ITALIAN FIRMS IN INTERNATIONAL PRODUCTION NETWORKS

UPDATED VERSION

ITA

ITALIAN TRADE AGENCY

ICE – Agenzia per la promozione all'estero e l'internazionalizzazione delle imprese italiane

Ministero dello Sviluppo Economico

Italian Firms in International Production Networks - Key Findings 2022

Updated Executive Summary of *Le imprese italiane nelle reti produttive internazionali*[*]

The 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). During the past decades, 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.

2. International production fragmentation has had a major impact on world trade of raw materials, parts and components (intermediate goods). 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 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.

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,

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which is even more relevant in times of rising inflation. Non-tariff measures, such as rules of origin and local content requirements, can have significant negative effects on the functioning of international production networks (IPNs), making business procurement less efficient and more costly.

5. A large part of trade takes place in the context of IPNs, which can be seen as complex organizations that intersect, at various levels, with other domestic and cross-border networks. The shapes assumed by IPNs 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", 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”. These exchanges, carried out within networks of companies, imply a high degree of coordination and cooperation, even if they are made by independent suppliers. 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, on how companies may increase their participation and on which policies are more appropriate to facilitate the operations of IPNs.

8. The worldwide reach of the Covid-19 crisis underlined the inter-connectedness of the global economy, highlighting the role of international production networks. Consequently, the debate on economic interdependence and on the resilience of IPNs has gained new momentum. Supply chain disruptions can derive from very different causes.[1] Since 2020, pressures on suppliers and logistic costs have reached unprecedented levels, fuelling the debate on the extent to which the pandemic, the following war in Ukraine and geopolitical tensions will lead to a substantial

[1] Some prominent examples are the earthquake in Japan and the floods in Thailand in 2011.

reconfiguration of firms' organisation, and if transnational companies will adopt reshoring or nearshoring strategies at a substantial scale.[2]

9. In fact, the economic case for making large-scale changes in a company's physical locations appears to be limited, given initial sunk costs and the interconnected nature of IPNs (Miroudot, 2020; OECD, 2021). Moreover, in many cases, supply chain resilience can be improved by adopting organisational strategies including enhanced risk management capabilities, building redundancy in supplier and transport networks, holding more inventory and creating the capacity to flex production across sites (McKinsey Global Institute, 2021).

10. The role and the diffusion of IPNs can be examined in many ways. An approach which has generated a large literature in the last few years aims at measuring the participation of national economies in IPNs, based on their contribution in terms of value added. In particular, the increasing availability of international input-output tables[3] has allowed to show more precisely the interdependencies between sectors and countries, highlighting their contribution to the creation of value along the production chain.

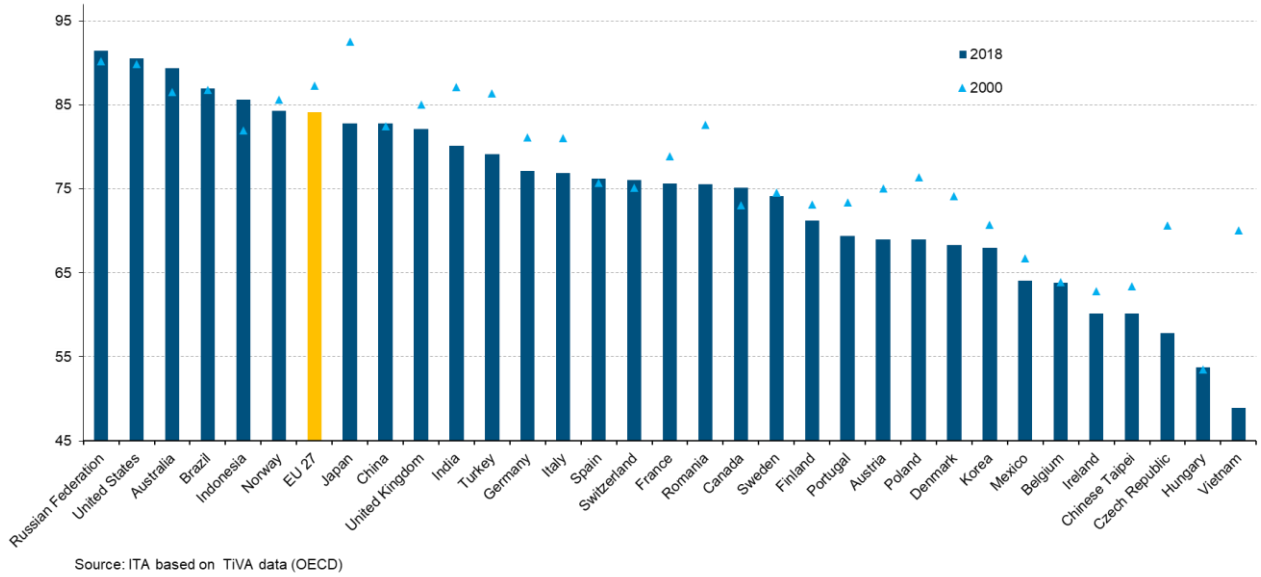
11. Based on these statistics, one can observe how the domestic value added share of gross exports has been falling, starting from the nineties, signalling the growing international fragmentation of production processes. A rising number of countries, mainly located in the same geographic area, is involved in different business functions 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.

[2] At present the evidence of shortening and regionalising IPNs seems to be scarce; see for example the case of Italy in Giovannetti et al. (2021).

[3] 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 (https://www.oecd.org/sti/ind/measuring-trade-in-value-added.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).

Graph 2 - Domestic Value Added content of exports of goods and services.

Percentage share of gross total exports.



Source: ITA based on TiVA data (OECD)

12. Considering the main trading countries, the domestic value added content of ngross exports differs widely, featuring higher levels in larger economies or in countries specialized in primary goods (graph 2). Over the last decades, the domestic value added content of exports has decreased especially in some emerging economies, characterized by a particularly fast development of the manufacturing sector and the presence of transnational corporations. 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 IPNs.

13. Another method to show the extent of international production fragmentation is to analyse international trade in intermediate goods and, in particular, trade of "processed" inputs (parts and components, excluding raw materials[4]). Overall, we observe that changes in the share of these inputs in world trade appear to be correlated to the time path of its aggregate volumes. The collapse and rebound which characterised the outset of the global financial crisis in 2009-2011 translated into fluctuations in trade in processed inputs, connected to the so-called “bull-whip effect” of the inventory cycle in

[4] See UNCTAD (2021) and previous annual reports.

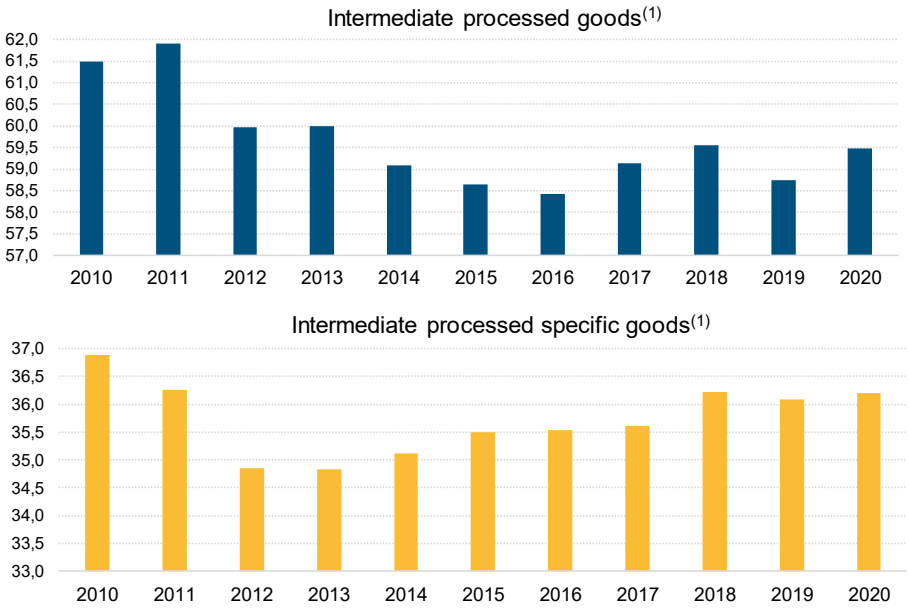
IPNs. The ensuing downward trend of the world trade share of processed inputs could be related to the lower income elasticity of trade volumes, which in turn seems to reflect, among other factors, a slowdown in the process on international production fragmentation. Since the global financial crisis in 2008-2009, the expansion of IPNs seems to have slowed down and – especially in Asian countries – firms tend to source more intermediate inputs locally.

14.Trade data available by the Broad Economic Categories classification Rev. 5 (and excluding products classified as dual-use) clearly show that processed intermediate goods represent a considerable share of world merchandise trade. Moreover, it is interesting to examine trade in intermediates using a new dimension introduced in the BEC Rev. 5 classification, in order to separate trade of highly specific intermediates from trade of more generic products.[5] The aim is to focus specifically on international transactions characterised by some level of "explicit coordination" between buyers and sellers (i.e. customised components to be assembled in final goods), rather than on arm's-length transactions.

15. Graph 1 shows that, during the past decade, trade in processed intermediate goods slowed down considerably until 2015, showing some signs of recovery between 2016-2018 and in 2020, during the Covid-19 crisis. However, it is interesting to note that, if we focus on the category of specific intermediates, the cross-border trade of these products has increased since 2014, reaching a share comparable to 2011 in 2018 and 2020. Therefore, it appears that the global trade slowdown of the last decade has mainly affected the share of standardized inputs, while the importance of specific intermediates has tended to grow, showing the resilience of IPNs.

[5] The "processed intermediate goods" category contains many generic products with published reference prices (e.g., cotton bales, linseed oil), or commonly sold at auction, as well as more differentiated, complex intermediate products intended for use in specific industries and for specific final goods (e.g. auto parts made for a specific brand or model of car). The specification dimension of BEC Rev. 5 defines an official, internationally agreed upon list of "specific" intermediates: see *Classification by Broad Economic Categories Rev.5* (2016), Statistical Papers Series M No.53, Rev.5, Department of Economic and Social Affairs Statistics Division, pages 13 and 17.

Graph 1 - Trade in goods by end-use. Percentage shares on total trade[(1)].



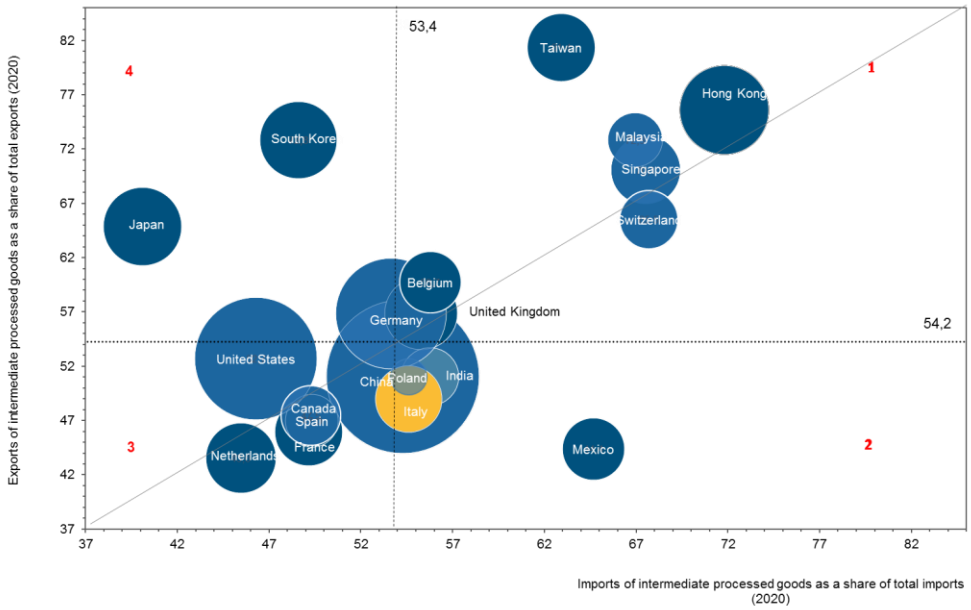
(1) Based on BEC rev. 5 classification, excluding primary goods and products classified as dual-use; 86 reporting countries.

Source: ITA based on data of Eurostat and national statistics institutes

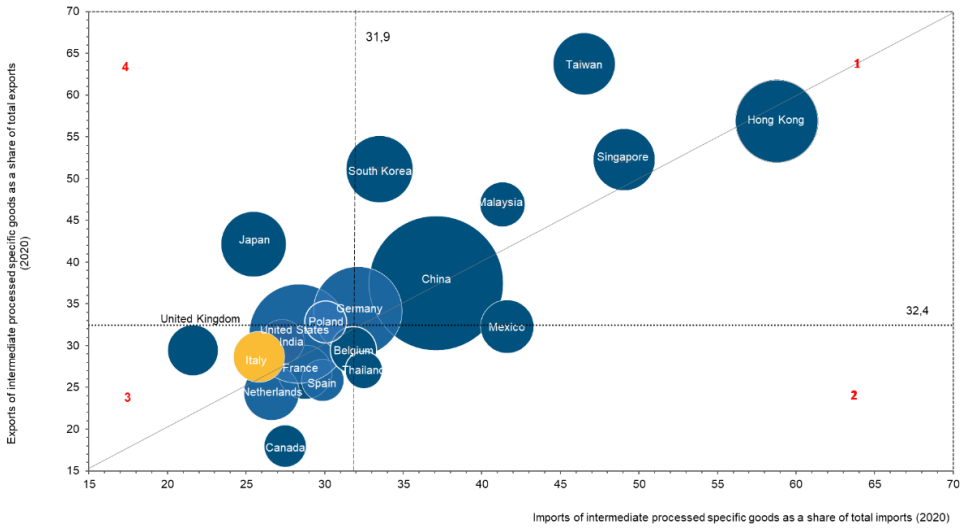
16. Each countries' participation in IPNs can be measured by computing the relative importance of intermediate goods in exports and imports (graphs 3a and 3b). For some Asian economies (Hong Kong, Malaysia, Singapore and Taiwan) the share of processed intermediates is well above world average for both exports and imports, highlighting their strong involvement in IPNs. Countries such as Japan, South Korea, and the United States appear to be more oriented towards exports of intermediates, suggesting that they tend to be located upstream in IPNs. Conversely, countries such as China, Mexico and Poland show a relative downstream position, as the share of intermediates in their imports is larger than in exports.

17. In comparison, if we consider specific intermediate products, we observe some differences, signalling - like in the case of Italy, Poland, India, and China - a relatively stronger specialisation in upstream production processes resulting from a higher orientation in exports of customised parts and components (graph 3b).

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



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



(1) The size of the bubble measures each country's share of world trade in processed (specific) intermediate goods (imports+exports of 110 reporting countries in 2020). The dotted lines refer to the total of reporting countries. Products classified as "dual use" by the Broad Economic Category Rev. 5 classification are excluded.

Source: ITA based on data from Eurostat and National Statistics Institutes

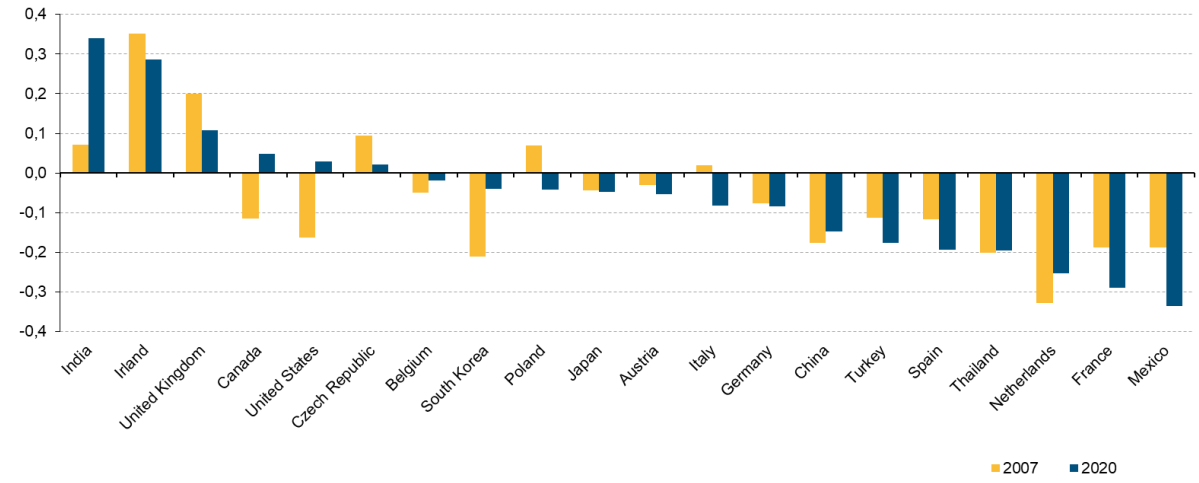
18. For each country, marked differences can be observed at sectoral level. We use a new "index of relative position in IPNs"[6], based on trade in processed intermediate goods, in order to analyse changes in the international distribution of business functions after the global financial crisis. This index is an adaptation of the net trade specialisation index used in Iapadre (2011), 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.

19.The following graphs focus on five sectors that are strongly characterised by international production networks, and highlight sectoral differences linked to the industrial specialization and the presence (or not) of supply chain leaders in the country. Moreover, a comparison between the indices computed on the total of processed intermediate goods and on their "specific" component shows several differences in the positions of the countries, upstream or downstream along the value chains.

20. In the transport equipment sector Mexico, Thailand, China and several European traders are relatively specialised in downstream activities. Between 2007 and 2020, while Mexico and France further strenghtened their downstream orientation, Canada and the United States changed their relative position towards more upstream activities. Especially India and Ireland, followed by the UK, stand out with a higher upstream specialization (in the case of India, following the liberalisation of foreign direct investment) (graph 4a). Considering specific intermediate products (graph 4b), in most cases there are minor differences in the countries' relative positions compared to what is shown in the previous graph. The main exception is the United Kingdom, which appears to be more specialized in downstream phases (i.e. in the assembling of specific intermediate products), while Italy appears to be more specialized upstream in the global production networks.

[6] 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 *s* and in each country *i*:
$x_k = X_k/X_t$
$m_k = M_k/M_t$
X_k = exports of processed intermediate goods of sector *s* of country *i*
X_t = total exports of sector *s* of country *i*
M_k = imports of processed intermediate 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 20 trading countries in processed intermediate goods, for each sector (2018).

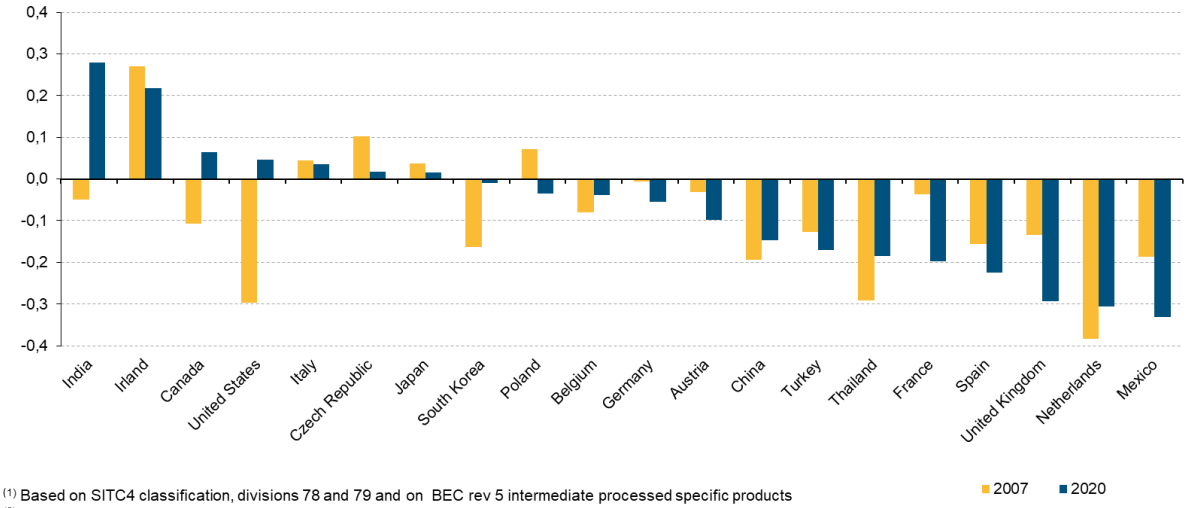
Graph 4a - Means of transportation: processed intermediate goods. Index of relative position in international production networks[1]



[1] Based on SITC4 classification, divisions 78 and 79 and on BEC rev 5 intermediate processed products
[2] Data for India and for UK 2009-2020, for Turkey.2013-2020.

Source: ITA based on data from Eurostat and National Statistics Institutes.

Graph 4b - Means of transportation: specific processed intermediate goods. Index of relative position in international production networks[1]

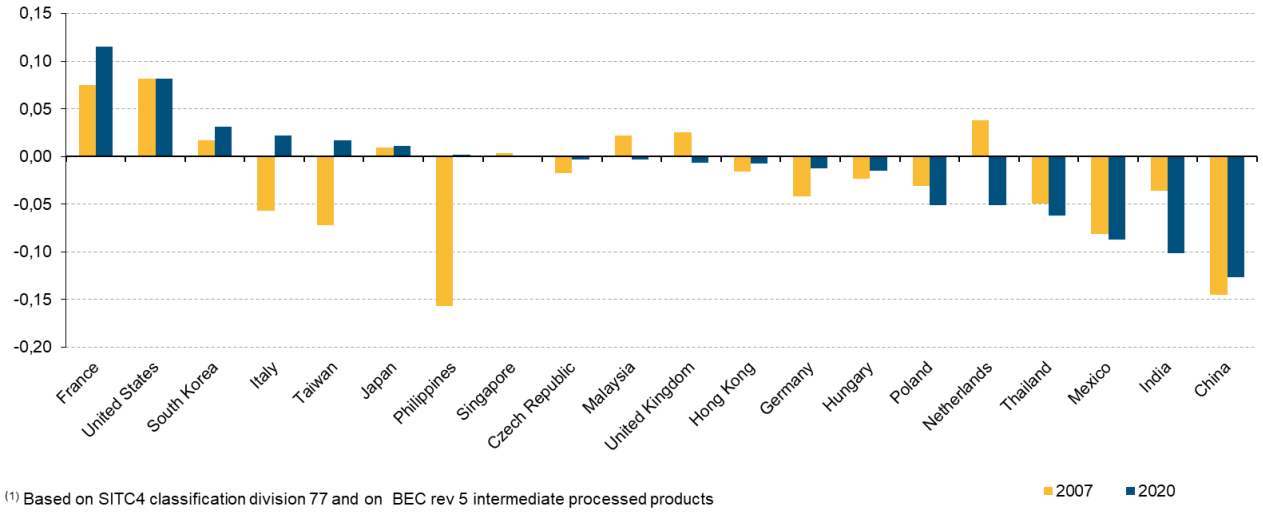


[1] Based on SITC4 classification, divisions 78 and 79 and on BEC rev 5 intermediate processed specific products
[2] Data for India and for UK 2009-2020, for Turkey 2013-2020.

21. In the case of electrical machinery and appliances, China, India and Mexico are more specialized in activities related to downstream production processes (graph 5a). On the other hand, France and the United States appear to be relatively oriented in the upstream phases of the production chain. Moreover, compared to the pre-crisis period, some countries show a considerable shift upstream, like Philippines, Taiwan and Italy.

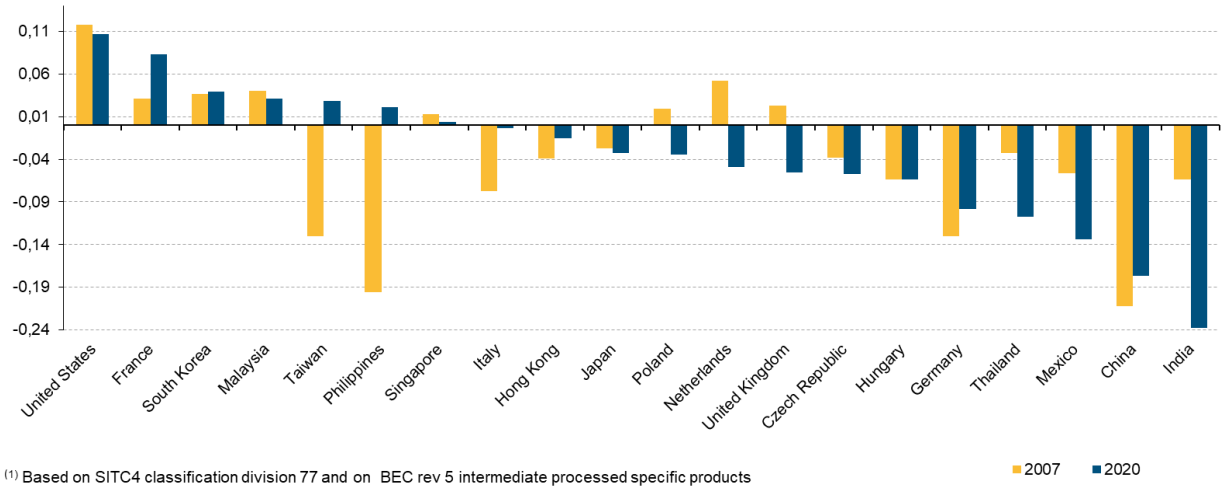
Considering specific processed intermediate goods, India's and China's specialization in downstream production phases appears to be more intense (athough decreasing) as well as Germany's, while Japan's relative position changes from upstream to downstream (the sign of the index turns negative from positive, although slightly) (graph 5b).

Graph 5a - Electrical machinery and appliances: processed intermediate goods. Index of relative position in international production networks[1]



[1] Based on SITC4 classification division 77 and on BEC rev 5 intermediate processed products
[2] Data for India, Malaysia and UK 2009-2020; for Singapore 2010-2020.

Graph 5b - Electrical machinery and appliances: specific processed intermediate goods. Index of relative position in international production networks[1]



[1] Based on SITC4 classification division 77 and on BEC rev 5 intermediate processed specific products
[2] Data for India, Malaysia and UK 2009-2020; for Singapore 2010-2020.

22. In the electronic industry[7] (graph 6a), India, Poland and Japan are more specialized in exports of processed intermediate goods, and particularly Japan strenghtened its upstream position in the value chain compared to 2007. On the other hand, Thailand, Malaysia and the Philippines appear relatively more specialized in downstream activities (assembling), even if their downstream specialization appears to be lower than before the financial crisis. Remarkable changes in the countries' position can be observed for trade in specific processed intermediates (graph 6b): United States, France and Japan appear to be more specialized upstream (and have all changed their relative position since 2007). Similarly, Canada, Italy and Germany specialized during the last decade towards upstream production phases. On the other side, we can observe that Mexico, Hungary, Poland, India show a more intense specialization in downstream phases.

23. Several differences can be observed in the intensity of specialization along the supply networks in the textile and apparel sectors, where Japan and the United States are significantly specialized in upstream phases, followed by Canada, South Korea and several European economies (including among others the Russian Federation, Germany, the United Kingdom; graph 7a). On the opposite, Pakistan, Indonesia,Turkey, India and other countries are relatively more specialized in assembling activities. Especially in the case of China, Poland and Mexico the graph shows in recent years a clear trend towards a less downstream position. It may be noted that in this sector most countries maintain a similar position even if we consider specific processed intermediates (graph 7b).

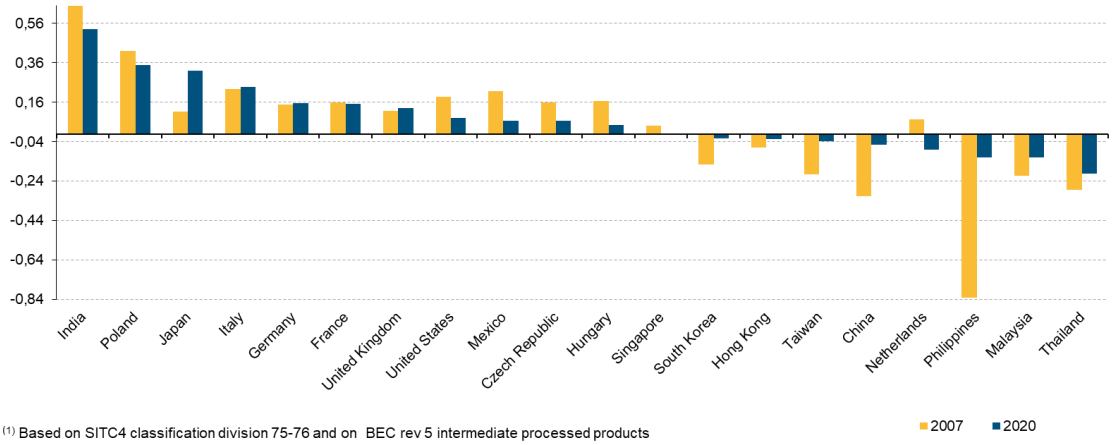
24. In the chemical and pharmaceutical sectors we observe that Canada, followed by Russia and Ireland, are the main countries specialized in the upstream phases (graph 8a). During the considered period, China clearly appears to have intensified its activities in the upstream phases, as well as Switzerland and Brazil. On the other hand, some European countries (France, Italy, Spain), Mexico and India are relatively specialized in downstream production phases, intensifying this orientation compared to 2007 (except India).

25. In comparison, considering specific processed intermediate goods there are several differences. Among the main traders, China appears to be much more specialized in

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

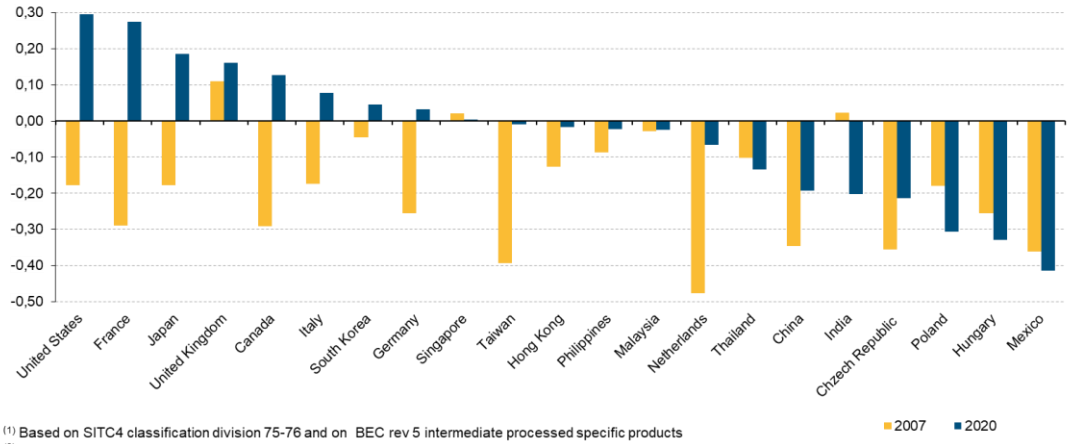
upstream phases, followed by Switzerland, Ireland, Brasil, India and UK. On the other hand, France, Spain and South Korea are relatively more oriented towards downstream production phases also within this specific category of goods. Moreover, compared to the previous graph, the Russian Federation and Taiwan show a higher specialization in downstream phases, while India's position appears to be clearly upstream (graph 8b).

Graph 6a - Office, automatic data-processing machines, telecommunication, sound recording and reproducing equipment: processed intermediate goods. Index of relative position in international production networks(1)



(1) Based on SITC4 classification division 75-76 and on BEC rev 5 intermediate processed products
(2) Data for India, Malaysia and UK 2009-2020; for Singapore 2010-2020.

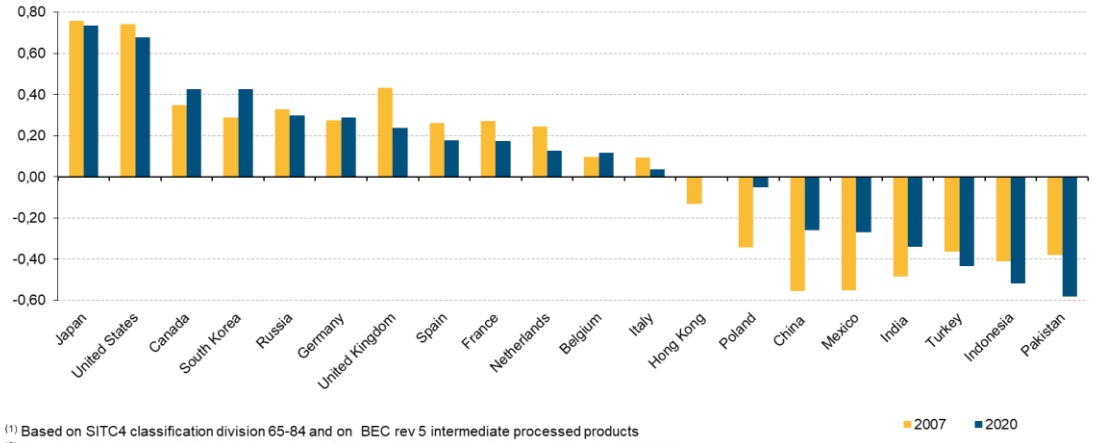
Graph 6b - Office, automatic data-processing machines, telecommunication, sound recording and reproducing equipment: specific processed intermediate goods. Index of relative position in international production networks(1)



(1) Based on SITC4 classification division 75-76 and on BEC rev 5 intermediate processed specific products
(2) Data for India, Malaysia and UK 2009-2020; for Singapore 2010-2020.

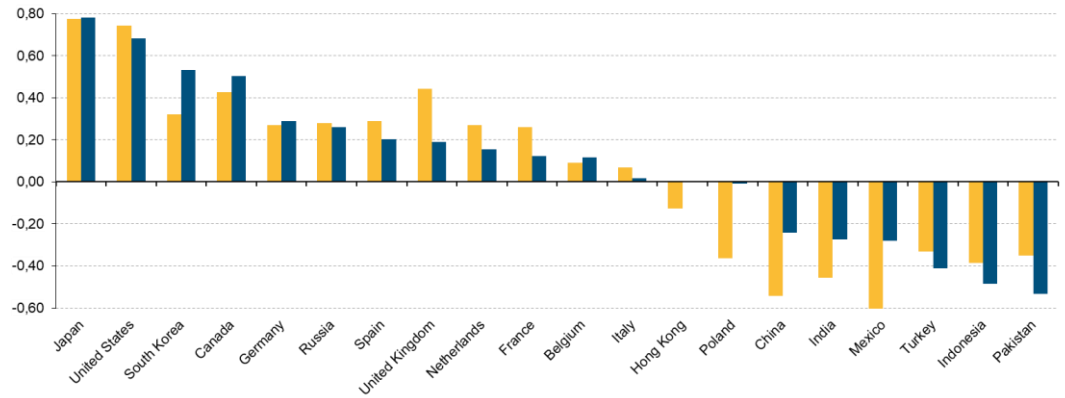
Source: ITA based on data from Eurostat and National Statistics Institutes.

Graph 7a - Textiles, yarn, fabrics, related products and articles of apparel, clothing accessories: processed intermediate goods. Index of relative position in international production networks[1]



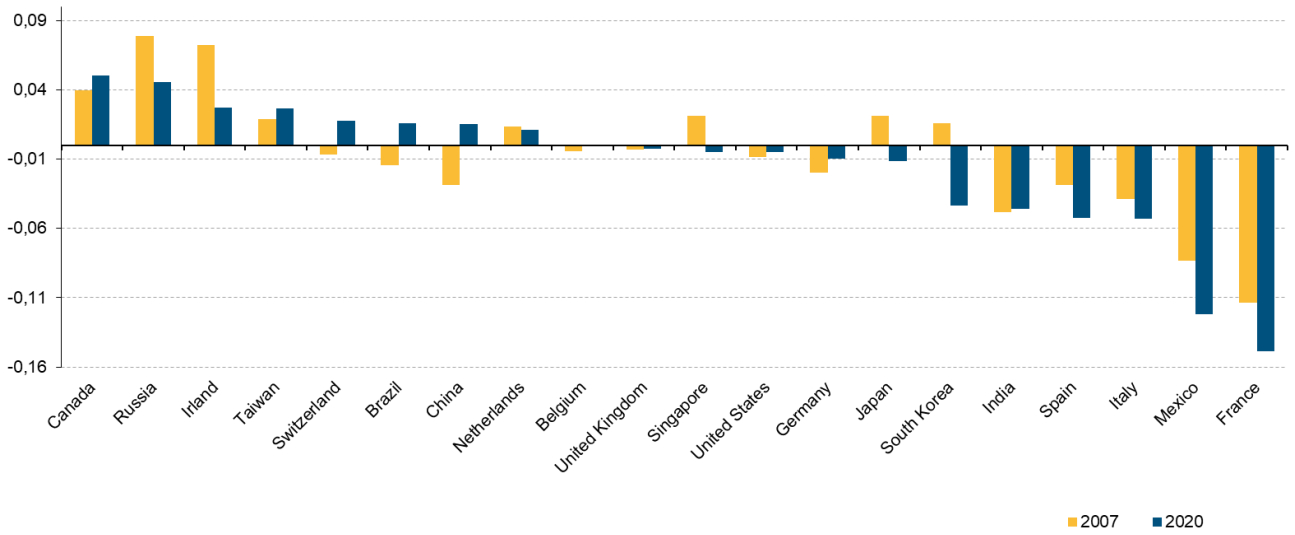
(1) Based on SITC4 classification division 65-84 and on BEC rev 5 intermediate processed products
(2) Data for India, UK 2009-2020; for Indonesia and Pakistan 2010-2020; for Turkey and Russia 2013-2020.

Graph 7b – Textiles, yarn, fabrics, related products and articles of apparel, clothing accessories: specific processed intermediate goods. Index of relative position in international production networks[1]



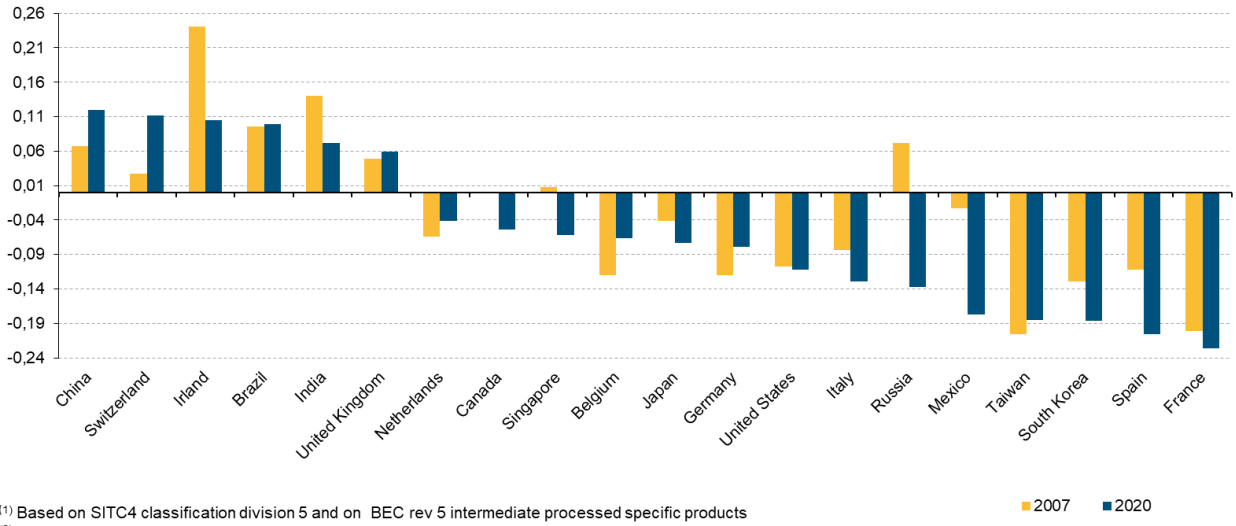
(1) Based on SITC4 classification division 65-84 and on BEC rev 5 intermediate processed specific products
(2) Data for India and UK 2009-2020; Indonesia and Pakistan 2010-2020; Turkey and Russia 2013-2020.

Graph 8a – Chemicals and pharmaceuticals: processed intermediate goods. Index of relative position in international production networks(1)



(1) Based on SITC4 classification division 5 and on BEC rev 5 intermediate processed products
(2) Data for India and UK 2009-2020; for Singapore 2010-2020; for Russia 2013-2020.

Graph 8b – Chemicals and pharmaceuticals: specific processed intermediate goods. Index of relative position in international production networks(1)



(1) Based on SITC4 classification division 5 and on BEC rev 5 intermediate processed specific products
(2) Data for India and UK 2009-2020; for Singapore 2010-2020; for Russia 2013-2020.

26. 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, researchers observed that 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. [8]

27. By analysing trade in processed intermediates (graph 3a), the Italian position appears to be relatively more involved in IPNs than other countries of the Eurozone (such as France, Spain, the Netherlands), featuring in the meantime a lower participation in IPNs compared to Germany, Belgium, UK or, even more, Switzerland and most emerging Asian countries. Italy's relative position changes however if we consider products classified as specific processed intermediates: in this case, the involvement in IPNs appears to be less pronounced, even vis-à-vis other European countries, and the specialization appears to be relatively oriented towards production stages located upstream in the value chain (graph 3b).

28. 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 appears to be relatively specialized in importing processed intermediate inputs (graph 4a). On the contrary, considering only specific processed intermediate products, a slightly positive "index of relative position in IPNs" suggests that Italy's position tends to be relatively oriented upstream (graph 4b).

29. In the case of electrical machinery and appliances, Italy (in 2020) is slightly specialized in exporting processed intermediates (graph 5a), while showing no orientation if we consider specific processed intermediate goods (graph 5a). Regarding

[8] See 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.

the electronic sector, Italy appears relatively specialized in upstream phases both for the category of processed intermediates and for specific intermediate products (in 2020) (graph 6a and 6b). Lastly, in the textiles, apparel and related sectors, we observe a very low (and decreasing) degree of export specialization (graphs 7a and 7b), while in the chemical and pharmaceutical sectors Italy tends increasingly downstream (graphs 8a and 8b).

30. Other contributions, based on international input-output tables, show that the domestic value added content of gross exports is slightly higher in Italy, compared to other Eurozone countries. Between 1995 and 2011, this indicator decreased significantly in all the above economies, confirming their greater participation in IPNs. This trend seems to have stopped during the years 2011-2014, when the indicator increased, especially in Italy. [9]

31. 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 IPNs, 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.

32. Empirical surveys on Italian firms indicate that participation in IPNs 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[10]. 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

[9] See 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.

[10] Agostino et al. (2015), however, note that firms' characteristics 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.

country, signalling the importance of adopting more sophisticated internationalization strategies in order to reduce regional development gaps. [11]

33. 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 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.

34. A specific survey on Tuscan companies[12] confirms the existence of a productivity bonus associated with the involvement in IPNs. 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).

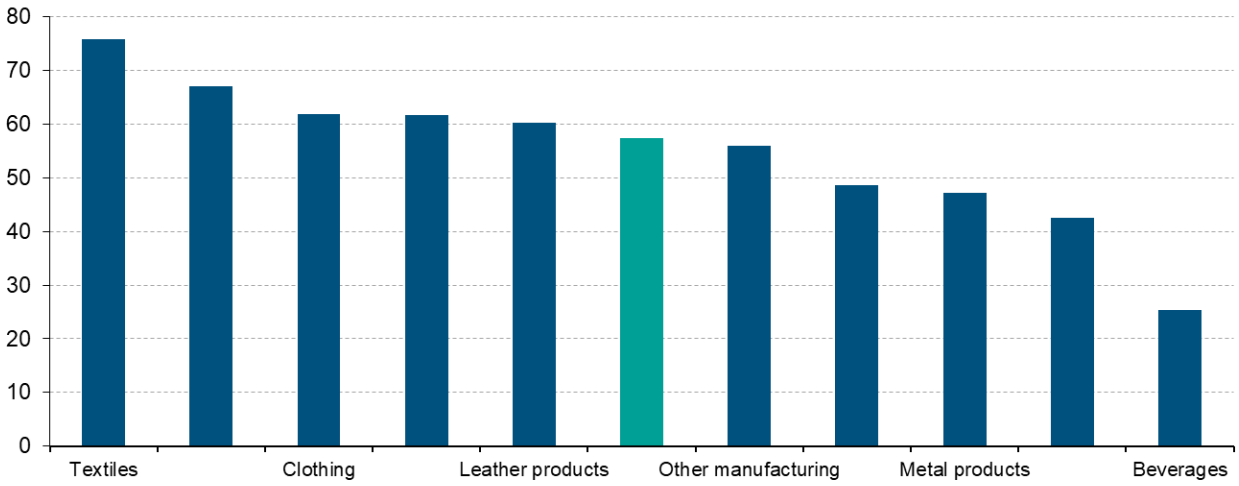
35. Using ISTAT micro-level data to further analyse the position of Italian companies in international production chains in 2010 (graphs 9-10),[13] and considering a subset of both exporting and importing companies (two-way-traders), it is possible to calculate the import content of their exports, which 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, showing the high content of domestic value added characterizing these two latter sectors.

[11] See 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.

[12] See 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.

[13] See 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.

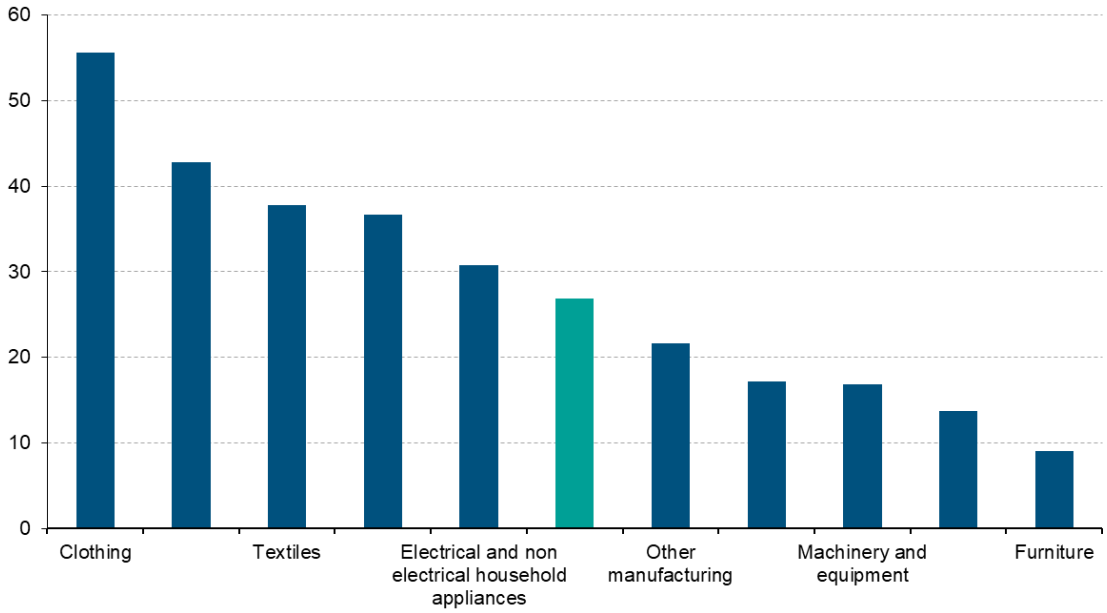
Graph 9 - Two-way trading firms[(1)] exporting "made in Italy" products by industry - 2010. Percentage shares



[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

36. 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.

37. The aim of the three case studies is to shed light on the degree of internationalization of core business functions (production/assembly) and of the other 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.

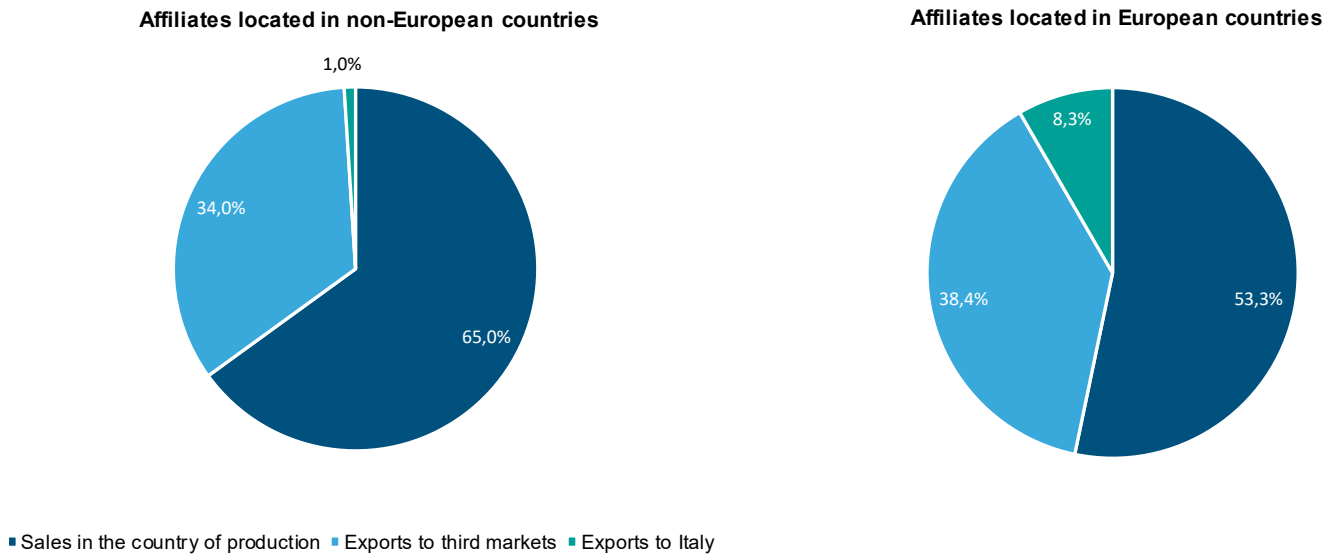
38. Although not statistically representative, the three case studies suggest some evidence on the different internationalization of business functions, highlighting among other issues, the differences between SMEs and large companies (see table 1 on the size of the sample). In line with the economic 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).

39. 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 2).

40. While R&D and ICT functions are mainly performed in Italy (respectively, 95.5 and 95.9 percent in the case of electrical appliances, and 94 and 90.5 percent for transport means), the geographic expansion of IPNs is more evident for after-sales services, which appear to be the most internationalized business function (32.5 percent for electrical appliances and 48.5 percent in the case of trasport means). Considering production/assembly and procurement, 26.6 per cent of the production of firms within the household/ professional appliances sector (table 3) is carried out in other countries (37 per cent for larger firms), against 13.3 per cent in the case of transportation means (table 5) and 9.1 per cent for suppliers (however, the percentage rises to 42.8 percent in the case of larger firms) (table 7). 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.

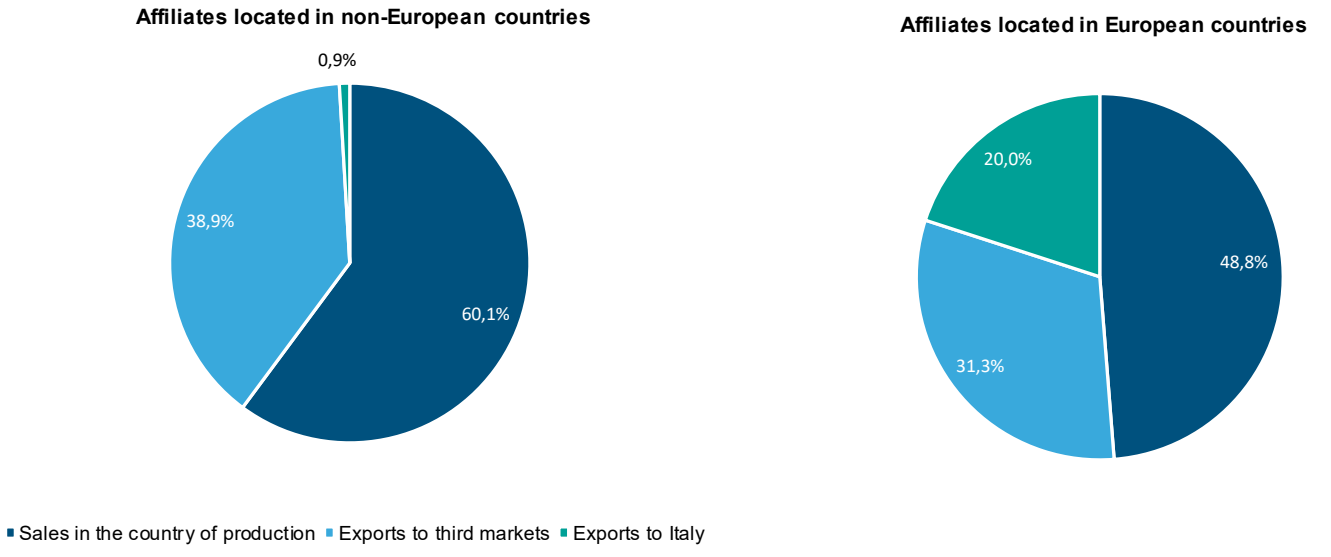
41. It may also be noted that, according to our sample, foreign affiliates act mostly as "export platforms", selling their production mainly in the country in which they are located, or in neighbouring markets. In the case of household/professional appliances, 65 per cent of the production made by European 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



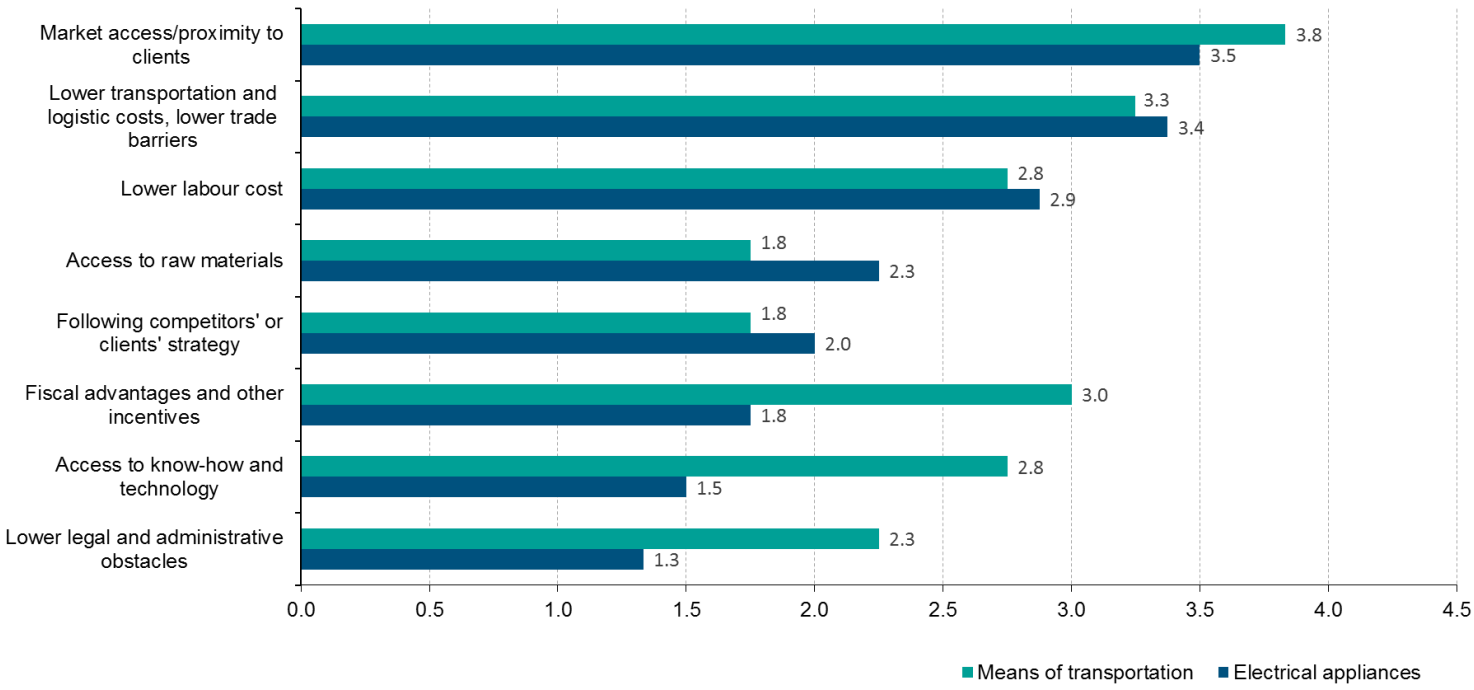
Source: ITA, based on data collected during the interviews

The determinants of foreign investments

"We open factories to stay close to the markets, as our products have important logistics costs. Where there is a big market we set up a factory to take advantage of having lower logistics costs and, at the same time, we develop a product suitable for that market. This is how we decide where to locate factories. However, if we serve for example the Far East, since the cost of the product is made up from raw materials, labour costs and logistics, certainly also labour cost is relevant. But logistics is the main determinant. Finished products made in China are not sold in Europe: despite the cost of labour - which is 3 euros instead of 24 euros - logistics does not allow it" (large company, electrical appliances).

"Considering the reasons that led us to the opening of the plant in Thailand, there was the need to overcome the obstacles deriving from the high duties on the finished product. This prompted us to develop an on-site assembly facility for components. In addition to this is the fact that we had many important suppliers in Asia. We benefit from the lower cost of labour, but this was not the main driver; we would never have moved for this reason, given the complexity of opening a new plant. Access/proximity to the market and to customers, as well as high duties are the main factors" (large company, transport means).

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.

42. 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 2). 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).

The role of procurement

"We consider ourselves as *big assemblers*: even the most simple product still has about seventy parts. So, yes, it's mostly components. Also raw materials, of course, like metal sheets or steel, depending on the parts that must be painted or enamelled, in addition to the glass" (SME, electrical appliances).

43. 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 3) and reaches 39.3 per cent in the case of transportation means (table 5). 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 7).

44. 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 percent), while in the case of electrical appliances the share amounts to 16.4 percent (out of 31.6 percent; tables 4 and 6). 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.

The localization of suppliers

"Imports come from Germany, where there are several suppliers, from the United States, where there is substantially one supplier, from Austria and Poland. We mainly buy semi-finished products, raw materials and components. The car industry is based on the assembly of components. We have added to historical suppliers of components - mainly German - components sourced within our group, so to exploit economies of scale" (large company, transport means).

"We have a global supplier network for our factories, including our subsidiaries. We have Indian suppliers that supply Vietnam, Chinese suppliers that supply Italy. Where we find availability, where we find the service, we go to buy. We have seen that it is worth it. Obviously duties, transport, logistics costs are all aspects that are taken into consideration, but finally we made a choice, and it pays back" (large company, transport means).

"If we talk about stable or well-defined technologies I don't see huge problems in having a global supply chain. For example, for sourcing carbon fibers it is a forced choice because there are only two manufacturers, and they are both Japanese. So it's about deciding which kind of raw material for the fiber we want, because they are different. Then, once chosen, it is necessary to ensure that the quality and quantity of the supply are in line with what we require. But in many other cases, partly because the suppliers are small, in my opinion a subcontracting chain too far from us does not help. Especially for companies that want to be lean, like ours, I prefer a close supply chain. Sometimes the supply management of certain components can be critical, and proximity certainly helps to overcome these drawbacks" (large company, transport means).

45. "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.

46. The share of R&D costs on turnover is, on average, between 2.5 and 2.8 per cent (respectively for household/professional appliances and transportation means, table 2), 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.

47. Interactions 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.

48. In order to provide some insights on the degree of “explicit co-ordination” in IPNs, 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 8). Moreover, the degree of co-ordination seems to be higher between the interviewed lead firms and Italian suppliers (69-83.6 percent), compared to interaction with foreign suppliers (51.5-65 percent). 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 percent) and foreign customers (86.7 percent).

Co-ordination between lead firms and suppliers

“We design the products and then assemble them, more in some product categories than in others. Our production cycle is mostly assembly and the sourcing of components is largely customized: we carry out the project and then ask suppliers to realize the components for us” (large company, electrical appliances).

“With several foreign suppliers the type of contractual relationship depends more on co-operation: it is a collaborative relationship of co-design rather than simply acquisition of intermediate goods. In other cases we design and then have the components made by the suppliers according to our drawing. We also buy standard components but this is less relevant in percentage terms” (SME, electrical appliances).

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

Source: ITA based on data collected during the interviews.

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 9). 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 10).

49. 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 their bargaining power vis-à-vis their clients, and contributes in reducing the risk of being replaced by competitors, as partnering with leading companies generates for the latter a higher "replacement cost".

Substitution-cost of suppliers

"The cost of replacing a supplier, especially the main one, is a significant cost. In order to change a supplier, I have to spend almost a year to define the classifications, the types of the various product models, and have them tested" (SME, electrical appliances).

"Changing suppliers is not easy and we try to avoid changing them. The choice of suppliers is strategic, and it is unthinkable to change the product that I stock from one day to the next. There is also a certification problem: I must make sure that it complies with the safety standards. Then, I can't change anything unless it is accepted by the customers, and there must be an economic advantage to be accepted by them, but I still have to make all the evaluations. So, the decision to change the component that I purchase from my main supplier is an important decision" (SME, electrical appliances).

50. 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.

51. 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 emerge in 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. Whereas 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.

52. 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 11).

How to support firms' participation in international production networks

53. 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 between SMEs and large companies, due to the fact that the latter are often better organized to face internationalization barriers (sunk costs, information asymmetries) and to expand on foreign markets.

54. Supporting firms' participation in 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.).

55. Considering specifically business assistance, one may note that some countries offer in addition 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.

56. 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.

57. 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 reduce the costs of sourcing parts and components. This scouting process is very expensive and time consuming. Therefore – according to the interviews – TPOs could play a very useful role in identifying local suppliers, especially in emerging countries.

58. From the standpoint of supply chain leaders, it is also important to support – even financially – Italian suppliers potentially interested in investing in foreign markets near the production facilities of their clients (follow-the-client-strategy). In fact, companies supplying intermediate goods often lack adequate resources to deal with complex forms 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.

59. According to several (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 labour, but regard the regulatory environment, an excessive bureaucracy or difficulties related to the number of institutions involved.

60. Most of the services offered by the Italian Trade Agency 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.

61. 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 its 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 universities and manufacturing companies. Since 2004, the project has mainly concerned digital activities, with the creation of two portals: the first one offers the possibility for registered companies to create a virtual showcase in which to present their business and look for new clients. The second is a “virtual fair”, with on-line exhibition spaces and the possibility of uploading and presenting a wide range of online content (catalogues, company brochures, audio and video presentations etc.).

62. In future, support to suppliers could be extended to include again joint participation of Italian producers in 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 network of the Italian Trade Agency.

Support to match suppliers with lead firms

"If we were to open a production plant, for example in Russia, it would be necessary to carry out a considerable scouting activity and to evaluate the quality of the suppliers. If there was a pre-acquired competence *[of an institution]* it is clear that this would be of valuable support. It also depends where: opening a factory in Europe, like in France, Germany or Poland would allow you to contact the same suppliers, and - as you have seen - we have many foreign suppliers. Many are German, so if I open the plant in Germany I will have the same supplying firms. But if my relocation is cost-driven and I want to go to distant countries, with very low costs, scouting suppliers becomes a long and expensive process. Anything that can support or shorten the list of potential suppliers is positive" (large company, transport sector).

"In the electrical appliance sector, the importance of co-localization between supplier and manufacturer of final goods is less marked than in the automotive sector. However it is an important factor, particularly for those supplies that have high transportation costs. The company often asks its suppliers to locate near their foreign factories. In fact it is not easy to find in foreign markets suppliers of the qualitative level as in Italy. It would therefore be absolutely useful to have a public intervention that could support suppliers who intend to invest in other countries to follow client companies, thus helping them to overcome entry barriers, first of all financial ones. Policies need to effectively support the internationalization strategies of Italian suppliers. If measures are partial or too limited over time, they could encourage the launch of FDIs, but they would not be effective (large company, electrical appliances sector).

"As part of a large group, it's clear that someone is scouting abroad for suppliers. We have to consider that this activity is systematically done in China, India, Vietnam. We look for suppliers also for secondary components and this can be possible for a group of our size. In the case of a smaller company, a similar service [*provided by an institution*] could be useful and supportive, since this scouting activity entails considerable costs. For example, to send a team for one or two months to China to meet the government and to look for suppliers represents a significant burden for a small company (large company, transport sector).

Conclusions 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 IPNs, 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. In particular, processed intermediate goods are considered separately from primary intermediates and we focus on processed ”specific” intermediate goods. A new “index of relative position” helps analyse the international distribution of business functions 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 IPNs, 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 studies highlight the role of the procurement business function: sourcing from independent suppliers (both national and foreign) is a relevant aspect of the production process, representing 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” among firms participating in IPNs, and highlights the relevance of co-projecting and co-design activities (and similar) in producing final goods. Their results show that traded inputs are more often customized 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 grasp the opportunities offered by 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 outward FDI, in order to allow Italian companies to follow their customers in foreign markets, and regarding inward 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 - Case studies on electrical appliances, means of transportation and sub-suppliers: interviewed firms by size

	Micro	Small	Medium	Large	Total sample
			Electrical appliances		
Number of employees	*<10*	*10-49*	*50-249*	*≥ 250*	
Number of firms	0	1	4	5	10
Turnover (million euro)	*<2*	*2-10*	*10-49*	*≥50*	
Number of firms	0	1	3	6	10
			Means of transportation		
Number of employees	*<10*	*10-49*	*50-249*	*≥ 250*	
Number of firms	0	1	0	9	10
Turnover (million euro)	*<2*	*2-10*	*10-49*	*≥50*	
Number of firms	0	1	0	9	10
			Sub-supplier		
Number of employees	*<10*	*10-49*	*50-249*	*≥ 250*	
Number of firms	7	16	1	4	28
Turnover (million euro)	*<2*	*2-10*	*10-49*	*≥50*	
Number of firms	10	11	3	4	28

Table 2 - Costs by business function. Percentage shares on total turnover

Business functions	Electrical appliances			Means of transportation			Suppliers		
	SMEs	Large firms	Total sample	SMEs	Large firms	Total sample	SMEs	Large firms	Total sample
Core functions									
Production/assembling of final goods	15,6	27,1	22,0	-	-	27,1	51,0	21,0	46,7
Sourcing of raw materials, intermediate goods and components	57,2	39,8	48,5	-	-	56,2	31,6	65,0	36,3
Support functions									
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 3 - Electrical appliances: business function costs by geographic location and organizational choice. Percentage shares of total turnover

		Italy			Abroad			TOTAL
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)	
Core functions								
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
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
Support functions								
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 4 - 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 functions						
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
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
Support functions						
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 5 - 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 functions							
Production/assembling of final goods	65,8	20,8	86,7	12,7	0,7	13,3	100,0
Sourcing of raw materials, intermediate goods and components	16,0	44,7	60,7	12,8	26,5	39,3	100,0
Support functions							
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 6- 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 functions					
Production/assembling of final goods	86,7	7,9	4,6	5,4	100,0
Sourcing of raw materials, intermediate goods and components	60,7	17,4	13,7	21,9	100,0
Support functions					
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 7 - 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 functions								
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
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
Support functions								
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 8 – 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 9 – 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 10 – 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 11 - 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)

	Percentage of positive answers (1)		importance	
ICT endowment	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	0,0	0,0		
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	0,0	0,0		
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	0,0	0,0		
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

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