Global value networks[1]

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We study, at the industry level, the patterns of correlation between value added trade flows and the presence of multinational business groups (MBGs) across countries and industries. Value added trade flows are computed from WIOD data through the methodology developed by Wang et al. (2013). Data on the presence of MBGs are obtained as in Altomonte and Rungi (2013), using data from ORBIS and the Ownership Database by Bureau van Dijk. We run gravity estimations augmented with measures of MBGs presence across "triplets", defined as "home country - home industry - partner country". We employ as dependent variables both gross exports and the four main value added components of exports (e.g. domestic and foreign value added). We find evidence of a rich pattern of positive correlations between value added trade and the presence of MBGs.

1 Introduction

There is broad evidence that the development of global value chains (GVCs) is strongly linked to the increasing presence of multinational business groups (MBGs) across countries. And yet, scant evidence exists at the micro level on the characteristics of these MBG-related production networks, and on their relationship with bilateral trade flows. This chapter aims at deepening our understanding of this phenomenon. In particular,

1 We thank Afrola Plaku for excellent research assistance. We are very grateful to Zhi Wang, Shang-Jin Wei, and Kunfu Zhu for having shared their data on the decomposition of exports with us.

we provide the first micro-based evidence on the patterns of correlation between the joint presence of multinational business groups across countries and industries and the corresponding bilateral flows of trade in value added.

We construct a dataset mapping more than 50,000 multinational business groups globally in the year 2010 (using ORBIS data). We develop several measures of MBG-based linkages across countries and industries, as stemming from the joint presence of the same business groups through their affiliates. We then study how these indicators correlate with bilateral trade flows within a gravity framework, focusing both on gross export flows and, separately, on the different value added components of the same flows. Figures on trade in value added are obtained through the gross export accounting methodology recently developed by Wang et al. (2013), using WIOD data.

Our work is the first to propose a gravity approach to studying the patterns of these bilateral value added trade flows, rather than simple gross measures of exports. To the best of our knowledge, it is also the first to augment gravity equations with a bilateral country-industry variation in terms of business groups' linkages.

Our results are consistent with the standard findings of the gravity literature on gross export flows, for example with respect to the negative role played by distance between countries. In addition, we show that such findings keep holding when considering each value added component separately. This is a novel finding, suggesting that a properly specified gravity approach may remain valuable when studying value added trade flows rather than gross flows. When we augment the gravity equations with indicators for the bilateral joint presence of MBGs across countries, we find evidence of a rich pattern of correlations with value added trade flows.

Section 2 of this chapter describes the methodology of Wang et al. (2013) for decomposing trade flows. Section 3 discusses our data on MBGs. Section 4 presents our econometric analysis, while Section 5 concludes.

2 Bilateral value added trade measures and stylised facts

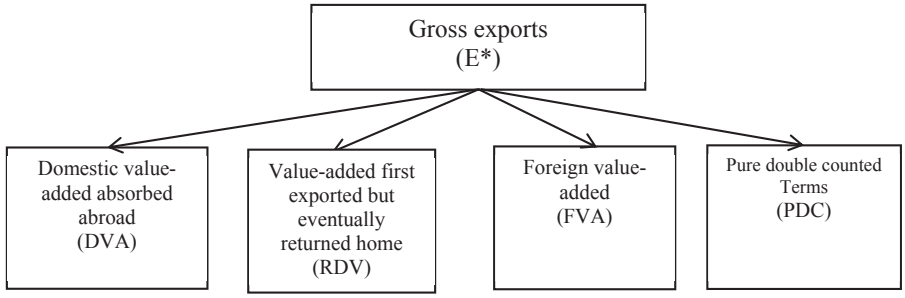
The ability to decompose gross export flows into their different value added components is key to our analysis. To do this, we rely on the methodology recently developed by Wang et al. (2013), which generalises the country-level decomposition by Koopman et al. (2014). Essentially, given a gross export flow equal to 100 from the home country A, in the home industry X, to the partner country B, the methodology by Wang et al. (2013) allows us to uncover which share of the total gross flow corresponds to domestic value added, to foreign value added, and so on, with the shares summing up exactly to 1. Just as in the latter example, the observational units of our analysis are then 'triplets', defined as home country (HC) - home industry (HI) - partner country (PC). Having decomposed each gross trade flow at the triplet level, we will focus on four main value added components, as reported in Figure 1, whose sum is always equal to the corresponding gross flow:

- Domestic value added (DVA) is the value added generated in the exporting home country (HC), which is embodied in exported goods of the home industry (HI) and is finally absorbed abroad (not necessarily in the partner country PC). It is important to note that this is a 'backward linkage'-based measure of value added exports. This means that it takes into account the domestic value added embodied in the exports of a given industry, no matter in which domestic industry such value added has been generated. Thus, it considers the creation of domestic value added along all the vertically related industries, finally embodied in the exports of the industry considered in the triplet (HI).[2]
- Domestic value added first exported but eventually returned home (RDV) is the domestic value added embodied in the export flows which returns home. It includes the export of intermediates that are processed abroad and return home, both as final and intermediate goods.

2 For a discussion of why forward linkage-based measures of value added exports are problematic when working at the industry level, see Wang et al. (2013).

- Foreign value added (FVA) is the foreign value added embodied in domestic exports, both in final goods and in intermediates.
- Pure double counting (PDC) is the portion of gross exports accounted for by intermediates crossing borders several times before being finally absorbed. PDC may include value added generated both in the home country (HC) and abroad, and can be considered a sort of indicator for the extent of production sharing across countries (Wang et al. 2013).

Figure 1 Gross exports accounting: Major categories



Wang et al. (2013) performed the decomposition of export flows for the 40 countries and 35 industries covered by the WIOD database, as described in the Appendix at the end of this book, over the period 1995-2011. For the purposes of our analysis, we will focus on the year 2010, for which we have been able to retrieve information on the joint presence of MBGs across countries and industries. In particular, we will relate gross exports and their four components to the underlying distribution of business groups, at the triplet level. For example, considering Germany as the home country (HC) and the automotive industry as the home industry (HI), how do trade flows vary as we consider different partner countries (i.e. different PCs and so different triplets)? Are these changes related to the underlying distribution of multinational groups across the different triplets? A practical example, clarifying the concept of triplets and the decomposition of bilateral exports is presented in Appendix A.

Table 1 reports instead some descriptive statistics, across triplets, on the relative importance of the four value added components, taken as shares of gross export flows. As can be seen in the table, DVA accounts for the largest share, about 77% on average, followed by FVA with about 17%, and PDC with an average share of 6.1%. RDV is much less relevant, accounting on average for only 0.4% of gross exports. However, these figures mask substantial heterogeneity across triplets, as suggested by the high standard deviations. In what follows, we investigate how such heterogeneity relates to the presence of multinational business groups across countries and industries.

Table 1 Shares of value added components across triplets

Variable	Obs.	Mean	Std. Dev.	Min	Max
Share DVA	49411	0.7667	0.1424	0.1294	0.9908
Share RDV	49411	0.0040	0.0092	0.0000	0.3033
Share FVA	49411	0.1678	0.1130	0.0004	0.8025
Share PDC	49411	0.0615	0.0621	0.0000	0.6074

3 Business group metrics

In order to build the dataset on multinational groups operating at the triplet level, we combine two sources of data: the Ownership database, containing worldwide proprietary linkages, and the Orbis database, containing firm-level financial accounts. Both databases are produced by the Bureau Van Dijk, and cover the same 40 countries and 35 industries covered by the WIOD data, from which we have obtained value added trade flows. Proprietary linkages data for the year 2010 are employed in order to identify firms that belong to the same business group, both within and across countries. The identification of business groups is performed using the methodology developed by Altomonte and Rungi (2013), considering both direct and indirect control through majority ownership.[3]

3 Group affiliation is identified through a direct or indirect control above 50.01%; see Altomonte and Rungi (2013) for additional technical details.

Having identified all of the business groups in the data (270,454), given the focus of our study we then restrict our analysis to 50,016 multinational business groups (MBGs), i.e. business groups controlling at least one subsidiary in a country different from the country of origin of the parent company. These 50,016 multinational groups account for a total of 758,696 'nodes', where a node is a firm belonging to a group, be it an affiliate or the parent company. Table 2 shows the distribution of nodes across the 40 WIOD countries. The majority of nodes are located in OECD countries, with the US and the UK being the two major hosts of multinational firms.[4]

Starting from the retrieved information on MBGs, we develop a number of metrics on the number and the characteristics of multinational business groups operating in each triplet. In particular, given the triplet home country (HC) - home industry (HI) - partner country (PC), we have the following:

- H_Nodes is the number of nodes located in home country (HC) - home industry (HI), belonging to MBGs that are also present with at least one node in the partner country (PC).
- P_Nodes is the number of nodes located in the partner country (PC), in any industry, belonging to MBGs that are also present with at least one node in the home country (HC) – home industry (HI). P_Nodes can be further split in two components:
    - P_Nodes_HI is the number of nodes operating in the partner country (PC) in the same home industry (HI).
    - P_Nodes_noHI is the number of nodes operating in the partner country (PC) in any other industry.

As a clarifying example, let us consider France as the home country (HC), food as the home industry (HI), and Italy as the partner country (PC). A value of H_Nodes = 145 means that, in the French food industry, there are 145 nodes owned by MBGs (no matter where they are originated) which are also present in Italy. P_Nodes = 230 means

4 The very large number of nodes in the UK partly reflects the fact that we are including MBGs of a financial nature.

that the MBGs operating in the French food industry control 230 nodes in Italy, across all industries. We can further decompose this figure into two components: P_Nodes_HI = 110 (nodes owned in the Italian food industry); and P_Nodes_noHI = 120 (nodes owned in any other Italian industry but food).

Table 2 Number of nodes by country

Country	Country Identifier	Total Nodes	Country	Country Identifier	Total Nodes
Australia	AUS	24,141	Italy	ITA	33,216
Austria	AUT	12,335	Japan	JPN	31,796
Belgium	BEL	12,493	South Korea	KOR	3,122
Bulgaria	BGR	7,795	Lithuania	LTU	1,300
Brazil	BRA	8,378	Luxembourg	LUX	6,741
Canada	CAN	15,493	Latvia	LVA	1,097
China	CHN	23,970	Mexico	MEX	10,062
Cyprus	CYP	2,915	Malta	MLT	872
Czech Republic	CZE	5,269	Netherlands	NLD	30,473
Germany	DEU	67,132	Poland	POL	11,719
Denmark	DNK	11,403	Portugal	PRT	7,091
Spain	ESP	34,076	Romania	ROM	2,541
Estonia	EST	1,663	Russia	RUS	17,492
Finland	FIN	5,324	Slovakia	SVK	2,233
France	FRA	48,432	Slovenia	SVN	1,294
United Kingdom	GBR	134,159	Sweden	SWE	14,500
Greece	GRC	3,245	Turkey	TUR	3,413
Hungary	HUN	3,094	Taiwan	TWN	3,710
Indonesia	IDN	2,370	United States	USA	130,200
India	IND	7,034			
Ireland	IRL	15,103			**Total 758,696**

In addition to the quantitative metrics presented above, we also compute four additional variables capturing some characteristics of the MBGs that are active in each triplet, i.e. that control at least one node in home country (HC) - home industry (HI), and one node in the partner-country (PC) in any industry. In particular, we retrieve two measures of size and two indicators of diversification:

- Average Total Sales is the average global sales of the MBGs operating in the triplet.
- Average Total Affiliates is the average number of affiliates of the MBGs operating in the triplet.
- Geographical Diversification is the average number of countries in which the MBGs operating in the triplet are active.
- Industrial Diversification is the average number of industries (NACE 2-digits) in which the MBGs operating in the triplet are active.

It is important to bear in mind that the same MBG can operate in several different triplets; in that case, its characteristics will be considered for the averages of each relevant triplet. Table 3 presents the median values for the MBG indicators by country. These figures are computed for each country C across all the triplets having country C as the home country (HC).

Table 3 Multinational group indicators: Medians by country across triplets

Country Identifier	H_ Nodes	P_Nodes	P_ Nodes_ HI	P_ Nodes_ noHI	Average Total Sales	Average Total Nodes	Geographical Diversification	Industrial Diversification
AUS	66	43	19	20	14,674,116	311	24	14
AUT	37	65	13	43	19,082,830	366	24	17
BEL	61	105	19	76	25,073,384	385	25	17
BGR	8	24	8	12	14,835,578	356	26	15
BRA	43	76	18	53	21,200,436	356	25	16
CAN	58	88	20	62	23,137,028	353	25	16
CHN	73	53	23	26	20,230,366	297	23	14
CYP	7	13	5	5	11,558,296	303	22	14
CZE	27	66	16	43	20,231,190	366	25	16
DEU	245	275	33	209	23,826,804	356	24	17
DNK	27	43	12	29	15,485,565	322	25	15
ESP	137	164	23	126	24,593,904	385	24	16
EST	6	17	4	10	13,617,586	349	26	16
FIN	18	38	9	25	16,485,939	306	25	15
FRA	240	202	28	155	29,848,053	403	25	17
GBR	463	278	39	222	24,845,375	349	22	16
GRC	11	27	8	15	22,298,174	364	26	15
HUN	19	49	16	27	20,502,895	372	26	16
IDN	10	22	9	9	18,845,260	338	26	15

Country Identifier	H_ Nodes	P_Nodes	P_ Nodes_ HI	P_ Nodes_ noHI	Average Total Sales	Average Total Nodes	Geographical Diversification	Industrial Diversification
IND	27	42	19	20	17,665,032	321	25	15
IRL	36	64	14	43	24,330,286	387	25	16
ITA	98	134	23	101	21,642,671	386	24	17
JPN	73	71	12	51	32,429,070	330	23	16
KOR	16	32	12	19	24,269,402	321	26	16
LTU	5	13	3	7	10,800,584	287	24	14
LUX	28	44	16	21	20,940,257	380	25	16
LVA	3	9	3	5	9,787,161	262	24	13
MEX	64	90	19	62	24,098,509	371	26	17
MLT	3	4	1	1	8,803,183	304	23	12
NLD	109	123	24	88	21,146,170	344	24	16
POL	56	112	23	79	22,421,414	367	24	16
PRT	32	58	15	37	22,208,305	392	26	16
ROM	19	52	18	28	21,567,157	404	27	16
RUS	71	98	21	70	25,090,180	357	24	17
SVK	14	37	11	20	20,624,558	371	26	16
SVN	5	14	4	7	13,091,379	325	27	16
SWE	71	85	16	62	19,434,209	353	25	16
TUR	21	30	13	14	18,562,468	333	26	15
TWN	8	16	8	6	15,895,090	321	27	15
USA	507	317	39	266	28,202,264	365	24	16

4 Econometric analysis

We investigate the correlation patterns between trade and MBG metrics within a gravity framework. The basic idea behind the gravity analysis is that two countries will trade more or less with each other depending on a number of factors related to geographical, cultural and institutional proximity.

Our analysis proceeds in steps. First, we run a standard gravity estimation (as in Anderson and Van Wincoop 2003) by regressing bilateral gross exports from country to country over the following variables: geographical distance and contiguity, common legal origin and language, and being part of a regional trade agreement involving trade in goods or also in services. We also include dummies for the exporting home country

(HC) and the recipient partner country (PC), to properly account for the multilateral resistance term in our cross-section. Such an approach has been widely adopted in trade studies aiming to identify the drivers of international trade.

Our results (available in Appendix B, Table 5) are in line with earlier studies, i.e. exports are higher towards closer and more similar trading partners. And yet, as suggested by Baldwin and Taglioni (2011), a gravity analysis based on gross exports alone may perform poorly in a world of global value chains, in which parts and components trade is relevant. Therefore, in the second step of our exercise, we repeat the same gravity analysis separately on the four bilateral value added components making up gross exports: DVA, RDV, FVA and PDC. To the best of our knowledge, we are the first to engage in such an analysis, thanks to the availability of precisely estimated bilateral value added flows via the methodology of Wang et al. (2013). By looking at the distance coefficient, the gravity specification seems appropriate also for each of the four value added components, and the results are essentially the same as in the analysis of gross exports. That is, all the value added components of exports tend to grow when considering closer and more similar trading partners. In the case of RDV, proxies for distance play an even stronger role, consistent with the fact that this component refers to domestic value added which is first exported and then re-imported and absorbed at home.

In the third step of our analysis, we replicate the analysis above at the triplet level, i.e. focusing on export flows from each home country (HC) and home industry (HI) towards each partner country (PC). We include in this case home country-home industry effects, as well as partner country effects. The results confirm the above findings obtained for country-to-country exports. In addition, a positive and significant association emerges

between trade flows and joint participation in a regional trade agreement covering trade in goods (Appendix B, Table 6).[5]

In the last step of the analysis, we augment the triplet-level gravity analysis by including our metrics for the presence of multinational business groups, aiming to uncover the correlation patterns between MBGs and (value added) trade. First, we include the variable Total Nodes, capturing the total MBG-based linkages in a triplet. This variable is computed as the sum of H_Nodes and P_Nodes, and thus considers both nodes present in the home country-home industry and nodes located in the partner country in any industry (Appendix B, Table 7). We then include separately H_Nodes and the two components of P_Nodes, i.e. P_Nodes_HI and P_Nodes_noHI (Appendix B, Table 8). The results suggest the presence of a robust positive correlation between MBG-based linkages, gross exports, and each of the four value added components. To give an idea of the magnitude of this correlation, a 1% increase in the number of Total Nodes operating in the triplet is associated with an increase in gross exports and DVA flows by 0.38%, an increase in RDV flows by 0.59%, an increase in FVA flows by 0.36%, and an increase in PDC flows by 0.45%. When breaking down the different components of Total Nodes, the highest correlation is always found between trade flows and H_ Nodes, i.e. the number of nodes located in home country (HC) - home industry (HI), belonging to MBGs that are also present with at least one node in the partner country (PC). Considering the nodes in the partner country, the correlation is higher for nodes that are operating in industries different from the home industry (HI) considered in the triplet. The latter finding suggests that vertical integration has a stronger correlation with exports than horizontal integration.

Finally, we enrich our specifications with the four indicators on the average size and diversification of the MBGs operating in each triplet (Appendix B, Table 9). A higher

5 Our analysis focuses only on triplets for which we observe both a positive trade flow and the presence of MBGs. Since we are working with the 40 largest economies in the world, and with relatively aggregated industries, few triplets drop out of the analysis. Robustness checks in which we have considered also the presence of the zero cells have confirmed our results.

average size of MBGs, as proxied by average total sales, is positively associated with gross exports and with each value added component. In contrast, higher diversification, especially at the geographical level, is negatively related to value added trade flows. This suggests that, having controlled for the number of MBG linkages, nodes operating in more dispersed countries and industries ceteris paribus will tend to trade relatively less.

All of the above findings mask some degree of heterogeneity across countries. In particular, results from Ramondo et al. (2015) suggest that intra-group trade may be less relevant for US multinational groups than for others. This result is also confirmed in our setting when restricting the analysis to triplets having the US as the home country. Indeed, in that case only P_nodes_HI is found to be associated with higher trade, consistent with the idea that the 'horizontal' dimension may be more relevant in the US FDI strategy.

5 Conclusion

Several policy-relevant findings emerge from our analysis.

First, although the nature of the four value added trade flows differs in principle, the economic drivers of these flows are largely similar. Indeed, the same bilateral gravity framework is able to explain each component of the value added trade decomposition, with very similar coefficients to those obtained for the standard aggregate export measure.

Second, the bilateral cross-country linkages established through the presence of business groups, however defined, are positively associated with each type of value added trade flow. This finding is quite unsurprising when considering the share of exported value added sourced from abroad (FVA), 'double counting' trade flows (PDC), and outward processing trade (RDV). In fact, in a model of 'vertical' FDI, the establishment of affiliates in a partner country (or the presence of local affiliates of foreign groups in

the home country) would generate a higher exchange of intermediates, eventually embodied in domestic exports. Much less obvious is our finding that the same business group linkages are also positively associated with the ability of any home country/ industry to export more domestic value added (i.e. the DVA component).

A causal (and non-exclusive) interpretation of the latter finding might suggest that, through the presence of multinational business groups, a country may raise its ability to export domestic value added, for example via access to superior technology, product upgrading, and the like. These channels have not been investigated in our contribution, and may constitute an interesting subject for future studies.

A further promising line of research could be to explore in more depth the cross-country heterogeneity behind our results, especially in light of the recent findings by Ramondo et al. (2015) on the US. This would certainly deepen our understanding of global value networks.

References

Altomonte, C and A Rungi (2013), "Business groups as hierarchies of firms: determinants of vertical integration and performance", ECB Working Paper No.1554, Frankfurt am Main.

Anderson, J E and E Van Wincoop (2003), "Gravity And Gravitas: A Solution To The Border Puzzle", *The American Economic Review* 93(1), pp. 170-192.

Baldwin, R (2014), "Multilateralising 21st-century regionalism", VoxEU.org, 20 January.

Baldwin, R and D Taglioni (2011), "Gravity Chains: Estimating Bilateral Trade Flows When Parts And Components Trade Is Important", NBER Working Paper No. 16672, Cambridge, MA.

Koopman, R, Z Wang and S Wei (2014), "Tracing Value-added and Double Counting in Gross Exports", *The American Economic Review* 104(2), pp. 459-494.

Ramondo, N, V Rappoport and K H Ruhl (2015), "Intrafirm Trade and Vertical Fragmentation in U.S. Multinational Corporations", mimeo, University of California, San Diego.

Wang, Z, S Wei and K Zhu (2013), "Quantifying International Production Sharing at the Bilateral and Sector Levels", NBER Working Paper No. 19677, Cambridge, MA.

Appendix

A. Decomposition of gross exports: An example

A practical example may help in understanding the concept of triplets and the decomposition of bilateral exports in different value added components. Consider the exports of the automotive industry (code c15 in the WIOD classification) originated in Germany, France and Italy, and directed to the US. Columns 1 and 2 in Table 4 report the exporting home country (HC) and home industry (HI) considered, while Column 3 reports the importing partner country (PC). Column 4 shows the value (in millions of US dollars) of gross exports for each triplet. For example, in 2010 the German automotive industry exported approximately $26 billion of goods to the US. Columns 5-8 decompose this export flow into the four major value added components: DVA, RDV, FVA and PDC. To ease comparison across triplets, the four components are reported as shares of gross exports. By summing up the four shares in each row, one obtains 100%, as the backward linkage methodology allows us to precisely decompose gross exports at the triplet level.

Table 4 Example of gross exports decomposition

Home country	Home industry	Partner country	Gross Exports	Share DVA	Share RDV	Share FVA	Share PDC
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEU	Automotive	USA	26,093	66.15%	0.18%	30.97%	2.70%
FRA	Automotive	USA	7,793	62.04%	0.18%	33.34%	4.45%
ITA	Automotive	USA	2,481	70.10%	0.09%	25.49%	4.31%
DEU	Automotive	CHN	22,794	65.72%	0.38%	30.16%	3.74%
FRA	Automotive	CHN	4,392	62.29%	0.12%	34.37%	3.23%
ITA	Automotive	CHN	5,854	69.94%	0.25%	25.40%	4.41%
DEU	Automotive	POL	7,288	59.81%	0.40%	19.84%	16.34%
FRA	Automotive	POL	1,203	61.32%	0.91%	29.45%	8.32%
ITA	Automotive	POL	1,925	65.95%	3.91%	15.87%	14.27%
DEU	Food	USA	1,353	76.14%	0.07%	23.04%	0.75%
FRA	Food	USA	2,457	82.64%	0.00%	17.30%	0.06%
ITA	Food	USA	2,527	80.54%	0.00%	19.40%	0.06%

Looking at the first row, we observe that 66.15% of the German automotive exports towards the US is accounted for by value added produced at home (in any industry of the home country) and ultimately absorbed by other countries (DVA). Domestic value added initially exported but ultimately returned home and absorbed at home (RDV) accounts for 0.18% of gross exports. The share of foreign value added embedded in German exports (FVA) is equal to 30.97%, while 2.7% is pure double counting (PDC). Comparing the German automotive exports towards the US to those coming from Italy and France, we can observe several differences. In particular, the Italian automotive industry has the highest DVA share (70.1%) and the lowest FVA share (25.49%), while the opposite holds for France. RDV shares are very small for all countries, while PDC is non-negligible, implying a significant extent of international production integration.

Considering a different partner country, China, quite surprisingly we find a very similar decomposition of gross exports, thus suggesting that the same value added structure holds for the automotive exports of Germany, Italy and France towards both China and the US. Different considerations can be made, however, when we repeat the same exercise decomposing the export flows towards Poland. In this case, both DVA and FVA shares are lower than those observed for the US and China. On the other hand, RDV and especially PDC shares are higher. For instance, in the case of Italy, almost 4% of gross exports towards Poland are re-imported and absorbed in the home market, while pure double counting, caused by multiple border crossing of intermediate goods, accounts for around 14% of gross exports. This evidence is in line with the idea that global value chains actually tend to have a stronger 'regional' nature (Baldwin 2014).

Finally, it is interesting to compare the value added structures for the same European exporting countries and the first considered partner country, the US, while focusing on a different home industry, i.e. food (code c03 in the WIOD classification), as reported in the last three rows of Table 4. In particular, we notice that DVA is always more relevant for the food industry than for the automotive industry, with France and Italy having the highest DVA shares. Consistent with this observation, we also find lower FVA shares, while RDV and PDC are negligible. Overall, food production thus seems to rely more

on domestic components and services, with a less internationally segmented value chain.

These simple descriptive statistics show how the value added structures of exports may differ substantially between exporting countries, between industries within each exporting country, and also for the same home country and home industry depending on the partner country towards which exports are directed.

B. Econometric analysis: Results

Table 5 Gravity country-to-country

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Gross Exports	DVA	RDV	FVA	PDC
Distance	-1.0821***	-1.0495***	-1.9769***	-1.1194***	-1.2178***
	[0.050]	[0.051]	[0.077]	[0.049]	[0.054]
Contiguity	0.3600***	0.3686***	0.7177***	0.3418***	0.3318***
	[0.099]	[0.100]	[0.153]	[0.096]	[0.107]
Common Legal Origin	0.2848***	0.2862***	0.4490***	0.2807***	0.2561***
	[0.050]	[0.051]	[0.077]	[0.048]	[0.054]
Common Language	0.2538**	0.2401**	0.4082***	0.2806***	0.2240**
	[0.100]	[0.102]	[0.155]	[0.098]	[0.108]
RTA Goods	1.2729	1.3056	1.8736	0.2289*	1.0944
	[0.141]	[0.143]	[0.218]	[0.137]	[0.152]
RTA Services	0.1639	0.2590	0.3590	0.0084	0.6097
	[0.149]	[0.151]	[0.230]	[0.145]	[0.161]
Obs.	1560	1560	1560	1560	1560
R2	0.63	0.63	0.63	0.63	0.62

Notes: Depending on the column, the dependent variable is, alternatively: (log of) Gross Exports (1), DVA (2), RDV (3), FVA (4), and PDC (5). These figures refer to bilateral exports country-to-country. Distance is the log of the population-weighted distance (pop-wt, km). Contiguity, Common Legal Origin, and Common Language are dummy variables indicating, respectively, if the two countries are contiguous, have the same legal origin, share the same language. RTA Goods and RTA Services are dummy variables indicating if the two countries have Regional Trade Agreements involving only goods, or both services and goods, respectively. All specifications are estimated by OLS and control for home country and partner country effects. ***,**,* = indicate significance at the 1, 5, and 10% level, respectively.

Table 6 Gravity at the triplet level

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Gross Exports	DVA	RDV	FVA	PDC
Distance	-1.2205***	-1.2149***	-2.1043***	-1.2105***	-1.2539***
	[0.023]	[0.023]	[0.026]	[0.023]	[0.024]
Contiguity	0.4128***	0.4044***	0.7981***	0.4210***	0.4271***
	[0.045]	[0.045]	[0.050]	[0.044]	[0.046]
Common Legal Origin	0.4007***	0.4014***	0.5535***	0.4081***	0.3690***
	[0.022]	[0.022]	[0.025]	[0.022]	[0.023]
Common Language	0.1452***	0.1408***	0.3480***	0.1426***	0.1701***
	[0.046]	[0.046]	[0.051]	[0.045]	[0.047]
RTA Goods	0.3480***	0.3489***	0.2893***	0.3602***	0.2568***
	[0.069]	[0.069]	[0.077]	[0.068]	[0.071]
RTA Services	-0.1538**	-0.1541**	-0.0340	-0.1728**	-0.0254
	[0.072]	[0.072]	[0.080]	[0.071]	[0.073]
Obs.	49,411	49,411	49,179	49,411	49,179
R2	0.762	0.758	0.818	0.789	0.780

Notes: Depending on the column, the dependent variable is, alternatively: (log of) Gross Exports (1), DVA (2), RDV (3), FVA (4), and PDC (5). These figures refer to bilateral exports at the triplet level. For further explanations see footnote on Table 5. All specifications are estimated by OLS and control for home country - home industry and partner country effects. ***,**,* = indicate significance at the 1, 5, and 10% level, respectively.

Table 7 Gravity at the triplet level, augmented (1)

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Gross Exports	DVA	RDV	FVA	PDC
Total Nodes	0.3827***	0.3823***	0.5890***	0.3554***	0.4460***
	[0.017]	[0.017]	[0.018]	[0.016]	[0.017]
Distance	-1.0673***	-1.0615***	-1.8758***	-1.0661***	-1.0773***
	[0.025]	[0.025]	[0.028]	[0.025]	[0.026]
Contiguity	0.3628***	0.3541***	0.7204***	0.3737***	0.3777***
	[0.047]	[0.047]	[0.052]	[0.046]	[0.048]
Common Legal Origin	0.3830***	0.3837***	0.5371***	0.3910***	0.3590***
	[0.024]	[0.024]	[0.027]	[0.024]	[0.025]
Common Language	0.1211**	0.1164**	0.2860***	0.1215**	0.1295***
	[0.048]	[0.048]	[0.054]	[0.048]	[0.050]
RTA Goods	0.2646***	0.2655***	0.2142***	0.2761***	0.1704**
	[0.073]	[0.073]	[0.081]	[0.072]	[0.075]
RTA Services	-0.0424	-0.0427	0.0630	-0.0581	0.0880
	[0.076]	[0.076]	[0.084]	[0.075]	[0.078]
Obs.	41,583	41,583	41,448	41,583	41,448
R2	0.759	0.755	0.817	0.787	0.777

Notes: Depending on the column, the dependent variable is, alternatively: (log of) Gross Exports (1), DVA (2), RDV (3), FVA (4), and PDC (5). These figures refer to bilateral exports at the triplet level. Total Nodes is computed as the sum of H_Nodes and P_Nodes. For further explanations see footnote on Table 5. All specifications are estimated by OLS and control for home country - home industry and partner country effects. ***,**,* = indicate significance at the 1, 5, and 10% level, respectively.

Table 8 Gravity at the triplet level, augmented (2)

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Gross Exports	DVA	RDV	FVA	PDC
H_Nodes	0.3173***	0.3165***	0.4652***	0.3165***	0.3178***
	[0.025]	[0.025]	[0.028]	[0.025]	[0.026]
P_Nodes_HI	0.0724***	0.0724***	0.1213***	0.0492***	0.1256***
	[0.013]	[0.013]	[0.015]	[0.013]	[0.014]
P_Nodes_ noHI	0.2517***	0.2518***	0.3884***	0.2430***	0.2723***
	[0.016]	[0.016]	[0.018]	[0.016]	[0.017]
Distance	-0.9961***	-0.9902***	-1.7692***	-0.9948***	-0.9999***
	[0.026]	[0.026]	[0.029]	[0.026]	[0.027]
Contiguity	0.3548***	0.3461***	0.6995***	0.3647***	0.3827***
	[0.047]	[0.047]	[0.052]	[0.047]	[0.049]
Common Legal Origin	0.3339***	0.3348***	0.4746***	0.3437***	0.3008***
	[0.025]	[0.025]	[0.028]	[0.025]	[0.026]
Common Language	0.0946*	0.0897*	0.2433***	0.0946*	0.1125**
	[0.049]	[0.049]	[0.055]	[0.049]	[0.051]
RTA Goods	0.1365*	0.1374*	0.0942	0.1533**	0.0683
	[0.074]	[0.074]	[0.083]	[0.073]	[0.077]
RTA Services	0.0869	0.0866	0.1860**	0.0720	0.1917**
	[0.077]	[0.077]	[0.086]	[0.076]	[0.080]
Obs.	36,963	36,963	36,867	36,963	36,867
R2	0.762	0.758	0.819	0.794	0.781

Notes: Depending on the column, the dependent variable is, alternatively: (log of) Gross Exports (1), DVA (2), RDV (3), FVA (4), and PDC (5). These figures refer to bilateral exports at the triplet level. For further explanations see footnote on Table 5. All specifications are estimated by OLS and control for home country - home industry and partner country effects. ***,**,* = indicate significance at the 1, 5, and 10% level, respectively.

Table 9 Gravity at the triplet level, augmented (3)

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Gross Exports	DVA	RDV	FVA	PDC
H_Nodes	0.1667***	0.1661***	0.2248***	0.1657***	0.1681***
	[0.028]	[0.028]	[0.031]	[0.027]	[0.029]
P_Nodes_HI	0.0482***	0.0482***	0.0824***	0.0249*	0.1003***
	[0.013]	[0.013]	[0.015]	[0.013]	[0.014]
P_Nodes_ noHI	0.2265***	0.2266***	0.3472***	0.2178***	0.2476***
	[0.016]	[0.016]	[0.018]	[0.016]	[0.017]
Average Total Sales	0.1389***	0.1387***	0.1448***	0.1368***	0.1050***
	[0.039]	[0.039]	[0.044]	[0.039]	[0.041]
Average Total Affiliates	0.0513	0.0505	-0.1475	0.0596	-0.0432
	[0.103]	[0.103]	[0.115]	[0.102]	[0.107]
Industrial Diversification	-0.3812**	-0.3811**	-0.2508	-0.3894**	-0.3035*
	[0.160]	[0.160]	[0.179]	[0.159]	[0.166]
Geographical Diversification	-1.1375***	-1.1345***	-1.7308***	-1.1403***	-1.0528***
	[0.133]	[0.133]	[0.149]	[0.132]	[0.138]
Distance	-0.9235***	-0.9177***	-1.6482***	-0.9222***	-0.9252***
	[0.026]	[0.026]	[0.029]	[0.026]	[0.027]
Contiguity	0.3073***	0.2987***	0.6237***	0.3171***	0.3353***
	[0.047]	[0.047]	[0.052]	[0.047]	[0.049]
Common Legal Origin	0.3043***	0.3052***	0.4253***	0.3141***	0.2697***
	[0.025]	[0.025]	[0.028]	[0.025]	[0.026]
Common Language	0.0547	0.0498	0.1807***	0.0545	0.0731
	[0.049]	[0.049]	[0.055]	[0.049]	[0.051]
RTA Goods	0.1465**	0.1474**	0.1109	0.1634**	0.0777
	[0.074]	[0.074]	[0.082]	[0.073]	[0.077]
RTA Services	0.0768	0.0765	0.1751**	0.0618	0.1839**
	[0.077]	[0.077]	[0.086]	[0.076]	[0.080]
Obs.	36,963	36,963	36,867	36,963	36,867
R2	0.763	0.759	0.821	0.795	0.782

Notes: Depending on the column, the dependent variable is, alternatively: (log of) Gross Exports (1), DVA (2), RDV (3), FVA (4), and PDC (5). These figures refer to bilateral exports at the triplet level. For further explanations see footnote on Table 5. All specifications are estimated by OLS and control for home country - home industry and partner country effects. ***,**,* = indicate significance at the 1, 5, and 10% level, respectively.