ITALIAN FIRMS IN INTERNATIONAL PRODUCTION NETWORKS

UPDATED VERSION

ITA

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Ministero dello Sviluppo Economico

Italian firms in international production networks

EXECUTIVE SUMMARY*

The new international scenario

1. The process of international production fragmentation, which has spurred the rapid increase of trade flows relative to world output, represents one of the most important changes in the global economy since the mid-eighties (Krugman, 1995). An increasing number of activities, previously carried out within the same company, have been separated into individual phases to be produced by other entities of the group, or by independent companies, located in different countries, thanks to the progress in communication and transportation technologies, as well as to trade and investment liberalization policies (Baldwin, 2011; Amador and Cabral, 2016).

2. International production fragmentation has had a major impact on world trade of raw materials, parts and components (intermediate goods) (Feenstra, 1998). Domestic production and exports incorporate a significant share of imports of intermediate goods. This link affects the competitiveness of firms on international markets, with important implications for the interpretation of macroeconomic indicators, as well as for policies.

3. Explaining the current account balance of a country is no longer possible without considering the links between trade and international production: for example, the US trade deficit towards China can also be traced back to the imports of intermediate goods generated by US companies' outsourcing activities. The increased relevance of imported

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inputs also implies that the price elasticity of exports appears to be lower than in the past, limiting the effects of so-called competitive devaluations (Ahmed *et al*., 2017). [1]

4. In this scenario, the effects of trade policies must also be considered, since an increase in duties on intermediate goods raises the production costs of final goods. Non-tariff measures, such as rules of origin and local content requirements, can have significant negative effects on the functioning of international production networks, making business procurement less efficient and more costly[2].

5. A large part of trade (according to UNCTAD,2013, roughly 80 percent of it) now takes place in the context of international production networks (IPNs), complex organizations that intersect, at various levels, with other more or less complex networks, national and international. The shapes assumed by these networks can be very different in terms of geographical extension and internal organization, depending on the characteristics of the companies that are part of them.

6. The expression that has spread most is "global value chains" (e.g. Gereffi and Fernandez-Stark, 2016), which are led by (generally) transnational companies coordinating several different types of actors (affiliates, joint ventures, independent suppliers etc.), that operate in an increasing number of countries and sectors. By supplying intermediate goods and services, these various firms contribute to the production of final goods.

7. With a much finer and more specialized division of labor than in the past, firms that are involved in IPNs frequently resort to exchanges involving parts of activities, defined by the economic literature as “trade in tasks” (e.g. Grossman and Rossi-Hansberg, 2006; Baldwin and Robert-Nicoud, 2014). These exchanges, carried out within networks of companies, imply a high degree of coordination and cooperation as within a company group, even if they are made by independent suppliers.

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[1]See the study by M. Ruta, *Svalutazioni non competitive : il ruolo delle catene produttive globali*, published in “Le imprese italiane nelle reti produttive internazionali”, ITA-Italian Trade Agency, 2018.

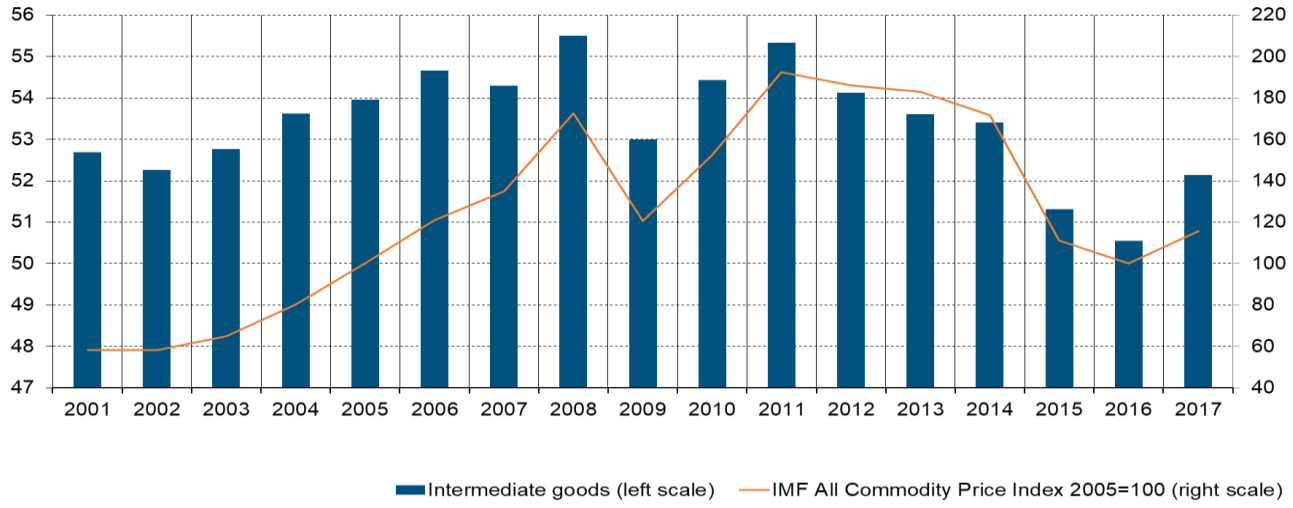
[2] According to Gawande *et al*. (2015), in fact, fragmentation of production into IPNs may have acted as a deterrent to make use of protectionist measures after the 2008 trade collapse. They find participation in global value chains as being a powerful economic factor in shaping trade policy responses.

8. The attention on the importance of IPNs is relatively recent, and these networks are presented as a new economic paradigm, raising questions on what statistical data is necessary for their measurement (e.g. Johnson, 2017), on how companies may increase their participation and on which policies are more appropriate to facilitate the operations of IPNs.

9. The role and the diffusion of international production networks can be examined in many ways. One method is to analyse international trade in intermediate goods, and in particular trade of "processed" inputs (parts and components, without raw materials, as in UNCTAD[3]). These trade flows represent more than 50 percent of world merchandise trade, a percentage whose changes have strictly reflected fluctuations in raw materials' prices over the last 15 years (graph 1). Focussing on processed inputs reveals a different picture: changes in their share appear to be correlated to the time path of world trade volumes (graph 2). The collapse and rebound which characterised the outset of the global crisis in 2009-11 translated into sharp fluctuations in trade in processed inputs, connected to the so-called "bull-whip effect" of the inventory cycle in IPNs. The ensuing downward trend of the world trade share of processed inputs could be related to the lower income elasticity of trade volumes, which in turn could reflect, among other factors, a slowdown in the process on international production fragmentation.

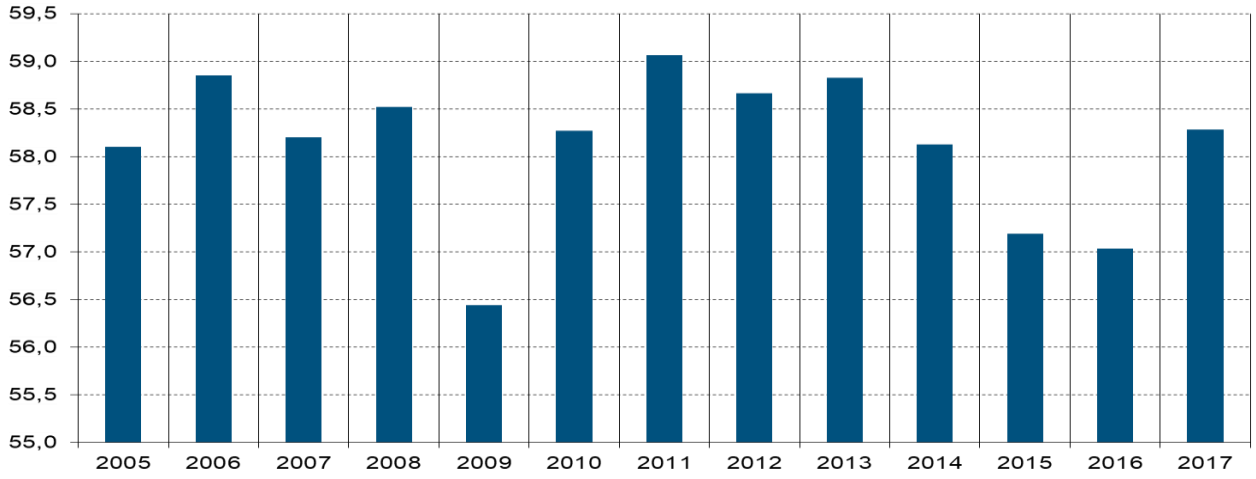
[3] UNCTAD, Key Statistics and Trends in International Trade, annual reports.

Graph 1 - World trade in intermediate goods and commodity prices. Percentage share on total trade, at current prices



Source: ITA based on IMF and OECD data.

Graph 2 – World trade in processed intermediate goods.
Percentage share on world trade, net of "primary intermediate goods" and of items not classified by Broad Economic Category (BEC rev.4)



Source: ITA based on data from National Statistics Institutes.

10. In recent years, China in particular recorded a strong increase in its share of trade in intermediate goods, confirming its leading role in international production networks. For some Asian countries (South Korea, Taiwan, Hong Kong, Malaysia and Singapore), the share of trade in processed intermediates is well above world average, highlighting their strong involvement in international production networks. Similar data can be observed for Switzerland and Germany, while most of the other European countries – including Italy – show a more limited degree of participation (graph 3).

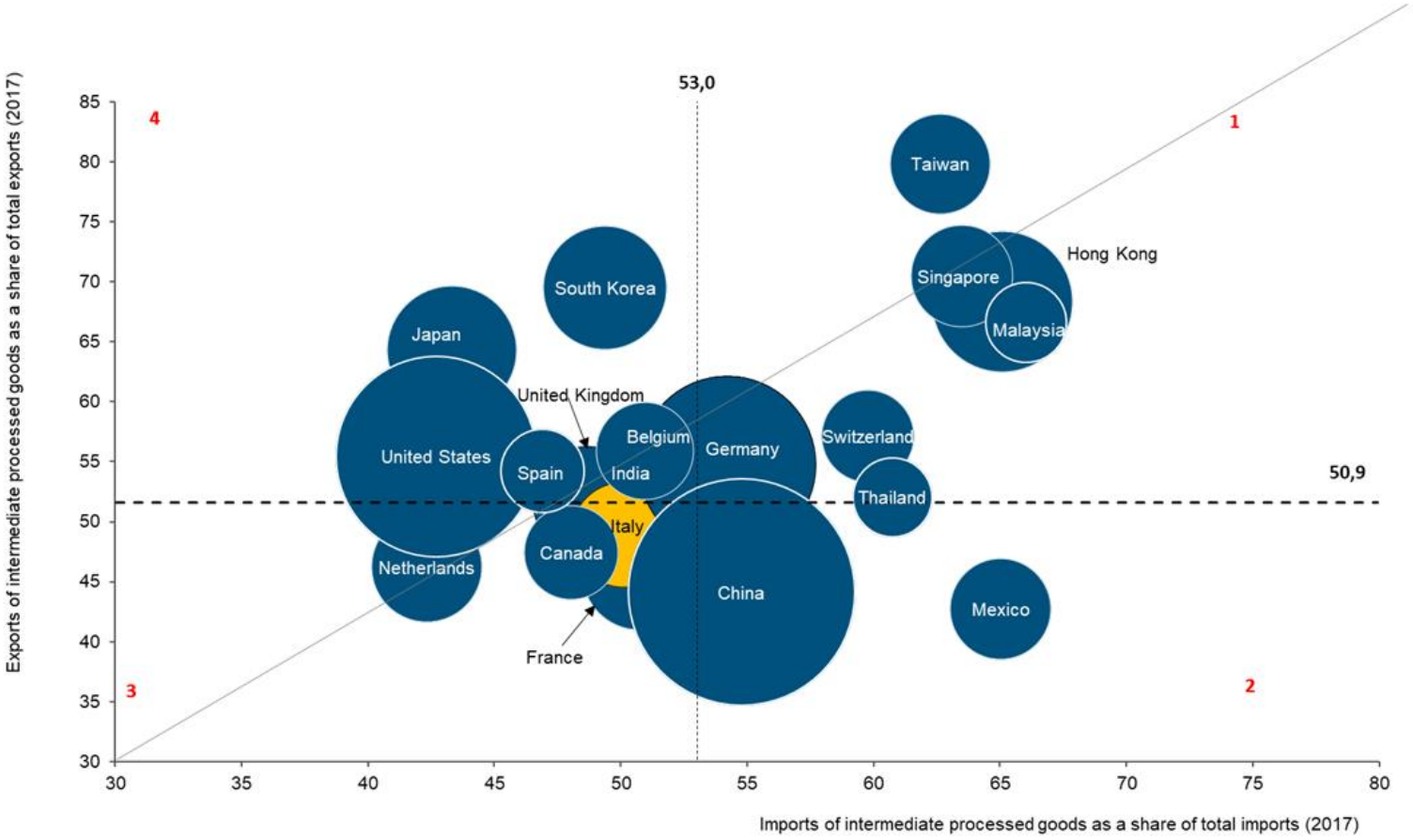
11. Another approach, which has generated a large literature in the last few years, aims at measuring the participation of national economies in international production networks, based on their contribution in terms of value added (e.g. Mattoo et al., 2013; Koopman *et al.*, 2014). In particular, the increasing availability of international input-output tables[4] has allowed to show more precisely the interdependencies between sectors and countries, highlighting their contribution to the creation of value along the production chain.

12. Based on these statistics, one can observe how the domestic value added share of gross exports has been decreasing, starting from the nineties, signalling the growing international fragmentation of production processes, with an increasing number of countries involved in different phases contributing to the production of final goods. At the same time, foreign value added embedded in gross exports has increased considerably, in particular in the manufacturing industry[5].

[4] See the World Input-Output Database (Wiod, http://www.wiod.org/home) of the EU and the Trade in Value-Added (TiVA) database of OECD and WTO (http://www.oecd.org/sti/ind/tiva/tivasourcesandmethods.htm). Other projects are Eora Mrio (Multi-regional Input-Output Database, http://www.worldmrio.com/) and the Global Trade Analysis Project (Gtap, https://www.gtap.agecon.purdue.edu/databases/archives.asp).

[5] Hummels et al. (2001) call "vertical specialisation" the use of imported inputs in producing goods that are exported. Working on data for ten OECD countries and four emerging ones, they find that vertical specialization represented the 21% of their exports at the end of the last century and that it grew by almost 30% between 1970 and 1990.

Graph 3 -Trade in processed intermediate goods as a share of total trade in goods, by country(1)



(1) The size of the bubble measures each country's share of all reporting countries' trade in intermediate processed goods, in 2017. The dotted lines refer to the total of reporting countries. Total trade excludes products not classified by the Broad Economic Category classification (BEC, Rev.4).

Source: ITA based on data from National Statistics Institutes

13. Considering the main countries, the content of domestic value added in gross exports differs widely, featuring higher levels in larger economies or in countries specialized in primary goods; on the contrary, the level of this indicator appears to be lower in smaller countries, which tend to be more integrated in international production networks. The domestic value added content of exports decreased especially in some emerging economies, characterized by a particularly fast development of the manufacturing sector. The reduction of domestic value added was more pronounced in regionally integrated areas, confirming the stimulating role that trade liberalization policies have played for the development of international production networks.

14. However, the global economic crisis has interrupted this process (Nagengast and Stehrer, 2016): in 2011 the foreign value added share of gross exports appeared to be similar to the pre-crisis period in all the main sectors. In fact, in recent years, the expansion of international production networks seems to have come to a halt[6] and – especially in Asian countries – firms tend to source more intermediate inputs locally. [7]

15. The report uses a new "index of relative position in IPNs"[8], based on trade in processed intermediate goods, in order to analyse changes in the international distribution of business functions during the global economic crisis. This index is an adaptation of the net trade specialisation index used in Iapadre (2011)[9], and aims at measuring a country's relative position in IPNs, in terms of revealed comparative advantages in exports or imports of processed intermediate goods. Results show wide sectoral differences, linked

[6] Constantinescu *et al.* (2015) suggest that the slowing pace of international fragmentation of production may be one of the explanations of the recent sluggish growth of trade.

[7]See the study by A. Dossena and I. Sangalli, *I cambiamenti in atto nel commercio mondiale visti attraverso i dati delle matrici input-output internazionali*, in "Le imprese italiane nelle reti produttive internazionali", ITA-Italian Trade Agency, 2018.

[8] The index of relative position in international production networks is: $P_{s,i} = \frac{x_k - m_k}{x_k + m_k}$ $-1 \leq P_{s,i} \leq 1$

Where, for each sector and in each country i:

x_k=(X_k/X_t)

m_k=(M_k/M_t)

X_k=exports of intermediate processed goods of sector s of country i

X_t=total exports of sector s of country i

M_k=imports of intermediate processed goods of sector s in country i

M_t= total imports of sector s in country i

The index has been calculated for the first 15 trading countries in processed intermediate goods, for ecach considered sector (2017).

[9] Iapadre, P. L. (2011), Trade and Employment in Italy, OECD Trade Policy Working Papers, No. 126.

to the industrial specialization and the presence (or not) of supply chain leaders in the country.

16. In the transportation equipment sector, most of the largest Asian and European traders are specialised in downstream activities (graph 4). However, in the last decade, China appears to be moving towards a less downstream position, as a result of the development of "global" industrial districts, where both multinational suppliers and local companies have set their production plants. In North America, Canada and the US have changed their relative position towards more upstream activities, whereas Mexico has further strenghtened its downstream orientation.

17. In the case of electrical machinery and appliances, China, Mexico and Thailand are more specialized in activities related to downstream production processes (graph 5). On the other hand, France, Japan, South Korea and Taiwan seem to have intensified their activities in the upstream phases of the production chain, given their increased orientation towards exports of intermediate goods.

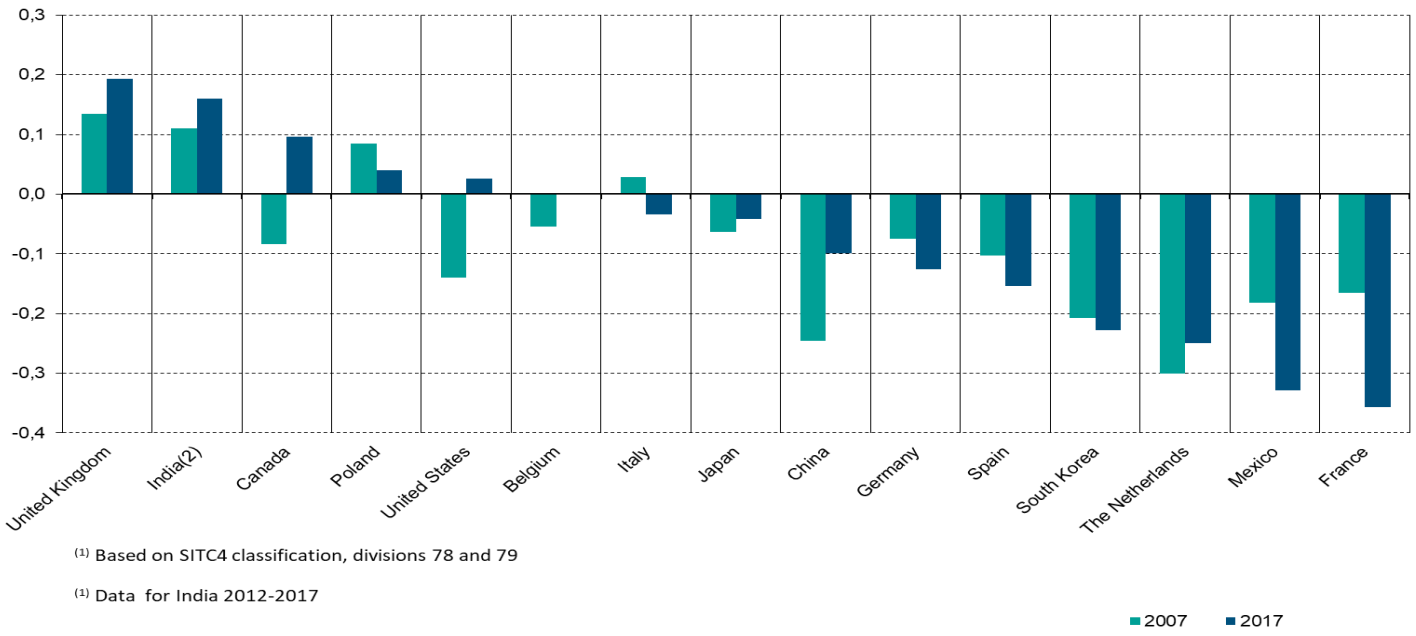
18. Considering the electronic industry[10] (graph 6), Japan is by far more specialized in exports of processed intermediate goods, followed by the United States, Taiwan, France and South Korea, that have all strenghtened their upstream position in the value chain. On the other hand, Mexico, China and the Czech Republic appear relatively more specialized in the downstream activities of their assembling plants.

19. Differences in the intensity of specialization along the supply networks are particularly intense in the textile and apparel sectors, where the United States and Japan are significantly specialized in upstream phases, followed by several European economies, including the United Kingdom, Germany, France, Spain, the Netherlands and Italy (graph 7). Among emerging countries, South Korea is clearly moving up the value chain to perform more upstream activities. On the opposite, Turkey, India and China, followed by Poland, are relatively specialized in assembling activities; however especially in the case of China the graph shows a clear trend towards a less downstream position.

[10] Defined as Office, automatic data-processing machines, telecommunication, sound recording and reproducing equipment (SITC-4 divisions 75 and 76).

20. In the chemical and pharmaceutical sectors, we can observe that the United States and Japan are the main countries specialized in the upstream phases, showing an increasing orientation towards exports of intermediates; on the contrary, compared to 2007, the relative position of Canada has changed in the opposite direction (graph 8). It is worth noting that, in this sector, China clearly appears to have intensified its activities in the upstream phases during the last decade. On the other hand, India and the main European countries (France, Switzerland, Italy, Germany, Spain, and the United Kingdom) are relatively specialized in downstream production phases, although some of them have reduced this orientation in the last decade.

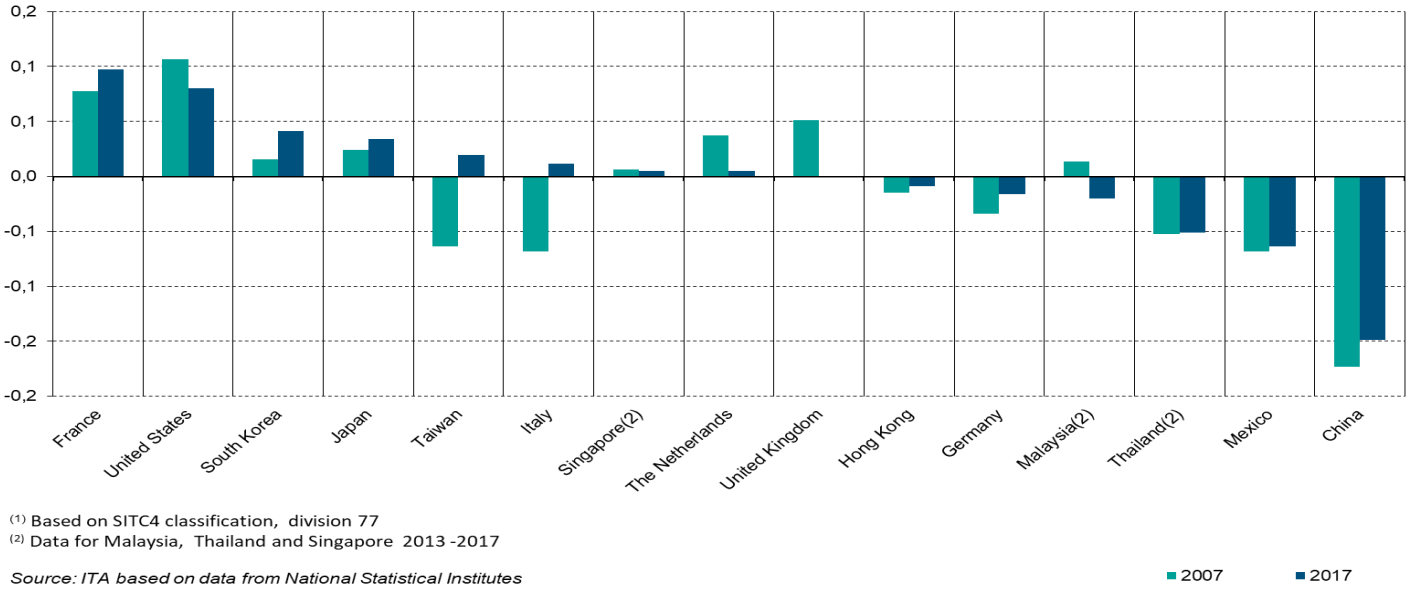
Graph 4 - Means of transportation: index of relative position in international production networks[1]



(1) Based on SITC4 classification, divisions 78 and 79

(1) Data for India 2012-2017

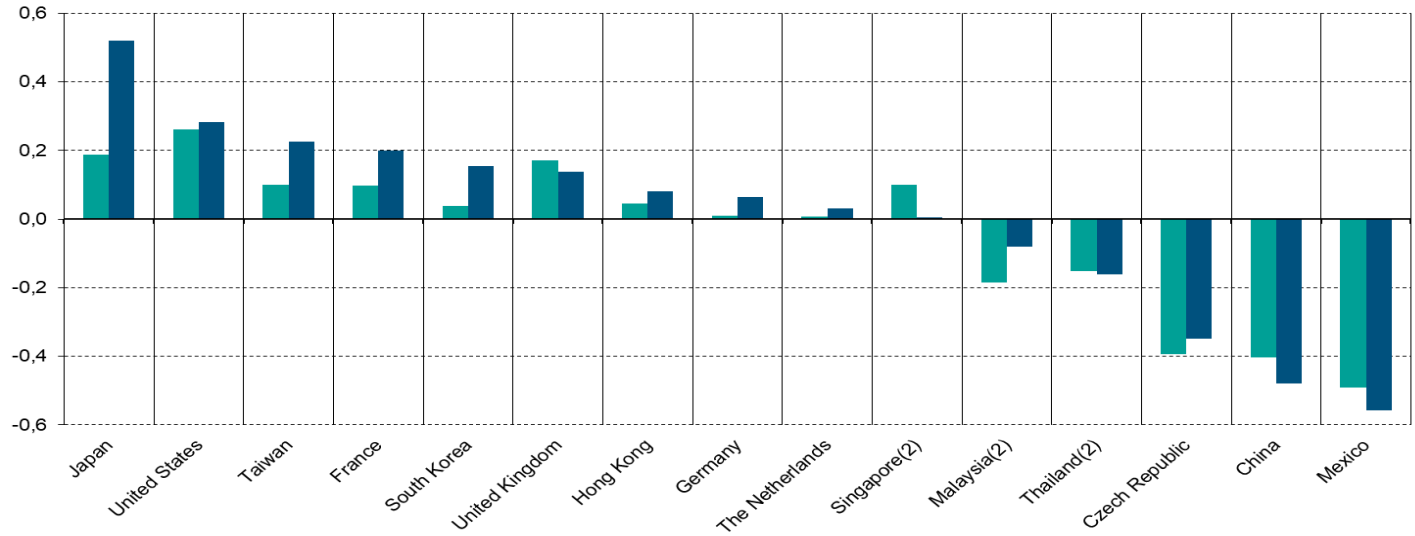
Graph 5 - Electrical machinery and appliances: index of relative position in international production networks(1)



(1) Based on SITC4 classification, division 77
(2) Data for Malaysia, Thailand and Singapore 2013 -2017

Source: ITA based on data from National Statistical Institutes

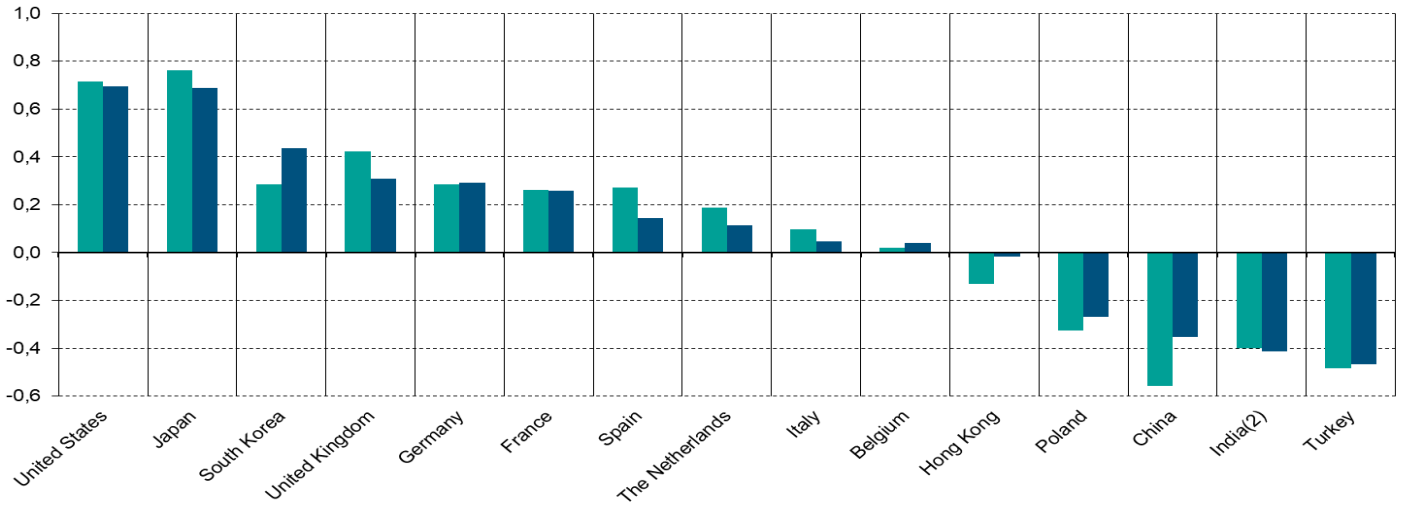
Graph 6 - Office, automatic data-processing machines, telecommunication, sound recording and reproducing equipment: index of relative position in international production networks(1)



(1) Based on SITC 4, divisions 75 and 76
(2) Data for Malaysia, Thailand and Singapore 2013-2017

Source: ITA based on data from National Statistical Institutes

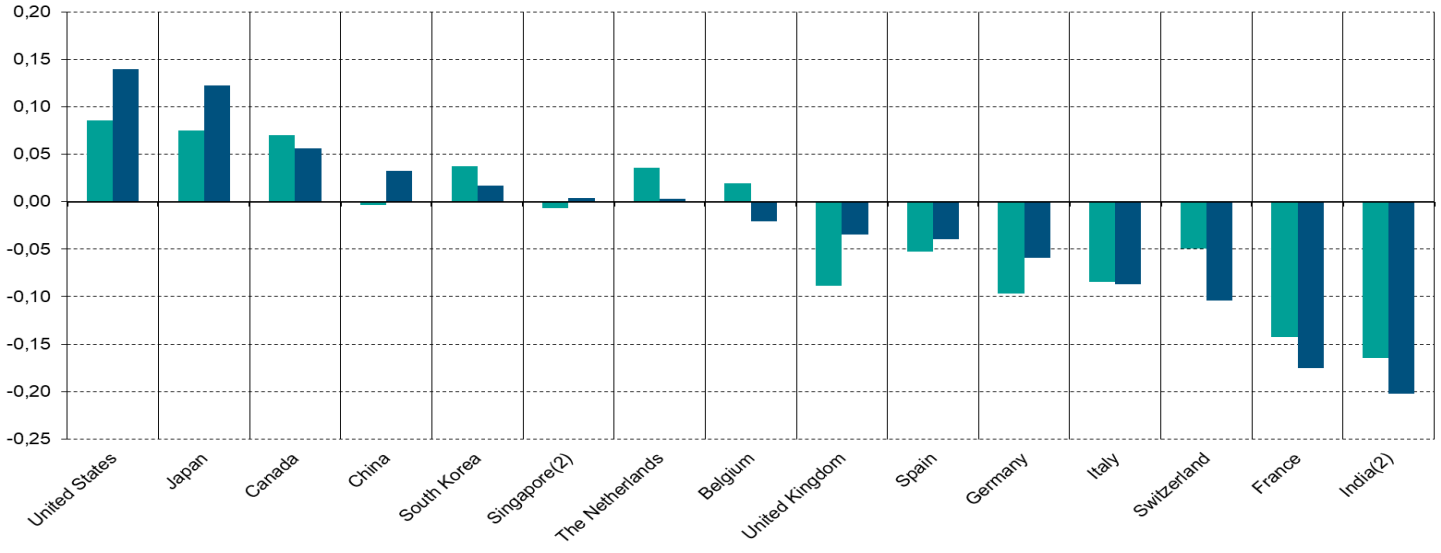
Graph 7 - Textiles, yarn, fabrics, related products and articles of apparel, clothing accessories: index of relative position in international production networks(1)



(1) Based on SITC 4, divisions 65 and 84
(2) Data for India 2012-2017

Source: ITA based on data from National Statistical Institutes

Graph 8 – Chemicals and pharmaceuticals: index of relative position in international production networks(1)



(1) Based on SITC4 classification, section 5
(1) Data for India and Singapore 2013-2017

Source: ITA based on data from National Statistical Institutes

The Italian economy in international production networks

21. As mentioned, the position of a country in IPNs can be measured through different statistical methods. Taking into account gross trade flows, social network analysis can show changes in a country's relative position in the world trade web. Based on this type of analysis, we observe that between 1995 and 2011 the degree of centrality of the Italian economy increased with reference to the number of connections, but decreased in value terms, being negatively affected by the growing centrality of the Asian area. Given the increasing interdependence of world markets, even if Italy's specialization has remained relatively stable, changes in the rest of the world have inevitably influenced the country's position. [11]

22. Considering trade flows in (processed) intermediates, the Italian position appears to be similar to other countries of the Eurozone, such as France and Spain. All these economies feature a relatively lower participation in IPNs than Germany or Switzerland and, even more, in comparison with most emerging Asian countries. Italy's participation in IPNs differs widely across sectors in terms of specialization towards downstream or upstream stages of production processes. For example, considering the transportation equipment sector, Italy appeared in 2007 as slightly specialized in exports of intermediate inputs (graph 4), but during the last decade its "index of relative position in IPNs" became negative, clearly suggesting a significant, albeit limited, shift towards downstream business functions (assembly of final goods). In the case of electrical machinery and appliances, Italy appeared to be specialized in importing intermediates in 2007, but its relative position has changed in the opposite direction in the last decade (graph 5). Considering textiles, apparel and related products, Italy shows a low (and decreasing) degree of export specialization (graph 7), while being clearly oriented in downstream phases in the chemical and pharmaceutical sectors (graph 8).

23. On the other hand, analyses based on international input/output tables show that the domestic value added content of gross exports is slightly higher in Italy, compared to the main Eurozone countries (France, Germany and Spain). However, between 1995 and 2011, this indicator decreased significantly in all the above economies, confirming their

[11] See the study by L. De Benedictis and L. Tajoli, *La centralità dell'Italia nelle reti internazionali di scambio e di produzione*, in "Le imprese italiane nelle reti produttive internazionali", ITA-Italian Trade Agency, 2018.

greater participation in international production networks. This trend seems to have stopped during the years 2011-2014, when the indicator increased, especially in Italy. [12]

24. The manufacturing industry appears to be involved in IPNs to a far greater extent than the services sector, even if the importance of production services, which are crucial for the functioning of international production networks, increased in recent years. Compared with the world average, Italy's participation in IPNs appears to be higher for almost all industries. It may be noted that Italy's sectoral specialization model appears to be similar in value added to the one based on gross trade data, and the main *made in Italy* sectors (food, fashion, mechanics) show a higher content of domestic value added, compared to the average of the manufacturing sector.

25. Empirical surveys on Italian firms indicate that participation in international production networks improves their competitiveness: companies involved in IPNs tend to have higher levels of productivity, and this advantage increases according to the modes of participation. Firms producing final goods, operating downstream in the production chain, show higher levels of productivity compared to suppliers producing intermediate goods, which are located more upstream[13]. The advantage, in terms of productivity, associated with the participation in IPNs appears to be higher in Southern Italy than in the rest of the country, signalling the importance of adopting more sophisticated internationalization strategies in order to reduce regional development gaps. [14]

26. Both productivity and performance of Italian firms appear to be closely linked to the complexity of their internationalization strategies, especially during the years of the global crisis, characterized by a collapse of domestic demand. The best results were

[12]See the study by A. Borin and M. Mancini, *La partecipazione dell'Italia alle catene globali del valore: evidenze dalle tavole Input-Output globali*, in "Le imprese italiane nelle reti produttive internazionali", ITA-Italian Trade Agency, 2018.

[13] Agostino et al. (2015), however, note that firms' characteristicts matter in determining the productivity gap between intermediate and final firms. In fact, the difference in productivity between the latter and suppliers able to export and innovate appears to be not statistically significant.

[14]See the study by M.Agostino, A.Giunta, D. Scalera and F.Trivieri, *Partecipazioni e posizionamento delle imprese italiane nelle catene globali del valore: nuova evidenza (2009-2014)*, in "Le imprese italiane nelle reti produttive internazionali", ITA-Italian Trade Agency, 2018.

obtained by firms operating in a large number of foreign markets, as well as by multinational companies under foreign or Italian control, although to a lesser extent. [15]

27. A specific survey on Tuscan companies[16] confirms the existence of a productivity bonus associated with the involvement in international production networks. The size of this premium grows according to the geographical extension of the network (from local to national and international), the position of the companies (from upstream and intermediate suppliers to producers of final goods) and the type of governance of the networks (from market to relational to hierarchical GVCs).

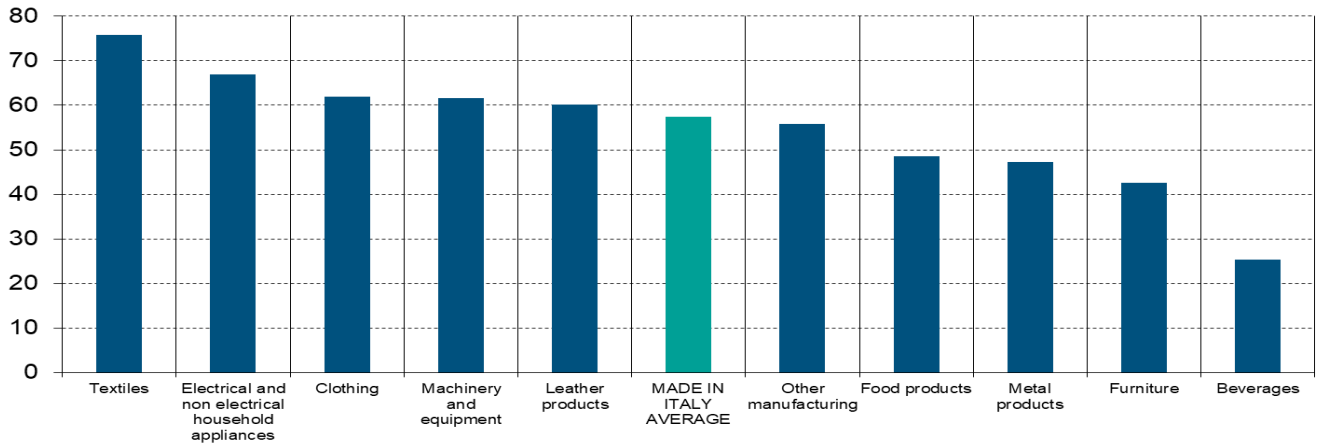
28. The report uses ISTAT micro-data to further analyse the position of Italian companies in international production chains in 2010 (graphs 9-10). **[17]** By considering a subset of both exporting and importing companies (two-way-traders), it is possible to calculate the import content of their exports, which can be considered as an estimate of their downstream participation in the supply chains. This share reached almost 30 percent in the manufacturing industry, showing a particularly high peak in the case of clothing (56 percent). Conversely, the mechanical industry reached only 18 percent, and even lower levels are observed in the case of beverages and furniture, confirming the high content of domestic value added characterizing these two latter sectors.

[15] See the study by S.Costa, F.Luchetti and C.Vicarelli, *Be global: le modalità vincenti dell'internazionalizzazione delle imprese in tempo di crisi*, in "Le imprese italiane nelle reti produttive internazionali", ITA-Italian Trade Agency, 2018.

[16] See the study by G.Giovannetti and E.Marvasi, *Le catene del valore in Toscana: governance e posizionamento delle imprese*, in "Le imprese italiane nelle reti produttive internazionali", ITA-Italian Trade Agency, 2018.

[17]See the study by R.A. Maroni, *Le imprese esportatrici italiane e la partecipazione alle reti produttive internazionali*, in "Le imprese italiane nelle reti produttive internazionali", ITA-Italian Trade Agency, 2018.

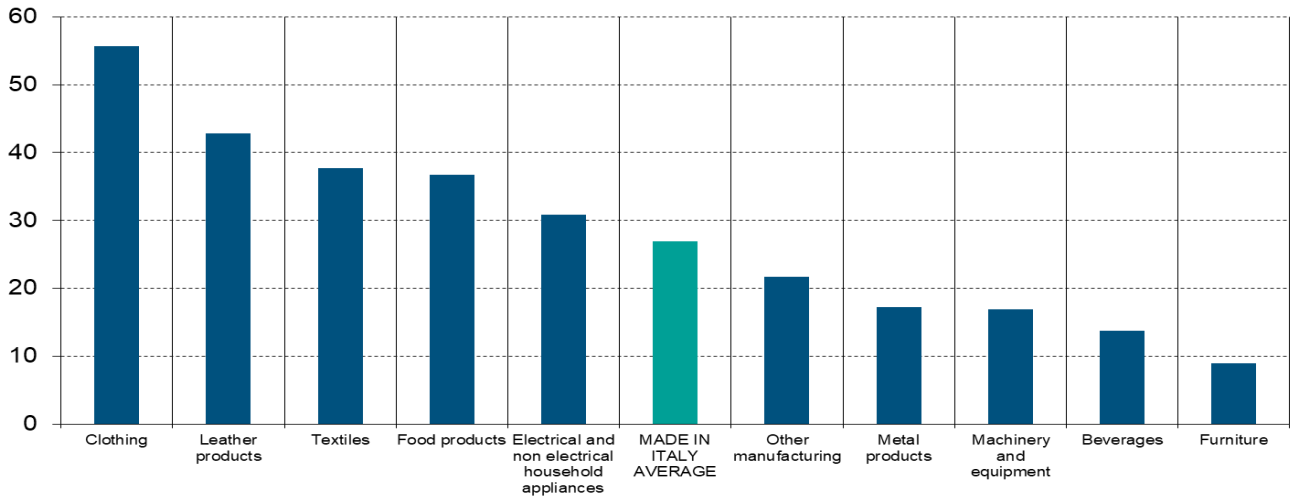
Graph 9 - Two-way trading firms[1] exporting "made in Italy" products by industry - 2010.
Percentage shares



[1] Number of firms reporting both exports and imports as a percentage of the total number of firms in each industry. The "made in Italy" average refers to the ten industries shown in the graph, accounting for about 90 per cent of exports of "made in Italy" products.

Source: ITA based on Istat data.

Graph 10 - Two-way trading firms[1] exporting "made in Italy" products, by industry, 2010.
Percentage share of import content in exports



[1] Percentage share between imports and exports reported by firms exporting "made in Italy" products in each industry. The "made in Italy" average refers to the ten industries shown in the graph, accounting for about 90 per cent of exported "made in Italy" products.

Source: ITA based on Istat data.

Case studies: firms' strategies, organisation and geographic location of business functions

29. In order to get a deeper insight of firms' organizational strategies within IPNs, the report presents the results of three case studies involving Italian companies (or foreign companies located in Italy). The first two cases concern 10 firms each, producing final goods and belonging to two sectors that are particularly integrated in IPNs: electrical appliances for household/professional use and transportation means (motor vehicles, motor cycles, ships and yachts). An additional survey involved 28 supplying companies, operating in the two sectors. These IPNs can be defined as *producer-driven global value chains*, whereas the central role of coordination, both in the upstream and downstream phases, is assumed by manufacturing companies leading the supply chain.

30. The aim of the three case studies is to show, in first instance, the degree of internationalization of core business functions (production/assembly) and of the related functions (procurement, research and development, marketing, distribution, after-sales services, information and communication technologies), as well as to find some evidence on co-ordinated activities within IPNs, among lead firms and suppliers In addition, in the case of supplying companies we investigated the role of ICT in facilitating the participation of firms in IPNs. Thirdly, we considered the role of Trade Promotion Organisations (TPOs) in promoting firms' inclusion in global value chains.

31. Although not statistically representative, the three case studies suggest some evidence on the different internationalization of business functions, highlighting among other issues, the differences between SMEs and large companies. In line with the economic literature, the interviews have shown how the organizational complexity and international extension of IPNs vary according to the firms' dimension: larger companies are characterized by a greater geographic extension of their business functions, even in the case of less internationalized activities (R&D and ICT).

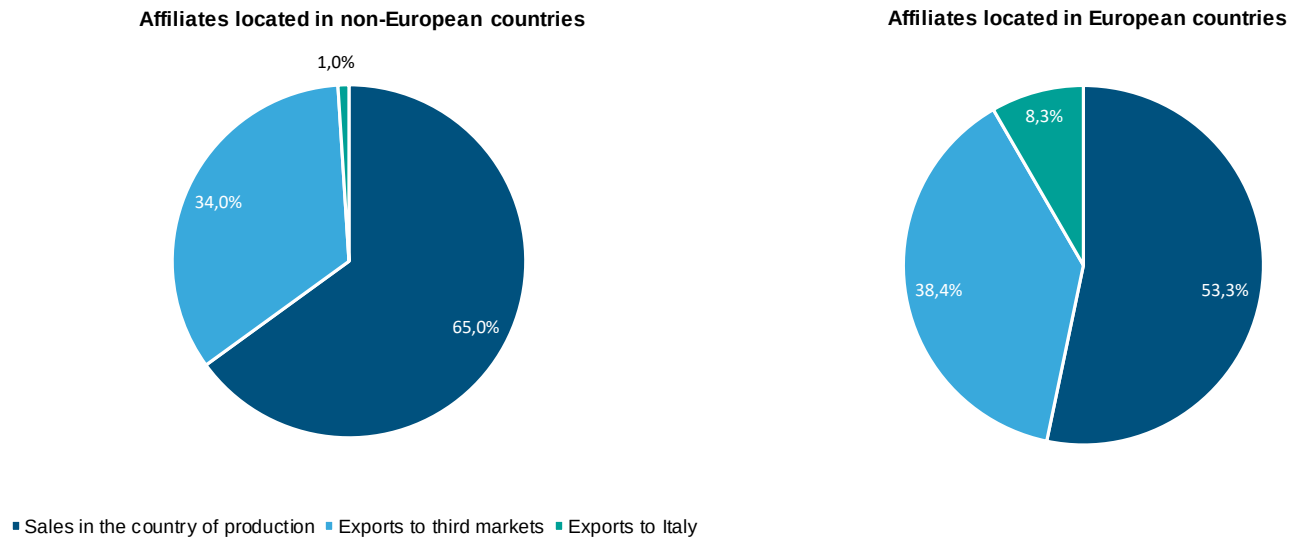
32. In terms of costs, the production/assembly function weighs on corporate turnover between 22 and 27 percent (for household/professional appliances and for means of transport, respectively), but rises to 46.7 percent in the case of suppliers (table 1).

33. While R&D is mainly performed in Italy (95.5 percent in the case of electrical appliances and 94 percent for transport means), as well as the ICT function (95.9% and 90.5%), the geographic expansion of IPNs is more evident for after-sales services, which appears to be the most internationalized business function (32.5% for electrical

appliances and 48.5% in the case of trasport means). Considering production/assembly and procurement, in the sample, 26.6 per cent of the production of firms within the household/ professional appliances sector (table 2) is carried out in other countries (37 per cent for larger firms), against 13.3 per cent in the case of transportation means (table 4) and 9.1 per cent for suppliers (however, the percentage rises to 42.8 percent in the case of larger firms)(table 6). Compared to SMEs, larger companies perform a considerable part of their production in other countries, mainly through their affiliates, relying less on contractual relationships with independent suppliers in order to ensure a better protection of their know-how/strategic assets.

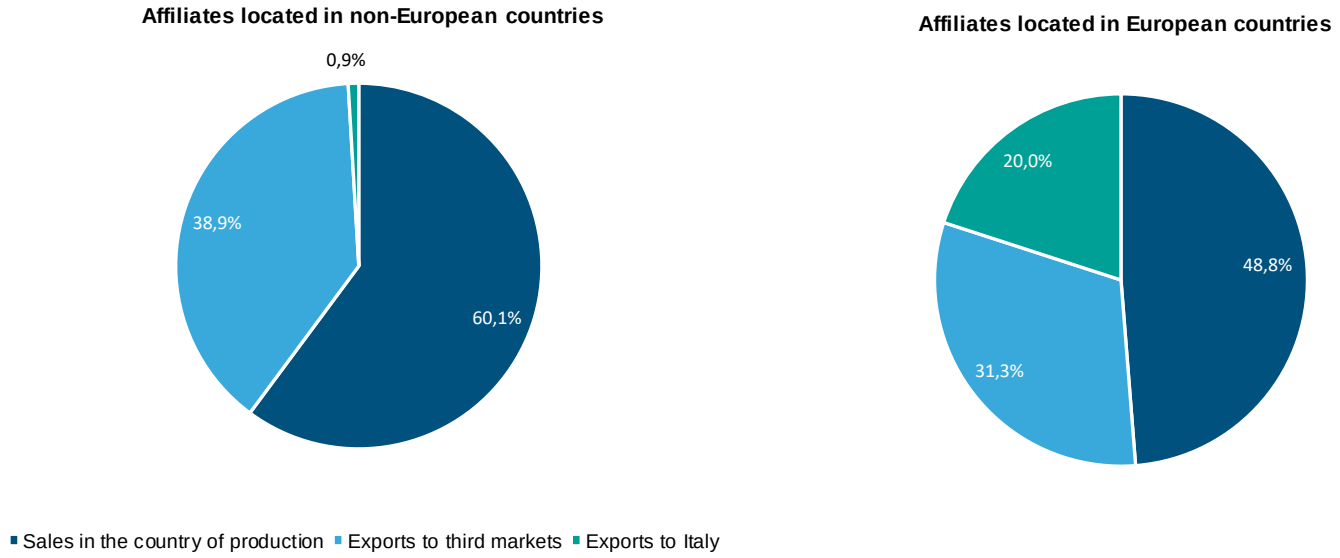
34. It may also be noted that, according to our sample, foreign affiliates act mostly as "export platforms", selling their production mainly in the country in which they are located, or in the neighbouring markets. In the case of household/professional appliances, 65 per cent of the production made by European affiliates is sold on the local market and 34 per cent in third countries, excluding Italy (graph 11). In the transportation means sector, these percentages reach, respectively, 60 and 38.9 per cent (graph 12). This is in line with the main factors determining foreign direct investment (FDI): facilitating market access (proximity to clients) and overcoming trade barriers - indicating the prevalence of "horizontal" FDI (graph 13).

Graph 11 - Destination of production of foreign affiliates: electrical appliances



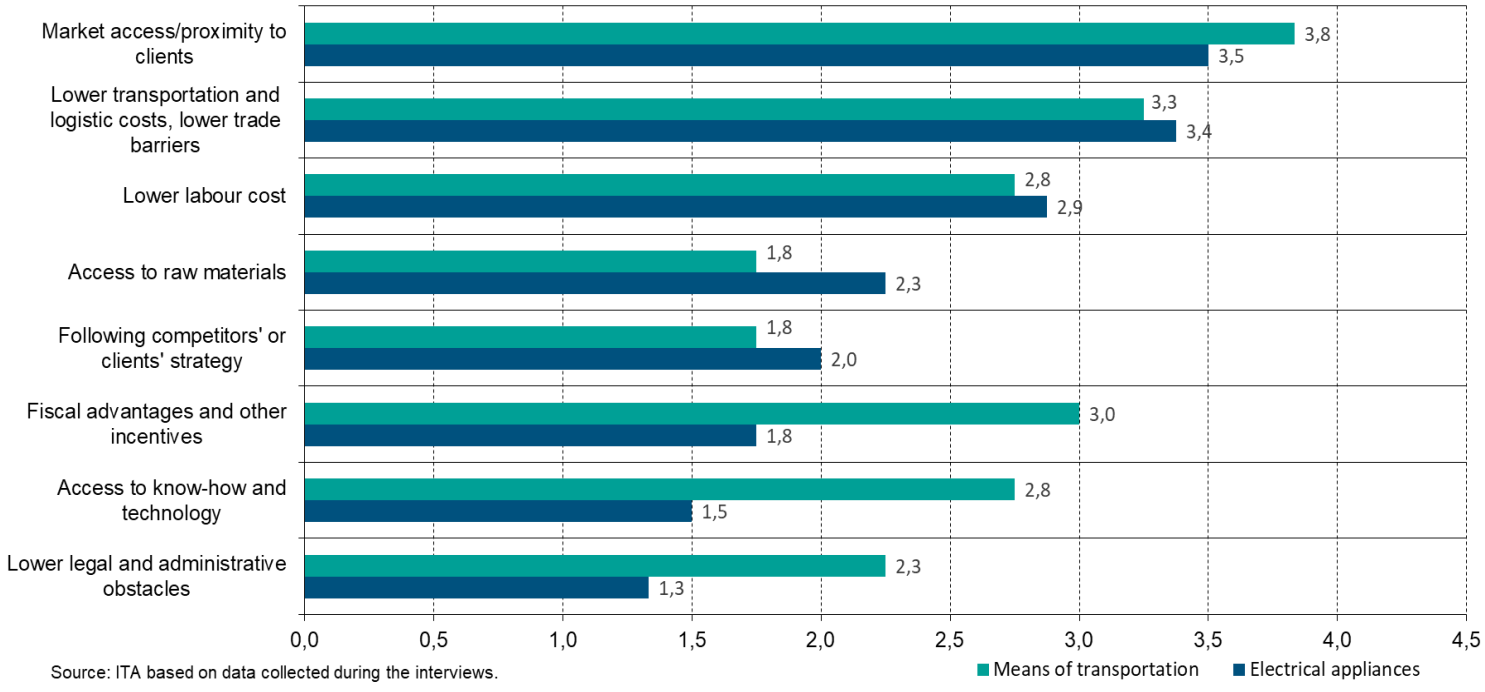
Source: ITA, based on data collected during the interviews

Graph 12 - Destination of production of foreign affiliates: means of transportation



Source: ITA, based on data collected during the interviews

Graph 13 - Main determinants for the location of productive foreign direct investment. Simple mean of evaluations; scale from 1 (very low importance) to 4 (very high importance)



Source: ITA based on data collected during the interviews.

35. Given the importance of assembly activities (in both sectors, leading companies define themselves as "big assemblers"), the procurement function plays a crucial role both for lead firms and for suppliers, especially first-tier. Figures show that supplies of raw materials and intermediate goods represent about half of the company's turnover: they reach 48.5 per cent in the case of household/professional appliances and 56 per cent in the case of transportation means (table 1). Conversely, the percentage appears to be lower for suppliers (36.3 percent) showing, however, a significant difference between SMEs (31.6 percent) and large companies (65 percent), also depending on their position in the "supplier pyramid" (as large firms are mainly first-tier) (graph 14).

36. Regarding the procurement function, according to our sample, over one third of the supplies is sourced in other countries, confirming a considerable international integration in the upstream phases of the production chain. This share amounts to 31.6 per cent in the household/professional appliance sector (table 2) and reaches 39.3 per cent in the case of transportation means (table 4). For suppliers, a similar percentage (38.7 percent) is reached by larger companies, while for SMEs imports appear to be less important (3.9 percent, table 6).

37. Inputs for production are largely imported from European countries, primarily from the EU. However, although the supply chain tends to be organized taking geographical proximity into account, in order to reduce costs and lead times, a considerable part of intermediate goods is imported from non-European countries. Lead firms of the transportation means sector source 21.9 percent from non-European countries (out of 39.3%), while in the case of electrical appliances the share amounts to 16.4 percent (out of 31.6 percent; tables 3 and 5). In fact, the interviews reported that larger and more structured companies are constantly looking also on global markets to find their suppliers: quality and technology are crucial aspects that can be traded-off with higher commercial costs.

38. “Supporting” business functions consist of different types of services (research and development, marketing, distribution, logistics, after-sales services, ICT), preceding or following production. For the companies involved in the three case studies, the cost of supporting functions represents, in total, between 9 per cent (transportation means) and 12 per cent (household/professional appliances) of turnover, reaching almost 15 percent in the case of suppliers. These functions show a relatively low degree of internationalization, which appears to be higher for larger companies, being related to production processes/activities carried out in other countries.

39. The share of R&D costs on turnover is, on average, between 2.5-2.8 per cent (respectively for household/professional appliances and transportation means, table 1), but reaches almost 6 per cent in the sample of supplying companies. R&D activities, characterized by high added value, are mainly carried out in Italy, regardless of where the production is located. However, a small share is performed in other countries, mainly by large companies, as their foreign affiliates often carry out design and development activities to adapt their products to local demand.

40. Interaction between the leading companies and their suppliers are often characterized by high levels of "explicit coordination", similar to what happens between units belonging to the same business group: some phases are carried out in a co-ordinated way, as for example, co-design and co-projecting activities prior to the production of parts and components.

41. In order to provide some insights on the degree of "explicit co-ordination" in IPNs' trade flows, we asked the lead firms to what extent the inputs provided by their suppliers were a result of co-projecting, co-design and similar activities. Results clearly indicate that, in their case, the share of customized inputs on total supplies is higher compared to standardized intermediates (table 7). Moreover, the degree of co-ordination seems to be higher between the interviewed lead firms and Italian suppliers (69%-83.6%), compared to interaction with foreign suppliers (51.5%-65%). Similarly, considering the sample of supplying fims, the larger companies (belonging to the first-tier, as over 94 percent of their clients are final goods producers, graph 14) supply mainly parts and components produced through collaborative activities, showing a considerable degree of co-ordination with both Italian (91.7%) and foreign customers (86.7%). Conversely, in the case of SMEs, we observe a lower frequency of co-ordinated activities, as about half of the products supplied to their clients consist of standardized products (table 8). Co-operation appears to be less frequent across the lower levels of the "supplier pyramid": the share of customized products decreases further in the case of trade with suppliers, and especially for smaller sized firms (table 9).

42. Being part of the upper tier represents therefore an important goal for suppliers to upgrade in the value chain: taking part in co-ordinated activities increases the bargaining power vis-à-vis their clients, and contributes reducing the risk of being replaced by competitors, as partnering with leading companies generates for the latter a higher "replacement cost".

Graph 14 - Suppliers: position in the supply chain by customer type. Percentage shares of sales

Source: ITA based on data collected during the interviews.

43. Among supporting functions, ICT (both infrastructure and software) is crucial in facilitating co-ordination and the functioning of IPNs. A number of ICT tools support co-ordination with affiliates or independent companies, including specific software applications related to different business functions.

44. Regarding ICT adoption, the survey concerning supplying firms suggests the existence of a large gap between smaller and larger companies (more involved in international activities). Considerable differences regard the basic IT structure: while large companies have almost all technologies listed in the questionnaire, SMEs use Internet much more than other systems and applications. For example, remote access, the provision of mobile telecommunications systems, access to Intranet and Extranet and Electronic Data Interchange (EDI) are less common among smaller companies. If all large companies have an ERP system (Enterprise Resource Planning), in the case of SMEs the percentage drops to around 40 per cent. Moreover, it is mainly large companies that use specific software applications for design and development.

45. Firms express different opinions also regarding the role of ICT in facilitating internationalization and the participation in IPNs: for example, large companies consider EDI systems of primary importance to facilitate the interaction with their partners.

Conversely, SMEs use ICT technologies mainly for marketing purposes, as their websites are mostly used to promote the company and to communicate, without allowing a direct interaction with customers or suppliers (table 10).

How to support firms' participation in international production networks

46. Answers provided during the interviews about the different types of services offered by Trade Promotion Organisations (TPOs) to support the participation of firms in IPNs differ widely considering SMEs and large companies, due to the fact that the latter are often more organized to face internationalization barriers (sunk costs, information asymmetries) and to expand on foreign markets.

47. Supporting firms' participation at international trade fairs (in the form of an indirect subsidy or through technical assistance) is mainly requested by medium-small businesses, as larger companies generally exhibit in their own stands. Similarly, large companies rarely ask TPOs for information or assistance, as they have most of times their own structure and dedicated staff (export managers, purchasing or representative offices, etc.).

48. Considering specifically business assistance, one may note that some countries offer in addition some services to facilitate foreign procurement (e.g. Canada, Germany, Switzerland, the Netherlands and Japan). This type of service could be of particular interest for SMEs, as they face greater difficulties in finding business partners in other countries. Both producers of final goods and suppliers could benefit from such an intervention, which could potentially improve firms' competitiveness and generate a pro-competitive effect in related industries.

49. Unlike other forms of support, financial and insurance services are required both by SMEs and by larger companies. However, smaller companies seem to be primarily interested in export promotion, while larger ones prefer to be supported in facilitating their direct presence on foreign markets.

50. Moreover, when companies (mainly medium-large firms) decide to open a production facility in another country, there is also the need to identify potential local suppliers, in order to contain the costs of sourcing parts and components. This scouting process is very

expensive and time consuming, therefore – according to the interviews – public institutions could play a very useful role in identifying local suppliers, especially in emerging countries.

51. From the point of view of the supply chain leaders, it is also important to support – even financially – Italian suppliers potentially interested in investing in foreign markets to locate near the production facilities of their clients (follow-the-client-strategy). In fact, companies supplying intermediate goods often lack adequate resources to deal with more complex ways of internationalization and to establish a direct presence on foreign markets. Being able to expand in other countries following leading companies of a supply chain means taking advantage of the opening of new markets, which would otherwise be served – sooner or later – by local suppliers, although it is not easy to find suppliers of the quality level found in Italy.

52. According to serveral (large) leading companies, public intervention could be appropriate to attract foreign investors producing intermediate goods and services. It may be noted that in Italy the obstacles to overcome are not so much referring to the cost of labor, but regard the regulatory environment, an excessive bureaucracy or difficulties related to the number of institutions involved.

53. Considering the range of services offered by the Italian Trade Agency, most of them can foster the participation of Italian firms in IPNs, especially SMEs: information and assistance services are provided on the basis of a specific request from companies (or institutions like Regions, Chambers of Commerce, consortia), while "promotional" services consist in the organisation of marketing events for a group of firms.

54. Starting in the nineties, the Italian Trade Agency promoted the participation of suppliers in IPNs targeting particularly small and medium-sized businesses, in line with the Italian Agency's main institutional mission. A project was launched to promote exports of Italian firms offering intermediate goods and services and technological cooperation: initially, a central element of the program was the participation in international fairs and other business matching events. In the last few years, since the funds for the project decreased, other types of services were organized, mainly in Italy. However, some events were focused in particular on the Scandinavian markets, promoting cooperative research projects between university and manufacturing companies. Since 2004, the project has mainly concerned digital activities, with the creation of two portals: the first offers the possibility for registered companies to create a virtual showcase in which to describe their business, insert photos of products, search for clients. The second is a "virtual fair", with on-line exhibition space and the possibility

of uploading and presenting a wide range of online content (catalogues, company brochures, audio and video presentations etc.).

55. In future, support targeting suppliers could be extended to include again joint participations of Italian producers at the main international fairs, which remains a crucial marketing tool for Italian firms. At the same time, more attention should be paid to technological aspects and to the services sector, as well as to supporting companies interested in acquiring enabling technologies from abroad. Moreover, it would be useful to encourage partnerships between companies aimed at creating consortia, or similar structures, in order to offer a wider range of products and related services on foreign markets, following a supply chain approach. These solutions are deemed to be more effective if they are integrated with other industrial policy instruments, for example with measures favouring ICT and the development of advanced manufacturing in Italy, supported by the organisation of promotional events and assistance services through the offices network of the Italian Trade Agency.

Conclusion and policy implications

World economic geography has been changing deeply in recent decades. The process of international production fragmentation, which was facilitated by progress in ICT and transportation systems, as well as by trade and investment liberalization policies, has contributed to the development of international production networks, fuelling the growth of trade in intermediate goods and services. These changes have supported the expansion of several emerging economies, which have progressively become the main driver of global growth.

This report offers some insights on the relevance of trade in intermediate goods by considering, in particular, processed intermediate goods separately from primary intermediates. A new "index of relative position" helps analyse the international distribution of business fumctions in the case of Italy and other countries, within five sectors, and to observe whether they appear more engaged upstream or downstream in the production networks. Some changes can be seen after the global economic crisis, confirming that a number of emerging countries – notably China – are moving up the value chain to perform more upstream activities.

Furthermore, the report analyses the involvement of Italian companies in international production networks, using micro-data at company level by means of a cross-section dataset. Results show that two-way trading firms (both importing and exporting) are

characterized – compared to the units that do not import – by a higher intensive export margin and by a greater degree of geographical and productive diversification of exports.

Finally, given the lack of data at enterprise-level, three case studies, involving 20 lead firms based in Italy and a group of 28 suppliers, provide some insights on firms' strategies in terms of make-or-buy choices, also taking into account their heterogeneity. Results show how the scope of geographic expansion differs across business functions and how organizational complexity and the degree of internationalization vary according to firms' dimension. Among other aspects, the case study section highlights the role of the procurement business function: sourcing from independent suppliers (both national and foreign) is a relevant aspect for the production process, and represents about half of the companies' turnover in the industries investigated.

Moreover, over one third of the companies sources intermediates from other countries, indicating a considerable international integration in the upstream phases of the production chain. Confirming findings of the GVC literature, the three case studies provide as well some evidence on the importance of "explicit coordination" between firms participating in IPNs, highlighting the relevance of co-projecting and co-design activities (and similar) in producing final goods: results show that traded inputs are more often customized rather than standardized, especially in the case of suppliers operating directly with leading firms.

In conclusion, it is clear that the most dynamic Italian companies have actively participated in the process of international production fragmentation, both creating their own networks in the main sectors of Italy's comparative advantage, and connecting to IPNs led by foreign companies. However, a significant part of SMEs, which form the backbone of the Italian industrial system, still fails to grasp the opportunities offered by the expansion of international networks, and is actually facing an erosion of its competitive position. The future scenario depends on how the factors that have supported the international fragmentation of production will be evolving. In recent years there have been signs of a slowdown in trade and investment flows, which seem to reveal a halt of the more expansive phase of IPNs. In addition, trade policies go through a very difficult phase, dominated by the re-emergence of dangerous protectionist stances.

Yet, the growth potential offered by a greater participation in IPNs is still high, both to consolidate the competitiveness of companies, and to catch the opportunities on emerging and developing markets. Some general indications can be drawn for policies aimed at favouring the involvement of companies in IPNs, in particular in the higher value-added phases. Firstly, it is crucial to support firms' innovative processes, through

the many possible measures aimed at promoting investment in applied research activities and at fostering collaboration between businesses and universities. This includes as well a support to enhance the role of ICT, which – as we have seen – plays a central role in facilitating internationalization processes, but requires an effort to improve the quality of IT skills and the necessary infrastructure. More specifically, regarding services to support firms' participation in IPNs, it is clear that interventions must be differentiated according to the needs of each stage of internationalization. As mentioned, a crucial role for competitiveness is played by the procurement function, which can be supported through measures aimed at promoting imports of intermediate goods, following the example of some public agencies in other countries.

Policies to support foreign investment can play an important role in favouring the participation of companies in IPNs, both with reference to outgoing FDI, in order to allow Italian companies to follow their customers expanding in other markets, and regarding incoming FDI, in order to attract transnational firms able to carry out innovative activities and generate relevant spillovers to the benefit of local businesses.

Statistical tables

Table 1 - Costs by business function. Percentage shares on total turnover

Business functions	Electrical appliances			Means of transportation			Sub-suppliers		
	SMEs	Large firms	Total sample	SMEs	Large firms	Total sample	SMEs	Large firms	Total sample
Core function									
Production/assembling of final goods	15,6	27,1	22,0	-	-	27,1	51,0	21,0	46,7
Other functions									
Sourcing of raw materials, intermediate goods and components	57,2	39,8	48,5	-	-	56,2	31,6	65,0	36,3
Research & development, innovation, design	3,2	1,8	2,5	-	-	2,8	5,7	6,3	5,8
Information and communication technologies (ICTs)	0,8	1,2	1,0	-	-	0,8	1,7	1,4	1,6
Marketing	2,4	3,2	2,8	-	-	2,2	2,1	0,0	1,8
Distribution, transportation, storage	3,1	3,4	3,3	-	-	2,0	4,4	3,0	4,2
After-sales services	1,5	2,8	2,2	-	-	1,5	1,3	1,2	1,3
Other (1)	16,2	20,8	17,8	-	-	7,5	2,2	2,0	2,2
Total	**100,0**	**100,0**	**100,0**	**-**	**-**	**100,0**	**100,0**	**100,0**	**100,0**

(1) general costs, financial expenses, contribution margin

Source: ITA based on data collected during the interviews.

Table 2 - Electrical appliances: business function costs by geographic location and organizational choice. Percentage shares of total turnover

		Italy			Abroad			
Business function	Firms by size	A) performed within the firm/group	B) performed by independent suppliers (ownership below 10%)	Total (A+B)	C) performed by foreign subsidiaries (ownership over 10%)	D) performed by independent suppliers (ownership below 10%)	Total (C+D)	TOTAL
Core function								
Production/assembling of final goods	**SMEs**	82,3	4,3	86,5	12,5	1,0	13,5	100,0
	Large firms	53,4	9,5	62,9	29,0	8,1	37,1	100,0
	Total sample	66,2	7,2	73,4	21,7	4,9	26,6	100,0
Other functions								
Sourcing of raw materials, intermediate goods and components	**SMEs**	0,8	75,6	76,4	5,6	18,0	23,6	100,0
	Large firms	1,5	58,7	60,3	3,9	35,8	39,7	100,0
	Total sample	1,2	67,2	68,4	4,8	26,9	31,6	100,0
Research & development, innovation, design	**SMEs**	73,0	25,0	98,0	2,0	0,0	2,0	100,0
	Large firms	83,8	9,2	93,0	7,0	0,0	7,0	100,0
	Total sample	78,4	17,1	95,5	4,5	0,0	4,5	100,0
Marketing	**SMEs**	71,5	15,2	86,7	9,3	4,0	13,3	100,0
	Large firms	28,4	42,0	70,4	9,0	20,6	29,6	100,0
	Total sample	49,9	28,6	78,5	9,2	12,3	21,5	100,0
Distribution, transportation, storage	**SMEs**	23,0	63,0	86,0	2,0	12,0	14,0	100,0
	Large firms	4,4	64,0	68,4	0,0	31,6	31,6	100,0
	Total sample	13,7	63,5	77,2	1,0	21,8	22,8	100,0
After-sales services	**SMEs**	8,0	58,7	66,7	0,0	33,3	33,3	100,0
	Large firms	29,2	38,8	68,0	32,0	0,0	32,0	100,0
	Total sample	21,3	46,3	67,5	20,0	12,5	32,5	100,0
Information and communication technologies (ICTs)	**SMEs**	13,8	86,3	100,0	0,0	0,0	0,0	100,0
	Large firms	57,0	35,6	92,6	4,0	3,4	7,4	100,0
	Total sample	37,8	58,1	95,9	2,2	1,9	4,1	100,0

Source: ITA based on data collected during the interviews.

Table 3 - Electrical appliances: the geography of business function costs. Percentage shares of total turnover

Business functions		Italy	European countries	of which: EU	Non-European countries	Total
Core function						
Production/assembling of final goods	SMEs	86,5	1,0	1,0	12,5	100,0
	Large firms	62,9	21,2	11,5	15,9	100,0
	whole sample	73,4	12,2	6,8	14,4	100,0
Other functions						
Sourcing of raw materials, intermediate goods and components	SMEs	76,4	15,0	9,0	8,6	100,0
	Large firms	60,3	15,5	6,5	24,2	100,0
	whole sample	68,4	15,2	7,8	16,4	100,0
Research & development, innovation, design	SMEs	98,0	1,0	0,5	1,0	100,0
	Large firms	93,0	3,7	2,4	3,3	100,0
	whole sample	95,5	2,4	1,4	2,1	100,0
Marketing	SMEs	86,7	4,6	4,6	8,7	100,0
	Large firms	70,4	18,0	14,0	11,6	100,0
	whole sample	78,5	11,4	9,3	10,1	100,0
Distribution, transportation, storage	SMEs	86,0	2,8	2,0	11,2	100,0
	Large firms	68,3	24,4	22,3	7,3	100,0
	whole sample	77,2	13,6	12,2	9,2	100,0
After-sales services	SMEs	66,7	9,2	6,8	24,1	100,0
	Large firms	68,0	30,2	29,5	1,8	100,0
	whole sample	67,5	22,3	21,0	10,2	100,0
Information and communication technologies (ICT)	SMEs	100,0	-	-	-	100,0
	Large firms	92,7	6,1	6,1	1,2	100,0
	whole sample	95,9	3,4	3,4	0,7	100,0

Source: ITA based on data collected during the interviews.

Table 4 - Means of transportation: business function costs by geographic location and organizational choice. Percentage shares of total turnover

	Italy			Abroad			TOTAL
Business function	A) performed within the firm/group	B) performed by independent suppliers (ownership below 10%)	Total (A+B)	C) performed by foreign subsidiaries (ownership over 10%)	D) performed by independent suppliers (ownership below 10%)	Total (C+D)	
Core function							
Production/assembling of final goods	65,8	20,8	86,7	12,7	0,7	13,3	100,0
Other functions							
Sourcing of raw materials, intermediate goods and components	16,0	44,7	60,7	12,8	26,5	39,3	100,0
Research & development, innovation, design	74,0	20,0	94,0	6,0	0,0	6,0	100,0
Marketing	68,8	13,0	81,8	6,3	12,0	18,3	100,0
Distribution, transportation, storage	22,5	51,0	73,5	1,3	25,3	26,5	100,0
After-sales services	1,5	50,0	51,5	48,5	0,0	48,5	100,0
Information and communication technologies (ICTs)	51,3	39,3	90,5	0,0	9,5	9,5	100,0

Source: ITA based on data collected during the interviews.

Table 5 - Means of transportation: the geography of business function costs. Percentage shares of total turnover

Business functions	Italy	European countries	of which: EU	Non-European countries	Total
Core function					
Production/assembling of final goods	86,7	7,9	4,6	5,4	100,0
Other functions					
Sourcing of raw materials, intermediate goods and components	60,7	17,4	13,7	21,9	100,0
Research & development, innovation, design	94,0	3,0	-	3,0	100,0
Marketing	81,8	5,0	5,0	13,3	100,0
Distribution, transportation, storage	73,5	4,0	4,0	22,5	100,0
After-sales services	51,5	-	-	48,5	100,0
Information and communication technologies (ICT)	0,9	9,5	9,5	-	100,0

Source: ITA based on data collected during the interviews.

Table 6 - Suppliers: business function costs by geographic location and organizational choice. Percentage shares of total turnover

Business function	Firms by size	Italy			Abroad			TOTAL
		A) performed within the firm/group	B) performed by independent suppliers (ownership below 10%)	Total (A+B)	C) performed by foreign subsidiaries (ownership over 10%)	D) performed by independent suppliers (ownership below 10%)	Total (C+D)	
Core function								
Production/assembling of final goods	**SMEs**	89,0	8,7	97,7	2,3	0,0	2,3	100,0
	Large firms	54,2	3,0	57,2	42,8	0,0	42,8	100,0
	Total sample	83,2	7,7	90,9	9,1	0,0	9,1	100,0
Other functions								
Sourcing of raw materials, intermediate goods and components	**SMEs**	10,4	85,7	96,1	3,9	0,0	3,9	100,0
	Large firms	61,3	0,0	61,3	38,7	0,0	38,7	100,0
	Total sample	19,4	70,6	89,9	10,1	0,0	10,1	100,0
Research & development, innovation, design	**SMEs**	93,3	0,0	93,3	6,7	0,0	6,7	100,0
	Large firms	91,7	0,0	91,7	8,3	0,0	8,3	100,0
	Total sample	92,9	0,0	92,9	7,1	0,0	7,1	100,0
Marketing	**SMEs**	100,0	0,0	100,0	0,0	0,0	0,0	100,0
	Large firms	90,0	0,0	90,0	10,0	0,0	10,0	100,0
	Total sample	99,0	0,0	99,0	1,0	0,0	1,0	100,0
Distribution, transportation, storage	**SMEs**	85,4	14,6	100,0	0,0	0,0	0,0	100,0
	Large firms	58,3	0,0	58,3	41,7	0,0	41,7	100,0
	Total sample	80,0	11,7	91,7	8,3	0,0	8,3	100,0
After-sales services	**SMEs**	100,0	0,0	100,0	0,0	0,0	0,0	100,0
	Large firms	70,0	0,0	70,0	30,0	0,0	30,0	100,0
	Total sample	96,7	0,0	96,7	3,3	0,0	3,3	100,0
Information and communication technologies (ICTs)	**SMEs**	94,4	5,6	100,0	0,0	0,0	0,0	100,0
	Large firms	95,0	0,0	95,0	5,0	0,0	5,0	100,0
	Total sample	94,6	4,2	98,8	1,3	0,0	1,3	100,0

Source: ITA based on data collected during the interviews.

Table 7 – Co-ordination of lead firms with their suppliers: type of inputs provided. Percentages computed as simple averages of the answers obtained

	Electrical appliances		Means of transportation	
	Italian suppliers	Foreign suppliers	Italian suppliers	Foreign suppliers
Standard inputs	31,0	49,5	16,4	35,0
Customized inputs (co-projecting, co-design, etc.)	69,0	51,5	83,6	65,0
Total	100,0	100,0	100,0	100,0

Source: ITA based on data collected during the interviews.

Table 8 – Co-ordination of suppliers with their customers: type of inputs provided. Percentages computed as simple averages of the answers obtained

	Large firms		SMEs	
	Italian clients	Foreign clients	Italian clients	Foreign clients
Standard inputs	8,3	13,3	50,0	48,8
Customized inputs (co-projecting, co-design, etc.)	91,7	86,7	50,0	51,2
Total	100,0	100,0	100,0	100,0

Source: ITA based on data collected during the interviews.

Table 9 – Co-ordination of suppliers with their lower-tier suppliers: type of inputs provided. Percentages computed as simple averages of the answers obtained

	Large firms		SMEs	
	Italian suppliers	Foreign suppliers	Italian suppliers	Foreign suppliers
Standard inputs	56,7	70,0	66,5	77,6
Customized inputs (co-projecting, co-design, etc.)	43,3	30,0	33,5	22,4
Total	100,0	100,0	100,0	100,0

Source: ITA based on data collected during the interviews.

Table 10 - ICT endowment and importance for GVCs' inclusion

Percentage share and simple mean of evaluations; scale from 1 (very low importance) to 4 (very high importance)

ICT endowment	Percentage of positive answers (1)		importance	
	SMEs	Large firms	SMEs	Large firms
ICT infrastructure				
Remote access to firms' ICT function	52,9%	100,0%	2,9	4,3
Internet ADSL connection (large bandwith)	94,7%	100,0%	4,6	3,7
Internet fiber-optic connection (ultra large bandwith)	11,8%	50,0%	2,9	4,5
Mobile Internet connection (telecom)	55,6%	100,0%	2,9	3,7
EDI (Electronic Data Interchange)	47,1%	100,0%	2,8	5,0
Intranet ed Extranet	47,1%	100,0%	2,7	4,0
Cloud Computing	25,0%	33,3%	2,2	2,5
Systems for design, R&D and co-projecting				
Computer-Aided Manufacturing (CAM) and digital manufacturing	25,0%	100,0%	2,9	4,3
Mechatronic system simulation (CAE 1D)	5,9%	100,0%	2,1	4,7
Computer Aided Systems for product co-development (client-supplier: CAD, CAE and 3D simulation software)	47,1%	100,0%	3,1	4,3
Document management systems (EDM-Engeneering data management; PDM- product data management; TDM-technical data management, etc.)	17,6%	100,0%	2,3	4,3
3D printers	5,9%	33,3%	2,3	*3,5*
Software for marketing, sales and procurement				
CRM (Costumer Relationship Management)	17,6%	0,0%	2,8	2,0
E-Commerce Services (e-purchases and e-sales; placement of orders, traceability, online payments)	29,4%	66,7%	2,9	2,0
SEO services (web research engine optimisation)	29,4%	50,0%	3,1	2,0
Data analytics systems (to identify potential customers, adapt products to customers' needs, increase sales, saving costs, etc.)	17,6%	33,3%	2,6	2,5
Website for marketing/external communication, without interaction with customers and suppliers	94,1%	66,7%	4,2	2,5
E-invoicing systems	35,3%	100,0%	2,9	4,3
Social Media (social network, blogs, file sharing, etc.) for advertising, new product launch, interaction with customers, recruitment)	11,8%	33,3%	2,2	2,0
Management Systems				
Supply Chain Management systems (ADE)	12,5%	33,3%	2,2	3,0
ERP management systems (Enterprise Resource Planning)	41,2%	100,0%	3,1	4,7
PLM integrated systems (Product Lifecycle Management)	11,8%	33,3%	2,0	4,5
E-training systems	11,8%	66,7%	2,6	2,7
RFID Technology	0,0%	0,0%	1,8	4,0

(1) Percentage based on the number of respondents

Source: ITA, online survey

Selected references

Agostino, M.; Giunta, A.; Nugent, J. B.; Scalera, D.; Trivieri, F. (2015), The importance of being a capable supplier: Italian industrial firms in global value chains, International Small Business Journal, vol. 33(7), 708-730.

Agostino, M.; Giunta, A.; Scalera, D.; Trivieri, F. (2016) Italian Firms in Global Value Chains: Updating our Knowledge, Rivista di Politica Economica, vol. VII-IX.

Ahmed, S.; Appendino, M.; Ruta, M. (2017), Global value chains and the exchange rate elasticity of exports, The B.E. Journal of Macroeconomics, vol. 17, issue 1, 24.

Alessandria, G.; Kaboski, J. P.; Midrigan, V. (2011), US Trade and Inventory Dynamics, American Economic Review, vol. 101(3), 303-307.

Amador, J., Cabral, S. (2016), Global value chains: a survey of drivers and measures, Journal of Economic Surveys, vol. 30 (2), 278-301

Arndt S.W. and Kierzkowsky H., (2001), Fragmentation. New Production Patterns in the World Economy, Oxford University Press.

Baldwin, R. (2011), Trade and Industrialization after Globalisation's 2nd Unbundling: How Building and Joining a Supply Chain Are Different and Why It matters, NBER Working Paper Series.

Baldwin, R.; Robert-Nicoud, F. (2014), Trade-in-goods and trade-in-tasks: an integrating framework, Journal of International Economics, vol. 94 (1), 51-62.

Baldwin R., (2016), The Great Convergence: Information Technology and the New Globalization, Harvard University Press.

Borin, A., Mancini, M. (2016), Participation in global value chains: measurement issues and the place of Italy, Rivista di Politica Economica, vol. VII-IX.

Castellani D., Serti F. and Tomasi C., (2010), Firms in International Trade: Importers' and Exporters' Heterogeneity in Italian Manufacturing Industry,"The World Economy", n. 33(3), pp. 424-457.

Constantinescu, C.; Mattoo, A.; Ruta, M. (2015), The Global Trade Slowdown: Cyclical or Structural?, Policy Research Working Paper 7158.

Costa, S.; Pappalardo, C.; Vicarelli, C. (2017), Internationalization choices and Italian firm performance during the crisis, Small Business Economics, 48, 753-769.

De Benedictis, L.; Tajoli, L. (2016), Comparative advantage and centrality in the world network of trade and value added: an analysis of the Italian position, Rivista di Politica Economica, vol. VII-IX, 1-36.

Feenstra, R.C. (1998), Integration of Trade and Disintegration of Production in the Global Economy, The Journal of Economic Perspectives, vol. 12, n. 4, 31-50.

Ferrantino, M. J.; Taglioni, D. (2014), Global Value Chains in the Current Trade Slowdown, The World Bank Economic Premise, No. 137.

Gawande, K.; Hoekman, B.; Cui, Y. (2015), Global Supply Chains and Trade Policy Responses to the 2008 Crisis, The World Bank Economic Review, vol. 29 (1), 102-128.

Gereffi G., Humphrey J. e Sturgeon T., (2005), The Governance of Global Value Chains, "Review of International Political Economy", n. 12(1), pp. 78-104.

Gereffi, G.; Fernandez-Stark, K. (2016), Global value chains analysis: a primer (2nd edition), Duke Center on Globalization, Governance & Competitiveness (Duke CGGC).

Giovannetti, G.; Marvasi, E., (2017), Governance, value chain positioning and firms' heterogeneous performance: The case of Tuscany, International Economics.

Grossman, G. M.; Rossi-Hansberg E. (2006), The Rise of Offshoring: It's Not Wine for Cloth Anymore, The New Economic Geography: Effects and Policy Implications, Jackson Hole Conference Volume, Federal Reserve of Kansas City, 59-102.

Hummels, D.; Ishii, J.; Yi, K.-M. (2001), The nature and growth of vertical specialisation in world trade, Journal of International Economics, 54, 75-96.

Iapadre, P. L. (2011), Trade and Employment in Italy, OECD Trade Policy Working Papers, No. 126.

ITA (2018), Le imprese italiane nelle reti produttive internazionali, Italian Trade Agency.

Johnson, R. C. (2017), Measuring global value chains, NBER Working Paper Series 24027.

Kierzkowski, H. and Chen L. (2010), Outsourcing and Trade Imbalances: The United States–China Case,"Pacific Economic Review", 15(1):56-70.

Koopman, R.: Wang, Z.; Wei, S.-J. (2014), Tracing Value-Added and Double Counting in Gross Exports, The American Economic Review, vol. 104, n.2, 459-494.

Krugman, P. (1995), Growing world trade: causes and consequences, Brookings Papers on Economic Activity 26 (1, 25th Anniversary Issue), 327-377.

Mattoo, A.; Wang, Z.; Wei, S. (Eds) (2013), Trade in Value Added. Developing New Measures of Cross-Border Trade, CEPR-The World Bank.

Miroudot S., Lanz R. and Rigoussis A., (2009), Trade in Intermediate Goods and Services, "Oecd Trade Policy Working Paper", n.93.

Nagengast, A. J.; Stehrer, R. (2016), The Great Collapse in Value-Added Trade, Review of International Economics, 24(2), 391-421.

Nielsen P. B., (2008), International Sourcing – Moving Business Functions Abroad, "Statistics Denmark".

Nielsen P. B., (2017), The Puzzle of Measuring Global Value Chains – The Business Statistics Perspective, in P.De Lombaerde, L.Iapadre, K. De Backer (editors),"Special Issue: Global Value Chains", International Economics Volume 153.

Stehrer R. et al. (2011), Trade in Intermediate Products and EU Manufacturing Supply Chains, "Research Report", n.369, Wiener Institut für Internationale Wirtschaftsvergleiche.

Sturgeon T. J.,(2013), Global Value Chains and Economic Globalization – Towards a New Measurement Framework.

UNCTAD (2013), Global value chains and development: investment and value-added trade in the global economy.

UNCTAD (2018), Key Statistics and Trends in International Trade, Unctad Trade Analysis Branch.

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