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Abstract

In the last decades, the extension of the supply and production networks at global level has deeply modified the manufacturing production paradigm. This paper analyses the evolution of these networks, taking advantage of the informative potential of the Word Input-Output Database (WIOD) and of the methodology proposed by Wang et al. (2013) to look at this issue "through the lenses of value added". More specifically, the paper focuses on Italy and its main trade partners and on two relevant industries (*Machinery* and *Leather, leather products and footwear*) and offers a comprehensive analysis of: (i) the export structure, to define the role of countries within the global networks; (ii) the main suppliers of foreign value added in exported goods and (iii) the productive links of Italy with its major exporting markets, replacing the traditional customers-suppliers analysis with a more detailed wisdom that brings to light the productive integration among countries.

JEL Classification: F150, L230, L600

Keywords: international trade, trade in value added, GVC, Italy, manufacturing

1. Introduction

The long European stagnation following the 2008-2009 global crisis has fuelled renewed debate about the importance of a strong European industrial base to sustain and strengthen recovery and foster competitiveness. In particular, the European Commission (2014) has underlined that «the economic importance of industrial activities is much greater than suggested by the share of manufacturing in GDP. Industry accounts for over 80% of Europe's exports and 80% of private research and innovation. Nearly one in four private sector jobs is in industry, often highly skilled, while each additional job in manufacturing creates 0.5-2 jobs in other sectors». Raising the contribution of industry to GDP to as much as 20% by 2020 has become one of the priorities for the Commission. Designing the appropriate policy measures to achieve this goal requires a full understanding of the characteristics of the current manufacturing production paradigm in terms of organization of international supply chains and production networks and a clear identification of the main linkages among countries and sectors.

Indeed, as extensively documented in the literature (see, among others, Feenstra, 1998; Baldwin, 2006, 2011), starting from the 1980s, production processes - mainly in manufacturing - have been progressively fragmented[1]and reorganized in plants located in different countries, each one specialized in a specific production stage and contributing with its domestic value added share to the production of final goods. Therefore, the manufacturing processes involve extensive flows of intermediate inputs supplied by other countries, i.e. foreign value added. Moreover, in the 2000s manufacturing has become more globalized as it expanded its production networks in emerging economies, which have assumed the role of important partners in the intermediate inputs production or in the assembly of final goods (Hanson, 2012; Koopman et al., 2012).

Thus, due to this international fragmentation of production, the production processes increasingly combine domestic and foreign value added and final goods has become the outcome of several linkages established between different countries and sectors over time, which reflect complex flows of value added sources and destinations and shape multi-country and inter-industry networks of supply and production. Each national industry can participate in these international production systems both as a user of foreign inputs and as a supplier of intermediate goods and services used in the other countries' production.

These networks, sometimes named Global Value Chains (GVC), led to a sustained expansion of trade in intermediate goods due to parts and components that cross international borders many

[1] This reorganization of production processes on a global scale has been named "international fragmentation of production" by Jones and Kierzkowski (1990). Since then, the economic literature has elaborated many other terms to describe specific aspects of the current production paradigm, e.g. offshoring (Grossman and Rossi-Hansberg, 2008), global production sharing (Yeats, 1998; Feenstra, 1998), slicing the value chain (Krugman, 1996).

times at different stages of production and traditional trade statistics, which record the gross value of goods at each border-crossing rather than the (net) value added between border-crossings, include a relevant number of double counting of the value of these intermediate inputs. Accordingly, the traditional customers and suppliers analysis based on conventional gross trade data are not able to represent the role of each country in international supply and production networks adequately because gross trade data give information on the amount of trade flows that cross borders but not on their composition in terms of domestic and foreign contribution. Moreover, the exports may be consumed by the importer country or be integrated in other products shipped to other foreign markets and, moving along the production network, part of the value added can even return to the domestic economy. In this framework, trade in value added emerges as a novel, relevant topic of research in international economics that seeks to allocate the value added in gross trade flows to its country and sector of origin and destination and to separate pure double counting from value added components.

This work provides a comprehensive analysis of the evolution of international supply and production networks of some selected countries and sectors, by looking at trade in value added. For this purpose, I use the World Input Output Database (WIOD - 2013 release)[2] and apply the accounting framework developed by Wang et al. (2013) to decompose gross exports into value added components at county-sector and bilateral-sector level, for three reference years: 1995, 2007 and 2011[3].

Focusing on Italy and its main trade partners, this paper makes three main contributions: (i) it provides a decomposition of gross sectoral exports in order to highlight differences and changes in the structure of each country's value added exports, especially with regard to domestic and foreign components, and define each country's role in international supply and production networks and some characteristics of its organization of export production; (ii) it identifies the main foreign suppliers of intermediate goods both of Italy and other leading exporters to capture changes in the geographical origin of imported inputs and convey additional information about the organization of their international supply networks. (iii) it analyses the bilateral links between Italy and its main foreign markets at industry level in order to detect productive linkages that underlie export flows. This exercise focuses on the manufacturing industry and, especially, on the *Leather, leather products and footwear* and *Machinery* sectors, two important industries for Italy[4] with different technological

[2] The 2013 release of the World Input Output Database provides global input-output tables for 40 countries and 35 sectors of activity (2-digit, according to the ISIC nomenclature rev.3), including 14 manufacturing sectors, for the years 1995-2011. See Appendix A for full lists of countries and sectors. For a complete description of the database and its construction, see Timmer (ed., 2012).

[3] I choose 2007 as the intermediate year to highlight any countertrends arisen since the start of the economic crisis in 2008.

[4] According to the latest analyses on the Italy's trade specialization based on both gross statistics (De Benedictis, 2005; Montalbano and Nenci, 2012; Santomartino, 2014) and value added trade data (Dell'Agostino and Nenci, 2016; Borin and Mancini, 2017), *Leather, leather products and footwear* and *Machinery* are the main sectors of current Italian trade specialization.

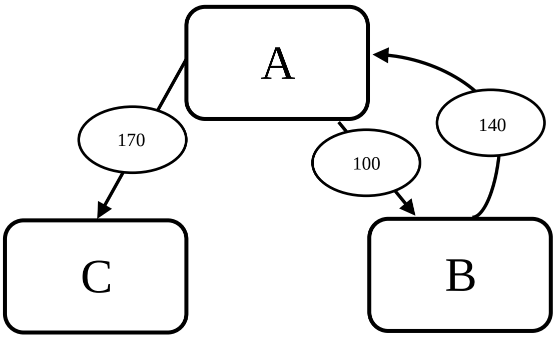
characteristics, different countries involved in their international production networks and different weights in the pattern of trade of Italy.

To briefly preview the main results, Section 3.1 highlights that during the 2000s the *Machinery* sector has made use of an increasing share of imported inputs in exported goods in all the countries analysed compared with the *Leather, leather products and footwear* sector, which has experimented a generalized consolidation of fragmentation processes. Focusing on the source of intermediate inputs in exports, Section 3.2 confirms the prominent regional dimension of manufacturing supply and production networks, with Asia as an emerging hub alongside Europe and North America. In particular, within Europe, Germany has a central position in the *Machinery* sector but it is substitute by Italy the *Leather, leather products and footwear* sector. Finally, Section 3.3 identifies Germany and China as important commercial bridges to third markets for Italian exports, in the *Machinery* and *Leather, leather products and footwear* respectively, and Russia emerges as a relevant supplier of value added in Italian exports in both sectors.

Overall, this paper shows how the structure and evolution of supply and production networks can be detected by using the methodology for disentangling gross exports proposed by Wang et al. (2013), making it possible to simultaneously check items usually obtained through multiple analysis. Moreover, "the lenses of value added" allow to replace the traditional customers and suppliers analysis with a more detailed wisdom that inserts the bilateral trade and production links into multilateral networks, strengthening the perception of the productive integration (and interdependence) among countries.

2. Trade in valued added and international production networks: methodology and data

The simple supply and production network in Figure 1 could be useful for illustrating the difference between gross and value added exports. Country A exports to country B an intermediate good worth €100 that embodies only country A's domestic value added. Country B adds €40 of value added to produce a more sophisticated intermediate good that is exported to country A for €140. Country A assembles the refined intermediate good, together with €30 of domestic value added, into a final product that is exported to country C. The gross exports recorded by country A is €270 (€100 + €170), whereas its domestic value added in exports is only €130 (€100 + €30). Indeed, the country A's gross exports embody foreign value added for €40 (from country B). The difference between gross exports and the sum of value added from country A and country B is double-counted in trade statistics. In this example, it is exactly the value of the first intermediate good (€100) which has been exported twice by country A (the first to country B and the second to country C as embedded in the final product). It is evident that value added exports is a net concept since it is the difference between gross exports and the sum of foreign value added and double counting.



<u>Figure 1</u> Value added and double counting in bilateral trade flows

Disentangling the simple supply and production network in Figure 1 is not possible using conventional trade statistics, which record the gross value of goods at each border crossing rather than the net value added. In order to overcome this shortcoming, the empirical literature has produced a wide range of tools to quantify more appropriately the effects of the international fragmentation of production on the organization of production[5]. In particular, trade economists began to use information from input-output tables[6] together with traditional trade data to provide an adequate representation of supply and demand linkages among the economies.

A first wave of studies has introduced synthetic indicators to focus on a specific and narrower aspect of the international fragmentation of production (Hummels et al., 2001; Daudin et al., 2011; Johnson and Noguera, 2012).

More recently, several scholars have implemented different projects to compile new datasets[7], typically merging input-output tables with the System of National Accounts and international trade statistics to compile inter-country input-output (ICIO) tables[8], in order to estimate the value added in trade by tracing the value added embedded in goods back to its country of origin. The estimate of value added trade data has represented a relevant step forward in understanding the trade flows linked to the international fragmentation of production and taking advantage of these new datasets, a

[5] Starting from the mid '90s, case studies on a single specific product, (Tempest, 1996; Varian, 2007; Linden et al., 2009; Ali-Yrkkö, 2010; Xing and Detert, 2010; Kraemer et al., 2011) or on a single sector (Grossman and Rossi-Hansberg, 2008; Baldwin, 2011) have enhanced our intuitive understanding of the fragmentation of production and have provided an effective representation of global supply and production networks. Nevertheless, these case studies are based on detailed microdata at firm level and cannot be obtained for every traded good in the global market.
[6] Input-output analysis has its origin in classical political economy and in the 20th century Leontief (1936), who computed the first national input-output table (IOT), revived it. He demonstrated that the amount and type of intermediate inputs needed in the production of one unit of output can be estimated based on the input-output structure across countries and industries which traces the gross output in all stages of production that is needed to produce one unit of final goods.
[7] Among these initiatives: the Global Trade Analysis Project (GTAP); the Asian International Input–Output Tables constructed by Institute of Developing Economies–Japan External Trade. Organization (IDE-JETRO); the TiVA database by OECD–WTO and the World Input–Output Database (WIOD). See Johnson (2014).
[8] For the main concepts and the basic notation of the inter-country input-output (ICIO) table see Timmer (ed., 2012).

growing literature proposes to use unified mathematical frameworks to completely disentangle gross exports into various value added components and accounting for a country's engagement in international production networks. The most influential methodologies have been proposed by Koopman et al. (2014) and by Wang et al. (2013)[9]. In this paper, I have decided to adopt the decomposition of trade flows proposed by Wang et al. (2013) which generalize at the sector, bilateral and bilateral sector level the original country-level framework by Koopman et al. (2014) and allows to enhance our knowledge of the bilateral links between countries shaping the geography of the production networks.

This work purposes to take full advantage of the informative potential of the Wang et al. (2013) decomposition framework and to interpret carefully the very large amount of results that it provides[10]. Indeed, in this decomposition, each value added component has its own economic interpretation and outlines a specific aspect of the international fragmentation of production, but taken all together these components allow to detect simultaneously several aspects of the multi-country production networks. What follows in this section is an overview of the most relevant value added components used to implement the empirical analysis in Section 3 and a short presentation of the WIOD database.

2.1 Accounting frameworks to disentangle gross exports at bilateral and bilateral sector level

The methodology proposed by Wang et al. (2013) decomposes gross exports at bilateral and bilateral sector level into four main components (Figure 2): 1) the domestic value-added in exports absorbed abroad (DVA), embodied in the exports of final and intermediate goods; 2) the foreign value added (FVA), which consists of the value added contained in intermediate inputs imported from abroad and exported in the form of final or intermediate goods, measuring the extent of involvement in the international production networks for relatively downstream industries; 3) the returned value added (RDV), which is the fraction of the domestic value added in exports of parts and components that is initially exported but ultimately returned home by being embedded in the imports from other

[9] Other authors have proposed alternative breakdowns of gross exports (Stehrer, 2013; Nagengast and Stehrer, 2014; Borin and Mancini, 2015; Los et al., 2015), but the decomposition frameworks proposed by Koopman et al. (2014) and Wang et al. (2013) continue to represent the main point of reference in the current debate.

[10] Further information on the structure of global interlinkages across countries could be recovered performing additional elaborations, in order to compute different indicators proposed in the literature, e.g. the GVC participation and position indexes (Koopman et al., 2011) or the index of "upstreamness" and "downstreamness" (Antràs et al., 2012; Antràs and Chor, 2013) and to implement complementary methodologies, e.g. network analysis (De Benedictis and Tajoli, 2011; De Benedictis et al., 2014; Santoni and Taglioni, 2015; Amador and Cabral, 2017).

countries and consumed at home; 4) the pure double counted term (PDC), which arises from intermediate goods that cross borders multiple times.

These main four terms are further disentangled into finer components[11]. In particular, the DVA is decomposed into the domestic value added in the exports of final goods absorbed by the direct importer (DVA_FIN); the domestic value added exports of intermediate goods absorbed by the direct importer (DVA_INT); and the domestic value added in intermediate goods re-exported by the direct importer to other foreign countries (DVA_INTrex[12]). The latter can be considered a proxy for the joint participation of the bilateral trade partners in a global production network since it contains the exporter's value added that passes through the direct importer for a (or some) stage(s) of production before reaching third countries in the form of intermediate or final goods. Thus, the direct importer is a node of a productive global network that also involves the exporter, which is in an upstream position compared with its importer[13].

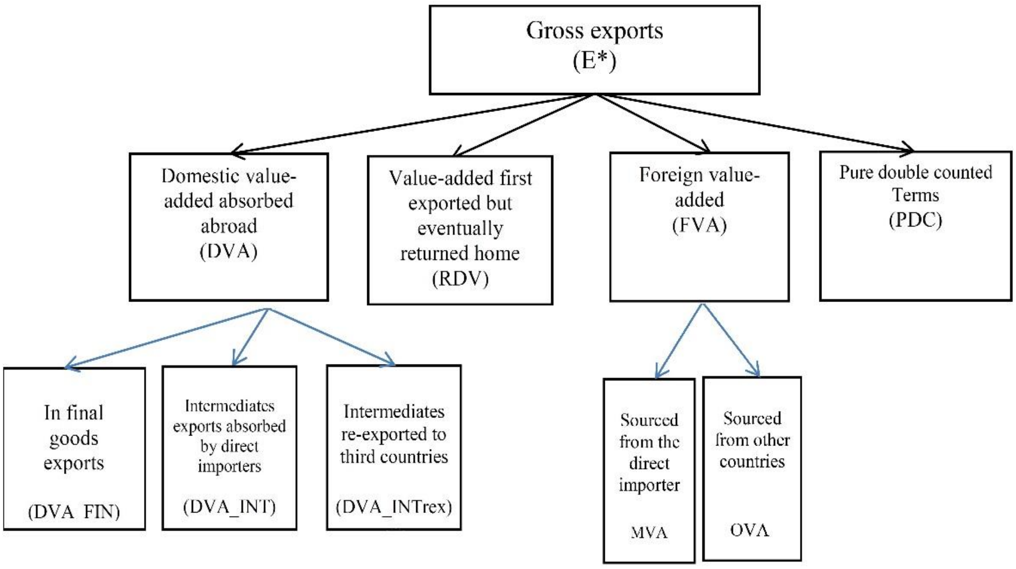


Figure 2 **Bilateral Gross Exports Accounting adapted from Wang et al. (2013, pp. 23-24)**

[11] Wang et al. (2013) decompose gross exports into sixteen components. Figure 2 is an adaptation that takes account of the most significant components for this work.

[12] Koopman et al. (2011) call this component "indirect value added exports". Together with "vertical specialization", this measure also became popular and has been widely used because it effectively approximates the participation of a country in international production networks and provides immediate intuition into how much a country participates in the international network through its exports. In particular, Koopman et al. (2011) propose two indices (GVC positions and GVC participation) whose main component is "indirect value added exports".

[13] As Borin and Mancini (2015) pointed out, DVA_INTrex is domestic value added in intermediates re-exported by the direct importer and *ultimately* absorbed in other foreign countries. Indeed, DVA_FIN and DVA_INT could also contain a share of domestic value added exported by the direct importer to third countries for further processing stage but this DVA is then reimported and ultimately absorbed by the direct importer.

The FVA is decomposed into the share that comes from the direct importer (MVA) and those that originates from third countries (OVA). In particular, the MVA share can be interpreted as an indicator for the level of productive integration between two partner countries. Indeed, if country *s* is the exporter and country *r* is the direct importer, the MVA share of country *s* in exports to country *r* captures the country *r*'s value added exported to the partner country *s* that returns in *r* in the form of final or intermediates goods. In other words, country *s* is a processing hub for country *r*. This component provides a clear intuition of the current complex network of supply and production. Finally, also, the PDC share of country *s* in exports to *r* has a relevant informative content. The higher the PDC share is, the higher the FVA share in the intermediate goods from *r* that are partially transformed by *s* and re-exported as intermediate goods to *r* where they are processed in final or intermediate goods for exports. That is to say, country *r* exports intermediate goods with a relevant share of FVA to country *s*. Then country *s* enters into the production network but only for one stage of production, whereas that network passes several times through country *r*, at different stages of production. Therefore, country *r* (the direct importer) is more involved in the processing of final goods than country *s* (the exporter)[14].

In the economic interpretation of this decomposition framework, a relevant point to note is that it measures the DVA from a user's perspective: the DVA in sector *j* gross exports summarizes all the backward linkages across upstream sectors that are suppliers of intermediate inputs to sector *j* and can include value added from all home supplier sectors. Thus, this backward perspective is very suitable for observing the supply networks of specific sectors because the DVA in sector *j* gross exports synthesizes the production linkages within the home country and the contribution of all upstream domestic sectors to the production of sector *j*'s exports. In other words, it measures the full amount of the domestic factors that the national productive system embodies in those sectoral exports. In the decomposition proposed by Wang et al. (2013), both DVA and RDV are based on these backward linkages[15].

2.2 The World Input-Output Database (WIOD)

In order to perform the empirical analysis presented in Section 3, the accounting framework proposed by Wang et al. (2013) has been implemented using the World Input–Output Database (WIOD), publicly available for free at www.wiod.org, and specifically the 2013 release of the

[14] We expect to register higher PDC shares in bilateral exports from advanced economies to new industrialized countries (e.g. US exports to China) than in symmetric flows (e.g. Chinese exports to US).

[15] Moreover, as Cappariello and Felettigh (2015) explicitly observe, "this strand of literature measures value added on a domestic rather than a national basis". Therefore, domestic value added in a country's exports provides information on "where" that value added has been produced but not on the nationality of the producers. A firm that off-shores its entire production and sales will not contribute to the home country's value added.

database, which covers the period 1995-2011. It presents world input-output tables for 40 countries, which include 27 members of the EU (as of 1 January 2007) and 13 other major economies (see Appendix A), which together represent more than 85% of world gross domestic product (GDP) in 2008 (at current exchange rates). For the remaining non-covered part of the world economy, WIOD estimates a model, called the "rest of the world" (RoW) region. The full list of the 35 sectors in 2013 release of WIOD is presented in Appendix A.

In November 2016, a new version of the dataset has been made available which covers more countries (43) and sectors (58) for the period 2000-2014, but due to different construction criteria, this 2016 release is not directly comparable with the previous one[16].

This paper prefers to adopt the 2013 release of WIOD mainly due to the time span. Indeed, including data for the 1995-1999 period, the 2013 version of the database is able to better detect differences in the supply and production networks due to increasing incidence of the emerging economies as intermediate or final goods processers, assemblers or producers, starting in the early 2000s (Hanson, 2012; Koopman et al., 2012).

3. Italy's participation in international supply and production networks: descriptive and empirical analyses

Having clarified the methodology of reference to decompose gross exports, I present the sectoral export structure of Italy and its main "competitors" in order to define the role of countries within the global supply and production networks (Section 3.1). Then, I go deep into the analysis observing the bilateral dimension and identifying the main source countries of foreign value added (Section 3.2) and the bilateral links between Italy and the main destination markets of its exports (Section 3.3), providing an original customers and suppliers analysis though "the lenses of value added". As anticipated in the introduction, these analyses are implemented for three reference years (1995, 2007 and 2011) and are focused on the *Machinery* and *Leather, leather products and footwear* sectors.

3.1 The export structure in value added of Italy and other selected countries

This section describes similarities and differences between countries in their role within the global supply and production networks, by looking at the different components of each country's exports. The specific export structure of Italy and of other selected countries is obtained by

[16] For the main methodological changes in the WIOD 2016 release, see Timmer et al. (2016).

implementing the decomposition of gross exports into its value added components according to the sectoral level breakdown proposed by Wang et al. (2013). To this purpose, the results are aggregated at country sectoral level. In this section, Italy is compared with the major world exporters in manufacturing goods: in 1995, the top three manufacturing exporters were Germany, USA and Japan, but in 2011 they were overtaken by China[17].

If we focus on ***Machinery*** - which has the most significant role in Italian gross exports, representing about 20% of exported manufacturing goods both in 1995 (19.8%) and in 2011 (19%) - Italy was the fourth world exporter in 1995 and in 2011[18] with gross exports data.

Table 1 Value added decomposition of gross exports in the Machinery sector - selected countries

Country	Year	GROSS EXPORTS (in millions of US$)	DVA TOT	DVA_FIN	DVA_INT	FVA	RDV	PDC
			in % of gross exports					
China	1995	5086.86	**84.89**	57.41	27.48	**13.46**	**0.29**	**1.37**
	2007	89957.12	**74.20**	50.17	24.03	**21.48**	**0.75**	**3.57**
	2011	143627.93	**75.46**	47.97	27.49	**19.51**	**1.34**	**3.70**
Germany	1995	85294.94	**81.99**	55.47	26.52	**14.41**	**1.31**	**2.30**
	2007	193411.11	**71.73**	42.12	29.60	**20.99**	**1.41**	**5.87**
	2011	203747.30	**70.82**	39.87	30.95	**22.14**	**1.31**	**5.73**
Italy	1995	43490.32	**79.36**	54.96	24.39	**18.02**	**0.44**	**2.18**
	2007	95961.24	**74.25**	43.70	30.55	**20.37**	**0.65**	**4.72**
	2011	94241.83	**74.40**	42.10	32.30	**20.52**	**0.55**	**4.53**
Japan	1995	63814.57	**93.06**	66.67	26.39	**5.64**	**0.71**	**0.59**
	2007	77476.23	**83.54**	44.97	38.58	**12.25**	**0.93**	**3.28**
	2011	93808.69	**82.99**	43.30	39.69	**13.23**	**0.84**	**2.94**
USA	1995	60630.41	**82.63**	53.71	28.91	**10.31**	**4.81**	**2.25**
	2007	116173.97	**76.92**	47.33	29.59	**14.07**	**4.92**	**4.09**
	2011	136486.95	**78.70**	46.54	32.16	**13.90**	**3.81**	**3.59**

Source: author's calculations on WIOD data, 2013 release.

Looking at the export structure (Table 1), all the selected countries present a reduction in the share of the DVA component that is more marked between 1995 and 2007 than between 2007 and 2011. This result reveals a greater use of imported intermediate goods because of a gradual increase in the international fragmentation of production, which has partially slowed down since the economic crisis. Italy, China and Germany have the highest dependence of their *Machinery* exports on foreign inputs, recording the greatest FVA share among the selected countries. While the Italian FVA share

[17] Italy ranks sixth and seventh in the world rankings by total gross manufacturing exports, in 1995 and 2011 respectively.
[18] In 1995, Germany, Japan and USA preceded Italy in the order. In 2011, China substituted Japan.

shows weak growth throughout the period, both China and Germany's shares register a significant increase. For China, this trend reflects its role of processing hubs for many advanced economies whereas the increasing FVA share in Germany is partially due to the offshoring of some production stages in plants localized in Eastern European countries, which led to the so-called "Factory Europe" (see Baldwin, 2006, 2014).

On the contrary, Japan maintains the highest DVA throughout the period but with a remarkable change in its export structure with a considerable decrease in DVA_FIN and a rise in the domestic value added in intermediate and unfinished goods (DVA_INT). Thus, in 2011, Japan is no longer mainly a source of finished goods, but it has become an important supplier of parts and components in the production of other countries. In more recent years, China registers the highest DVA share in final goods (DVA_FIN) among the selected countries.

Together with Japan, the USA also presents a low FVA share. However, compared with the former, which produces its exports with a domestic contribution of over 80%, the USA has a less prominent DVA share and the highest RDV share among the five countries[19]. This means that in the *Machinery* sector, the USA is the country that makes greater use of foreign manufacturing systems to perform some stages of productions and to assemble goods ultimately consumed at home. In other words, among the selected countries, the USA has the most internationalized organization of production for its domestic consumption and its production stages are in more upstream positions compared with the other countries. On the contrary, Italy has the lowest RDV share, especially in 2011, that reflects a downstream position in this sectoral global production network.

I then analyse the decomposition of gross ***Leather, leather products and footwear*** exports (Table 2) and compare these results with the evidence that has emerged from the *Machinery* sector, to highlight specific sectoral characteristics. In Italy *Leather, leather products and footwear* represents a share of exported goods that is much lower than the *Machinery* one. Indeed, in 1995, *Leather, leather products and footwear* exports account for 5.51% of manufacturing gross exports whereas in 2011, they account for 4.26%. Nevertheless, Italy was the first world exporter in 1995 and the second in 2011, preceded by China, whereas the value of *Leather, leather products and footwear* exports is much less relevant for Japan and USA.

Overall, the four main components in Table 2 have more moderate variations than those recorded in the *Machinery* sector. This reflects the fact that the *Leather, leather products and*

[19] I would like to mention that RDV is a share of domestic value added in exports (see Section 2). The difference between DVA and RDV is where this value added is absorbed: DVA represents the share of domestic value added in exports that is absorbed abroad, whereas RDV captures the share of domestic value added in intermediate goods exports that turns back through imports and is finally absorbed in the home country.

footwear sector - along with other unskilled labour-intensive manufacturing sectors - was among the first to be affected by the international fragmentation of production that started in the ‘80s. In more recent years, the phenomenon has been gradually consolidated without significant changes in the structure of exports. At the same time, the DVA share is greater than in *Machinery* sector, suggesting that the exports of *Leather, leather products and footwear* products embody a more significant contribution from domestic production factors.

Table 2 Value added decomposition of gross exports in the Leather sector - selected countries

Country	Year	GROSS EXPORTS (in millions of US$)	DVA TOT	DVA_FIN	DVA_INT	FVA	RDV	PDC
			in % of gross exports					
China	1995	9431.04	**81.05**	61.22	19.84	**17.94**	**0.13**	**0.88**
	2007	31394.06	**83.22**	72.06	11.16	**15.90**	**0.15**	**0.73**
	2011	51506.11	**85.32**	73.65	11.67	**13.88**	**0.22**	**0.58**
Germany	1995	2709.87	**74.65**	55.57	19.08	**19.78**	**2.39**	**3.18**
	2007	5292.73	**66.62**	55.12	11.51	**27.99**	**1.39**	**4.00**
	2011	4274.92	**68.43**	55.03	13.40	**26.21**	**1.39**	**3.96**
Italy	1995	12069.86	**82.65**	62.29	20.36	**15.27**	**0.49**	**1.59**
	2007	19401.94	**79.55**	63.12	16.43	**17.65**	**0.66**	**2.14**
	2011	20998.83	**79.09**	62.44	16.65	**18.26**	**0.57**	**2.08**
Japan	1995	266.69	**90.89**	44.52	46.37	**4.01**	**3.71**	**1.39**
	2007	219.92	**88.69**	51.38	37.31	**7.32**	**1.69**	**2.30**
	2011	227.44	**87.79**	52.74	35.05	**8.82**	**1.22**	**2.16**
USA	1995	967.37	**82.85**	74.17	8.68	**14.17**	**2.02**	**0.96**
	2007	869.17	**80.07**	70.04	10.03	**16.32**	**2.21**	**1.40**
	2011	834.53	**81.86**	71.58	10.28	**15.44**	**1.48**	**1.23**

Source: author’s calculations on WIOD data, 2013 release.

In particular, small changes characterize the Italian trend in all the value added components and the main shift is the decreasing DVA_INT share in favour of the FVA share. This outcome is in line with the transformation of the sector’s production and sales structure (a reduction in the number of firms and employees in Italy and in other advanced countries and the emerging of new countries that have developed the production of these sectors’ goods, in particular in Asia) and confirms the remarks of some sectoral analysis. In particular, Milone (2015) reports that in the last two decades, the Italian firms in the *Leather, leather products and footwear* sector have modified their strategic positioning, placing themselves in the upper segment of the market (in which a greater value is attributed to Italian style and brand recognition) and have outsourced abroad some stages of production with low value added. At the same time, Italian small and medium enterprises in the

Leather, leather products and footwear sector have been able to join global supply chains thanks to the partnership with big international brands based in Italy.

As for *Machinery*, Japan maintains the highest DVA throughout the period, but with an opposite trend: a considerable increase in DVA_FIN and a symmetrical fall in DVA_INT. However, the DVA_INT share remains strongly above the share of the other top world manufacturing exporters, signalling a significant contribution of Japanese intermediate leather goods in the production of final goods by third countries. On the contrary, the USA has the less prominent DVA_INT share, suggesting its low participation in the international production networks of *Leather, leather products and footwear*. China presents an increasing DVA share and a decreasing FVA share, signalling that the country manufactures at home some parts and components that in the mid ’90s were purchased abroad. Its domestic supply chain is becoming more complete and only a small part of its exports embodies imported inputs. Finally, as for *Machinery*, also in *Leather, leather products and footwear* Germany is the country with the highest FVA share (above 25% both in 2007 and 2011), revealing a greater dependence of sectoral exports on imported inputs.

3.2 The main source countries in the supply chains with value added data

In light of the growing importance of imported intermediate inputs in exports, in this section the decomposition framework by Wang et al. (2013) is used to present an extensive analysis of the composition of the FVA in terms of countries that are suppliers of intermediate inputs in a country’s exports in order to detect any change that has taken place in the organization of international supply chains[20].

With the aim of identifying the productive ties of both Italy and other main manufacturing exporter countries (namely Germany, USA, Japan and China) with their foreign sources of inputs, I select the top five suppliers of FVA for each country in each reference year (1995, 2007, 2011). I report the sum of the FVA shares of the top five suppliers as an indicator of the concentration of the geographical origin of imported inputs. Moreover, the tables provide the share of FVA by all the EU countries in the dataset, which, when analysing single EU exporter countries, can be considered as a proxy for the integration of the production networks within the EU[21].

[20] See Section 3.2 in Wang et al. (2013) for their application of this measure.

[21] The EU share considers in each year all the 27 EU countries in WIOD (26, when the exporter is an EU country) and not only the countries that in the specific year are members of the UE. In this way, this avoids the increase of the FVA share from the EU countries being attributed to the process of enlargement of the EU, rather than to greater productive integration.

Among the main foreign source countries of value added in the Italian ***Machinery*** exports (Table 3), Germany is the leading supplier throughout the period. However, the most striking feature is the increasing role of China and, to a lesser extent Russia, in the Italian international supply chain and the corresponding decline of EU countries (Germany included). Moreover, the weight of the top five suppliers on the whole FVA decreases by about 10% during the period, suggesting a lower concentration of the supply network of intermediate and unfinished goods in 2011 compared to 1995. The decrease of the FVA share of the top five suppliers is not constant, but a slight reversal of the trend is registered in 2011 compared to 2007, a feature common to all analysed advanced countries (see Table 4, 5, 7). This phenomenon could be interpreted as a sign of a consolidation of the supply chains since the economic crisis.

Table 3 Main source countries of FVA in Italian Machinery exports

Unit: % of gross export, (n) position in the rankings of foreign suppliers of value added in sectoral exports

Year	1995		2007		2011	
FVA share of gross exports	**18.02**		**20.37**		**20.52**	
Germany	3.78	(1)	3.47	(1)	3.20	(1)
China	0.23	(13)	1.01	(5)	1.54	(2)
France	2.24	(2)	1.56	(2)	1.42	(3)
Russia	0.69	(6)	0.78	(7)	1.32	(4)
USA	1.56	(3)	1.23	(3)	1.22	(5)
UK	1.20	(4)	1.12	(4)	0.77	(7)
Belgium	0.75	(5)	0.52	(9)	0.49	(9)
EU	11.25		11.05		9.88	
Top 5 supplier	9.52		8.39		8.68	
% of FVA	52.83		41.20		42.33	

Source: author’s calculations on WIOD data, 2013 release.

Table 4 Main source countries of FVA in German Machinery exports

Unit: % of gross export, (n) position in the rankings of foreign suppliers of value added in sectoral exports

Year	1995		2007		2011	
FVA share of gross exports	**14.41**		**20.99**		**22.14**	
China	0.22	(17)	1.29	(5)	2.17	(1)
USA	1.45	(2)	1.67	(1)	1.76	(2)
Italy	1.23	(3)	1.53	(3)	1.62	(3)
France	1.51	(1)	1.56	(2)	1.41	(4)
UK	1.14	(4)	1.30	(4)	1.06	(5)
Japan	0.86	(5)	0.98	(6)	0.90	(7)
EU	8.57		11.16		10.79	
Top 5 suppliers	6.19		7.35		8.01	
% of FVA	42.98		35.04		36.20	

Source: author’s calculations on WIOD data, 2013 release.

As for Italy, China performs a surprising progression as foreign supplier of value added in *Machinery* exports (moving from 17th place in 1995 to 1st place in 2011) for Germany as well (Table

4). The main difference between Italy and Germany is the EU countries' contribution: the FVA share sharply increased during the period, confirming the strengthening of its EU productive links especially with the Eastern European countries, as mentioned in the previous sections. The fact that Italy ranks third for the FVA share and shows an upturn, contributing to the growth of the EU share in German exports is worthy of note. Finally, the share of the top five suppliers in the total FVA is lower than Italy's: German's supply chain seems to be more fragmented since a larger number of countries are a strategic source in the production of its exports.

Moving from European exporter's supply chains to the USA one (Table 5) emphasises the strong regional focus of international production networks, already observed in other studies (Amador et al., 2015), a feature closely related to the fact that trade overall is still highly regional. When looking at Table 5, it is therefore not surprising that the main suppliers of FVA for the US *Machinery* exports include the NAFTA partner countries (Canada and Mexico). Moreover, the increasing FVA share of Mexico combined with that of China (the first source of FVA in 2011) can be attributed to their most recent role of processing hubs for many advanced economies in manufacturing sectors, performing mainly intermediate stages of production by processing imported inputs for re-exporting[22].

To fully understand the great importance of the productive links between US and China, bear in mind that the US figures at the top of the rankings as a supplier of FVA in the Chinese *Machinery* exports (Table 6). A positive trend characterizes the EU share and especially those of Germany from 1995 to 2007. Conversely, from 2007 to 2011, the FVA share of the great majority of the most industrialized economies faced a downturn that can only be partially explained by the phenomenon of reshoring intermediate stages of production to the home country due to the economic crisis. Once again, the regional organization of global manufacturing production appears when looking at the main source countries in the Chinese exports, with Asia as an emerging hub alongside Europe and North America. Indeed, several Asian countries (Japan, South Korea and Taiwan) result among the top five suppliers of the Chinese *Machinery* exports.

Similar remarks about the prominent regional dimension of the supply chains can also be made for the Japanese exports in the *Machinery* sector where China, South Korea, Indonesia and Taiwan appear among the main source countries of FVA (Table 7). From 1995 to 2011, China and Indonesia showed an increasing trend whereas South Korea and Taiwan fell in the rankings. The Japanese supply chain has a considerable level of concentration. The EU share in Japanese exports is the lowest compared to the share in USA and Chinese exports, signalling weak productive links between Japan and Europe in this sector.

[22] Some studies have documented the specialization of those countries in assembly activities and led the researchers to differentiate the estimate of the input-output coefficients in computing value added trade when processing trade is prevalent (Koopman et al., 2012).

Table 5 Main source countries of FVA in US Machinery exports

Unit: % of gross export, (n) position in the rankings of foreign suppliers of value added in sectoral exports

Year	**1995**		**2007**		**2011**	
FVA share of gross exports	**10.31**		**14.07**		**13.90**	
China	0.31	(10)	1.77	(2)	2.35	(1)
Canada	1.47	(2)	1.85	(1)	1.75	(2)
Mexico	0.55	(5)	1.05	(5)	1.17	(3)
Japan	1.83	(1)	1.10	(3)	1.01	(4)
Germany	0.89	(3)	1.10	(4)	0.94	(5)
UK	0.59	(4)	0.58	(6)	0.46	(7)
Italy	0.34	(9)	0.43	(7)	0.34	(8)
EU	3.30		3.72		3.23	
Top 5 suppliers	5.34		6.86		7.22	
% of FVA	51.79		48.78		51.95	

Source: author's calculations on WIOD data, 2013 release.

Table 6 Main source countries of FVA in Chinese Machinery exports

Unit: % of gross export, (n) position in the rankings of foreign suppliers of value added in sectoral exports

Year	**1995**		**2007**		**2011**	
FVA share of gross exports	**13.5**		**21.5**		**19.5**	
USA	1.50	(2)	2.50	(2)	2.20	(1)
Japan	3.46	(1)	3.03	(1)	2.17	(2)
Australia	0.54	(6)	1.13	(5)	1.77	(3)
Germany	0.75	(5)	1.81	(3)	1.42	(4)
South Korea	0.96	(4)	1.46	(4)	1.15	(5)
Taiwan	1.05	(3)	1.12	(6)	0.76	(6)
Italy	0.28	(10)	0.50	(9)	0.41	(11)
EU	2.57		4.97		3.72	
Top 5 suppliers	7.72		9.92		8.71	
% of FVA	57.38		46.21		44.66	

Source: author's calculations on WIOD data, 2013 release.

Table 7 Main source countries of FVA in Japanese Machinery exports

Unit: % of gross export, (n) position in the rankings of foreign suppliers of value added in sectoral exports

Year	**1995**		**2007**		**2011**	
FVA share of gross exports	**5.64**		**12.2**		**13.2**	
China	0.29	(4)	1.91	(1)	2.71	(1)
USA	1.35	(1)	1.68	(2)	1.44	(2)
South Korea	0.45	(2)	0.81	(3)	0.87	(3)
Australia	0.22	(7)	0.54	(5)	0.81	(4)
Indonesia	0.19	(9)	0.38	(7)	0.49	(5)
Germany	0.31	(3)	0.65	(4)	0.49	(6)
Taiwan	0.24	(5)	0.48	(6)	0.44	(8)
Italy	0.10	(13)	0.18	(12)	0.13	(13)
EU	1.10		2.10		1.57	
Top 5 suppliers	2.64		5.59		6.32	
% of FVA	46.82		45.63		47.77	

Source: author's calculations on WIOD data, 2013 release.

The evolution of the top five foreign suppliers of value added in the Italian ***Leather, leather products and footwear*** exports is presented in Table 8. As for *Machinery*, Germany is also the leading supplier of FVA to Italy in this sector revealing a productive link between the countries in a traditional labour intensive manufacturing sector as well. The most remarkable feature of the table is the rapid rise of China (which in a few years may overtake Germany), Russia and Brazil and the corresponding decline of France, UK and Australia. In addition, compared to the Italian supply chain in the *Machinery* sector (Table 3), the share of the top five suppliers in the *Leather, leather products and footwear* exported products is lower, signalling a broader network of countries suppliers in Italian sectoral exports.

More stable is the foreign supply chain in German exports (Table 9), in which only China emerges rising from 16^{th} place in 1995 to 1st place in 2011 and mainly eroding Italy's share. The fall in the value added from Italy also seems to be the reason underlying the decreasing EU share in German exports that, nevertheless, remains above the EU share in Italian exports (Table 8), confirming a stronger production link of Germany with the European countries.

Table 8 Main source countries of FVA in Italian Leather and footwear exports
Unit: % of gross export, (n) position in the rankings of foreign suppliers of value added in sectoral exports

Year	1995		2007		2011	
FVA share of gross exports	**15.27**		**17.65**		**18.26**	
Germany	2.13	(1)	1.92	(1)	1.67	(1)
China	0.28	(13)	0.83	(6)	1.52	(2)
USA	1.48	(3)	1.24	(2)	1.47	(3)
Russia	0.55	(8)	0.60	(8)	1.19	(4)
Brazil	0.42	(10)	0.99	(5)	1.17	(5)
France	1.64	(2)	1.18	(3)	0.98	(6)
UK	0.90	(4)	1.03	(4)	0.72	(7)
Australia	0.60	(5)	0.42	(11)	0.36	(11)
EU	7.66		7.81		6.51	
Top 5 suppliers	6.76		6.36		7.02	
% of FVA	44.24		36.02		38.44	

Source: author's calculations on WIOD data, 2013 release.

Table 9 Main source countries of FVA in German Leather and footwear exports
Unit: % of gross export, (n) position in the rankings of foreign suppliers of value added in sectoral exports

Year	1995		2007		2011	
FVA share of gross exports	**14.41**		**20.99**		**22.14**	
China	0.22	(16)	2.83	(2)	4.29	(1)
Italy	4.81	(1)	3.28	(1)	2.57	(2)
USA	1.34	(3)	1.63	(3)	1.51	(3)
France	1.59	(2)	1.41	(5)	1.22	(4)
UK	1.01	(6)	1.51	(4)	1.22	(5)
Nederland	1.12	(4)	1.20	(6)	1.21	(6)
Austria	1.05	(5)	0.86	(7)	0.74	(7)
EU	13.30		13.62		11.69	
Top 5 suppliers	9.91		10.66		10.82	
% of FVA	68.80		50.77		48.86	

Source: author's calculations on WIOD data, 2013 release.

Although China becomes a significant supplier during the first decade of the 2000s for both Italy and Germany, the country was the first foreign supplier in the US *Leather, leather products and footwear* exports (Table 10) as early as 1995. In the period of analysis, China triples its contribution to the detriment of the other suppliers with the only exception of Mexico, which shows extraordinary growth and rises from 10th to 3rd place. Overall, the USA sectoral supply chain becomes more and more concentrated (about 60% of the FVA comes from the top five suppliers in 2011).

On the contrary, the supply chain of the Chinese Leather exports (Table 11) is more and more fragmented (only about 34% of the FVA comes from the top five suppliers in 2011), where the top five suppliers in 1995 show a relevant decrease in their contribution (e.g. Japan remains in second place throughout the entire period but it more than halves its share of value added). In the 2000s, Brazil also emerges among the top five suppliers in Chinese exports.

Table 10 Main source countries of FVA in US Leather and footwear exports
Unit: % of gross export, (n) position in the rankings of foreign suppliers of value added in sectoral exports

Year	**1995**		**2007**		**2011**	
FVA share of gross exports	**14.17**		**16.32**		**15.44**	
China	2.08	(1)	4.52	(1)	5.85	(1)
Canada	1.09	(3)	1.26	(2)	1.02	(2)
Italy	1.28	(2)	1.21	(3)	0.88	(3)
Mexico	0.48	(10)	0.68	(4)	0.59	(4)
Germany	0.65	(7)	0.65	(5)	0.48	(5)
Brazil	0.73	(5)	0.62	(6)	0.42	(6)
Japan	0.79	(4)	0.50	(7)	0.41	(7)
EU	4.58		3.88		2.93	
Top 5 suppliers	5.97		8.32		8.81	
% of FVA	42.13		51.01		57.08	

Source: author's calculations on WIOD data, 2013 release.

Table 11 Main source countries of FVA in Chinese Leather and footwear exports
Unit: % of gross export, (n) position in the rankings of foreign suppliers of value added in sectoral exports

Year	**1995**		**2007**		**2011**	
FVA share of gross exports	**17.9**		**15.9**		**13.9**	
USA	2.18	(3)	1.70	(1)	1.57	(1)
Japan	2.38	(2)	1.39	(2)	0.96	(2)
Brazil	0.32	(12)	0.73	(7)	0.83	(3)
South Korea	2.70	(1)	1.16	(3)	0.73	(4)
Australia	0.50	(7)	0.49	(8)	0.64	(5)
Italy	1.64	(5)	0.80	(5)	0.54	(7)
Taiwan	1.87	(4)	0.81	(4)	0.50	(9)
EU	3.88		3.36		2.44	
Top 5 suppliers	10.77		5.86		4.73	
% of FVA	60.03		36.88		34.06	

Source: author's calculations on WIOD data, 2013 release.

Finally, looking at the Japanese supply chain in the *Leather, leather products and footwear* sector (Table 12), Germany and Italy lose positions in favour of the USA, China and other regional suppliers such as Indonesia and South Korea. In particular, at the end of the period, Italy exits not only from the top five but also from the top ten major suppliers of FVA in Japanese exports.

Table 12 Main source countries of FVA in Japanese Leather and footwear exports
Unit: % of gross export, (n) position in the rankings of foreign suppliers of value added in sectoral exports

Year	1995		2007		2011	
FVA share of gross exports	**4.01**		**7.3**		**8.8**	
China	0.30	(2)	1.04	(1)	1.71	(1)
USA	0.75	(1)	0.86	(2)	0.88	(2)
Australia	0.16	(7)	0.36	(3)	0.54	(3)
South Korea	0.24	(3)	0.35	(4)	0.43	(4)
Indonesia	0.14	(9)	0.26	(6)	0.41	(5)
Germany	0.20	(5)	0.27	(5)	0.23	(7)
Italy	0.23	(4)	0.20	(7)	0.17	(11)
EU	0.98		1.18		1.00	
Top 5 suppliers	1.72		2.88		3.97	
% of FVA	42.95		39.33		44.99	

Source: author's calculations on WIOD data, 2013 release.

3.3 Supply and production links between Italy and its main destination markets

The decomposition by Wang et al. (2013) provides a broader knowledge of the bilateral links between countries that shape the geography of the production networks. In particular, the picture presented in Section 3.1 and 3.2 can be enhanced by a specific analysis of the bilateral trade flows at industry level because at this level some components acquire a remarkable economic meaning and enable commercial and productive linkages underlying export flows to be better detected. In particular, the components that interest us most in this analysis are the DVA_INTrex and the MVA.

I analyse Italian exports to its main destination markets, according to gross exports in 2011. For both *Machinery* and *Leather, leather products and footwear* sectors, the main destination markets for Italian exports are China, France, Germany, Russia and the USA[23].

When observing the export structure of the Italian ***Machinery*** sector to each of its main destination markets (Table 13), it is evident that the exports flow with Germany conceals greater supply and productive links with Italy. Indeed, a relevant share (about one-fifth in 2011) of the Italian value added in exports to Germany is not absorbed by the direct importer, but is shipped to third countries (DVA_INTrex). The MVA share is also higher in the Italian bilateral exports to Germany signalling that in the *Machinery* sector Italy is an important processing hub especially for Germany

[23] Germany is the main market for Italian *Machinery* exports, followed by China, France, the USA and Russia whereas in *Leather*, *leather products and footwear*, the USA is at the top of the rankings followed by China, Russia, France and Germany. Thus, with the term "main destination markets" I refer to the main importers.

rather than for the other countries in the table, which include some of the major world exporters. Therefore, it is not surprisingly that exports to Germany record a relevant share of PDC because intermediate goods cross the border multiple times due to the productive linkages described above. This outcome reflects the central position of Germany in European manufacturing which has already been underlined by other studies using standard data (Veugelers R., 2013) and its great ability to become China's privileged partner in a number of productions including mechanics (Foresti and Trenti, 2012).

Table 13 Value added decomposition of Italian gross exports in Machinery to its main destination markets

Main foreign markets	Year	ITALIAN GROSS EXPORTS in millions of US$	in % of total exports	DVA: DVA_FIN	DVA_INT	DVA_INTrex	FVA: MVA	OVA	RDV	PDC
				in % of gross exports						
China	1995	1469.17	*3.38*	71.26	6.94	**1.67**	**0.25**	19.39	0.04	0.46
	2007	4686.40	*4.88*	27.09	31.37	**16.02**	**0.96**	18.35	0.37	5.83
	2011	9431.76	*10.01*	29.37	33.49	**11.83**	**1.55**	19.18	0.25	4.33
France	1995	4187.52	*9.63*	53.62	16.92	**8.45**	**2.20**	15.51	0.76	2.54
	2007	8015.04	*8.35*	44.88	16.79	**12.22**	**1.56**	18.82	0.98	4.73
	2011	8076.80	*8.57*	45.20	16.72	**12.12**	**1.41**	19.03	0.89	4.64
Germany	1995	5008.55	*11.52*	49.53	16.40	**12.91**	**3.47**	13.06	0.89	3.74
	2007	8107.28	*8.45*	39.85	11.85	**21.68**	**2.90**	14.14	1.42	8.16
	2011	9443.00	*10.02*	40.24	12.50	**20.99**	**2.71**	14.66	1.14	7.76
Russia	1995	1504.84	*3.46*	45.53	25.63	**7.91**	**0.68**	17.20	0.65	2.40
	2007	3621.91	*3.77*	39.91	25.95	**8.56**	**0.84**	20.96	0.47	3.31
	2011	5377.52	*5.71*	40.79	25.24	**8.12**	**1.40**	20.43	0.74	3.29
USA	1995	3546.89	*8.16*	51.16	23.83	**4.75**	**1.63**	17.18	0.09	1.37
	2007	7553.30	*7.87*	44.31	24.86	**5.72**	**1.38**	21.46	0.09	2.18
	2011	7178.73	*7.62*	44.92	23.67	**6.36**	**1.35**	21.28	0.09	2.34

Source: author’s calculations on WIOD data, 2013 release.

When looking at the MVA share in Italian ***Leather, leather products and footwear*** exports (Table 14), it is evident that in 1995 Italy participates more in the German, French and USA production networks compared with those of the emerging countries. Nevertheless, at the end of the period the shares are more similar and between 1.02 and 1.56 %, reflecting the growing role of emerging countries in the international organization of production. This phenomenon becomes even more evident looking at the DVA_INTrex: China results to be the main country where Italian intermediate inputs are processed and assembled in more complex intermediate goods or in final goods destined for third countries. This outcome confirms and supports the remarks in Section 3.1 on the restructuring process of this sector in the Italian productive system, which has been provided by studies that discuss the emergence of China in the *Leather, leather products and footwear* sector (Milone, 2015) and, more in general, in all sectors related to the fashion industry (De Nardis and

Traù, 2005; Schütz and Palan, 2016). On the contrary, the structure of Italian exports to Russia is dominated by a higher share of DVA_FIN, suggesting that it is mainly a consumer market for Italian products.

<u>Table 14</u> Value added decomposition of Italian gross exports in Leather, leather products and footwear to its main destination markets

Main foreign markets	Year	ITALIAN GROSS EXPORTS in millions of US$	ITALIAN GROSS EXPORTS in % of total exports	DVA: DVA_FIN	DVA: DVA_INT	DVA: DVA_INTrex	FVA: MVA	FVA: OVA	RDV	PDC
				in % of gross exports						
China	1995	575.35	*4.77*	25.30	31.11	**26.13**	**0.21**	11.15	0.52	5.59
	2007	1104.39	*5.69*	22.74	25.90	**30.46**	**0.56**	11.36	0.96	8.02
	2011	2324.59	*11.07*	47.87	17.09	**14.27**	**1.37**	15.11	0.41	3.88
France	1995	1301.95	*10.79*	76.85	3.16	**2.91**	**1.73**	14.37	0.27	0.70
	2007	2104.95	*10.85*	72.77	2.63	**4.21**	**1.23**	17.25	0.64	1.27
	2011	1649.48	*7.86*	72.60	2.63	**3.91**	**1.02**	18.07	0.56	1.21
Germany	1995	2239.87	*18.56*	69.15	7.52	**6.07**	**2.15**	13.28	0.40	1.44
	2007	1757.87	*9.06*	68.70	1.67	**9.15**	**1.87**	15.36	0.71	2.54
	2011	1500.07	*7.14*	70.05	1.99	**7.05**	**1.67**	16.61	0.59	2.04
Russia	1995	541.14	*4.48*	74.22	7.44	**1.30**	**0.59**	15.84	0.20	0.41
	2007	1662.63	*8.57*	77.30	2.41	**0.54**	**0.66**	18.88	0.04	0.17
	2011	2050.48	*9.76*	76.58	2.52	**0.57**	**1.31**	18.77	0.06	0.19
USA	1995	2508.11	*20.78*	52.02	27.54	**3.52**	**1.55**	14.45	0.07	0.85
	2007	3509.05	*18.09*	63.48	14.03	**2.70**	**1.33**	17.65	0.05	0.76
	2011	2466.42	*11.75*	55.71	20.79	**3.13**	**1.56**	17.85	0.05	0.90

Source: author's calculations on WIOD data, 2013 release.

4. Synthesis of outcomes and conclusions

The export decomposition framework proposed by Wang et al. (2013) can be used to disentangle the gross exports into different value added components and provide useful insights into the organization of the international supply and production networks in specific sectors.

The analysis of the export structure of the major world exporters in manufacturing goods (Section 3.1) has highlighted specific sectoral characteristics in terms of level and dynamic of the fragmentation of production at global level. First, in the *Machinery* sector the production of exported goods makes use of a higher share of imported inputs (FVA) compared with the *Leather, leather products and footwear* sector, which exports embody a more significant contribution from domestic production factors in all the countries analysed. Second, during the 2000s the share of FVA in *Machinery* exports has grown, reflecting a general increase in the international fragmentation of production, whereas the *Leather, leather products and footwear* sector has experimented moderate variations, revealing a consolidation of the production networks that has been well documented in sectoral studies.

Focusing on the main source countries of foreign value added in exports, Section 3.2 has confirmed the prominent regional dimension of manufacturing supply and production networks, with Asia as an emerging hub alongside Europe and North America. In *Machinery* sector China, Germany and USA have a central position in their regional manufacturing systems and are strictly interlinked with each other. In the *Leather, leather products and footwear* sector, Italy substitutes Germany in the central position of the European hub and in the interlinkages with USA and China. Moreover Brazil emerges as supplier of foreign value added in these sectoral exports.

Finally, some specific results for Italy - that include also the analysis of bilateral links with the main destination markets of its exports (Section 3.3) - can be summarized as follows:

- The structure of the Italian exports in the *Machinery* sector appears similar to the German one but with a less prominent RDV share, reflecting a more downstream position and a lower level of internationalization of the production network of exported goods. Italy has not seen substantial shifts in its foreign suppliers, except for the increasing role of China, and has maintained strong links with the European countries and Russia. In particular, Italy shows solid productive integration with Germany, which also represents an important commercial bridge to third markets, whereas the strong bilateral linkage with Russia is a peculiarity of Italy, which differentiates it from the other major world exporters.
- Moving on to the *Leather, leather products and footwear* sector, beside China and Brazil, in recent years Russia has also emerged among the main foreign suppliers of value added in Italian exports. As for *Machinery*, it is a peculiarity of Italy. Moreover, Italy has strengthened its supply and productive linkages with China, which enable to Italian intermediate goods to reach third markets, at the expense of European countries.

In both sectors, the outcomes are in line with the literature. However, the empirical analysis in Section 3 has shown how the advantage of using the accounting methodology by Wang et al. (2013) is that it provides an effective way of summarizing the main features of the sectoral productive networks between countries and monitoring their trends, making it possible to simultaneously check items usually obtained through multiple analysis. Moreover, “the lenses of value added” allow to replace the traditional customers and suppliers analysis with a more detailed wisdom that inserts the bilateral trade and production links into multilateral networks. Overall, even though a decomposition, this work shows that the value added approach strengthens the perception of productive integration (and interdependence) among countries, rather than that of fragmentation and favours a vision of the countries in terms of partnerships and not only competition. Both items could be relevant for policymaking in order to design the appropriate policy measures.

Appendix A - WIOD 2013 release: countries and sectors' coverage

Table A.1 **Country Coverage of WIOD (Release 2013)**

European Union	North America
Austria	Canada
Belgium	United States
Bulgaria	
Cyprus	
Czech Republic	**Latin America**
Denmark	Brazil
Estonia	Mexico
Finland	
France	
Germany	
Greece	**Asia and Pacific**
Hungary	Australia
Ireland	China
Italy	Indonesia
Latvia	India
Lithuania	Japan
Luxembourg	Russia
Malta	South Korea
Netherlands	Turkey
Poland	Taiwan
Portugal	
Romania	
Slovak Republic	
Slovenia	
Spain	
Sweden	
United Kingdom	

Table A.2 **Industry Coverage of WIOD (Release 2013)**

ISIC Rev. 3 Code	Industry	Categories
AtB	Agriculture, Hunting, Forestry and Fishing	Primary sectors
C	Mining and Quarrying	
15t16	Food, Beverages and Tobacco	Manufacturing sectors
17t18	Textiles and Textile Products	
19	Leather, Leather and Footwear	
20	Wood and Products of Wood and Cork	
21t22	Pulp, Paper, Paper , Printing and Publishing	
23	Coke, Refined Petroleum and Nuclear Fuel	
24	Chemicals and Chemical Products	
25	Rubber and Plastics	
26	Other Non-Metallic Mineral	
27t28	Basic Metals and Fabricated Metal	
29	Machinery, n.e.c.	
30t33	Electrical and Optical Equipment	
34t35	Transport Equipment	
36t37	Manufacturing, n.e.c.; Recycling	
E	Electricity, Gas and Water Supply	Service sectors
F	Construction	
50	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	
51	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	
52	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	
H	Hotels and Restaurants	
60	Inland Transport	
61	Water Transport	
62	Air Transport	
63	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	
64	Post and Telecommunications	
J	Financial Intermediation	
70	Real Estate Activities	
71t74	Renting of M&Eq and Other Business Activities	
L	Public Admin and Defence; Compulsory Social Security	
M	Education	
N	Health and Social Work	
O	Other Community, Social and Personal Services	
P	Private Households with Employed Persons	

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