Detecting value added chains in exports of Italian regions

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Abstract

The growing importance of global value chains in an interconnected world makes standard exports data less and less meaningful. Together with the value added distributed in the exporting country, gross exports contain raw materials and intermediate products that cross many other countries. This mechanism determines a decreasing significance of gross exports as an indicator of the stimulus coming from foreign demand to national value added. Moreover, since regional economies often differ in development level and inner industrial structure, there is need for an analysis that is able to disentangle interregional and international trade. Indeed, differences in international trade openness may mirror diverse structures in the composition of international and interregional exports and, in presence of close links between international and interregional GVCs, old and new theories of interregional trade do not seem to fit adequately

This paper estimates the value added content of Italian regions' exports and examines to which extent they are embedded in global value chains. In order to do so the analysis uses the following instruments: i) a newly produced dataset of interregional-international flows in intermediate and final goods, among regions and countries; ii) a decomposition of regional bilateral inter-products flows that disentangles international from interregional trade. In a nutshell, our results show that Italian regions strongly differ in terms of their degree of participation to global value chains and point out the power of interregional spillovers activated by regional exports.

JEL Classification: E16, F1, F14, F15.
Keywords: global value chains, input-output tables, trade in value added, regional trade

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1. Introduction[2]

The growing diffusion of global value chains (GVCs), with production being fragmented in several different countries, makes standard trade data less and less meaningful.

Official trade statistics measure the value of merchandise flows in gross terms by including, together with the value added produced in the final good exporting country, raw materials and intermediate products crossing many other countries. This procedure determines a decreasing significance of gross exports as an indicator of the stimulus coming from foreign demand to national value added.

This is true also at the regional level, possibly to a larger extent. The analysis of regional international gross trade flows does not tell anything on the interdependence created by the fragmentation of production inside the country itself. Indeed the productive systems of regions of the same country could be more interconnected than different countries due to the lower trade barriers. Therefore a complete measure of the value added in exports should take into account the interdependencies among regions as a significant component of the interregional trade.

A multi-regional multi-country input-output (IO) approach could tackle the problem by linking the international and regional interdependencies.

This paper constitutes a first outcome of a joint effort of IRPET and Banca d'Italia researchers, and analyzes empirically the degree of integration of Italian regions in the interregional and international global value chains. Italy and its regions are an interesting subject of analysis because North and South of Italy, and in general all Italian regions, are very dissimilar in terms of growth path, economic performance and economic specialization.

To this purpose, we integrate the supply and use matrices and trade data for the Italian regions, the European Union, USA, Canada, and Japan, in order to make regions' international flows as much endogenous as possible. We use these data to build a product by product symmetric multiregional-multi-country Input Output table , from which we derive measures of value added in exports in interregional and international trade that we compare to the traditional measures of gross exports.

Moreover, we build on existing literature about the decomposition of gross trade flows (e.g., Koopman et al., 2014) and provide a consistent framework to analyze bilateral interregional and international inter-industry (product) trade.

According to our results, Italian regions differ for the degree to which they are embedded in GVCs. In particular, whereas no substantial differences emerge in terms of cents of domestic value added (VA) for each euro of exports and outflows, the share of regional value added activated by foreign demand in most of Northern and Central regions largely exceed that of Southern ones. Moreover, the composition of "foreign" value added of regional exports and outflows reflects differences in the participation of Italian regions to GVCs. Proper foreign VA (i.e., distributed abroad)is larger than other regions' VA (i.e., distributed to domestic regions different from the exporting one) in Northern and Central regions; the opposite is true for Southern Italian regions.. Finally, our analysis clearly shows that to a

[2] The views expressed in the article are those of the authors and do not necessarily correspond to those of the Bank of Italy and of Irpet. We would like to thank Jan Oosterhaven and the participants to the Input-Output workshop (Osnabrück, March 2017) for their useful suggestions and comments.

large extent, interregional trade exists to serve foreign countries. In this respect, theories looking at interregional trade as a mirroring phenomenon of international trade appear lacking, and in need of further developments.

The paper is organized as follow. Next section (Section 2) introduces the GVC literature, emphasizing the (rather few) approaches disentangling international from interregional trade. Section 3 briefly describes the dataset whereas Section 4 presents a first introductory analysis on interregional and international trade and on value added flows. In Section 5 we set the stage for our analysis by proposing a fully consistent decomposition of regional interregional and international trade starting from bilateral inter-products flows.

2. The GVC literature

The study of GVCs has intensified starting from the 1990s due to the empirical observation that international trade in goods was evolving from an exchange in finished products into that of parts, components and increasingly also services, as a result of the international fragmentation of firms' production processes. This phenomenon has been denominated "trade in tasks" (Grossman, Rossi-Hansberg, 2008).

Trade in tasks has been approached from different points of view starting from business economics to international and industrial organization economics (Amador, Cabral, 2016). On the business side, Gereffi (1999) studies the organizational and governance dimension of GVCs together with the conditions for a firm to improve its position in a trade network.

From an international trade and industrial organization perspective, a number of contributions modeled the structural characteristics of fragmentation of production, and its effects on the international division of labor, on income distribution, and so on. For example, the Grossman and Rossi-Hansberg (2008) model determines the extent of tasks offshoring in each industry based on transportation and communication costs as well as on the costs of monitoring and coordination. Costinot et al. (2013) model predicts that more productive countries specialize in later stages of production. An increase in the length of production processes ("complexity") and a uniform decrease in failure rates worldwide ("standardization") lead all countries to move up the supply chain, with standardization benefiting more poor countries. One prediction of the model is that countries with similar GDP per-capita are more likely to trade with one another because they specialize in nearby parts of a value chain. The more general question related to GVCs is whether and under which conditions participation in GVCs is growth enhancing or industry upgrading for a country, i.e. whether there are gains from participating in GVCs. The conclusions of the literature support in general the idea that international fragmentation of production expands the opportunities of countries to specialize according to tasks comparative advantage and hence to gain from trade (Timmer et al. 2014).

The first empirical studies on global value chains were mostly case studies. Among the most famous ones in the business studies field there are the ones on Apple iPod (Dedrick et al., 2010) and the automotive industry (Escait et al., 2010; Feenstra,1998).

Other (rare) studies using firm-level data study the effects of being part of a GVC. One interesting contribution concludes that participation in a GVC is associated with a higher productivity growth through a better division of labor (OECD, 2016). Altomonte et al. (2012) show that, due to faster information sharing within the GVC, the participation in it increases a firms' vulnerability during recessions, but at the same time implies a faster recovery after it. Moreover, GVC networks tend to be more long lasting than simple export relationships, and therefore they have more chances to survive during a world demand crisis.

Another empirical approach tried to capture interdependencies through the use of trade data and IO tables (Amador, Cabral, 2016). This strand of literature uses IO tables, consistent with the national accounts aggregates and merged with international trade statistics, that describe the production processes of goods and services and help to distinguish more precisely between intermediate inputs and other categories of goods and to trace the production stages through countries or regions. After a few studies in the 1990s and 2000 (such as Hummels et al., 2001), empirical works on GVCs intensified recently thanks to the construction of global IO tables that made possible to study GVCs in a more complete way.[3] The contributions, among many others, of Hummels et al. (2001), Johnson and Noguera (2012), Dietzenbacher et al. (2013a), Timmer et al. (2013), and Koopman et al. (2014, hereafter KWW) produced methodologies and indicators to measure GVCs. Together with the availability of global IO tables, new value-added measures of trade represent a new toolbox to study international trade. The empirical results of these works confirm that the difference between gross exports and value added exports has increased, but the difference is very heterogeneous across countries and industries (Johnson, 2014).

For some countries the analysis of value chains at a regional level might be relevant to better understand the effects of global integration on different territories, as in the case of Italy, where interregional differences in GDP level and productive structure are strong. Within a country interregional networks of firms can easily develop because of a (mostly) common legislation, language, culture, easier enforcement of contracts (compared to international trade contracts), absence of tariffs, and shorter distances. As a result, a picture of strong differences in openness among regions drawn by looking at gross exports might change by looking at their value added content. The analysis of the effects on regional GDPs of a change in foreign demand might lead to very different results when one uses the valued added content of exports instead of their gross value as reference measure. For example if region A mostly produces parts and components for region B, an increase in world's demand for B products would have expansionary effects on region A too, even if the latter is not a direct international exporter at all. In this case value added in exports can be a preferable measure than gross exports of the strength of foreign demand activation on regional GDP.

The availability of IO-trade data at the regional level is however poor. Dietzenbacher et al. (2013) combine world IO table with a multiregional IO table for Brazil showing that the participation of Brazil in GVC is limited, with a strong heterogeneity among Brazilian states. Meng et al. (2013; MWK) apply the KWW approach to IO data on Chinese regions integrated into an international IO model.[4] They find, for example, that central region exhibits low gross exports compared to value added exports, because it does not directly export abroad but provides intermediate products to the exporting coastal regions. Therefore China's coastal regions linked together global and domestic value chains. Their results are confirmed by Pei et al. (2015). Previous analyses on Italian regions include Cherubini and Los (2016): based on data from WIOD and Irpet, they study the links between the Italian macro-regions employment dynamics and patterns and their integration in global value chains.

3. The dataset

[3] Among the most used world IO tables there are WIOD, GTAP, and TiVA datasets. See Bentivogli et al. (2014) for a short description of the datasets, and Dietzenbacher et al. (2013a) and Timmer et al. (2015) for details on WIOD.

[4] In this respect, see also Meng et al. (2017).

The dataset utilized in this paper is a interregional-intercountry, commodity by commodity input-output table (henceforth MRMC-IOT), obtained from a symmetric transformation of the multiregional and multi-country SUT (MRMC-SUT) under the industry-technology assumption, The construction of such a dataset involves a multi-step process that we briefly summarize here[5].

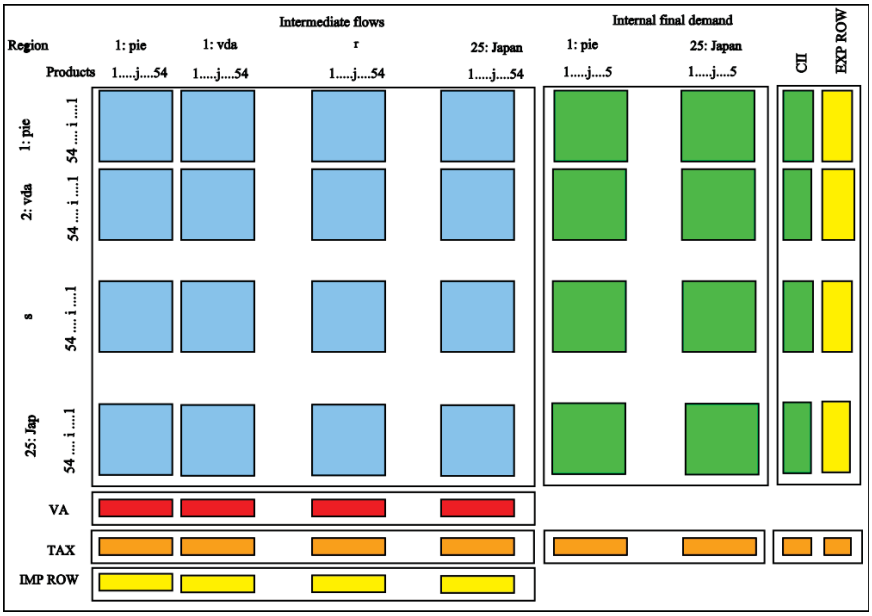
The starting point of this process is the 2012 Italian multiregional SUT of IRPET's MRIO model (Cherubini and Paniccià, 2013). A key component of this SUT is a multiregional trade flows matrix.

The multi-country dimension has been introduced in this multiregional framework in three steps. First, the structure of available official SUTs for the EU, the US, Canada and Japan (Italy's major trade partners and related countries) is harmonized to that of the Italian multiregional SUT. Second, international trade matrices for both intermediate and final 54CPA2008 products are built from available international statistics on the international trade in goods and services between Italy, the EU, the US, Canada and Japan. Finally, foreign countries' SUTs are linked among themselves and to the multiregional Italian SUT by means of the constructed international trade matrix and an estimation procedure similar to the one that has been used to build the multiregional SUT; the resulting MRMC-SUT is then used to estimate the multiregional and multi-country product by product (industry technology) input output table (MRMC-IOT).
The last step has been the transition from an extended Cheney matrix representation to a "quasi" Isard type of dataset, similar to what presented in WIOD world table. [6]
The result has been the interregional-intercountry MRMC-IOT as follow:

[5] For a detailed description of the MR-MC SUT construction reference is made to a forthcoming technical report.

[6] We decided to build a multiregion-multicountry matrix instead of using the WIOD for international IO matrices mostly for two reason: i) at the time of the estimate of multi-country SUTs the WIOD tables were not consistent with the new SNA2008 as the regional SUT, only in November 2016 new SUT fully consistent with the SNA2008 has been released ii) A bottom-up approach that gradually integrates partner countries' SUTs and trade flows into the multiregional model for Italy has therefore been preferred. The advantages of this choice are that the enriched system follows to a greater extent the most recent international standards for national accounts and it allows for a better control of data origin and transformation. In particular, the analysis might be weakened by the fact that GVCs' effects on Italian regions' trade are examined only with respect to few of its major trading partners, while a relevant link in GVCs like China is missing. In a future extension of the work we will certainly try to include China in our model and we will also try to broaden it by using the new release of WIOD.

Figure 1 – Interregional-intercountry input output structure

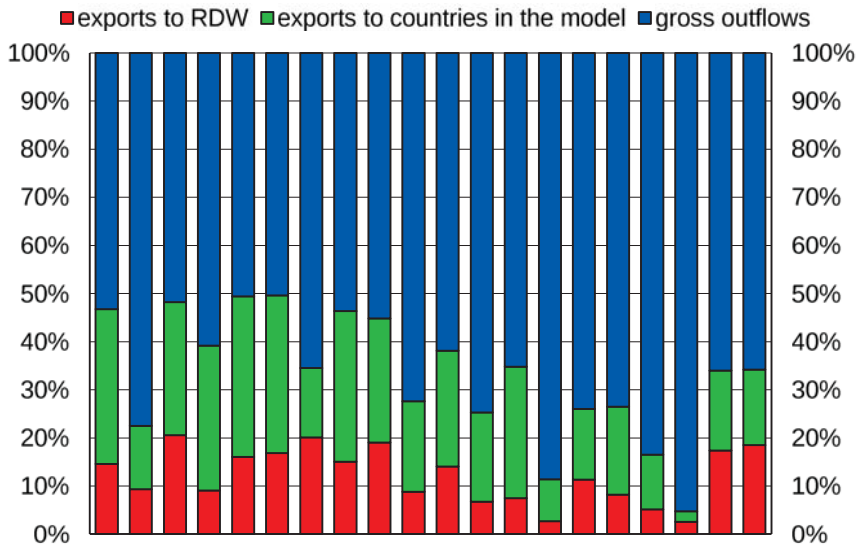


4. Linking interregional and international trade and value added flows: a preliminary analysis

Using the MRMC-IOT table and the resulting Isard model, it is possible to draw a picture of the interregional and international trade interdependencies of Italian regions. This is an helpful step to evaluate the results of the value added analysis presented in the next paragraph.

In Figure 2 a first breakdown of foreign exports (henceforth just exports) and interregional exports (henceforth just outflows) is presented.

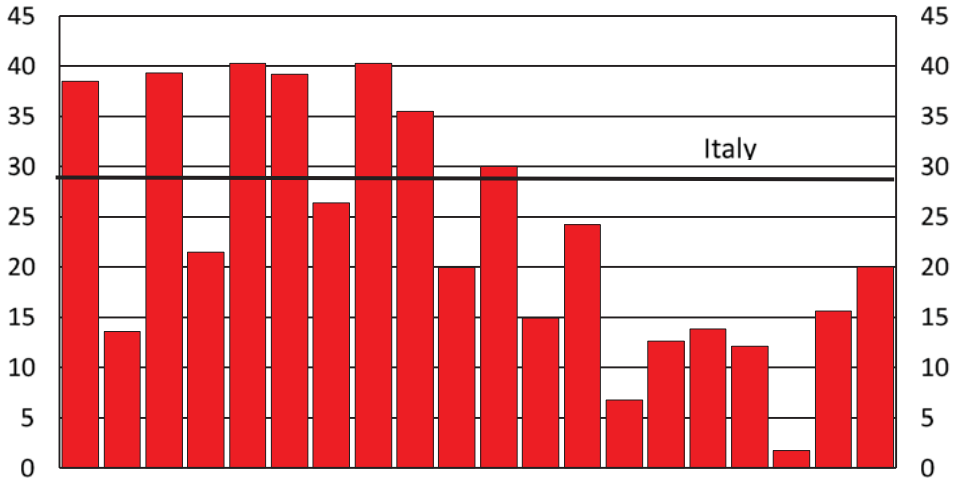
Figure 2 – Share of gross exports and gross outflows, by Italian region (exports and outflows of goods and services; 2012)



Source: data from MRMC-IOT.

All the Northern regions (but Liguria and VDA) show a percentage of exports between 40 and 50%, as for the Central (with the exception of Tuscany) and almost all southern regions, this ratio decreases to 20-35% (indeed in Calabria and Molise it is below 10%). Exports to countries not explicitely modeled are particularly relevant in all regions, especially in Piemonte, Veneto and Trentino-Alto Adige. The degree of "external" openness of Italian regions shows a high variability (Fig. 3).

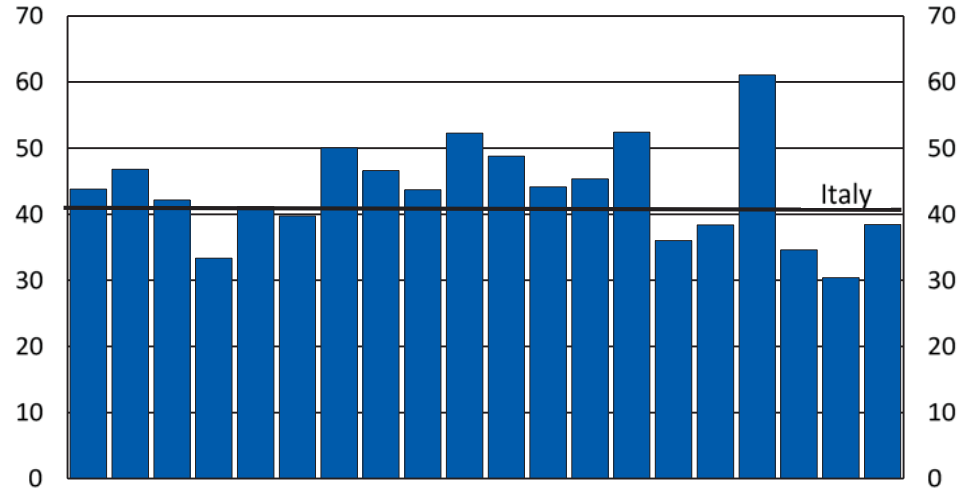
Figure 3 - Exports of Italian regions
(exports of goods and services as a % of regional value added; 2012)



Source: data from MRMC-IOT.

The share of foreign exports of goods and services over regional value added ranges between 40.3% for Emilia-Romagna and Veneto and 1.7% for Calabria. It is above the Italian average (29%) in seven Center-Northern regions and lower than that in all Southern regions. Among the regions with foreign borders, only Valle d'Aosta, Trentino-Alto Adige and Liguria have a degree of openness below the average. The picture is very different when we look at the degree of "internal" openness, that is at the share of interregional exports to value added (Fig. 3). The variability around the Italian average (42%) is smaller than before. Southern regions still are on the lower side. Few exceptions are Basilicata, Molise, and Abruzzo.

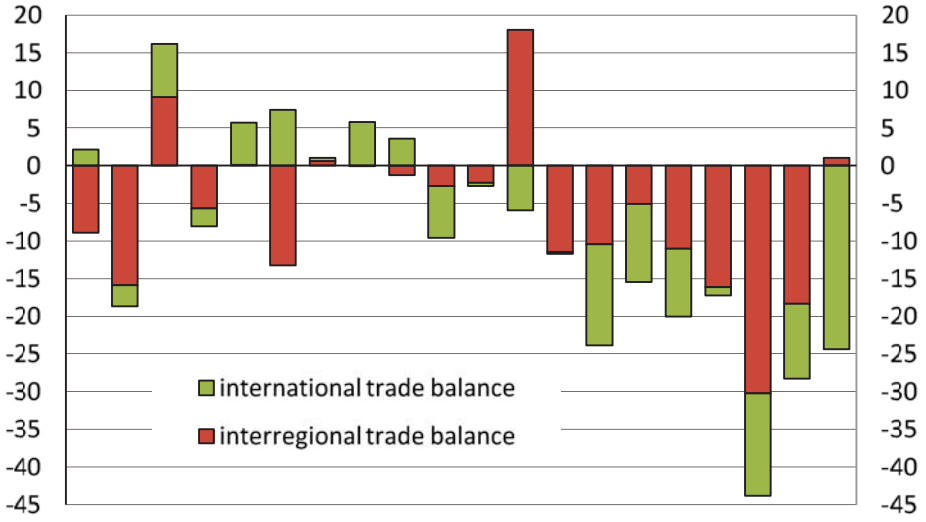
Figure 4 - Outflows of Italian regions (outflows of goods and services of the regions as a % of regional value added; 2012)



Source: data from MRMC-IOT.

Taking imports from abroad and from other regions into account by looking at regional "external" and "internal" trade balances, Lombardy turns out having the largest trade surplus among Italian regions (50 billion, 16.2% of value added), followed by Lazio (20 billion, 12% of value added; Fig. 4). All Southern regions show a trade deficit both for international and interregional trade.

Figure 5 - Interregional and international trade balance in goods and services of Italian regions



(% of regional value added; 2012)

Source: data from MRMC-IOT.

Table 1 shows interregional trade balances by Italian macro-areas as source and destination of flows. North-West and Centre have almost balanced trade to value added, while the South is a net importer from all the other areas; its deficit reaches 5.9% of its value added

in bilateral trade with the Centre.

Table 1 - Trade balances between Italian macro-areas (% of value added of row macroarea; 2012)

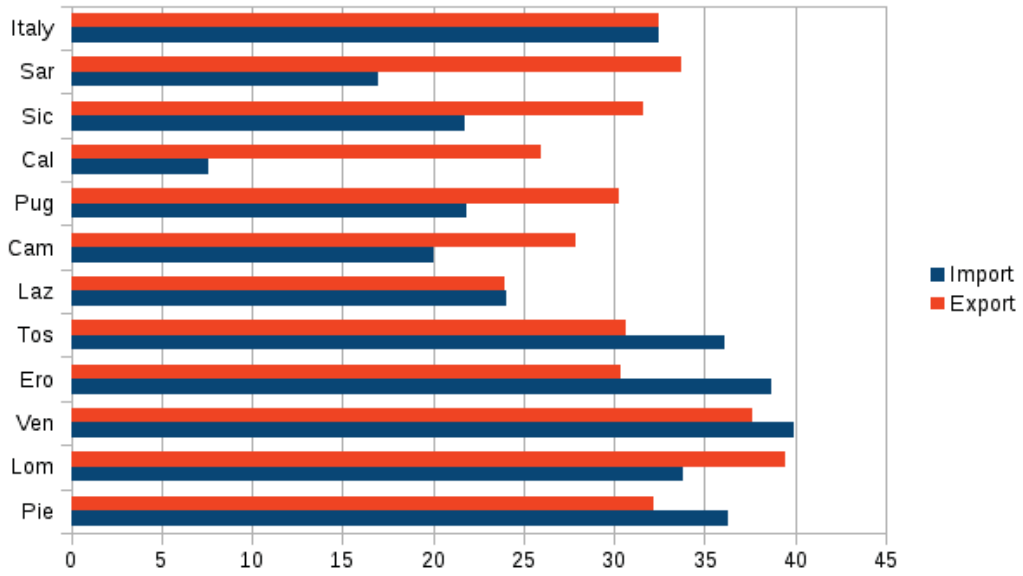
Source area \ Exchange area	North-West	North-East	Centre	South and Islands
North-West		1,3	-0,5	3,1
North-East	-1,9		-1,6	1,7
Centre	0,7	1,6		6,3
South and Islands	-4,3	-1,6	-5,9	

Source: data from MRMC-IOT.

The strong dependence of Southern regions from the other areas of Italy, and from the rest of the world is a persistent feature, as Cherubini *et al.* (2011) confirm with calculations made on multiregional Input-output tables for 1995, 2001 and 2006.

With respect to the amount of intermediate interregional imports and exports that is activated by national foreign exports, figure 6 shows that foreign exports determine 33% of total intermediate and interregional imports/exports.

Figure 6. Impact of foreign exports on interregional intermediate trade : incidence in selected regions



Source: data from MRMC-IOT.

As expected the impact is quite different amongst regions: intermediate interregional trade flows of Lombardy, Veneto and Emilia Romagna seem to be particularly affected by national foreign exports. In Lombardy almost 40% of interregional intermediate exports is caused by foreign export; in Veneto the same value refers to the impact on intermediate interregional imports. It is important to note the relatively high incidence of the impact of national foreign exports on Sicily, Sardinia and Apulia, mostly due to exports of oil derived products and basic intermediate products.

Moreover this analysis confirms how much the two types of trade are related. The next chapter will estimate the components of this interdependency.

5. Decomposing and linking regional trade flows

In this paper we decompose gross exports into various (domestic and foreign) value-added and double counted components, starting from bilateral inter-product trade.

The starting point for our recognition is the contribution of Koopman et al. (2014) (KWW), who decompose gross exports into 9 items. Following Cappariello and Felettigh (2015), the KWW decomposition, can be illustrated as in Figure 7. The essential items are domestic value added (DVA) in exports (1.1-1.3); reimported DVA (1.4-1.5); foreign VA (FVA) (2.1-2.2) and pure double counted terms (3.1-3.2). Following Meng et al. (2013; MWK), we can further decompose the three items in VAX into 13 components so as to keep separated inter-country trade (hereafter, exports/imports) from inter-regional trade(outflows/inflows) and purely domestic vis-à-vis international segments of GVCs. Applying the same approach to all the items of KWW decomposition we can appreciate a complete decomposition of regional gross exports and outflows.

Figure 7 - KWW decomposition of gross exports

Domestic value-added (1)		+	Foreign value-added (2)	+	Double counting (3)	=	Gross exports
Value-added exports	- in direct **final exports** (1.1)		- in exports of final (2.1)		- in ***intermediate exports*** originally produced at home (3.1)		
	- in ***intermediate exports*** absorbed by direct importers (1.2)		- in export of intermediate (2.2)		- in ***intermediate exports*** originally produced abroad (3.2)		
	- in ***intermediate exports*** re-exported to third countries (1.3)						
Re-imported domestic value-added	- in ***intermediate exports*** reimported as final imports (1.4)						
	- in ***intermediates exports*** reimported as intermediates and finally absorbed domestically (1.5)						

Such an approach would ignore bilateral inter-product trade, which may be of some relevance in order to figure out interesting patterns involving trade relations between regional/country sectors/products. In this respect, Borin and Mancini (2015) refine the KWW framework by proposing a consistent decomposition of bilateral trade flows. In particular they break down bilateral gross exports using both a source-based and a sink-based approach, that is, taking on the one side the perspective of the country where the value-added originates, on the other that of the country where the value-added is finally absorbed. Wang et al. (2013) (WWZ) go further by breaking down bilateral inter-sectoral (-product) trade into 16 components, which can be collapsed into the 9 items of the KWW decomposition.

In our work we build on the contribution of WWZ that, besides being consistent with KWW framework, has the advantage of preserving bilateral inter-product trade. We modify the original decomposition so as to take into account of the regional dimension of trade flows, meaning that instead of having countries trading among themselves, we have a number of regions trading not only with each other (interregional trade) but also with foreign countries

(international or external trade). A complete 1-to-1 mapping with the 16 components of WWZ as well as the "regionalized" KWW is nevertheless provided (the technical report will be soon available from the authors upon request).

With respect to the extant literature embedding regions into exports' decompositions, we innovate in the following ways: i) by looking at both bilateral and aggregate trade; ii) by disaggregating sectors/products; iii) by distinguishing domestic vis-à-vis international segments of domestic/global value chains for both domestic and foreign content of regional exports/outflows; iv) by allowing for domestic regions to activate international demand.

While addressing the interested reader to the technical report under construction for a formal exposition, here we provide an intuitive explanation of the mechanisms at work.

Let us start by tracking (aggregated) bilateral flows in our multi-region-multi-country economy. Consider a set of *g* regions and *G* countries. Taken an exporting region *s*, either it trades with a region *r* or with a country *R*. Moreover, either it exports final goods or intermediates. If the former is the case, the story stops here since the importing area also coincides with the absorbing one. However, if the latter holds, the treatment of the flow depends on what region (country) *r* (*R*) does with the imported intermediate goods: if its final demand absorbs them after processing we end up in the previous case; whereas if it ships them as finals or intermediates, we need to keep track of the ensuing activated trading relations. Tacking a "sink-based" approach, as implicitly done in KWW, we can go on following shipments of goods and services up to absorption (apart from double-counted terms).

In recording such set of flows we may encounter different types of segments of value chains, in terms of geographical configuration. For instance, take flows involving a network structure of three nodes, in which the trading relations originate from region *s* exporting intermediates to region (country) *r* (*R*), the latter re-exporting either intermediate or final goods and services to region (country) *t* (*T*) in which eventually the absorption takes place. The 4 potential combinations are displayed in Figure 8, in which regions are denoted as grey nodes in lower-case letters, and countries as white nodes in capital letters. Following KWW, we can call such flows either exports or outflows depending on where they are finally absorbed. In this way, Fig. 8.b and 8.d would catch exports, whereas Fig. 8.a and 8.c would pin down outflows. Moreover, the patterns of the paths connecting *s* with the absorbing region (country) are relevant so as to disentangle purely domestic value chains from domestic segments vs. international pieces of GVCs.

When products (sectors) are involved, complexity tends to rise, since region *s* exports product *k* to a partner *r* (*R*), which may use it in the production of product *j*, which is then shipped to region (country) *t* (*T*), and so on and so forth. As widely illustrated in the technical report, we can keep track of inter-product flows originating from *s* up to the "sink" area.

Each bilateral trade relation as reconstructed in our approach contains the whole set of ingredients of exports/outflows decompositions. Namely, domestic value added, returned DVA, other regions/countries' VA and double counted terms. Diagrams displayed in Figures 9 and 10 demonstrate the sets of components of our decomposition consistent with WWZ for domestic value added in bilateral inter-product outflows (Fig. 9) and exports (Fig. 10).

Notice that the 5 items for DVA derived from the WWZ decomposition come in an even more disaggregated fashion in a multi-region-multi-country setting, which accounts for 17 components, encompassing all the potential routes shipments can follow and separating "domestic activation" from feedback effects.

According to our proposed decomposition, interregional trade relations may emerge in response of foreign demand shocks and viceversa. Moreover, the degree of embeddedness of Italian regions in GVCs can be examined and diverse nuances of international trade openness be pinned down.

As a final remark, a major issue that we do face when switching from our formulation to the model at hand for our application consists in deciding how to treat the "Rest of the world" (Row) side of the economy.

In theory in a standard I-O approach, all the flows to the Row have to be treated as *leakages* as they do not go back and forth as it happens for goods and services exchanged among the modelled areas, and instead are "instantaneously" absorbed. In practice, however, we have to take decisions about whether embed some of the flows towards the Row and according to which rules.

For instance, we could decide to preserve all the flows which are "mediated" by the endogenous areas, although then absorbed by the exogenous part. This means that we do exclude direct flows from region *s* to the Row but include Row as a sink area for region s' outflows and exports originally shipped to endogenous regions and countries.

Differently, we could exclude the Row as a sink area. That is, we do not consider it neither as a direct importer from region *s*, nor as indirect importer throughout the "mediation" of the other endogenous areas.

In both cases we cannot consistently buildup aggregate bilateral flows since we lack the feedback effects from the Row.

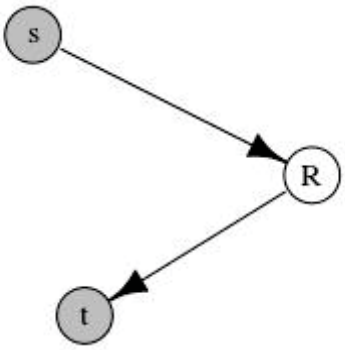
Being conscious of the limitations of both hypotheses, we take the former one. More precisely, we single out shipments to Row in bilateral trade,[7] by separating them from the other flows and discard direct exports to the Row, which we simply weight in terms of their share in exports for each endogenous area. Moreover, we assess the importance of the Row in all bilateral flows by showing the share of "unexplained" bilateral flows for each region.

Figure 8 – Examples of trade patterns connecting region s to region (country) t (T) via third regions (country) r (R)

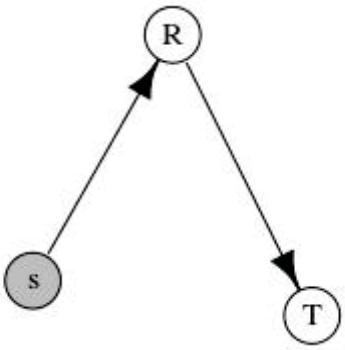
a. From region to region via region

b. From region to country via region

[7] In particular, we do this for DVA and foreign VA, as they are the most interesting cases.



c. From region to region via country



d. From region to country via country

Figure9 – Bilateral outflows from region s to region r

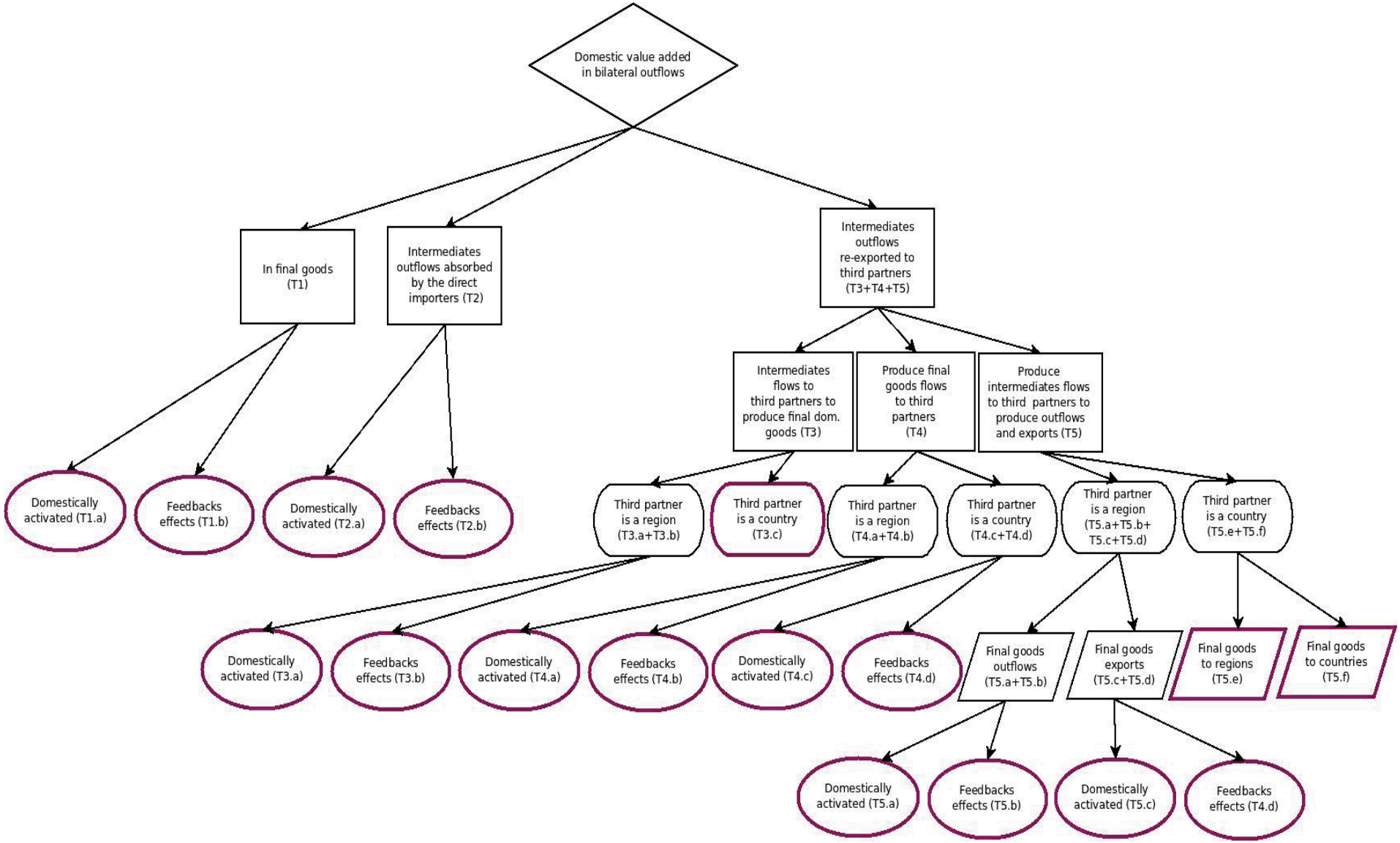
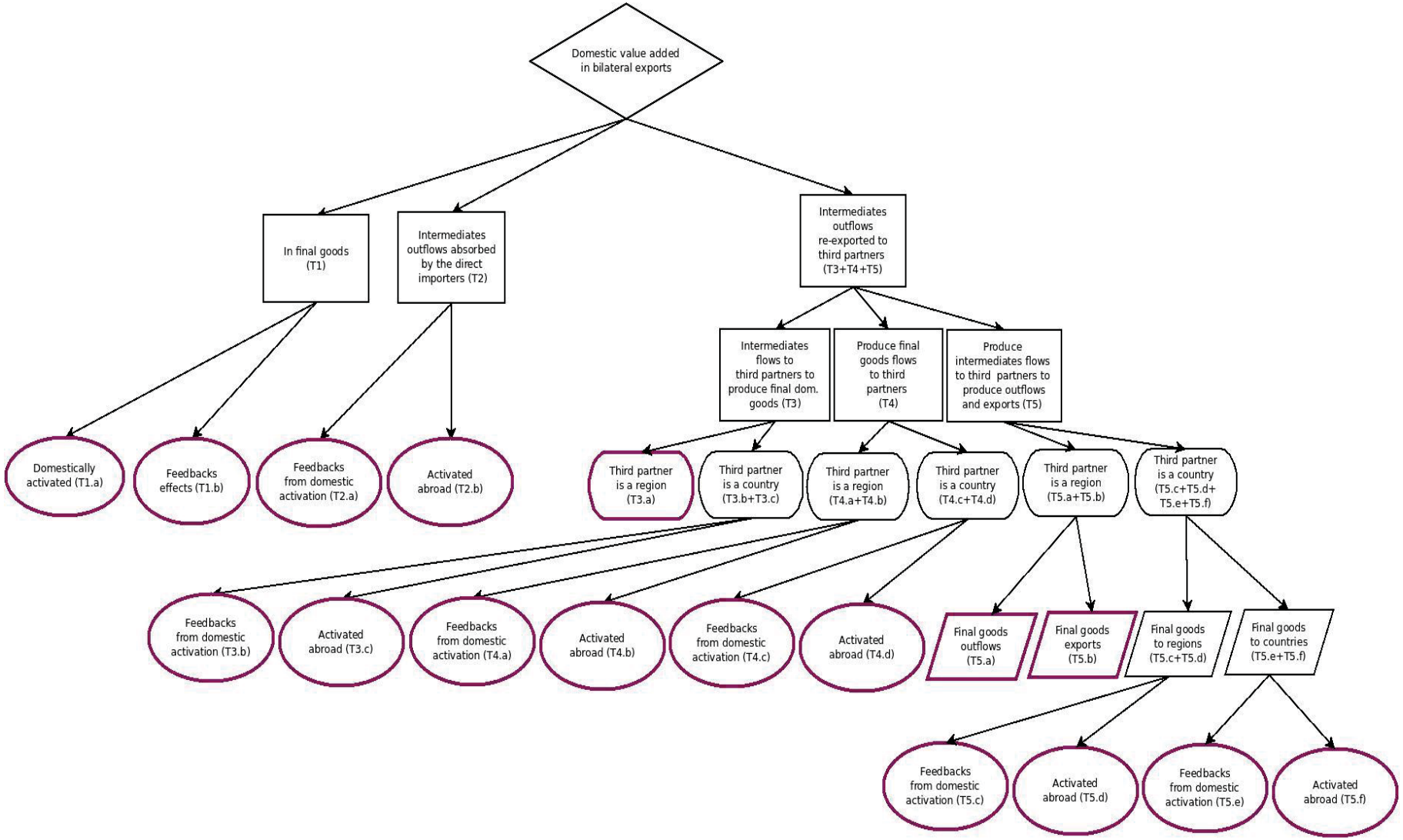


Figure10 – Bilateral exports from region s to country R



6. Detecting value added chains in exports of Italian regions

A first glimpse of the results returns a rich picture about how much diverse is the degree to which Italian regions are embedded into GVCs. Below we first concentrate upon some indicators characterizing the participation of each region to domestic vis-à-vis international value chains and then move to a more aggregated analysis by NUTS1 regions.

In Table 2 we report, for each Italian region, the results from the KWW decomposition of exports and outflows (EOs), by treating interregional and international trade as they were the same phenomena. Moreover, in the last column we display the share of total EOs which is explained by KWW in a framework in which flows to the Row are treated as leakages. Notice that for a not negligible number of regions the importance of Row is such that we cannot explain more than 70% of gross exports and outflows. Whereas the regions which are more open to international trade tend to display lower levels of "explained" EOs, a peculiar pattern characterizes Sicily (57,3%) and Sardinia (47,6%). The results discussed below also depend on this and should therefore be taken with the due caution.

In Figure 11 we report the share of domestic value added in total EOs for each region. As it can be noticed, whereas the degree of heterogeneity is relatively high, no clear patterns distinguishing Northern vs. Southern regions emerge. However, if we look at value added of exports (VAX) and of outflows (VAO) as shares of regional value added, strong differences among regions arise (Fig. 12). In particular, the VAX as a share of regional value added is extremely high in regions that are more open to international trade, namely Lombardy, Veneto and Emilia-Romagna, whereas it is rather low in Southern regions.[1] A second pattern emerging from Fig. 12 concerns Central regions, which tend to display a relatively higher share of VAO on VA with respect to both Northern and Southern economies. This is relevant as it clearly depicts differentiated shapes for international vis-à-vis interregional trade patterns.

As to the degree to which Italian regions are embedded into GVCs, according to Figures 13, Northern and Central regions tend to participate more intensively to international segments of supply chains, as the foreign share in total external value added of exports and outflows tends to exceed 50% , in particular in regions with the highest propensity to export. Moreover, for each euro of exports and outflows, spillovers activating national value added from the North are less powerful than those originating from exports stemming from the South.

Let us now aggregate Italian regions according to NUTS 1 definition. This is clearly important as it helps to overcome the issues due to the extremely small size of some regional economies and at the same time mitigates the role of trade patterns involving some of the closest areas.

Figure 14 replicates Figure 13 for NUTS 1 regions. Once purged from trade with the closest regional economies, Northern and Central regions even more strongly emerge as those economies which are more integrated in GVCs, both in terms of exports and of outflows. Moreover, for each euro of non-domestic value added embodied in international exports stemming from the North and the Centre, less than 50 cents are distributed to other Italian regions, whereas the opposite holds for the exports from the South and the Islands.

[1] With the caveat that the VAX and the VAO will be unequally reconstructed for regions with different exposure to trade with the Row.

Table 2 – KWW decomposition of gross export/outflows (EO), by Italian region (2012; million euro and percentages)

Italian region	Domestic content					Foreign VA		Double counting		Share total EO
	Value added EO			Re-imp. domestic value added						
	in direct final EO	in interm. EO absor. by direct partners	in interm. EO re-exp. to third parties	interm. EO that return via final imp./infl.	interm. EO that return via interm. imp./infl.	in EO of final	in EO of interm.	in interm. EO orig. prod. at home	in interm. EO orig. prod. abroad	
Piemonte	16.581	14.357	8.273	185	303	7.241	10.813	627	7.145	71,4
Valle d'Aosta	406	569	396	1	1	235	201	2	296	84,6
Lombardia	46.527	46.724	24.930	990	1.953	14.106	18.936	3.638	14.445	67,8
Trentino A.-A.	4.301	4.008	2.346	14	21	1.518	2.023	33	1.568	83,4
Veneto	21.145	17.108	11.252	178	334	6.716	11.555	687	7.655	71,2
Friuli V. G.	5.523	3.099	1.813	8	14	1.698	3.125	28	1.651	68,8
Liguria	5.716	5.561	3.440	28	55	1.833	2.345	80	2.172	66,3
Emilia-Romagna	21.420	19.077	10.489	176	336	8.596	13.068	766	7.963	73,3
Toscana	14.391	12.480	7.007	99	194	5.176	7.486	316	5.093	68,5
Umbria	2.745	2.481	1.666	6	13	1.028	1.490	20	1.334	77,6
Marche	5.828	4.357	2.663	18	31	1.962	3.131	60	2.067	71,7
Lazio	29.506	23.746	10.766	263	423	5.674	6.984	581	5.002	85,8
Abruzzo	5.029	3.261	1.931	16	25	1.579	2.594	47	1.690	81,3
Molise	983	455	321	0	1	219	602	1	284	84,6
Campania	9.772	7.895	4.322	97	160	2.356	4.129	164	2.682	71,9
Puglia	7.719	5.459	3.360	46	81	2.303	3.553	110	2.832	75,9
Basilicata	1.331	1.179	1.036	3	6	562	1.171	15	951	86,2
Calabria	2.302	2.225	1.408	20	34	771	1.124	24	1.030	83,8
Sicilia	6.344	4.316	2.999	65	107	1.937	2.762	115	2.523	58,2
Sardegna	2.690	1.969	1.455	8	15	570	849	12	884	48,4

Source: MRMC-IOT calculations on KWW (2014), p. 482 decomposition.

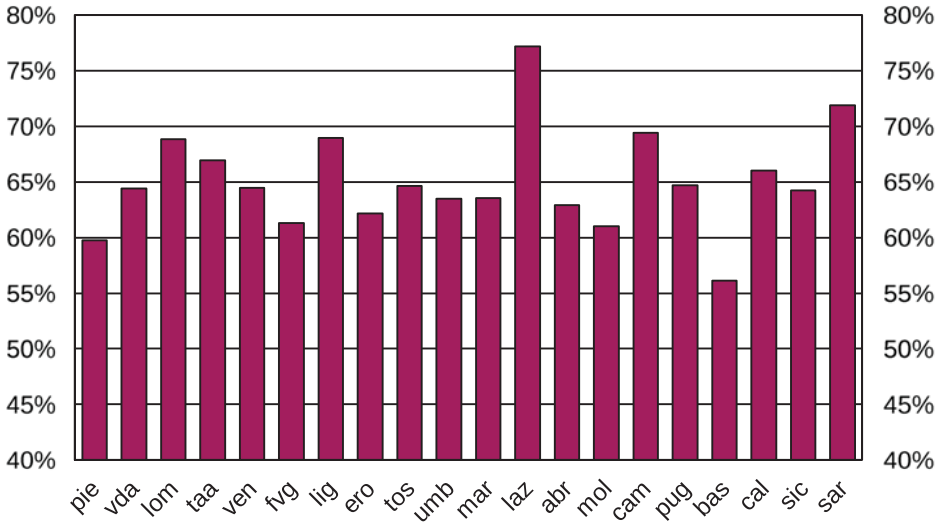
Figure 15 summarizes the structure of the content of value added in exports by NUTS 1 regions. Whereas the share of domestic value added is similar for different regions, the content of foreign value added is almost double for Northern and Central regions with respect to Southern ones.

Consider now Table 3, in which we report for each NUTS 1 Italian region, the share of different sources of value added in their exports and outflows (namely, domestic, national and foreign) with respect to the total in Italy, both normalized through exports shares and output shares. For instance, in the first column (DVEP) first row (North West) we display the share of North-West region's domestic value added of exports in Italy's DVEP divided by the share of North-West's exports over Italy's gross exports. Values above 1 mean that the region is overrepresented for that item, whereas the opposite holds for values below 1. In this respect, Northern regions present higher values when it comes to foreign value added, especially when the normalization comes through output shares. This means that, when compared with how much they produce, Northern regions tend to remunerate foreign factors of production more than Central and Southern ones. The South and the Islands

tend instead to perform rather poorly in terms of foreign value added whereas some of the high values in DVEP and NVEP when normalizing through exports shares are due to the low level of the latter ones in these economies.

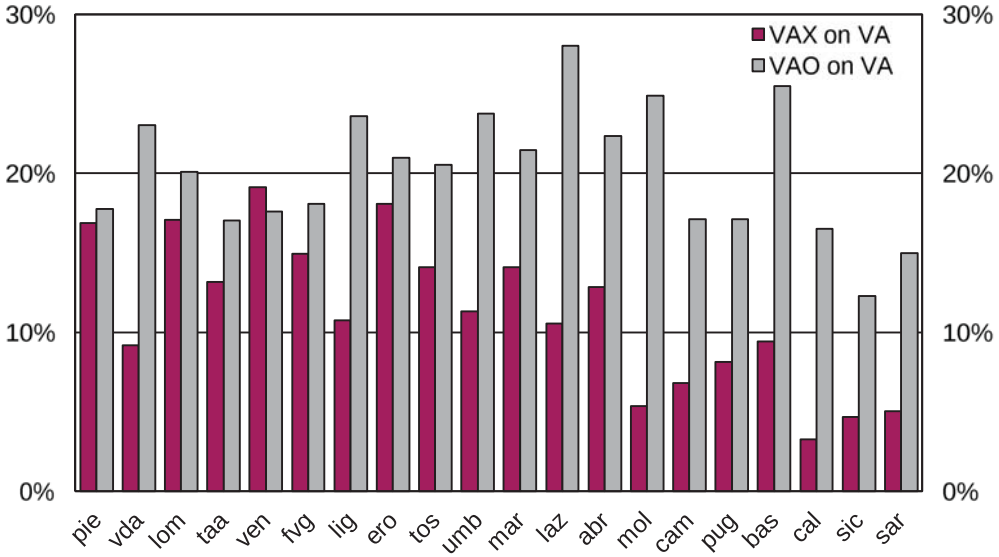
An interesting result stemming from Table 3 regards the share of external national value added activated from exports and outflows of some of the NUTS 1 regions. This is true in particular for Southern regions' and the Island's outflows as well as for North-East's exports. What can be added to this picture regards the sources of such national value added components. This is shown in Table 4. For each NUTS 1 region, we do report the share in national value added of exports (NVEP) and outflows (NVOP), by different source. Here we see that most of the activation of other regions' value added goes in favor of Northern regions, in particular North-West. The latter area emerges as an important partner for all other areas, with a stronger entrenchment with North-East, to which it supplies more than 50% of DVEP. As to Southern regions and the Islands, most of the activated external national value added, comes from the North and the Centre, with the South representing a (relatively) relevant source of value added only for the Centre.

Figure 11 – Domestic value added of EOs as a percentage of "explained" gross EOs (2012)



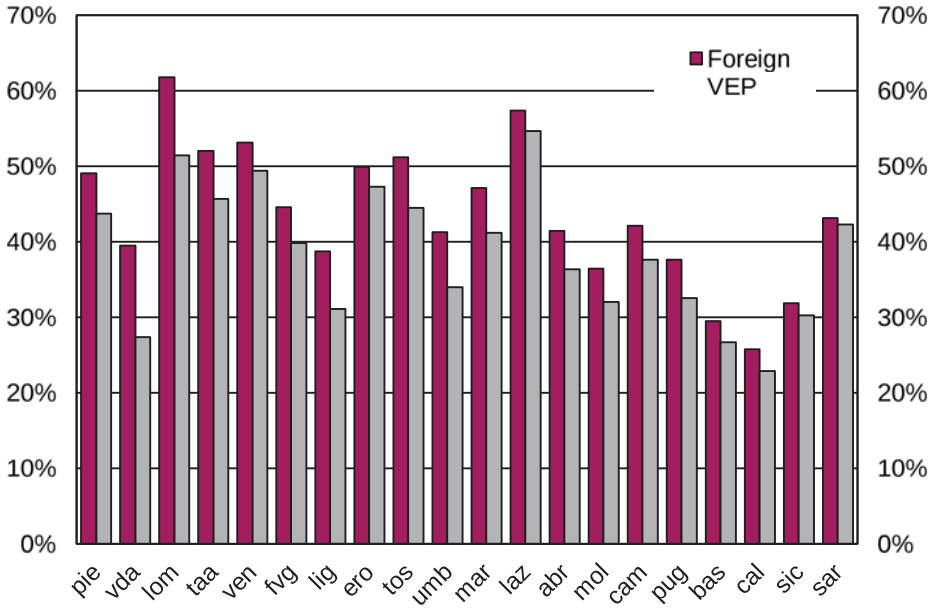
Source: MRMC-IOT calculations on KWW (2014), p. 482 decomposition.

Figure 12 – Value added in exports (VAX) and value added in outflows as percentage of regional value added (VA) (2012)



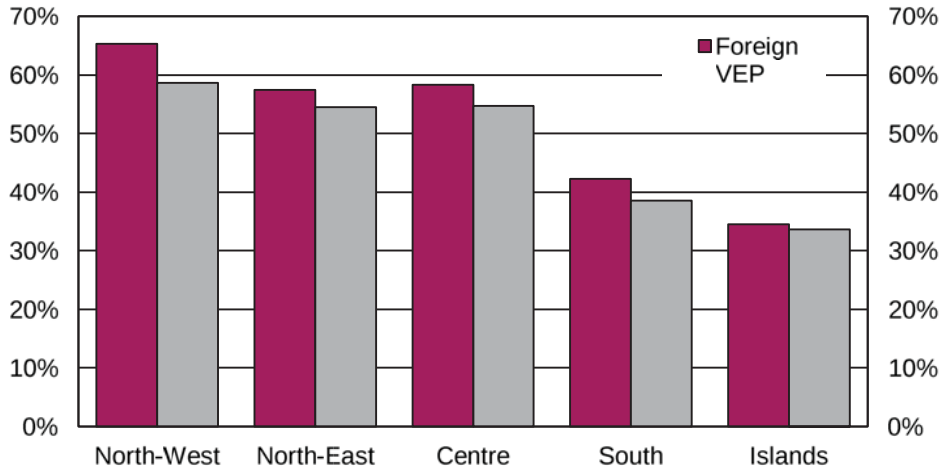
Source: MRMC-IOT calculations on KWW (2014), p. 482 decomposition.

Figure 13 – Foreign value added of exports (VEP) and outflows (VOP) as percentages of total external value added of exports and outflows, by region (2012)



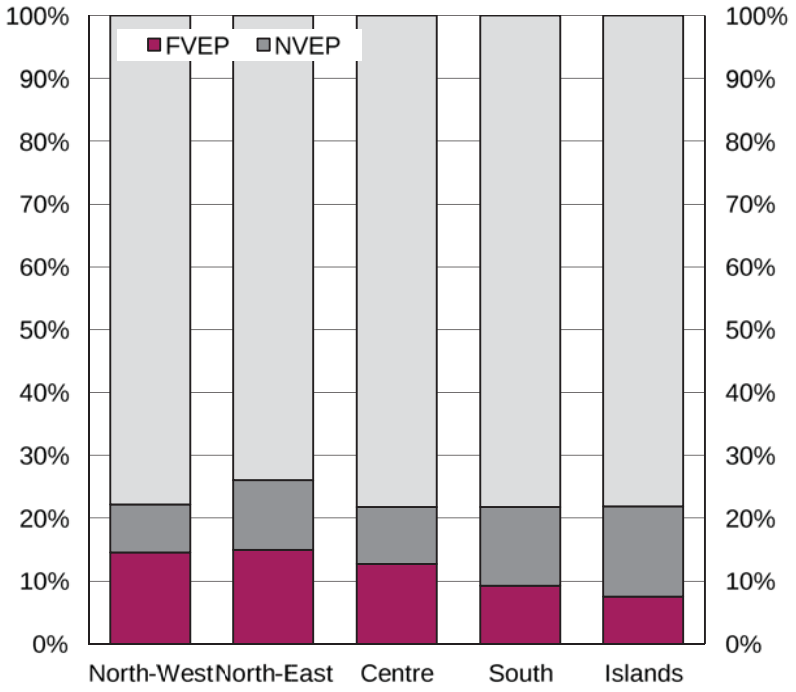
Source: MRMC-IOT calculations on KWW (2014), p. 482 decomposition.

Figure 14 – Foreign value added of exports (VEP) and outflows (VOP) as percentages of total external value added of exports and outflows, by NUTS 1 regions (2012)



Source: MRMC-IOT calculations on KWW (2014), p. 482 decomposition.

Figure 15 – Structure of value added of exports in terms of domestic (DVEP), other regions' (NVEP) and domestic value added, by NUTS 1 regions (2012)



Source: MRMC-IOT calculations on KWW (2014), p. 482 decomposition.

Table 3 – Shares of different component of value added of exports and outflows with respect to the total in Italy normalized through exports and output shares, by NUTS 1 regions (2012)

Macro-regions	DVEP	NVEP	FVEP	DVOP	NVOP	FVOP
	normalized through exports shares					
North-West	0.98	0.78	1.03	0.97	0.79	1.04
North-East	0.92	1.11	1.06	0.95	1.15	1.27
Centre	1.10	1.02	1.01	1.16	0.87	0.98
South	1.23	1.58	0.81	0.95	1.33	0.78
Islands	0.83	1.21	0.45	0.82	1.24	0.58
	normalized through output shares					
North-West	1.16	0.92	1.22	0.89	0.73	0.95
North-East	1.26	1.52	1.44	0.91	1.09	1.21
Centre	0.96	0.89	0.87	1.40	1.06	1.19
South	0.59	0.75	0.39	0.90	1.27	0.74
Islands	0.37	0.54	0.20	0.82	1.23	0.58

Source: MRMC-IOT calculations on KWW (2014). p. 482 decomposition.

Table 4 – Composition of national value added of exports (NVEP) and outflows (NVOP) by source. by NUTS 1 regions (2012)

Macro-regions	North-West	North_East	Centre	South	Islands
			NVEP		
North-West	0.0%	45.8%	28.8%	16.6%	8.8%
North-East	56.5%	0.0%	26.0%	12.3%	5.2%
Centre	43.5%	27.3%	0.0%	23.0%	6.2%
South	38.7%	19.4%	36.2%	0.0%	5.7%
Islands	38.3%	17.5%	23.7%	20.6%	0.0%
			NVOP		
North-West	0.0%	44.3%	29.5%	16.7%	9.5%
North-East	54.4%	0.0%	27.1%	12.7%	5.8%
Centre	41.3%	25.4%	0.0%	26.6%	6.7%
South	35.5%	17.7%	39.6%	0.0%	7.2%
Islands	35.8%	18.0%	25.8%	20.4%	0.0%

Source: MRMC-IOT calculations on KWW (2014). p. 482 decomposition.

In lieu of a conclusion

GVCs are not only affecting international growth pattern. When the focus of the analysis goes down to the regional level it could be possible to detect. as in this paper. how important are the interdependencies between international and interregional GVCs in explaining a significant part of regional value added generation. This finding shows the drawbacks of the existing theories of interregional trade in explaining the not only the gross flows amongst regions but also the impact of international GVCs on regional value added generation.

This is particular relevant in a country like Italy where the persistent economic divide between North and South is mirrored in a different way to participate in the international and interregional GVCs.

A further step of analysis. besides the update and upgrade of the multiregion-multicountry table. will be tracing the positions and the role played by the regions/macro-regions (hubs/spokes) in whole GVCs and on the impact on value added growth.

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