. Now, we turn to the variation at the level of national economies. As Fig. 4 shows, the general tendency is increasing openness for all but two of the 24 economies. Countries in the core region are relatively bounded in their increase of openness, with increase in the 5–25% range. The East and the GIPS regions are more diverse. In the GIPS region, the openness of Ireland increased dramatically, by 50%. In Portugal, Spain, and Greece, the increase in openness is below European average of 0.161 (16.1% higher openness in 2011 over 1995). The highest increase in openness was in Hungary: a 67% increase. There are only two countries, Estonia and Latvia, where the openness in 2011 is less than the openness in 1995. Unevenness (shown on the secondary axis) varies more than
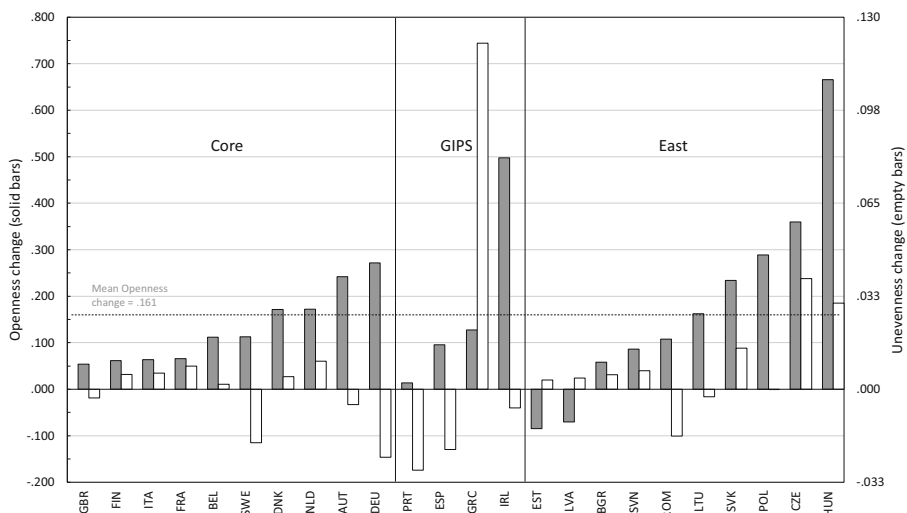

Fig. 4 Relative change in openness and unevenness for national economies between 1995 and 2011

openness. Some countries experienced a decrease in unevenness, while some (especially Greece) saw a major increase.

To compare countries by the tradeoffs between openness and unevenness, we computed regression slopes for each country. While in the previous section we estimated the differences in the openness-unevenness association by region, here we do so at the country level. As the datasets become small (17 observation in each case), we only use bivariate models. We test for the significance of the slope coefficient using a permutation test again, especially appropriate for small samples. The results of the regression estimates are presented in Fig. 5.

Negative slope coefficients mean that when the openness of an economy increases, the unevenness decreases. In such countries, the increase of exports, for example, is located in sectors that are already well embedded in domestic upstream flows. A positive slope means that when the openness of that economy increases, unevenness also increases. In such an economy, sectors that increase their exports are disembedded from the domestic inter-sectoral flows.

Figure 5 shows that the three economic regions are not homogenous, but the overall differences among regions seen before are manifested in the country breakdown as well. The most important inequality is between the core countries and the countries in the East. Four core countries (Sweden, Germany, Great Britain, and Austria) show a significant negative relationship between openness and unevenness, while none of the Eastern countries have a significant negative coefficient. (Only one non-core country has a negative coefficient: Spain.) What this indicates is that several core countries have increased their openness in a way that benefits domestic upstream embedding of their sectors, while there is evidence for the opposite trend in the East. We find five economies in the East (Poland, Slovenia, Hungary, Estonia, and Czech Republic) where an increase in openness means disembedding from domestic upstream flows.
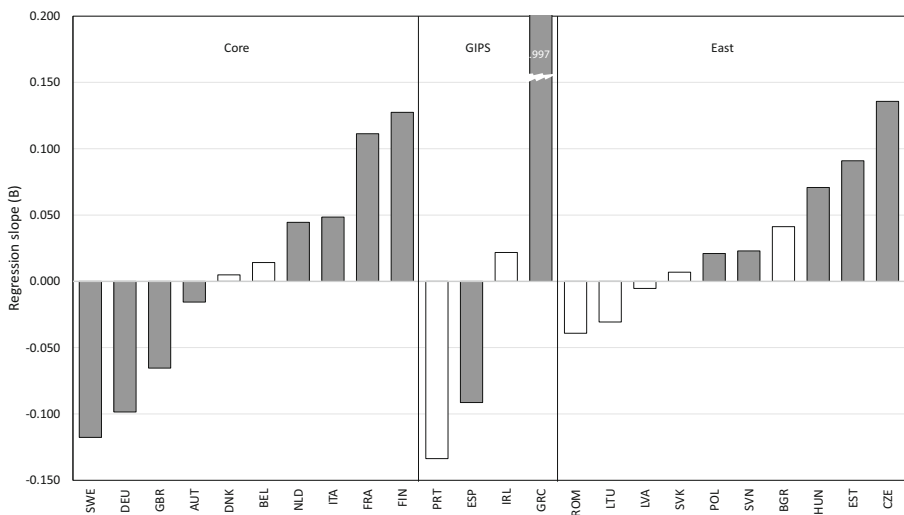

Fig. 5 Regression slopes (B coefficients) for predicting unevenness based on openness. Light shading indicates statistically insignificant slopes ($p > .010$)

Structural benefits of increasing openness seem to accumulate in the core, but these benefits are not experienced by all core economies. In four of them (Netherlands, Italy, France, and Finland), openness brings unevenness (domestic disembedding).

Trajectories

Up to this point, we considered only incremental (annual) change or overall change from 1995 to 2011. In this section, we consider the shape of trajectories that economies traveled in the space of openness and unevenness. As our initial motivation was to distinguish between transient and durable inequalities, we need to know the historical shape of changes. We construct trajectories charts for each country aggregating our data into 3-year periods for smoothing. We argue that the concept of trajectory is especially relevant to understand economic development in the space of openness and unevenness. While in the previous analyses we were identifying overall linear trends, here we are interested in non-linear developmental paths that are specific to individual countries, or types of countries. Our trajectory charts show the traces for each country colored by the slope of the trajectory. A red line indicates that the trajectory follows a statistically significant positive linear trend (unevenness increases with openness). A blue trajectory has a significant negative trend, while a grey trajectory has no significant linear trend.

The Core

Figure 6 presents the trajectories of countries in the space of openness and unevenness from 1995 to 2011. Great Britain, Germany, Sweden, and Austria have significant negative slopes: their unevenness decreases with increasing openness. Of the trajectories in the core, it is Germany that shows the longest distance traversed—the greatest increase in openness and the greatest corresponding decrease in unevenness.

Germany

What happened in the German economy that explains the increase in openness that at the same time decreased unevenness? To understand this, we analyze the starting and ending point of this trajectory at the level of particular German sectors. Figure 7 shows German sectors in 1995 and in 2011, ranked by their upstream domestic embedding. For each sector, we also show the export share and the import share (the proportion of the economy's imports and exports that took place in that sector). Sectors at the left have the lowest values of domestic upstream embeddedness, and sectors on the right have the highest values. An economy where the line representing upstream domestic embedding is completely flat is an economy that is perfectly balanced, such that for every sector the share in exports is the same as the share in domestic intermediate inputs. This line for Germany in 1995 is not flat. On the left-hand side, the transport equipment sector has the highest negative value: -0.128. This means that the share of this sector in the total domestic inter-sectoral flows (0.058 or 5.8%) is 0.128 less than the proportion of all German exports that is
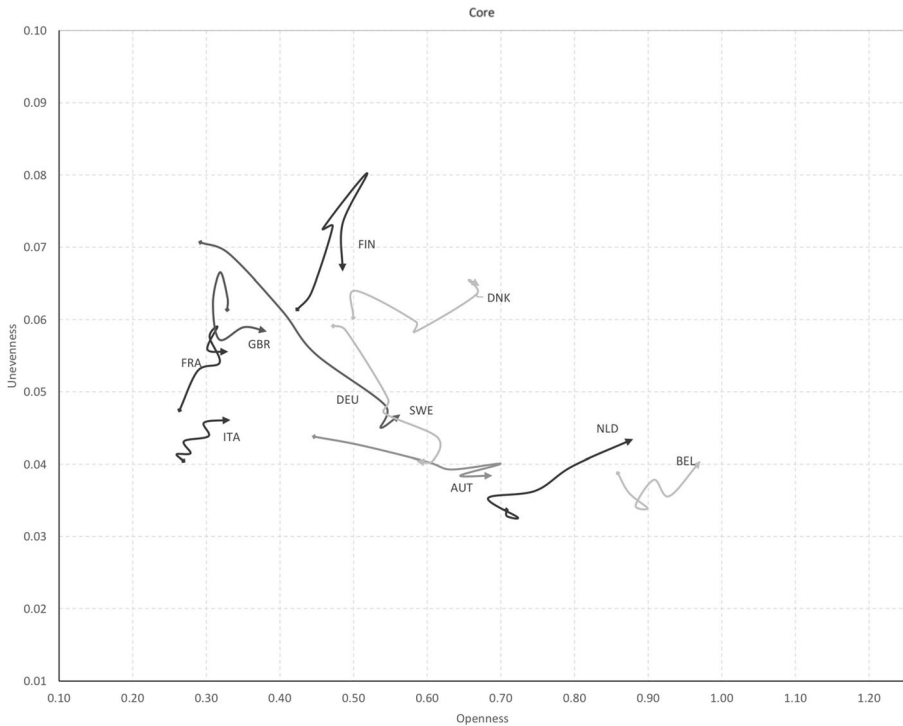
Fig. 6 Core country trajectories in the space of openness and unevenness. Note: Shading indicates slope: darker lines have significant slope coefficients, while lighter lines do not

located in this sector (0.186 or 18.6%). On the right end of the chart, there is the construction sector, with a positive upstream embeddedness score. The construction industry consumed 11% (0.110) of domestic inter-sectoral flows, while its export share was only 0.3% (0.003). Thus, its UDE score is 0.107. For the following case studies, we present only the bottom five sectors in the ranking by upstream domestic embeddedness—the most disembedded export sectors.

As we have seen on the chart of core country trajectories, Germany's openness steadily increased from 1995 to 2011, while its unevenness decreased. Comparing the sectoral breakdowns from 1995 and 2011, there is no apparent radical difference at first sight. The charts tell of important changes though: key sectors increased both their openness (mostly import shares) and their domestic intermediate inputs—their upstream embedding.

The key example is the leading sector of Germany: the transport equipment manufacturing sector. This sector has increased its export share between 1995 and 2011 from 18.6 to 19.5%, while it also increased its share from domestic sectoral inputs from 5.8 to 9.2%. Even though this period saw a great increase in the foreign production and value-added component in this sector, there was a great increase in German inputs as well. The inputs of the German metallurgy sector (the largest domestic supplier) to the transport equipment sector increased by 143.1%, while the overall increase of the German economy (measured in total flows) was 47.9%. Supplies from the renting sector increased by 244.0% (reflecting the major increase in the
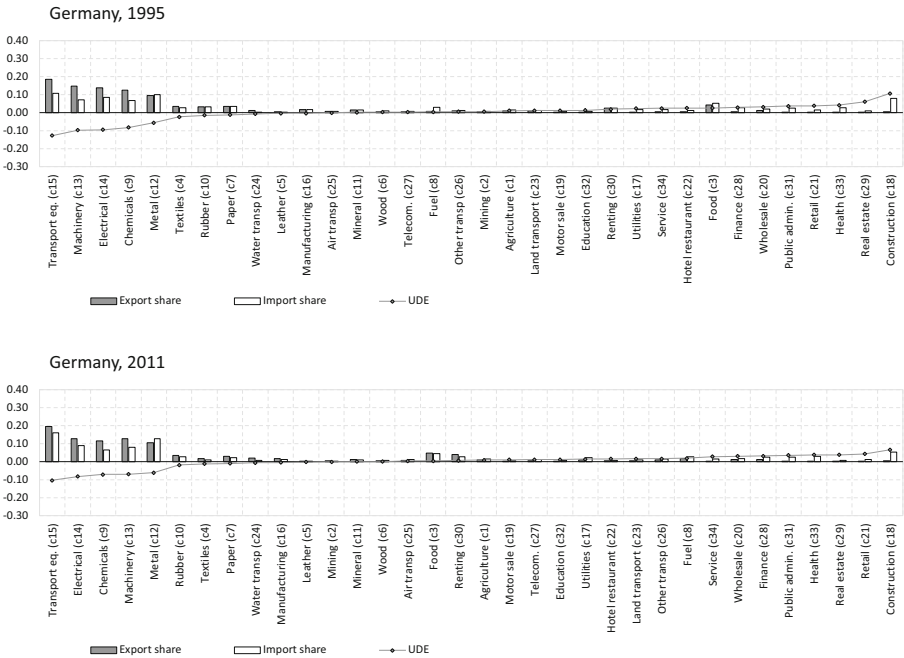
Germany, 1995

Germany, 2011

Fig. 7 German sectors in 1995, ranked by upstream domestic embedding (UDE)

practice of relying on rented equipment in industry). Flows from German wholesale increased by 107.4%.

Similar trends can be observed in other major German sectors as well: machinery, electronics, chemicals, and metallurgy. The machinery sector increased its inputs from domestic metallurgy by 97.5%, from renting by 123.4%. The metallurgy sector increased inputs from renting by 102.2%, from utilities by 74.7%. In sum, the German economy managed to both increase its production abroad, and to increase its reliance on domestic sectors. Why and how this was possible is a question outside the scope of this article—but one might guess that technological change (the increasing significance of powdered metals), labor policy (pacts to curb domestic wage increase), and dependence on high-quality specific inputs might constitute parts of the explanation.

France

The trajectory of France is orthogonal to the German trajectory. The French economy has been becoming more open, but it also became more uneven in the process. Figure 8 shows the five sectors with the least domestic upstream embeddedness in 1995 and in 2011. (For the sake of saving space, we use only the five most disembedded sectors for this and following country cases.) The chart from 1995 looks very similar to the same chart from Germany—with the same sectors, and with slightly smaller negative values for embeddedness. By 2011, the list and order of these top five sectors remain the same, with an increased disembedding.

Similar to Germany, the sector with the largest share of exports is the transport equipment sector. In 1995, this sector was responsible for 15.7% of all exports,
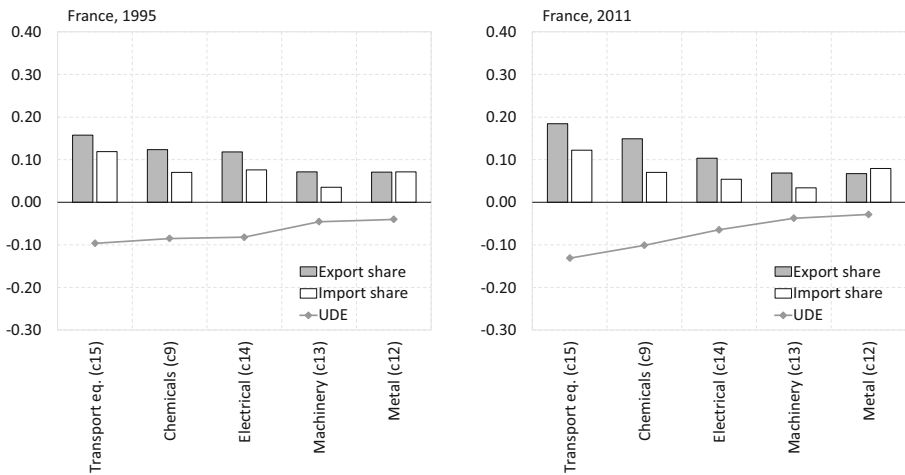
Fig. 8 French sectors in 1995 and 2001, bottom five sectors, ranked by upstream domestic embedding (UDE)

while it used 6.1% of domestic intermediate flows. In 2011, the export share of this sector increased to 18.5%, while the share in domestic upstream decreased to 5.3%. The composition of domestic inputs to the transport equipment sector changed little—with equipment renting, metallurgy wholesale, and electrical equipment sectors being the top suppliers.

The second largest sector, chemicals shows a similar pattern. Its export share increased from 12.3 to 14.9%, while the share from domestic inputs increase at a slower rate (from 3.8 to 4.8%). There was practically no change in the outside and inside flows of the other sectors in the top list (electrical, machinery, and metallurgy). Overall, it seems that France was not able to involve domestic supply sectors into the process of increasing transnationalization in the same way that Germany did.

Trajectories in the GIPS Countries

Figure 9 shows the country trajectories in the space of openness and unevenness for the GIPS countries. Greece is a clear outlier in its extreme increase in unevenness, with only a moderate increase in openness. Ireland is the opposite of the Greek story—outstanding increase in openness with only moderate levels of unevenness.

Greece

The Greek economy in 1995 was not significantly more uneven than the German economy in the same year (Greek unevenness was 0.083, German unevenness was 0.071). By the end of the time period, we studied that the Greek economy became the most uneven (unevenness = 0.204), while Germany's unevenness decreased to 0.047. What happened?

The sectoral breakdown of the Greek economy is presented on Fig. 10. In 1995, the moderate level of unevenness in upstream domestic embedding was chiefly due to water transport, textiles, agriculture, and metallurgy. In this year, water transport was responsible for 16.0% of exports, textiles and agriculture represented about 12% of exports each, and metallurgy was 8.6%. By 2011, the openness of the Greek economy
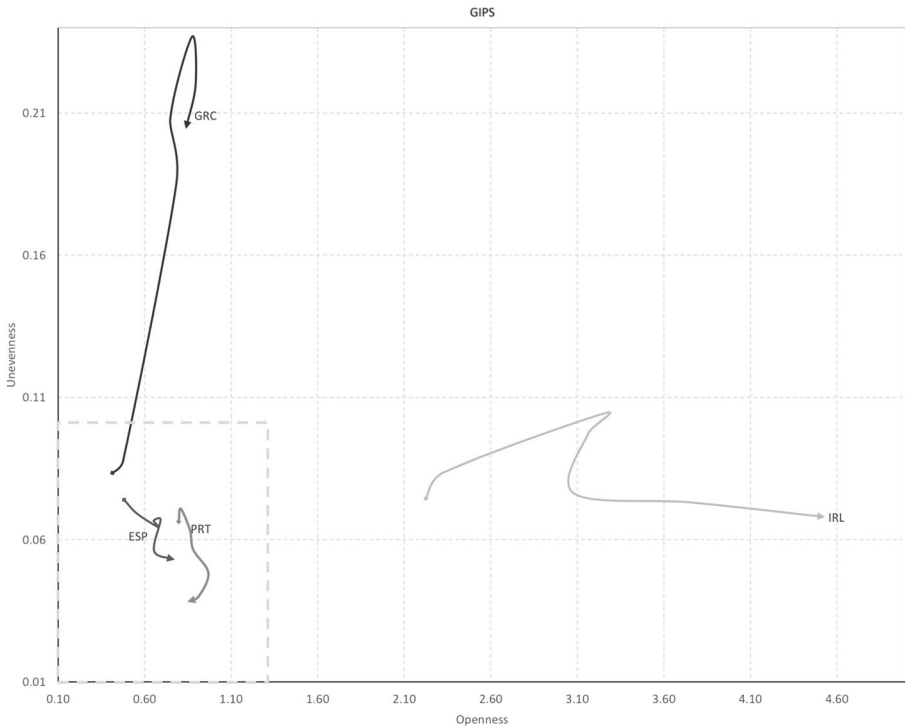
Fig. 9 GIPS country trajectories in the space of openness and unevenness. Note: Shading indicates slope: darker lines have significant slope coefficients, while lighter lines do not. The area outlined by dashed grey rectangle represents the area covered by the Core and East trajectories charts

increased only slightly (see Böwer et al. 2014 for a report on the missing Greek exports), but the sectoral structure of exports changed drastically. Water transport dominated Greek exports, with 42.1% of all exports originating from this sector. The main contributor to the greatly increased unevenness is the water transport sector. Greece is the most important player in maritime transport in the world, it controls 16.2% of global water transport capacities. As the export share of water transport increased dramatically (from 16.0 to 42.1%), its share in domestic inputs did not follow this increase (share in domestic intermediate inputs increased from 2.1 to 9.1%). In absolute nominal terms, the amount of exports from the water transport sector increased from US$ 1527 to US$ 17,905 million (an 11-fold increase), while domestic intermediate inputs from other sectors increased from US$ 631 to US$ 1952 million (a threefold increase). The main domestic inputs to this sector come from other transport services, which include cargo handling, storage, and transport agency services.

Ireland

In many respects, Ireland is the exact opposite of Greece. The trajectory of Ireland is dominated by increasing openness, with a first phase where unevenness increased slightly (between 1995 and 2001 uneveness increased from 0.075 to 0.107), and a second phase where unevenness stays around 0.070 (from 2002 to 2011).
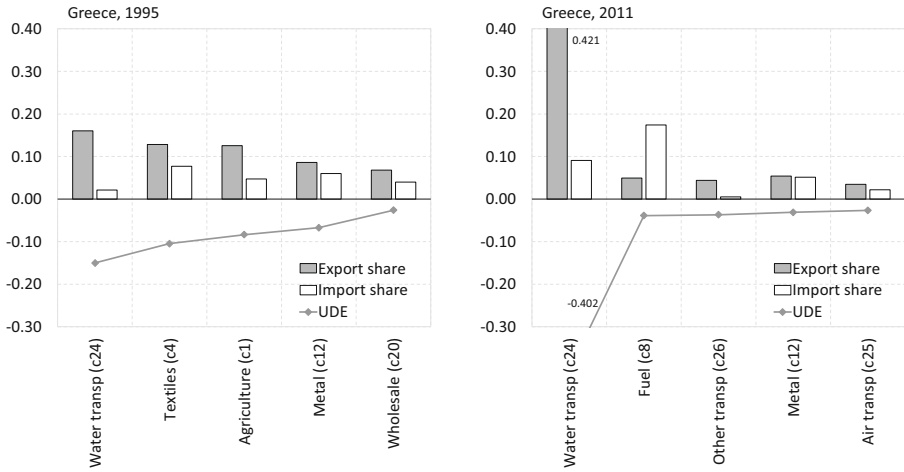
Fig. 10 Greek sectors in 1995 and 2001, ranked by upstream domestic embedding (UDE)

The major growth of the Irish economy from the 1990s was fueled by a great influx of foreign direct investment into high-technology manufacturing and services (Kirby 2010; Kirby and Carmody 2010). Between the 1990s and 2000s, Ireland became a hub for electronics companies. As Fig. 11 shows, electronics was the largest contributor to the unevenness of the economy. It contributed 25.6% of exports, while it used only 5.7% of domestic intermediate inputs and 19.8% of all imports. The unevenness of the economy increased slightly to 2001, with the electronics sector further increasing its export share to 29.0%, with a 7.9% share of domestic intermediate inputs, and the chemical industry drastically increasing its export share from 15.1 to 24.7%, while its domestic upstream share increased from 3.9 to 8.1%.

The unevenness of the Irish economy decreased from 2001 to 2011, partly due to changes in the weight of sectors, and partly due to changes within sectors. The export share and unevenness of the electronics sector decreased drastically. The export share decreased from 29.0 to 10.5%, while the sector's share from domestic inputs decreased much less (from 7.9 to 5.6%). Overall, the distribution of export shares becomes more even, and chemical products became the top export share sector. The nature of the electronics sector seems to have changed as well. Whereas in 1995 this sector mostly used inputs from wholesale and retail, by 2011 the weight of equipment renting, chemical products, metallurgy, and utilities increased significantly. The sector switched
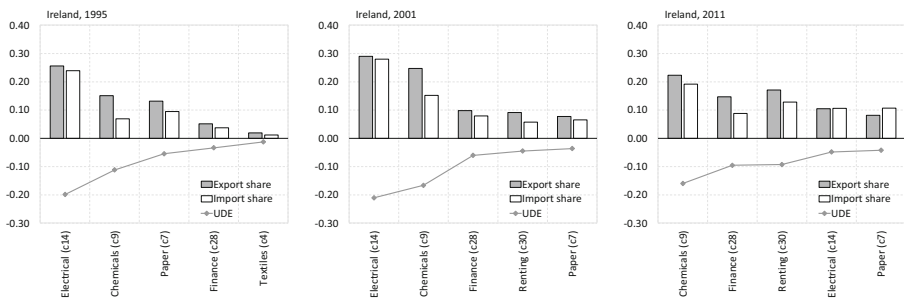

Fig. 11 Ireland sectors in 1995, 2001, and 2001, ranked by upstream domestic embedding (UDE)

from simple assembly to a deeper integration with domestic sectors and reoriented towards healthcare equipment manufacturing. In sum, the Irish trajectory switched from a parallel increase of openness and uneveness to a trajectory where drastic further increase in openness was paired with a marked decrease in unevenness.

Trajectories in the East

Trajectories in the Eastern region of the EU are more varied and complex than the trajectories in the core and GIPS regions. As our pooled time series model of distance traversed indicated, East economies experienced larger jumps from1 year to the next—as it is apparent on Fig. 12.

The longest trajectory is the Hungarian one, with a marked increase of both openness and unevenness in the first part (between 1995 and 2004), followed by a turning point, onto a trajectory of increasing openness with decreasing unevenness. We label this a "turning point trajectory"—a pattern followed by Poland as well (to the left of the Hungarian trajectory). There is a second kind of trajectory as well, where countries start with increasing openness and unevenness and then turn back toward decreasing openness and unevenness. We label this a "retrograde trajectory". Figure 13 separates trajectories in the East accruing to these two patterns.
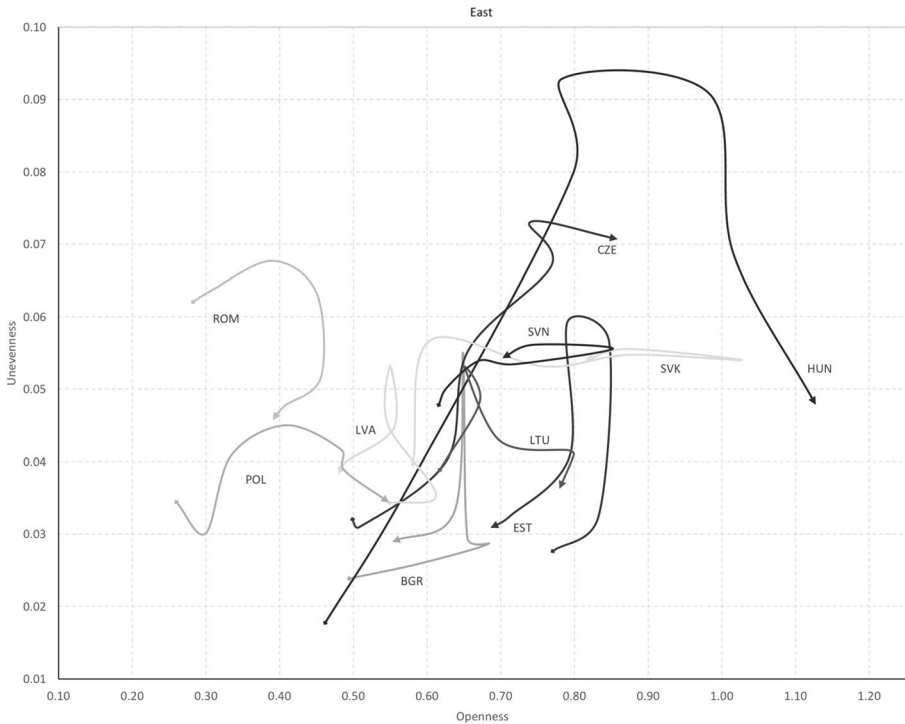

Fig. 12 Trajectories of economies in the space of openness and unevenness by region. Framed area within the GIPS chart indicates area of core and East charts. Shading indicates slope: darker lines have significant slope coefficients, while lighter lines do not

Hungary best exemplifies the turning point trajectory, with Czech Republic, Poland, and Lithuania in the same category. This trajectory suggests a structural adjustment to increasing openness, a change to a path where an increased embedding of export sectors into the domestic intermediate sectoral flows becomes possible.

Estonia is the best example of the retrograde trajectory, with Bulgaria, Latvia, Romania, Slovakia, and Slovenia also in the same category. This trajectory suggests change where domestic embedding improves not by increasing flows inside, but by decreasing flows with the outside world.

Hungary

Hungary experienced the greatest amount of change of any East European economy in terms of openness and unevenness. Interestingly, the most even economy in our entire dataset was the Hungarian economy in 1995. As the first panel of Fig. 14 shows, sectors in the Hungarian economy in 1995 had very similar and evenly distributed export shares. None of the sectors had an export share exceeding 10%, and the sector with the highest export share—food—was actually over-embedded in domestic upstream flows (this sector was responsible for 9.1% of all exports and used 14.9% of all intermediate flows). The sector with the second highest export share—metallurgy—was the most uneven of all sectors, with 8.5% of exports and 3.2% of domestic upstream flows.

This even sectoral structure changed drastically over the next 10 years. By 2004, the Hungarian economy became highly uneven. The sector mostly responsible for this is electronics: by 2004 this sector was responsible for 32.9% of all exports, used 28.4% of all imports, but only 6.1% of domestic sectoral output. By 2001, Hungary was responsible for half of all electronics exports from Eastern Europe. A key example of the kind of electronics operations responsible for this is IBM Storage Products, an assembly plant of computer hard drives that started operating in 1996. By the end of the 1990s, this company became the second largest exporter. In 2002, IBM decided to close the assembly operation and consolidate hard drive assembly in Asia. The second sector that contributed to unevenness in 2004 was the manufacturing of transport equipment. This sector provided 13.9% of all exports, using 11.1% of all imports and 4.1% of domestic intermediate output.

What was the nature of the turning point after 2004? By 2011, the list of five least domestically embedded sectors did not change much—only the ordering of the third, fourth, and fifth sectors. Electronics and transport equipment were still the sectors
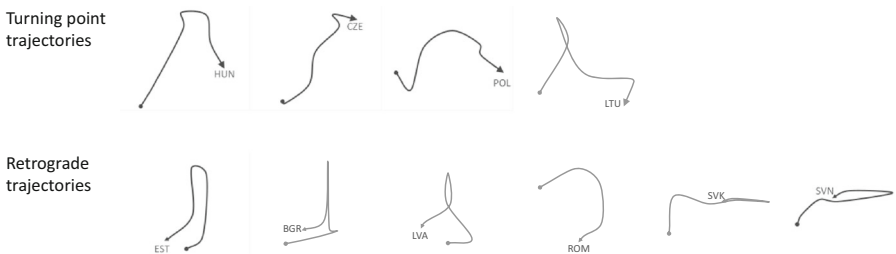
Note: Trajectories are not drawn to the same scale.

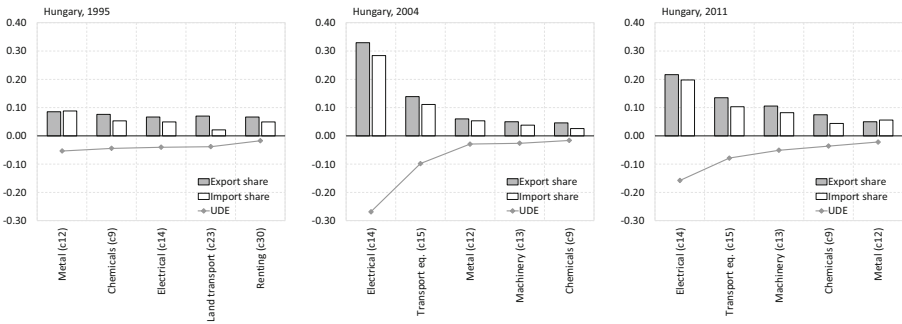**Fig. 13** Types of trajectories of East European economies. Note: Trajectories are not drawn to the same scale

Fig. 14 Hungary sectors in 1995, 2004, and 2011, ranked by upstream domestic embedding (UDE)

responsible for the highest share of exports, although their share decreased: from 32.9 to 21.7% for electronics, and from 13.9 to 13.5% for transport equipment. Electronics changed the most: the marked decrease in the export share was paired with a minor change in the proportion of domestic output used (from 6.1 to 5.9%). A sign of switching away from simple assembly is the increasing amount of output used from the domestic machinery sector. (In 2004, 2.1% of intermediate inputs to electronics came from the domestic machinery sector, while in 2011 this proportion was 19.9%.) While the export share of the transport equipment sector decreased slightly (from 13.9 to 13.5%), its share in domestic inputs used increased (from 4.1 to 5.6%). Much of this increase was due to a rise in the share of the machinery sector (from 9.5 to 40.0% of all domestic sectoral inputs).

Estonia

Estonia is an example for a retrograde trajectory—an economy that started to become more open and uneven, and then both openness and unevenness declined. Estonia was seen as a key example of an institutional restructuring success in the 1990s and early 2000s (Bohle and Greskovits 2012). The case of Estonia was marked by an increase in openness mostly due to FDI-led electronics production, then an extreme decline during the 2008–2009 economic crisis. In 2008, Estonian GDP declined by 5.1% and in 2009 to 13.9%.

The increase in openness and unevenness was mostly driven by the electronics sector, as Fig. 15 shows. While in 1995 this sector provided only 5.1% of exports, and
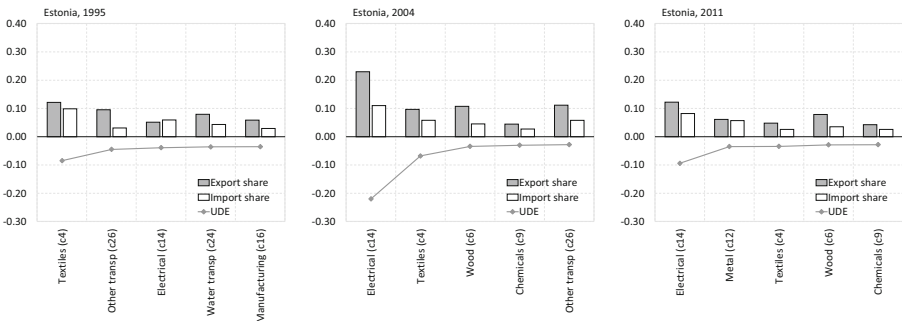

Fig. 15 Estonia sectors in 1995, 2004, and 2011, ranked by upstream domestic embedding (UDE)

used 1.2% of domestic intermediate inputs, in 2004 it provided 23.0% of exports, and used only 0.9% of domestic input. The size of the electronics sector is much smaller than Hungarian electronics; total electronics exports from Estonia were never more than 6% of total electronics exports from Hungary. The output of the sector came from a handful of companies (mostly from Ericsson) and depended on Scandinavian export markets. By 2011, the export share of the sector declined to 12.2%, and its share from domestic sectoral output used increased to 2.8%.

Conclusions

European economic integration resulted in unprecedented growth in economic openness throughout the continent. The economic crisis of 2008–2009 left only faint dips in the increasing trend of integration, while increasing by 50% over the next decade. Yet, there has been dramatic unevenness in the growth of economic openness, with Northern Europe, Ireland, and the Visegrad group being the leaders in the internationalization of their sectoral flows, and Southern Europe, the Baltics, and the Balkans experiencing lower than average integration, with even a decrease in sectoral economic openness in Estonia and Latvia. An exclusive attention to flows between national economies, however, would miss a key dimension of increasing integration: the impact of openness on the domestic structure of economies and the extent to which integration is embedded in the domestic flows.

The core of the core—Germany, Great Britain, Sweden, and Austria—are economies that can increase their participation in transnational flows and at the same time let their domestic sectors benefit twice: both as exporters and as suppliers of other export sectors. The domestic sectoral hinterland grows with the flagship export sectors in a virtuous circle of growth. German export sectors—primarily exporting sophisticated transport equipment, machinery, electronics, and chemical products—rely on other sophisticated domestic products, with sectors innovating and learning together.

Then there are regions—Eastern Europe and Greece—where this does not seem to be the rule. In the East, as a main trend, exporting means disconnecting. Exports are concentrated in sectors that are assembling imports and rely little on other domestic sectors. A whole sector can be built up quickly, and, because domestic inputs do not bind the sector, can be moved overnight to another continent.

Beyond focusing on trends, we also focus on trajectories. The first finding here is that the trajectories in the East show more volatility than the trajectories in the core. The increase in unevenness with increasing openness in the East is not a linear trend—there are signs of turning points. Economies in Eastern Europe will not be heading down a disembedding path indefinitely—we have not found a trajectory type for a truly vicious circle—although the Greek and the Czech trajectories come close. In the East, economies are experiencing a turning point. Partly due to opportunities opened by the 2008 crisis, export sectors are growing domestic roots, and well-embedded domestic sectors are starting to access export markets. Hungary, Poland, and Lithuania seem to switch over to a path similar to the core.

Contrary to the expectations of either the optimistic vision of integration as convergence, or the pessimistic idea of structural reproduction of the peripheral status, our findings show that combining openness with domestic embeddedness is indeed

possible, and it is not predetermined by the initial status of the economy as a core or a peripheral one. While the Hungarian or the Polish trajectories suggest that the pathway towards the core is possible in the periphery, the French trajectory suggests that core countries are not immune to disembedding either. Developmental pathways, rather than being merely the result of the structural starting conditions, are rather always shaped by developmental agency. Furthermore, we find important intra-peripheral national variation in developmental pathways, similar to the ones discussed by Bohle and Greskovits (2012). Our results thus suggest that at least with respect to trade flows, the developmental implications of increased openness may be primarily the result of domestic developmental agency, rather than a supranational one (see Bruszt and Vukov's introduction to this issue on supranational developmental agency).

Further research is needed to identify the impact of unevenness on other developmental outcomes. This article aimed at highlighting an inequality that we have theoretical reasons to expect to be connected to underdevelopment, but we have not analyzed these outcomes here. There are several hypotheses that need to be investigated. Is there an optimal value for unevenness that is not zero? Are there tradeoffs, where decreasing unevenness is related to, for example, increasing unemployment? We should also investigate the limits of growing unevenness and also decreasing unevenness. What are the limits for the Greek economy in terms of the domestic disembedding of export sectors? How far can the German economy develop by increasing openness and reducing unevenness? Our goal in this article was to highlight these inequalities, using the new perspective that the WIOD dataset offers with transnational input-output flows.

References

Appelbaum RP, Smith D, Christerson B. Commodity chains and industrial restructuring in the Pacific Rim: garment trade and manufacturing. In: Gereffi G, Korzeniewicz M, editors. Commodity Chains and Global Capitalism. Westport: Praeger Publishers; 1994.

Balassa B. The theory of economic integration. London: Routledge; 1962.

Balassa B. Trade creation and trade diversion in the European common market. Econ J. 1967;77(305):1–21.

Bauer PT. West African trade: a study of competition, oligopoly and monopoly in a changing economy: University Press; 1954.

Bergstrand JH. 2008. How much has European economic integration actually increased members' trade? Centre for Economic Policy Research, available at http://www.voxeu.org/article/european-economic-integration-and-trade-how-big-was-boost (27 November 2015).

Berman BJ. Clientelism and neocolonialism: center-periphery relations and political development in African states. Stud Comp Int Dev. 1974;9(2):3–25.

Bohle D, Greskovits B. Capitalist diversity on Europe's periphery. New York: Cornell University Press; 2012.

Böwer U, MIchou V, Ungerer C. The puzzle of the missing Greek exports. In: Economic papers 518. Brussels: Directorate-General for Economic and Financial Affairs; 2014.

Bruszt L, Langbein J, Vukov V, Bayram E, Markiewicz O. The developmental impact of the EU integration regime: insights from the automotive industry in Europe's peripheries. MAXCAP Working Paper Series no. 16. 2015.

Chan S. Cores and peripheries interaction patterns in Asia. Comp Pol Stud. 1982;15(3):314–40.

Condliffe JB. The commerce of nations: Norton; 1950.

Dietzenbacher E, Los B, Stehrer R, Timmer M, de Vries GJ. The construction of world input-output tables in the WIOD project. Econ Syst Res. 2013;25(1):71–98.

Dominguez JI. Mice that do not roar: some aspects of international politics in the peripheries. Int Organ. 1971;25(2):175–208.

Galtung J. A structural theory of imperialism. J Peace Res. 1971;8(2):81–117.

Gereffi G, Korzeniewicz M, editors. Commodity chains and global capitalism. Westport: Praeger Publishers; 1994.

Good PI. Resampling methods: a practical guide to data analysis. Third edition. Boston: Birkhäuser; 2006.

Greskovits B. Leading sectors and the variety of capitalism in Eastern Europe. Actes du GERPISA. 2005;39: 113–28.

Hardy J. Cathedrals in the desert? Transnationals, corporate strategy and locality in Wroclaw. Reg Stud. 1998;32(7):639–52.

Heintz J. Low-wage manufacturing and global commodity chains: a model in the unequal exchange tradition. Camb J Econ. 2006;30:507–20.

Hoen AR. An input-output analysis of European integration. Amsterdam: Elsevier; 2002.

Kirby P. Celtic Tiger in collapse: explaining the weaknesses of the Irish model. New York: Palgrave MacMillan; 2010.

Kirby P, Carmody P. The legacy of Ireland's economic expansion: geographies of the Celtic Tiger. New York: Routledge; 2010.

Krugman P. Geography and trade. Cambridge: MIT Press; 1991.

Maya-Ambía J., C. 2011. Constructing agro-industrial clusters or disembedding of the territory? Lessons from Sinaloa as the leading horticultural export-oriented region of Mexico. Open Geogr J, 4:29–44.

Meier GM, Baldwin RE. Economic development: theory, history, policy: John Wiley & Sons; 1957.

Nordlund C. Social ecography: international trade, network analysis, and an Emmanuelian conceptualization of ecological unequal exchange. Lund: Lund university; 2010.

Oman CP, Wignaraja G. The postwar evolution of development thinking. Houndmills & London: Macmillan, St. Martin's & OECD Development Centre; 1991.

Porter ME. Competitive advantage: creating and sustaining superior performance. New York: Free press; 1985.

Singer HW. Dualism revisited: a new approach to the problems of the dual society in developing countries. J Dev Stud. 1970;17(1):60–75.

So AY. Social change and development: modernization, dependency and world-system theories. California: Sage publications; 1990.

Timmer M (ed). 2012. The world input-output database (WIOD): contents, sources and methods. Available at: http://www.wiod.org/publications/source_docs/WIOD_sources.pdf

Timmer MP, Dietzenbacher E, Los B, Stehrer R, de Vries GJ. An illustrated user guide to the world input-output database: the case of global automotive production. Rev Int Econ. 2015;23:575–605.

Wallerstein I, Hopkins T. Commodity chains in the world prior to 1800. In: Wallerstein I, editor. The Essential Wallerstein. New York: New Press; 2000 [1986]. [Orig. publ. in Review, 1986, 10: 157–170].

Yanikkaya H. Trade openness and economic growth: a cross-country empirical investigation. J Dev Econ. 2003;72:57–89.

Balazs Vedres is associate professor and director at the Center for Network Science at Central European University. His research furthers the agenda of understanding historical dynamics in network systems, combining insights from network science, historical sociology, world systems research, and studies of complex systems in physics and biology. His research results were published in the top journals of sociology, with two recent articles in the American Journal of Sociology exploring the notion of structural folds.

Carl Nordlund is assistant professor at the Institute for Analytical Sociology at Linköping University, with an additional affiliation at the Center for Network Science at Central European University. He holds a PhD in human ecology from Lund university, combining studies in computer science, economic history, economic geography, development studies and world system analysis. Currently researching ethnic integration in Sweden using population-register data and network methods, recent publications have addressed ecological unequal exchange, European integration, historical core-periphery conceptualizations and methods for valued blockmodeling.