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Dissecting Italian manufacturing:

sector, dimension and resource allocation in the last ten years

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Summary

After a prolonged and disappointing period, manufacturing productivity has relatively improved in Italy. It is a decade now that it has been increasing in line with Germany and France. Better manufacturing productivity helped to stop the long-lasting fall of the share of industrial value added and then to reverse it. This mainly reflected the biased productivity growth in the traded sector starting in 2009, a process similar to the one that has characterized Germany since the inception of the monetary union. A substantially stable specialization pattern has underlain productivity improvement. This sector composition stability, relative to competitors, reflected real technological comparative advantages that influenced the distribution of the firm population: there are more producers, compared to competitors, in sectors in which Italy has a comparative advantage. Contrary to sector specialization, no correlation is observable when considering size-class distributions of productive advantages and firms. Italian manufacturing is characterized by a relatively large population of micro-firms which present a comparative disadvantage. On the contrary, the size-classes where Italian technological advantages are the highest (medium and small sized firms) appear relatively low-populated. As a corollary, the breakdown of the Italian productivity gap with Germany highlights that size is the most important factor explaining the remaining distance. The productivity performance observed in the last decade has reflected the selection process among producers induced by global competition and the cleansing effects of the recessions. Italy lost more than 70.000 manufacturing firms between 2008 and 2016. The shrinkage was also accompanied by a substantial reshuffling in the population of producers. Recent evidence shows that reallocation of workers from less towards more productive firms sustained productivity. Information about exporting and non-exporting firms helps to point out that reallocation also involved an increase in the proportion of exporters characterized by a productivity advantage over domestic producers; a productivity premium that also rose somewhat in the observed period. Italian manufacturing came out smaller from the recessions, but also more efficient.

1. Not a glittering renaissance, but a prosaic adjustment

In early 2014, still in the heart of the Eurozone crisis, a catchy watchword made its appearance in European rhetoric: industrial renaissance. With this expression, the European Commission (EC, 2014) meant that manufacturing had to become the fulcrum of the next recovery in Europe. To this end, a wide-ranged set of policy actions was recommended in order to strengthen the so-called industrial competitiveness. The aim was to stop the decline of manufacturing and bring its share back from about 15% of European total value added, as it was at the time the renaissance era had been conceived, to as much as 20% by 2020. As strange as it was to set a quantitative objective for industry dimension with a vague central-planning flavor, the fact that political leaders of European countries each tended to present the pursuit of such a structural shift as referred to the countries' own economy was even more bizarre. Sticking to this interpretation, it implied that countries like France, Italy and Spain had to simultaneously enlarge the share of their manufacturing sector (which at the time was 10-15% of respective value added) and become more similar to Germany, which, in contrast to their experience, had registered no industrial decline. On the contrary, this economy had been characterized since the euro adoption by a surging share of manufacturing value added (from 21 to 23%). Symptomatic of the peculiar zeitgeist of the period was the fact that the employers' associations of the two economies with the strongest manufacturing sector (German BDI and Italian Confindustria), which were actually competing for market shares, signed a joint appeal calling for policies supporting European industry.[1] This was peculiar since if an appeal had to be underwritten at the time, it should have been one of Italy with the Eurozone's periphery countries that were struggling to regain competitiveness in order to call for a symmetric rebalancing of intra-area competitive gaps with a more substantial contribution by Germany (that is, with an adequate increase of its wage and price levels).[2]

No matter how catchy the watchword was, it was fundamentally flawed. First, it did not get to grips with the actual changes of the economic geography within the monetary union. Much in accordance with the predictions made by Paul Krugman as far back as in the early 1990s (Krugman, 1993), manufacturing growth in the Eurozone was a diverging process, with an increasing concentration of production in the core country: Germany constituted 40% of the whole Eurozone manufacturing value added (starting from 35% in 1999) and absorbed as much as 35% of the production capacity (starting from less than 30%).[3] Second, it did not consider intrinsic inconsistencies of the objective of pursuing a larger manufacturing sector (in the aggregate EU and across member countries) with basic macroeconomic constraints. Due to the natural trends of de-industrialization[4] and the globalization shocks (the appearance in world trade of a huge new player such as China, which had formerly been absent) the weight of manufacturing in the value added of the advanced economies as well as their share in world industrial production had to shrink. European governments had hence to lean against strong winds to pursue the project of industrial renaissance. And since the expansion of manufacturing in mature economies can only rely on increasing net exports (that is, rising trade surpluses), the promotion of industrial competitiveness would fatally imply pursuing beggar-thy-neighbor policies, mainly in the form of real exchange rate depreciations (both between the member countries and vis-à-vis the rest of the world).[5]

[1] See the joint appeal of BDI and Confindustria "Let the EU relaunch Industry", March 18, 2014.
[2] For recent discussions on competitiveness imbalances and the asymmetric adjustment within the Eurozone see Micossi, D'Onofrio and Peirce (2018) and De Nardis (2018).
[3] In value terms; estimates of the distribution of manufacturing capacity in the Eurozone are in De Nardis (2015a).
[4] See Baumol (1967), Baumol et al.(1966) and Rowthorn and Wells (1987).
[5] On the beggar-thy-neighbor implications of the manufacturing targeting in mature economies see De Nardis (2015b.)

There was actually no industrial renaissance in the following years and, accordingly, the watchword fell into oblivion. The recovery from the European recession was indeed driven by manufacturing production. Yet this was not so much the outcome of policy initiatives supporting industrial competitiveness as the reflection of global trends: manufacturing was rebounding in Europe as in the rest of the world. Mainly as a result of this, the weight of the industrial sector within the European economies stopped declining and it has even increased slightly since 2014. In the Eurozone as a whole the manufacturing share surged to as much as 17% in 2018, but excluding Germany it rose only modestly, to 15%. As a matter of fact, the industrial recovery in Europe was not accompanied by any significant geographic redistribution of manufacturing productions away from the core country and towards the periphery economies: Germany still produced in 2018 about the same share of Eurozone value added and was home to the same share of Eurozone manufacturing capacity as in 2014.

However, the absence of a policy-induced renaissance in no way signified structural inertia. Quite the contrary, the efforts to correct within-area competitiveness gaps and the selection impulses brought about by the two recent recessions gave rise to relevant changes in the manufacturing sector that were largely in the form of a spontaneous adjustment. This differed in intensity across countries, differentiating performances and final outcomes. In this paper we focus on the Italian performance relative to the main Eurozone partners. Italian manufacturing was characterized by a slow adaptation to the big changes that took place in the global environment at the turn of the century and that affected specifically the Italian economy due to its specialization (the China shock, the single currency, the expiration of the multifiber agreement that gave protection to lower-quality productions). The manufacturing sector was emerging from these shocks when it suffered a new serious setback due to the financial crisis (2008-2009) that hit the traded sector through the huge collapse of world trade. Since then Italy's manufacturing performance appear to be gradually improving, cancelling the lags with the main Eurozone partners that had characterized the initial period of the monetary union. We try to dissect the main characteristics of this adjustment, defining it prosaic (as opposed to the more glittering expectations raised by the renaissance project) because it was mainly market driven and it was not new in the Italian manufacturing experience, which had already shown analogous forms of spontaneous adaptation in the past at every new turn of the globalization process.[6] In the remaining part of the paper we first discuss the de-industrialization trend and the recovery of manufacturing productivity (section2). We then investigate the changes that occurred in firm distribution according to their sector specialization and size-class (section 3). We finally discuss the evidence for the firm-level changes underlying the productivity developments, pointing out the role played by resource reallocation in sustaining the overall efficiency of the sector (sector 4).

2. De-industrialization, re-industrialization and productivity

2.1 When Italy began to emulate Germany

A convenient starting point for the analysis is the examination of how the share of manufacturing in the economy (that is, the target of the renaissance supporters) changed over a sufficiently long period. In particular, this share is analyzed for Italy and Germany over a time span (1990-2018) embracing the periods before and after the adoption of the single currency (figs. 1A-1F).

[6] See the discussion in De Nardis and Trau' (2005) and Arrighetti and Traù (2013).

Observing the weight of manufacturing employment, in terms of both working hours and number of persons employed, it emerges that the de-industrialization process was a common phenomenon for Germany and Italy since the early 1990s. It was also experienced by both countries with similar intensity, at least until 2009 (figs. 1A-1B). In that year, when the collapse of world trade hit the manufacturing sector more severely than the rest of the economy, there was a more pronounced downward shift of the Italian share of industrial employment than the German one. Moreover, after 2009 the trend of employment share in manufacturing stopped declining in Germany (in fact, it even rose slightly in terms of hours worked), while it continued relentlessly in Italy, at least until the last couple of years. Therefore, from the employment perspective, a divergence in the de-industrialization process of Italy and Germany arose only after the world-trade shock of 2009, when German de-industrialization stopped.

The real difference in the industrial performance of the two countries appears striking when observing the share of manufacturing value added, both at current and constant prices (figs. 1C-1D).[7] According to this measure, Germany experienced, since the adoption of the single currency, no de-industrialization at all. Actually, the weight of German manufacturing even increased in volume terms since 1999 (from 21 to 24% in 2018). Therefore, far from de-industrializing, Germany re-industrialized during the monetary union period. This was quite abnormal for a mature economy, given the natural tendency to increase the demand for services by affluent consumers of rich economies, as Germans are, and the shock to the manufacturing sector of advanced economies induced by China's integration in world trade following its 1999 WTO accession.

German re-industrialization implied an enlarging external surplus which was made possible by significant and persistent misalignments of the real exchange rate both within the Eurozone and vis-à-vis the rest of the world. As argued in De Nardis (2018), the persistent undervaluation of the German real exchange rate was actually the outcome of the combination of three elements: the absence of an exchange rate within the monetary union (and a weak exchange rate for Germany vis-à-vis non-member economies), wage restraint and unbalanced productivity growth in the traded (manufacturing) sector. This latter element of real undervaluation helps explain the observed coexistence in Germany of value-added re-industrialization and employment de-industrialization. The gap between these two phenomena reflects precisely the biased productivity growth in the manufacturing sector that Germany experienced in the euro years (and shown in figs. 1E-1F).[8]

In light of the above, it can be said that the German experience of value added re-industrialization, since the single currency inception, was indeed a successful experience of industrial renaissance, although it was realized in only one country. Or rather, putting it bluntly, it was a successful experience precisely because it was realized in only one country.

Concerning Italy, the share of the manufacturing value added of this country had been declining almost monotonically until 2009 (figs. 1C-1D)- a fall that was in line with the observed decrease of the weight of manufacturing employment. The joint fall of employment and value added shares of the manufacturing sector pointed to a squeezing of the industrial sector mainly due to a

[7] ESA-2010 volume (constant prices) value added in fig. 1C is considered as chain-linked volume at 2005 basic prices (and not at 2010 basic prices as in national accounts) for sake of comparison with ESA-1995 classification whose volume value added is chain linked at 2005 prices.

[8] The link between relative productivity and (employment and value added) de-industrialization is provided by the following relationship $\frac{Manufacturing\ productivity}{Economy\ productivity} = \frac{Manufacturing\ value\ added}{Economy\ value\ added} : \frac{Manufacturing\ employment}{Economy\ employment}$

competitive deterioration that was related to both globalization and intra-Eurozone industry relocation.

Fig. 1A - Manufactuting: employment share in the economy (working hours)

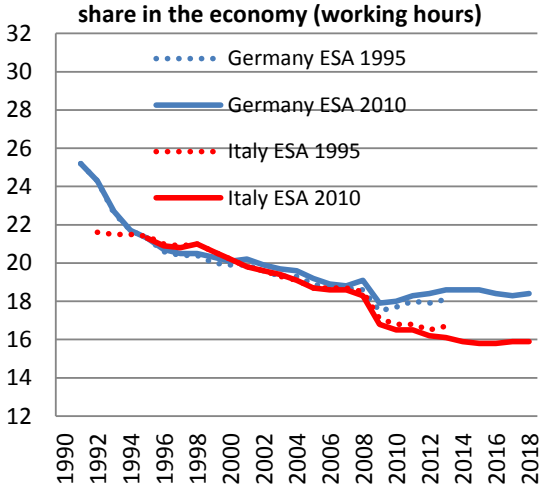


Fig. 1B - Manufacturing: employment share in the economy (persons)

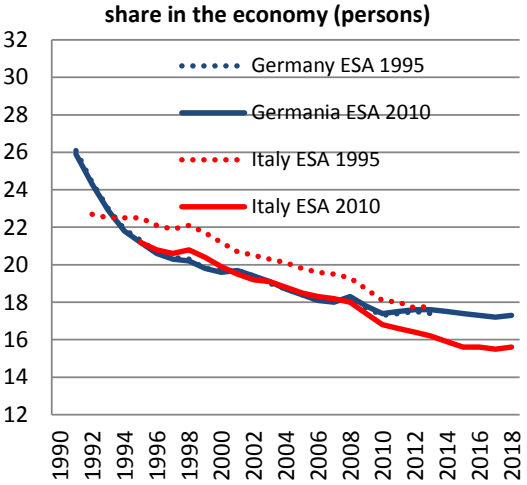


Fig. 1C - Manufacuturing: value added share in the economy (current prices)

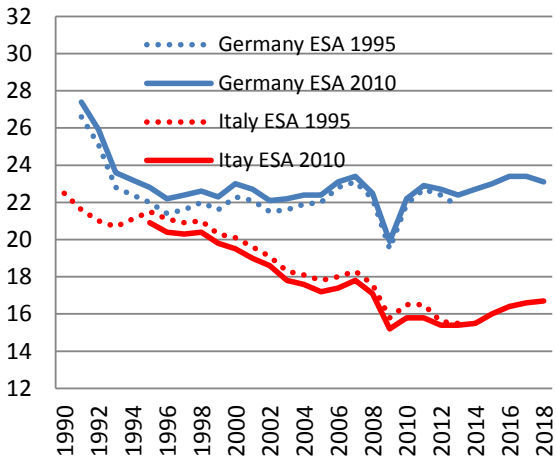


Fig. 1D - Manufacturing: value added share in the economy (volume)

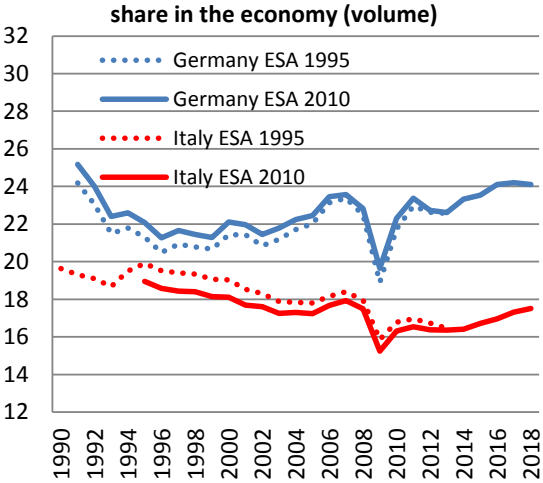


Fig. 1E - Value added (volume) per hour: manufacturing/total economy

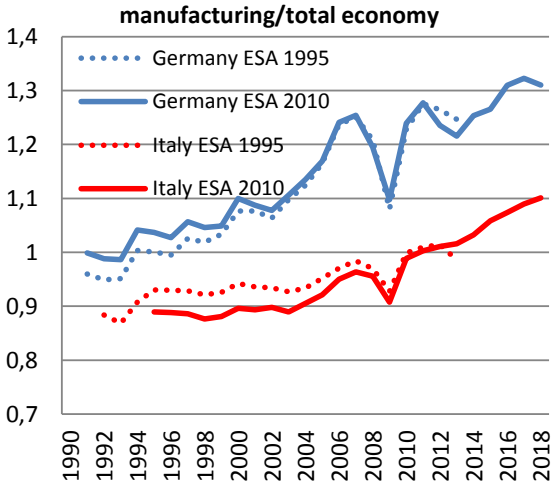
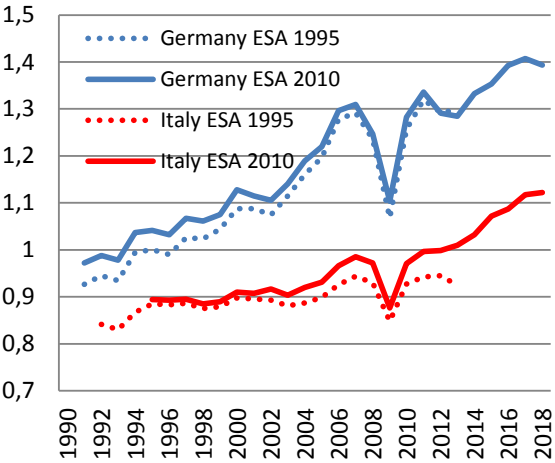


Fig. 1F - Value added (volume) per person: manufacturing/total economy



Source: computations based on Eurostat data

The declining process stopped in 2009 when the manufacturing share in the Italian economy started rising slightly. This gradual upward movement continued throughout the whole following decade. In volume terms, the manufacturing share in the Italian economy shrank from 18% in 1999 to as low as 15% in 2009, and subsequently went up to 17.5% in 2018, recovering part of the lost ground since the start of the monetary union. The gradual recovery of the industry share occurred concomitantly with the continuing decline of the weight of industrial employment and, analogously to Germany, it reflected a relative acceleration of the Italian manufacturing productivity, which increased substantially more than in the rest of the economy.

It can be said that in the effort to regain competitiveness Italy started to emulate Germany in 2009, registering a biased productivity acceleration in the traded sector, with an intensity similar to the unbalanced growth that characterized the German economy in the same period (figs. 1E-1F). The emulation was nevertheless partial since wage restraint- another element of German success - was substantially less stringent than in the German case.

2.2 Data revisions and the belatedly perceived productivity improvement

The improvement of Italian manufacturing productivity usually goes somewhat underrated in many assessments of the industrial situation. The perception of a weaker performance than what actually happened may partly be related to the rather dismal estimates of Italian productivity that came out from the preliminary and provisional releases of the national accounts. These estimates were systematically and significantly revised upwards in the subsequent definitive data. Yet, perceptions seem to be affected by first releases rather than by lagging revisions that pass largely undetected, especially by media commentators. Nevertheless, the picture of manufacturing performance of the last years is strikingly different when comparing the productivity behavior based on provisional first estimates and the one arising from the final figures (see table 1 for annual changes and fig. 2 for quarterly data).

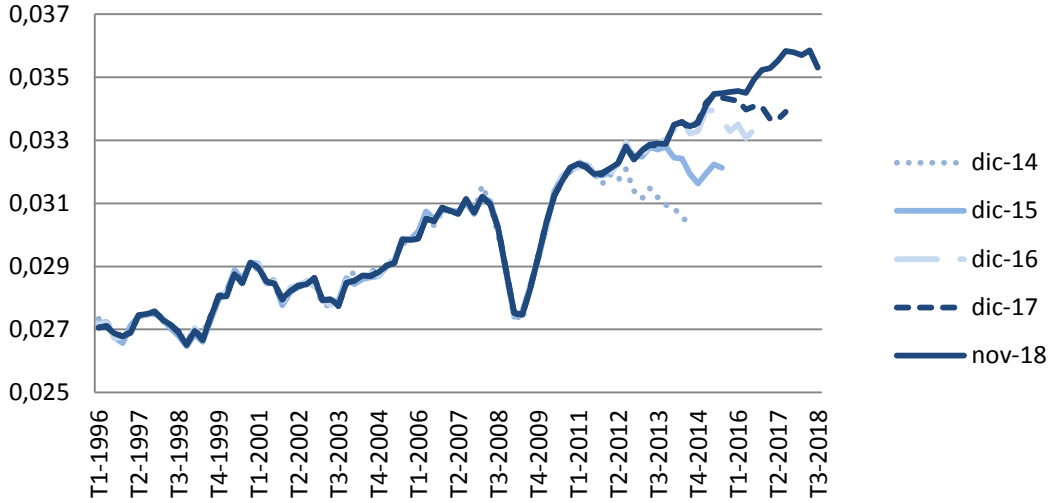
Table 1 - Italian Manufacturing: hourly productivity (value added in volume per hour worked), according to end-of-year releases of the annual national accounts (% change)

Release date	2012	2013	2014	2015	2016	2017	2018
October-2014	-1,0	-1,6					
September-2015	1,1	1,0	-1,9				
September-2016	1,1	1,4	1,6	1,2			
September-2017	1,1	1,4	2,0	2,6	-0,9		
September-2018	1,1	1,4	2,0	2,9	0,9	2,2	
March-2019[1]	1,1	1,4	2,0	2,9	0,9	2,0[1]	0,6[1]
Revision size: latest release (March 2019)- oldest release in the table	2,0	3,0	3,8	1,7	1,8	-0,2[1]	-
-contribution of value added revision (% of total)	*27,7*	*39,8*	*35,3*	*87,5*	*76,4*	*34,1[1]*	-
- contribution of labor input revision (% of total)	*72,3*	*60,2*	*64,7*	*12,5*	*23,6*	*65,9[1]*	-

[1]For the sake of completeness, the last release of the annual national accounts (March 2019) that provides information on 2018 is inserted in the table. However, March estimates on both 2017 and 2018 are provisional as they do not incorporate the full set of information on business outcomes (Frame-SBS register), which will be available in September 2019 and September 2020, respectively for 2017 and 2018.

Source: computations based on Istat data.

Fig. 2 - Italian manufacturing: quarterly value added (volume) per hour according to end-of-year releases of the quarterly national accounts



Source: computations based on Istat data.

The main piece of information leading to such large revisions is constituted by the final and complete set of information on business outcomes (drawn from the FRAME-SBS register) that become available in September of each year, with a year and a half delay with respect to the corresponding first estimates. Actually, the ample differences of productivity estimates between provisional and final releases suggest that a relevant part of the Italian productivity improvement experienced by manufacturing in the last period has to be related to changes in the segment of lower-size firms (more on this in section 4). As a matter of fact, information on smaller firms is precisely that collected with longer lags and whose delayed availability affects mostly the revisions. Furthermore, it is interesting to note that the breakdown of the revisions (last two rows of table 1) highlights that the underestimation of manufacturing productivity in provisional estimates was brought about not only by underestimations of the numerator (volume value added), but also by significant overestimations of the denominator (hours worked).This means that the consequences of the incomplete sets of information in provisional data were pervasive, affecting both the output and input measures. Estimation errors of the two variables did not compensate each other. On the contrary, they cumulated, giving rise to temporarily, but significantly, misleading pictures.

2.3 Alignment to German and French performance

We end this section by underlining that the productivity improvement brought the Italian manufacturing performance broadly in line with Germany and France, closing the growth gaps detected since the half of the 1990s. On this issue it is, however, worth noting that international comparisons of national accounts in volume terms are made uncertain by several factors, primarily, but not only, by the methods of estimation of deflators that differ quite substantially across the national statistical agencies (see the recent analysis of Romano and Traù, 2019). This is particularly the case of France, whose estimates of chain-linked manufacturing value added appears to be affected by the estimated low dynamics of the deflator, although also a comparison

with Germany seems conditioned by statistical uncertainties on deflation methods, particularly in the first few years of the monetary union.[9]

Yet, even disregarding the issues of comparability, it appears that it is about a decade now that Italian manufacturing productivity stopped the relative deterioration that had characterized the former years and is currently evolving, in volume terms, in line with Germany and France (fig. 3A). The un-deflated (current prices) productivity measure shows a substantially less negative performance even in the preceding period (fig. 3B)

Fig. 3A - Manufacturing, hourly productivity: Italy/Germany and Italy/France (VA in volume)

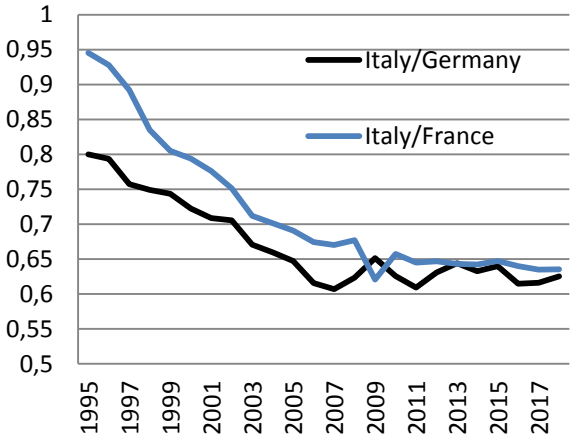
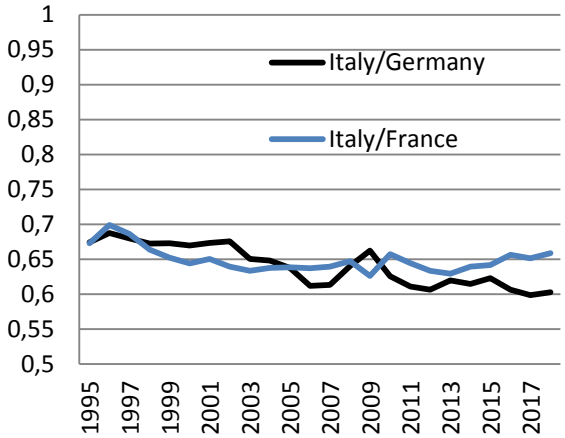


Fig. 3B - Manufacturing hourly productivity: Italy/Germany and Italy/ France (VA at current prices)



Source: computations based on Eurostat data.

The following sections study the underlying features in the behavior change of Italian manufacturing productivity with respect to firms' specialization, firms' dimension and allocation of resources.[10]

3. Specialization, size and productivity

3.1 Sector distribution of firms and productivity

The productivity improvement of Italian manufacturing in the last decade does not seem to have involved significant changes in the specialization pattern of the economy. Figure 4 shows a specialization index (Balassa index of revealed comparative advantage) of Italian value added in manufacturing sectors compared to the EU aggregate in 2008 and 2016 (last data available). This index, based on business-level value-added data, is appropriate to define sector comparative advantages and disadvantages as it reveals the cross-sector allocation of national resources (labor

[9] One source of difference is related to the export deflator. Italian national accounts link, since 2002, the estimate of the export deflator to the producer price index in non-domestic markets; before 2002 there was no such link. Hence, the Italian export deflator has moved in a (quasi) 1-to-1 relationship with producer prices in export markets since 2002. This is not the case in the other economies. Not only France, but also Germany and Spain show, up to 2005, an undervaluation of the export deflator relative to (export) producer prices. This different method of deflation tends, for that period, to overvalue export volume estimates in those countries and to undervalue them in Italy.

[10] Many authors have addressed the issue of Italian productivity, also dealing with the manufacturing sector; see the ample survey by Bugamelli, Lotti at al. (2018) and the recent survey by De Santis and Ferroni (2019).

and capital measured by their remuneration) relative to the correspondent allocation experienced in the other EU economies.[11]

For ease of interpretation, the index values in the figure are presented in descending order from the sector that in 2008 had the largest advantage (*tanning and dressing of leather; manufacture of luggage, handbags, etc.; dressing and dyeing of fur*) to that with the lowest (*manufacture of consumer electronics*). As can be seen, the ranking of sector comparative advantages and disadvantages vis-à-vis EU hardly changed in 2016 with respect to 2008. Though some movements of specialization in specific sectors may also be discernible. Hence, to better define what actually happened to the specialization pattern, Table 2 complements the information provided by the figure by showing in detail the sectors that in 2016 confirmed the specialization and de-specialization they had 2008, those that reinforced their initial position and those that changed it gaining or losing a comparative advantage. As the table shows, most sectors were characterized by stable specialization/de-specialization conditions.[12] Furthermore, a number of sectors, involving both traditional productions and manufacture of investment goods, strengthened their initial specialization. There were indeed cases of changing specialization, yet they regarded a limited number of sectors with a modest weight in manufacturing value added: they represent 10% of total value added in 2016 (6% for the sectors that gained a comparative advantage, 4% for those that lost it).

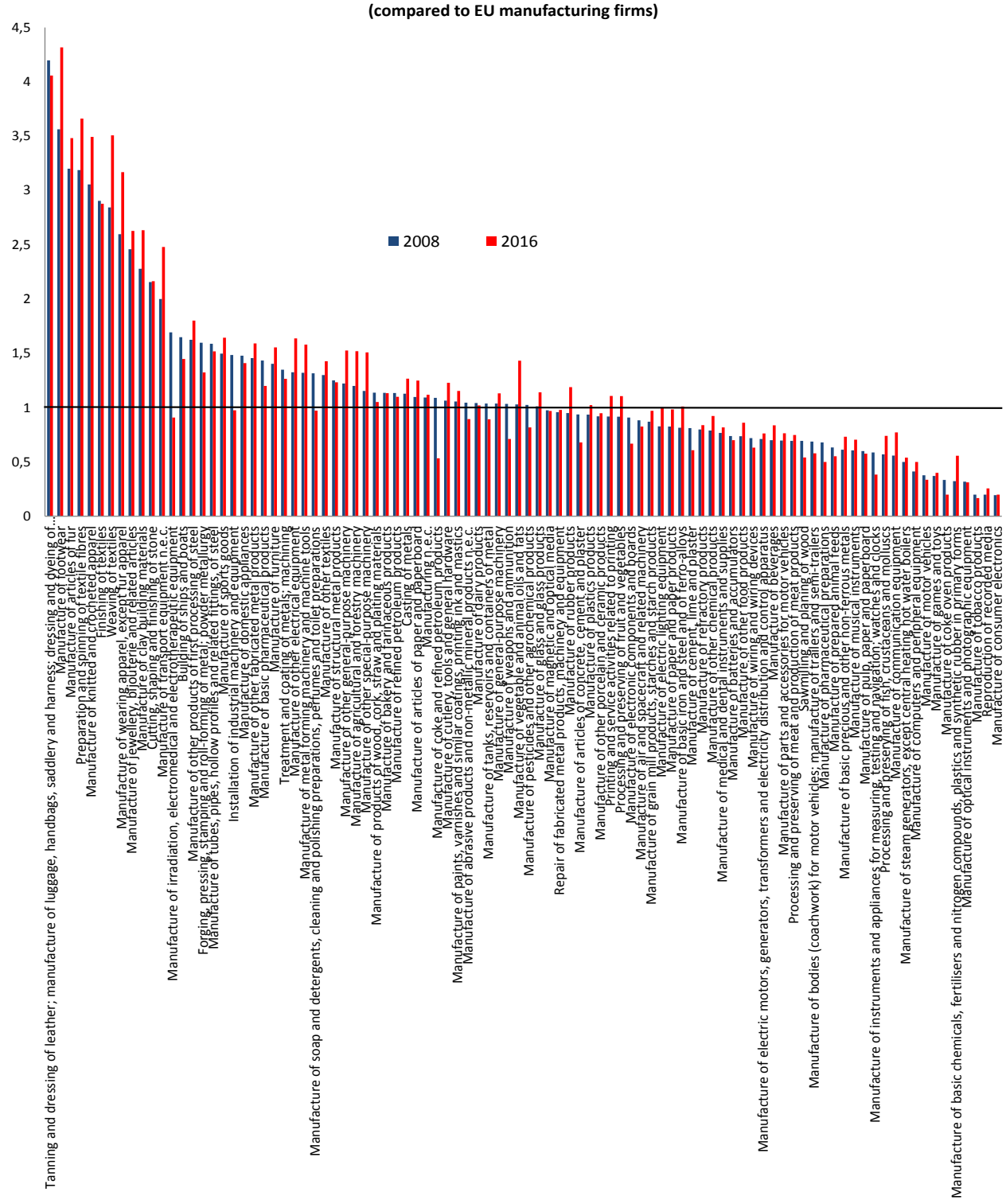
The fact that most sectors, covering as much as 90% of total manufacturing value added, confirmed or even reinforced in 2016 the position of advantage/disadvantage they had in 2008 signals a profoundly rooted pattern of specialization supported by essential technological advantages/disadvantages. We see this in year 2016. In Figures 5A, 5C and 5E the Balassa index of Italian revealed comparative advantages in 2016 is plotted against a measure of Ricardian technological comparative advantages (that is, relative productivity). This is done considering Italy's position towards the three main Eurozone partner countries, namely Germany, France and Spain.[13] The figures show that: *a)* the clouds of points (corresponding to sectors) are placed around upward-sloped lines and; *b)* they populate most densely the S.-W. and N.-E. quadrants of the graphs, that is, those quadrants where both indexes are either lower than 1 (0 in log terms in the figures) or are higher than 1 (0 in log terms). Hence, revealed comparative advantages (Balassa indexes) increase with technological comparative advantages (Ricardo indexes) and the frequency of abnormal combinations of the two indexes (revealed comparative advantage in sectors where there is no technological advantage and vice versa, that is, points in N.-W. and S.-E. quadrants) is relatively low. In other words, revealed comparative advantages vis-à-vis Eurozone countries are for real: they mirror a Ricardian specialization pattern.

[11] The index is expressed as $B_i = \frac{VA_i/VA_{tot}}{VA_i^*/VA_{tot}^*}$, where ***VA*** and ***VA**** are respectively the value added of Italian and EU firms in sector ***i*** and total manufacturing. When $\boldsymbol{B_i}$>1, it reveals a comparative advantage of Italian firms in sector ***i*** (the opposite when $\boldsymbol{B_i}$<1)**.** Computations are based on Eurostat Structural Business Statistics, at the 3-digit level of disaggregation of the classification NACE Rev.2; about 100 manufacturing sectors are considered.

[12] In table 2 the specialization of a sector is defined stable if $\boldsymbol{B_i}$ changed, between 2008 and 2016, within an interval of $\pm 0{,}2$. The choice of the interval is clearly arbitrary, however, it does not affect the cut-off line between sectors that changed specialization and those that did not, this threshold being uniquely defined by $\boldsymbol{B_i}$ crossing the unit value.

[13] The bilateral Balassa index is defined in figs. 5A, 5C and 5E as in footnote 11, with the only difference that the reference country is represented, from time to time, by Germany, France and Spain. The Ricardo index of comparative advantage is constructed similarly. It is defined as $R_i = \frac{\Pi_i/\Pi_{tot}}{\Pi_i^*/\Pi_{tot}^*}$, where Π and Π^* are respectively the productivity (value added per person employed) of Italian firms and partner-country firms in sector ***i*** and total manufacturing. In these figures both the Balassa and Ricardo indexes are taken in natural logs to allow for non-linearities characterizing the two measures.

Fig. 4 - Sector specialization of Italian manufacturing firms in terms of value added (compared to EU manufacturing firms)



Source: computations based on Eurostat data

Table 2 – Evolution of sector specialization of Italian manufacturing firms vis-à-vis EU firms, 2008-2016		
Confirming specialization	***Increasing***	***Stable***
	-Manufacture of footwear -Manufacture of articles of fur -Preparation and spinning of textile fibers -Manufacture of knitted and crocheted apparel -Weaving of textiles -Manufacture of wearing apparel, except fur apparel -Manufacture of clay building materials -Manufacture of other electrical equipment -Manufacture of metal forming machinery and machine tools -Manufacture of other general-purpose machinery -Manufacture of vegetable and animal oils and fats	-Tanning and dressing of leather goods; dressing and dyeing of fur -Finishing of textiles -Manufacture of jewelry, bijouterie and related articles -Cutting, shaping and finishing of stone -Manufacture of transport equipment n.e.c. -Building of ships and boats -Manufacture of other products of first processing of steel -Forging, pressing, stamping and roll-forming of metal; powd. Metal. -Manufacture of tubes, pipes, hollow profiles, fittings of steel -Manufacture of sports goods -Manufacture of domestic appliances -Manufacture of other fabricated metal products -Manufacture of basic pharmaceutical products -Manufacture of furniture -Treatment and coating of metals; machining -Manufacture of other textiles -Manufacture of structural metal products -Manufacture of agricultural and forestry machinery -Manufacture of other special-purpose machinery -Manufacture of products of wood, cork, straw and plaiting materials -Manufacture of bakery and farinaceous products -Casting of metals -Manufacture. articles of paper, paperboard. -Manufacturing n.e.c.

		-Manufacture. of cutlery, tools and general hardware -Manufacture. of paints, varnishes, similar coatings, print. ink, mast. -Manufacture. of general-purpose mach. -Manufacture of glass, glass products

Table 2, continued

Confirming de-specialization	***Increasing***	***Stable***
	-Manufacture of articles of concrete, cement and plaster -Manufacture of electronic components and boards -Manufacture of cement, lime and plaster -Manufact. of instr. appl, for meas. test. navigat.; watches, clocks	-Repair of fabricated metal products, mach. and equipment -Manufacture of plastics products -Manufacture of other porcelain and ceramic products -Manufacture of air and spacecraft and related machinery -Manufacture of other chemical products -Manufacture of medical and dental instruments and supplies -Manufacture of other food products -Manufacture of wiring and wiring devices -Manufacture of parts and accessories for motor vehicles -Processing and preserving of meat and product. of meat prod. -Sawmilling and planing of wood -Manufacture of bodies for motor vehicles; trailers and semi-trailers -Manufacture of pharmaceutical preparations -Manufacture of prep. animal feeds -Manufacture of basic precious

		and other non-ferrous metals -Manufacture of musical instruments -Processing and preserving of fish, crustaceans and mollusks -Manufacture of communication equipment -Manufacture of motor vehicles -Manufacture of basic chemicals, fertil,plast. and synth.rubber -Manufacture of paper products -Manufacture of optical instruments and phot. equipment -Reproduction of recorded media -Manufacture of consum. Electronics
Changing specialization	***Acquired***	***Lost***
	-Printing and service activities related to printing -Processing and preserving of fruit and vegetables -Manufacture of electric lighting equipment -Manufacture of basic iron and steel and of ferro-alloys	-Manufacture of irradiation, electrom., electrother. Equipment -Installation of industrial machinery and equipment -Manufacture of soap, detergents, clean. polish. prepar., perfumes -Manufacture of coke and refined petroleum products -Manufacture of abrasive prod., non-metallic min. products n.e.c. -Manufacture of tanks, reservoirs and containers of metal -Manufacture of weapons, ammunit. -Manufact. of pesticid., agroch prod.

Moreover, it can be pointed out that the natural consequence of the configuration of comparative advantages is a sector distribution of the population of firms which is in accordance with the intensity of specialization: the stronger the latter, the higher is the relative number of Italian firms

in the sector in comparison with partner countries.[14] And, similarly to what was noted for the Balassa and Ricardian indexes, the abnormal cases (relatively more firms in sectors of comparative disadvantage and vice versa) have very low frequency. This is detectable with respect to each of the three considered economies (Figures 5B, 5D and 5F).

Fig. 5A - Italy vs. Germany: sector specialization and comparative advantages (manufacturing)

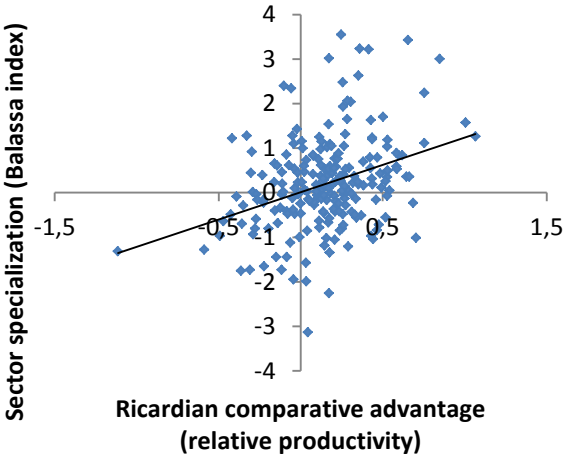


Fig. 5B - Italy vs. Germany: sector distribution of firms and specialization (manufacturing)

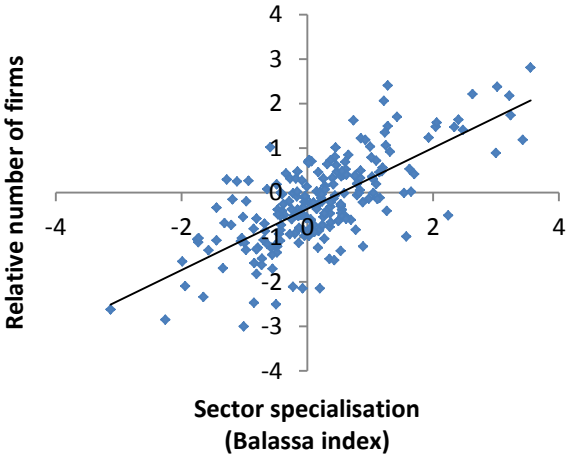


Fig. 5C - Italy vs. France: sector specialization and comparative advantages (manufacturing)

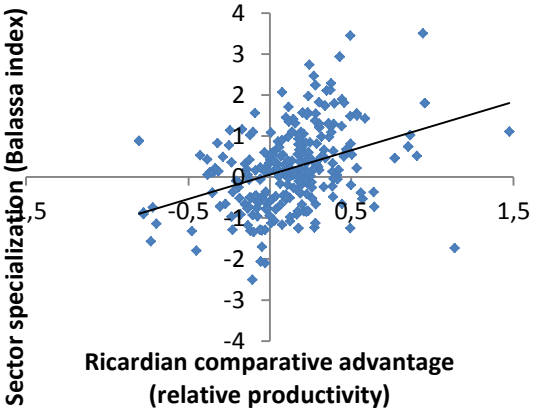
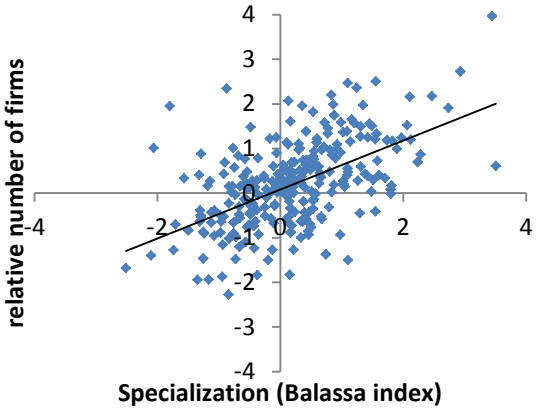


Fig. 5D - Italy vs. France: sector distribution of firms and specialization (manufacturing)



[14] In analogy with the ***B*** and Π indexes, in Figures 5B, 5D and 5F the relative number of firms is expressed as $N_i = \frac{N_i/N_{tot}}{N_i^*/N_{tot}^*}$, where ***N*** and ***N**** are the number of firms in sector ***i*** and total manufacturing. In these figures, the index of relative number of firms is taken in natural logs.

Fig. 5E - Italy vs. Spain: sector specialization and comparative advantages (manufacturing)

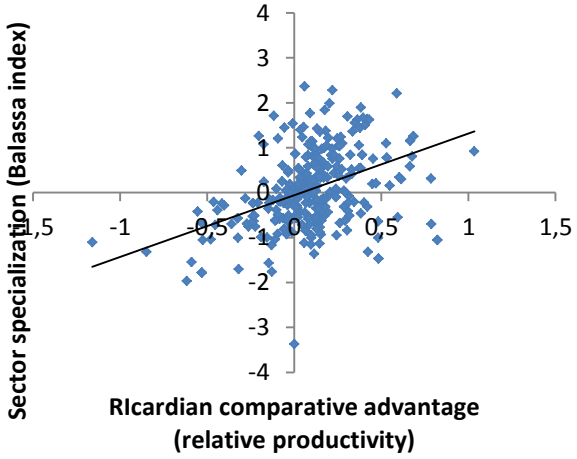
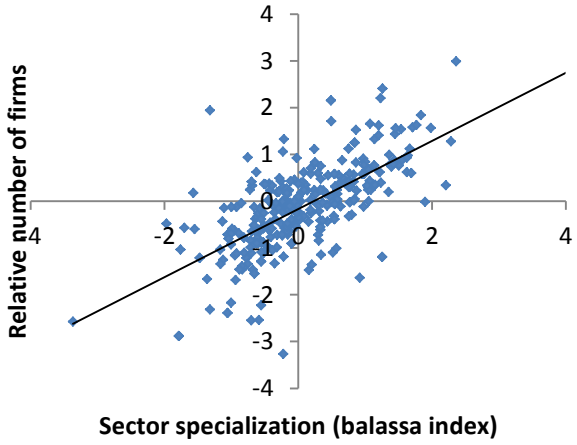


Fig. 5F - Italy vs. Spain: sector distribution of firms and specialization (manufacturing)



Source: computations based on Eurostat data

To sum up: a) Italian manufacturing specialization remained generally stable over the period of productivity improvement; b) with a relatively denser population of firms in the specialization sectors; c) these sectors were the ones in which Italian firms actually presented larger technological comparative advantages (i.e. they were relatively more productive) than their competitors in partner countries.

3.2. Size-class distribution of firms and productivity

The general consistency that is found when observing the distribution of Italian firms across specialization sectors blurs somewhat when firm distribution by size class is analyzed. We examine this point resorting to the Structural Business Statistics (SBS). Although this source is affected by issues of comparability, it represents the only and most complete official source of information about balance-sheet variables of European firms by size-class. [15]

Figures 6A-6F show the size-class productivity developments (measured by value added at current prices per person employed) of Italian manufacturing firms relative to the analogous firms of Germany, France and Spain. These comparisons - and in particular those with Germany and France - highlight quite clearly where Italian advantages and disadvantages are. Compared to Germany, Italy presents a productivity advantage in medium (50-249 persons employed) and small-sized firms (10-19 and 20-49 persons employed). Such advantages have even enlarged in the last few years sustaining the Italian relatively better performance in the latter period. Also compared to France, Italy's medium-sized firms stand out for a higher productivity, while advantages appear less pronounced for small-sized producers.

[15] Structural Business Statistics (SBS) are collected by national statistical agencies of EU member states under the Council Regulation (EEC) N. 696/93. As already mentioned, they are the only official source of information about size-class business variables in European economies and as such they are used in this analysis. Yet, it should be underlined that there are relevant uncertainties about the cross-country comparability of these statistics. Differences across member states in the way firms are defined as legal entities in their legal framework, in the identification of firms as statistical units and, more in general, in the interpretation and practical application of European rules by national statistical agencies make comparability a soft ground. What is possibly more worrying is that the uncertainties in the international comparability of SBS inevitably affect also the so-called tertiary statistics that are strictly connected to SBS, including National accounts.

Fig. 6A - Italy/Germany: value added per person employed (manufacturing)

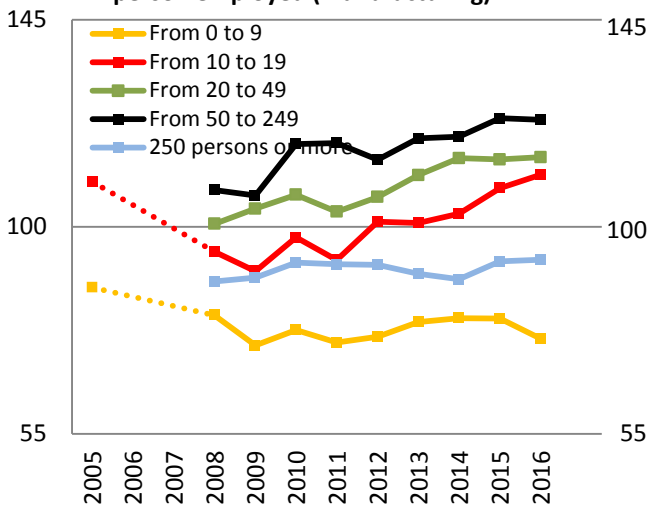


Fig. 6B - Italy/Germany: value added per person employed (manufacturing)

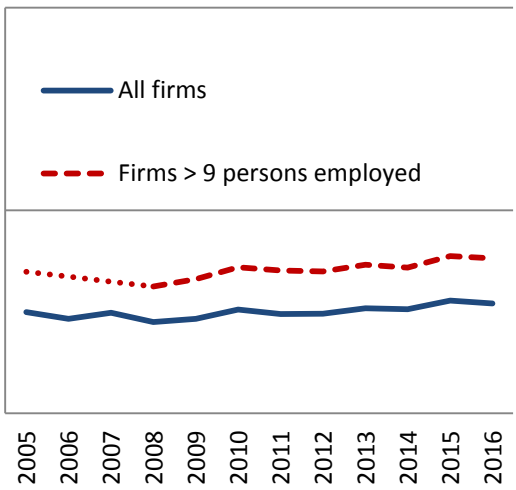


Fig. 6C - Italy/France: value added per person employed (manufacturing)

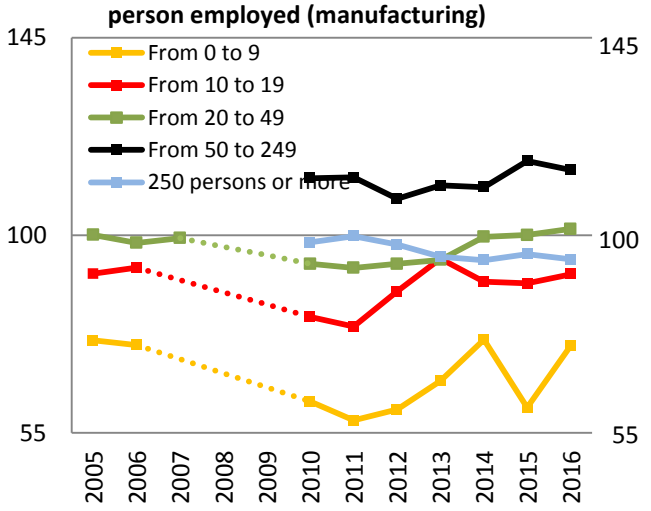


Fig. 6D - Italy/France: value added per person employed (manufacturing)

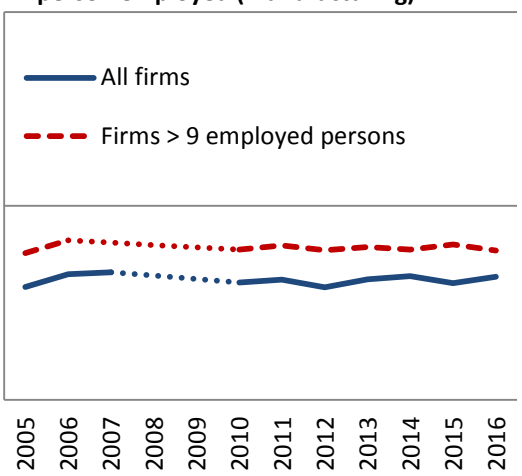


Fig. 6E - Italy/Spain, value added per person employed (manufacturing)

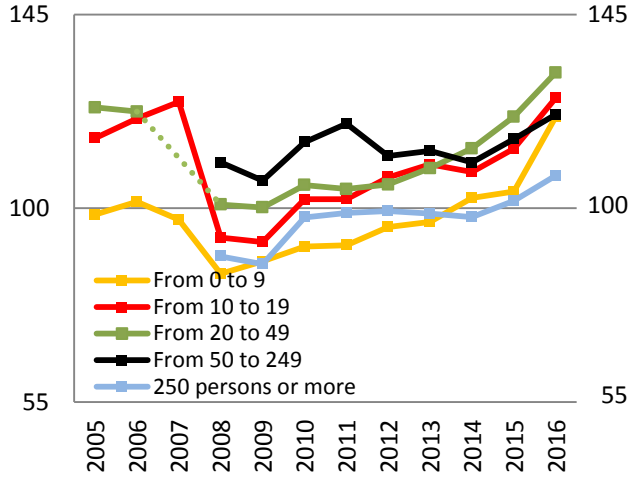
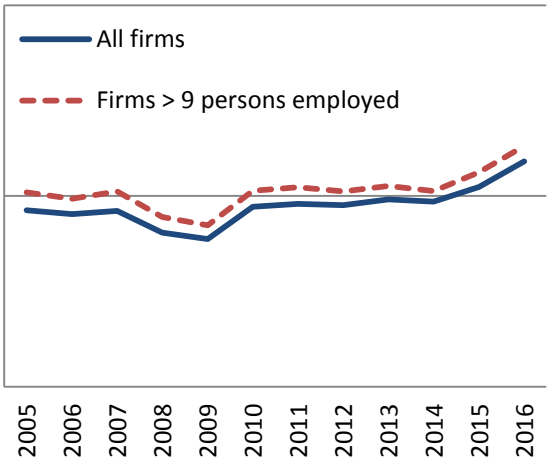


Fig. 6F - Italy/Spain value added per person employed (manufacturing)

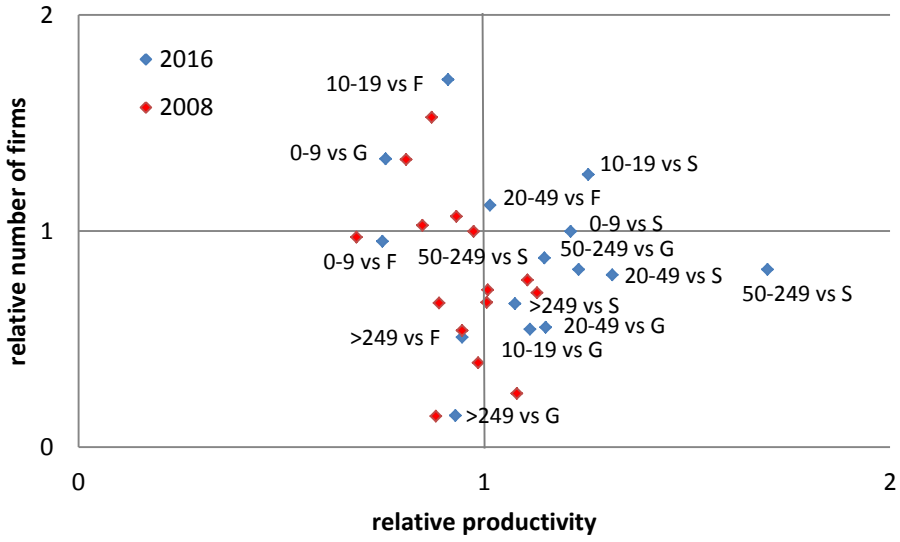


Source: computations based on Eurostat data

Italian disadvantages are, instead, marked with respect to both Germany and France in the segment of micro-firms (less than 10 employees). A disadvantage characterizes also larger firms (250 or more employees), but it is of a lesser extent than the gap affecting the micro-firms. The latter indeed acted as the main brake for the whole sector's performance: excluding the micro-firms, the Italian gap compared to Germany and France reduced in 2016 by half (Figg.6B, 6D and 6F).

Given this evidence, it is striking that - in contrast to what was observed for sectoral specialization – it is hard to detect any positive correlation between the size-class (relative) distribution of Italian firms and the size-class distribution of productivity advantages (Figure 7). Actually, there was indeed an improvement, since 2008, in the size-class distribution of firms which were more in accordance with productivity (as shown in the figure by shifts from red to blue indicators), but any correlation is still unobservable. Particularly, Italy has the highest relative share of firms (with respect to both Germany and France) in the class of micro-firms, that is, those characterized by the most significant productivity disadvantage (N.-W. quadrant of the graph). On the other hand, the share of producers is relatively low compared to Germany, France and also to Spain (S.-E. quadrant) in the size classes where Italian firms are more productive (medium and small-sized firms). Ultimately, this result qualifies more accurately the well-known evidence of a large number of micro-firms in Italy: a comparison with the main partner countries highlights the fact that there is still a comparatively larger number of firms in the size class that is least productive and that there are relatively few producers in the size classes where they are most productive.

Fig. 7 - Italy vis-à-vis Germany, France and Spain: relative productivity and number of firms by size class (2008-2016)



Source: computations based on Eurostat data

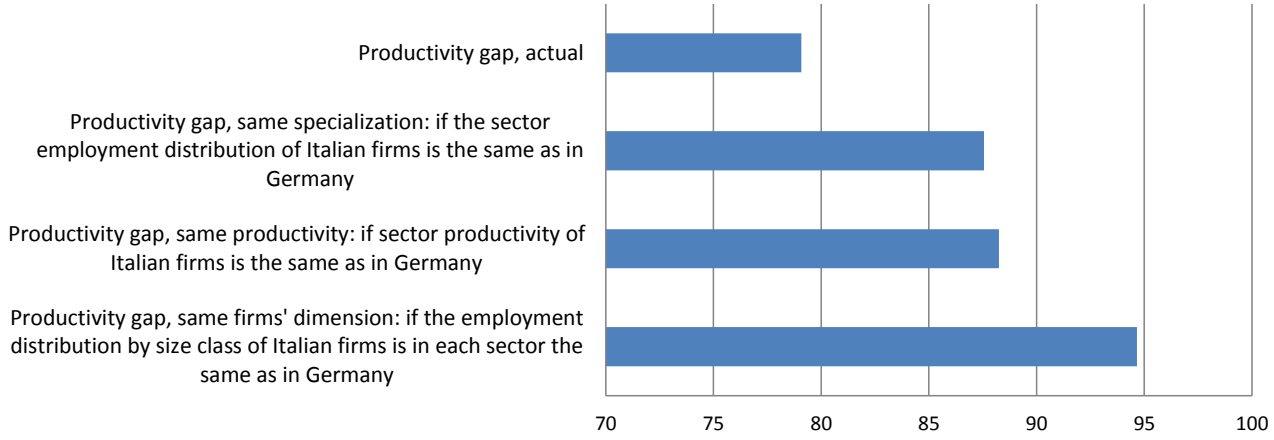
3.3 Factors influencing the productivity gap of Italy vs. Germany

On the basis of this analysis we finally undertake a test aimed at disentangling the influence of the three main factors (firms' efficiency, sector and size-class composition) that are capable of affecting Italian productivity with respect to Italy's competitors. We do this comparing Italy with the best European productivity performer in manufacturing, Germany.

Particularly, we ask how the overall efficiency of the Italian industry would change if, from time to time, it were to take on the composition by sector of the German industry, or if, for the given sector and class-size composition, Italian firms were to have the same average levels of efficiency as German firms, or if, finally, for the given sectoral mix and levels of productivity, the size distribution of Italian firms would be in each sector the same as that observed in Germany.[16] This is purely a mechanical simulation exercise that separates phenomena (sectoral composition, average productivity of firms, distribution by size-class) that have clear interconnections among each other. Nonetheless, it is useful in providing a ranking of each separate element in influencing the overall productivity gap between Italian and German manufacturing.

Figure 8 shows that applying the assumption of the same sector composition as German industry would indeed have positive although limited effects on the relative productivity of the Italian industry: the gap compared to Germany would be reduced from 20% to 12%. The achievement of average productivity levels of German firms, within Italian sectors and size classes, would have just a marginally stronger effect, but would still be largely insufficient to bridge the existing gap. Rather, the change that would reduce the productivity gap more substantially would concern the firms' dimension: if the distribution by size-class of Italian firms were to become in each sector identical to that of Germany, maintaining unaltered existing sector composition and efficiency levels, the productivity distance of Italian manufacturing from that of Germany would shrink by two-thirds, falling from 20% to 5%.

Fig. 8 - Productivity gap of Italian manufacturing firms vis-à-vis German firms under different hypotheses of convergence (value added per person employed in 2016, Germany=100)



Source: computations based on Eurostat data

To sum up, the atypical size-class distribution of Italian firms, in relation to their (size-class) revealed comparative advantages, appears to actually affect the productivity gap, resulting as the most prominent factor influencing the Italian distance from Germany. The fact that sector composition and within-sector firms' average productivity play a lesser role in explaining this gap seems quite in line with the evidence of a more general consistency between Italian sector

[16] Productivity of the manufacturing sector is defined as $\Pi=\Sigma\ s_i d_{i,j} \Pi_{i,j}$ where $\Pi_{i,j}$ is the average productivity of firms in sector ***i*** and size-class ***j***, $d_{i,j}$ is the (employment-based) weight of size-class ***j*** in sector ***i***, s_i is the (employment-based) weight of sector ***i*** in total manufacturing, where the ***i*** sectors considered in the exercise are 92 and the ***j*** class sizes are 5 (0-9, 10-19, 20-49, 49-249 250 and more). The exercise is implemented by substituting, one at a time, the Italian values of s_i, $\Pi_{i,j}$,and $d_{i,j}$ by the corresponding values computed for German firms.

specialization and real technological advantages. Yet, a static snapshot such as the one of Figure 8 does not allow us to appreciate the movement of firms that took place, especially within sectors, under the impulses produced by the two successive recessions that have occurred since 2008. Reshuffling of firms was relevant and gave a substantial boost to productivity adjustment, especially in the segment of small-sized producers. The evidence on this is discussed in the following section.

4. Fewer, but better allocated, producers

The two recessions brought about a huge fall of production capacity in the manufacturing sector. According to Monteforte and Zevi (2016), the loss of productive potential ranged, depending on methodologies of estimation, between 11% and 17% in 2008-2013 and it resulted as large as 20% on the grounds of a counterfactual exercise based on a production function approach. According to De Nardis (2015), manufacturing capacity fell by 18% in 2007-2014, a decline that was smaller only than those experienced in the same period by Spain and Greece.[17]

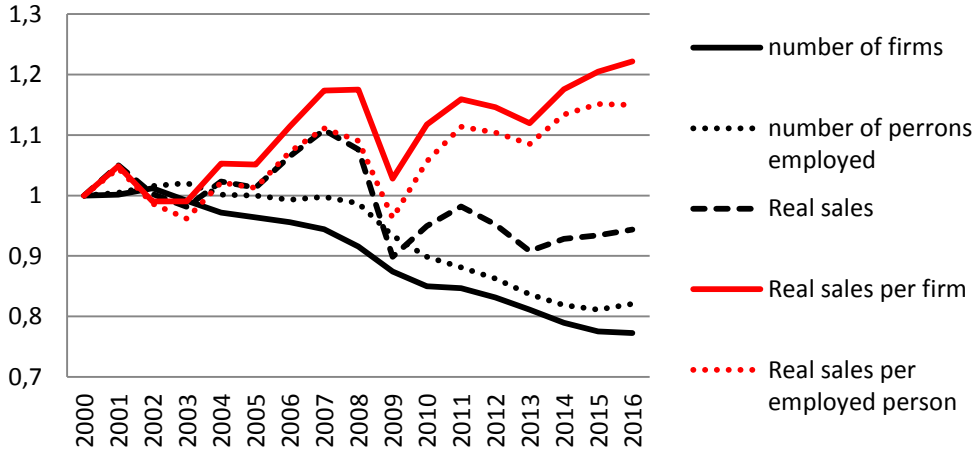
By far the largest portion of the capacity contraction in Italian manufacturing was due to the extensive margin, that is, the reduction of the number of producers. Actually, the basin of manufacturing firms, which was as large as half a million enterprises at the beginning of the monetary union, had already started to decline during the first half of the last decade, diminishing to 474,000 units in 2007 (a loss of a bit less than 4,000 firms per year since 2000). The ensuing double-dip recession strongly accelerated this fall. The number of firms reduced to about 388,000 units in 2016, increasing by two and half times the yearly contraction compared to the former period (-9.700 on average per year). As for employment, the number of persons employed was reduced only marginally between 2000 and 2007 (-1.600 persons employed over seven years), to drop then dramatically when the two subsequent recessions hit the sector (-87.500 persons between 2007 and 2016).

4.1 Reallocation of employment

Hence, Italian manufacturing appeared substantially smaller in 2016, in terms of both the number of enterprises and the number of persons employed, than it was at the start of the monetary union. The sector dimension shrank by about one fifth regarding both firms and workers. As can be seen, a retrenchment took place mostly in the 2007-2016 period, which registered 80% of the decline in the number of firms since 2000 and almost the entire fall in workers. Yet, manufacturing came out from this shrinkage more efficient as output contracted less than producers and production inputs. Firm-level estimates of productivity in volume terms since the beginning of the monetary union can only be based on real sales.[18] According to this measure, on average each firm sold in 2016, in real terms, 23% more than in 2000, while the volume turnover per person employed in manufacturing firms was, on average, 16% higher than at the start of the monetary union (fig. 9). Estimates based on volume value added are available for 2005-2016, which is anyway the period covering most of the manufacturing contraction. According to these estimates, firms became, on average, more productive in 2016 by about 20% compared to 2005; a similar increase characterized, on average, the value added productivity of the persons employed in those same firms (fig. 10).

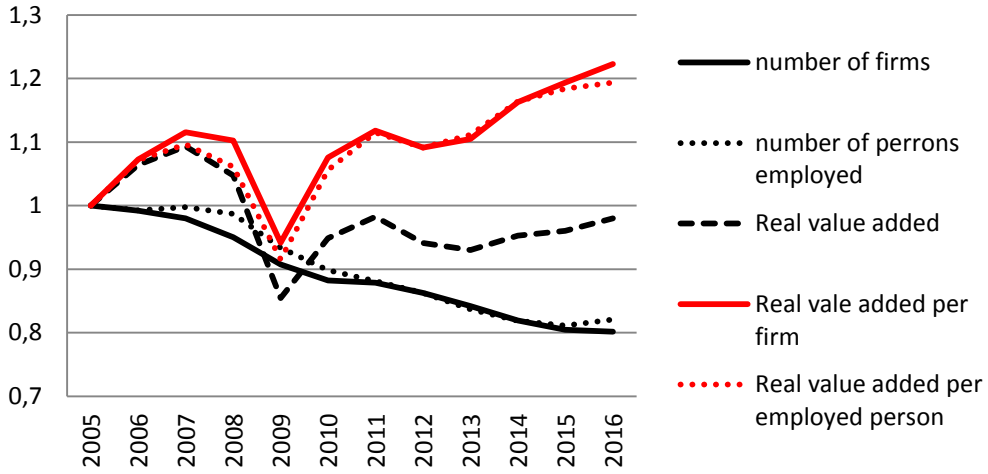
[17] See also the estimates in Locatelli, Monteforte, Zevi (2019).
[18] Estimates of firm-level real sales and real value added are from Linarello, Petrella and Sette (2018) and from Linarello and Petrella (2017).

Fig. 9 - Real sales, number of firms, number of persons employed and sales productivity (manufacturing, 2000=1)



Source: computations based on Linarello, Petrella, Sette (2019) and Istat; author's own estimate for 2016

Fig. 10 - Real value added, number of firms, number of persons employed and value added productivity (manufacturing, 2005=1)



Source: computations based on Linarello, Petrella (2017) and Istat; author's own estimate for 2016

To gauge the firm-level forces underlying the manufacturing productivity developments it is crucial to base the empirical analysis on an adequate dataset. In this respect, fundamental has been the joint work made in the last few years by researchers from the Bank of Italy together with Istat in reconstructing a dataset of the universe of firms for a sufficiently long period (Linarello and Petrella 2017, Abbate, Ladu and Linarello 2017). This work, on which we greatly rely in this section, has been important because it has substantially changed the evidence on the contribution of workers' reallocation across firms to sector productivity. According to preceding analyses based on incomplete datasets (typically balance sheets datasets including incorporated firms with more

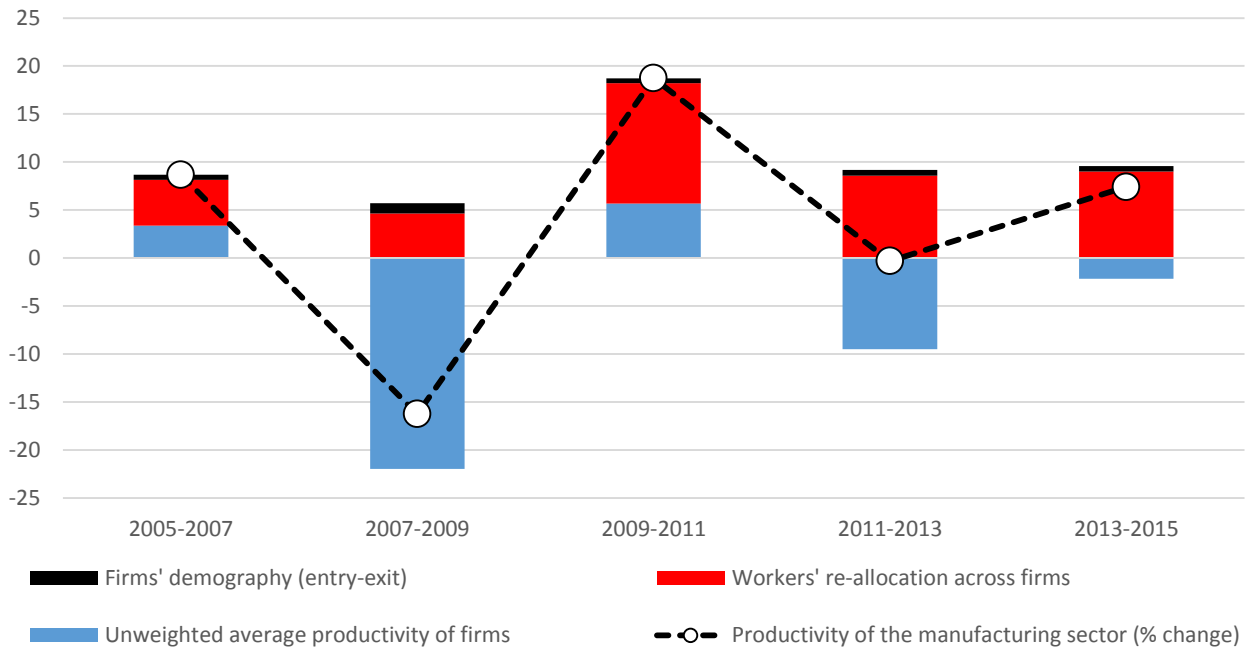
than 19 employees), workers' misallocation (i.e. the fact that workers move insufficiently toward more productive firms) was seen as a major lagging factor of Italian productivity even in the manufacturing sector (e.g., see the EC analyses and particularly Calligaris at al. 2016). Contrary to this evidence, Linarello and Petrella (2017) show that when considering the universe of firms, the contribution of workers reallocation to sector efficiency is substantially stronger. It actually represented the main driving force of manufacturing productivity developments since 2005. The difference of results with former analyses reflects the fact that a large portion of reallocation involved unincorporated firms with less than 20 employees, that is the segment of producers that are overlooked by balance-sheet data.

In Figure 11 we report the Melitz-Polanec decomposition made by Linarello and Petrella (2017) of the manufacturing volume value added per person employed (that is, the corresponding variable represented in figure 10) over the 10-year 2005-2015 period.[19] As can be seen, the contribution to productivity coming from the movement of workers towards more efficient firms (reallocation) has always been positive throughout the period; it actually represented the most important component of aggregate productivity. During the 2011-2013 recession, re-allocation compensated for the fall in firm productivity, substantially curbing the slowdown of sector efficiency. In addition, there was some positive contribution from firm demography, in the sense that new entrants were characterized by higher productivity levels than exiting producers. The weakest component was the (unweighted) average efficiency of firms, which was much exposed to the cycle driving down the productivity of the whole sector during the 2007-2009 and 2011-2013 recession years.

The evidence of the positive contribution of reallocation to productivity is related to the selection of producers, induced by both the pressures of international competition exerted on the traded sector (Melitz 2003) and the so-called cleansing effects of recessions (Caballero and Hammour 1998), which appeared to be particularly intense when combined with the severe credit crunch. As for the first point, the scope of input misallocation in manufacturing is much smaller than in other sectors. Lenzu and Manaresi (2019) measure firm-level distortions in the use of production input as the gap between marginal revenues and user costs. On the grounds of such a measure, they estimate quite a limited output loss in Italian manufacturing (3-4%) compared to the loss estimated for other sectors (6-9% in services, 8-11% in construction). As for the second point, Linarello, Petrella and Sette (2019) find that the scarcity of credit supply during the double-dip recession had no significant effect on the aggregate productivity of manufacturing. But this was the result of the significant and opposing impacts of credit reduction on the various margins considered in figure 11. In particular, they show that the credit crunch reduced per-firm productivity, but at the same time it also raised the positive contribution of reallocation to sector productivity as the proportion of resource of more productive and less credit-constrained firms substantially increased. Moreover, this reallocation in manufacturing occurred not so much between sectors, as within sectors: this is evidence that is quite in line with the stability of sector specialization over the crisis period pointed out in section 3.

[19] The Melitz-Polanec breakdown allows to decompose the productivity change in the contribution of the changes of three factors: 1) the unweighted average productivity of incumbent firms; 2) the covariance (measuring workers' allocation) between the productivity of incumbent firms and the share of persons employed; 3) the productivity difference between entrant and exiting firms (demography); see Melitz and Polanec (2015).

Fig. 11 - Manufacturing: Melitz-Polanec decomposition of sector productivity, biennial % changes (value added in volume per person employed)



Source: computations based on Linarello and Petrella (2017)

4.2 Reallocation of firms

During the last two recessions there was also a shrinkage of the absolute number of exporting firms. In the first recession (2008-2009), exporters reduced as they were directly hit by the world trade collapse; in the second recession (2012-2013), it was the credit crunch that involved also the firms exporting abroad since these firms sold a large fraction of their output in the shrinking national market and were hence affected by the tightening of liquidity constraints that was induced, through the credit channel, by the huge fall in domestic demand.[20] Yet, the decline of exporters was much less severe than the contemporaneous contraction experienced by the number of non-exporting firms. Moreover, while the latter kept on diminishing during the subsequent recovery, the number of exporters stopped falling and has even mildly increased since 2013.

As a consequence of these developments, firm distribution registered a slight but clear shift from producers selling exclusively in the domestic market towards those selling (also) abroad. Exporters are, as everywhere, a minority in the whole set of producers, as shipping goods abroad is more expensive than selling at home and only the most productive firms (that is, a minority) can profitably afford it. However, the portion of exporting firms in total manufacturing was able to increase in the last few years (from 19.9% in 2008 to 22.8% in 2016, Tab. 3). Correspondingly, also the share of manufacturing value added produced by these producers increased (going up from 79% in 2008 to 83% in 2016) and so rose the share of manufacturing employment absorbed by exporting (more productive) firms (from 65.5% to 68.2%). These movements point to an

[20] The existence of a link, induced by liquidity constraints, between falling domestic demand and exports in the last recession is analyzed by Bugamelli, Gaiotti and Viviano (2015).

enlargement of the extensive margin of the population of best producers (exporters) which may help to qualify the previous evidence about the contribution of resource reallocation across firms to overall manufacturing productivity.[21] In addition, there was a positive effect for aggregate productivity coming from an increase of the productivity premium of exporters over producers selling (exclusively) in the national market (the premium rose by about 11% in an eight-year time span).

Table 3 -Exporting manufacturing firms: number, value added, employment and productivity premium

	Number of active firms	Number of exporting firms	Share of exporters in total firms (%)	Share of exporters' value added on total value added (%)	Share of persons employed in exporting firms on total employment (%)	Productivity premium of exporters over domestic producers (value added per person at current prices of exporters relative to domestic firms)
2008	459,728	91,617	19.9	79.2	64.5	2.03
2009	439,112	87,550	19.9	76.8	63.6	1.91
2010	426,778	89,028	20.9	80.4	65.4	2.18
2011	425,481	87,868	20.7	83.2	65.9	2.21
2012	417,306	86,919	20.8	81.0	66.1	2.19
2013	407,344	87,110	21.4	81.7	66.8	2.21
2014	396,422	87,890	22.2	82.3	67.7	2.22
2015	389,317	88,419	22.7	82.7	68.1	2.23
2016	387,866	88,367	22.8	83.0	68.2	2.25

Source: computation based on Istat data.

Therefore, between 2008 and 2016 a shift occurred in firm distribution towards the segment of producers (exporters) characterized by a productivity premium and, at the same time, such a premium tended to rise. To understand to what extent these two effects (larger proportion of firms in the productivity- premium fraction and rising premium) have actually tended to cumulate, in table 4 exporters and domestic producers are examined by size class. As can be seen, the share of exporting firms rose in all size classes, except in the largest-sized one (where actually almost all producers are also exporters). However, the greatest (percentage) increase of the share of exporters occurred in smaller firms (0-9 and 10-19 employed persons), where substantially there was no rise in the productivity premium between 2008 and 2016. Only in the 20-49 size-class we can observe a positive association between an appreciable increase of the share of exporters and a rise in the productivity premium.

[21] An increase of the extensive margin is highlighted by Istat (2019) also with regard to exports. Italian exports have risen in the last few years not only thanks to the intensive margin (more exports of the same goods in the same destinations) but also because there has been an enlargement in the scope of products and destinations.

Although a much more detailed (firm-level) analysis would be needed to substantiate the evidence, the class-size cross examination of producers seems to indicate that the correlation between the two effects (relatively more exporters in manufacturing and higher productivity advantage for exporters between 2008 and 2016) was limited to a segment of small firms (20-49). In particular, it was grossly absent in the larger size classes, which are already characterized by a very high proportion of exporters (over 90% in the 50-249 and 250 and more employed persons size classes); these densely populated by exporters size classes were those that also benefited from more pronounced increases in the productivity premium of exporters over domestic producers.

Table 4 – Share of exporters over total manufacturing producers and productivity premium of exporters by firm size-class

	Share of exporting firms (%)		Productivity premium of exporters	
	2018	2019	2008	2009
0- 9	11.4	14.2	1.57	1.55
10-19	44.4	50.5	1.40	1.42
20-49	68.5	73.7	1.36	1.48
50-249	89.8	90.2	1.37	1.54
250 and more	98.4	97.9	1.43	1.52
Total	19.9	22.8	2.03	2.25

Source: computation based on Istat data.

5. Conclusions

After a prolonged disappointing period of lagging performance in the Eurozone, manufacturing productivity has improved in Italy. It is a decade now that it is increasing in line with Germany and France. Acknowledging the more positive developments took time among analysts and commentators, probably because of the quite dismal initial estimates based on provisional and incomplete information which were corrected systematically upwards in the final revisions. Better manufacturing productivity helped to stop the long-lasting fall of the share of industrial value added in Italy, and even to reverse it in the last few years. Such a reversion basically reflected the biased productivity growth in the traded sector that Italy has experienced since 2009: a process that very much resembled the one registered by Germany since the start of the whole monetary union period. In a way, it was an emulation of Germany in the effort to bridge the competitiveness gap that opened in the first decade of the single currency.

A substantially stable specialization pattern has underlain the productivity improvement over the last ten years . As a matter of fact, scarcely changed sector composition, relative to competitors, reflected real technological comparative advantages that ended up by influencing also the distribution of the firm population in those same sectors: relatively more producers, compared to competitors, are in sectors in which Italy has a comparative advantage.

Contrary to sector specialization, a correlation between productive advantages distribution and firm distribution cannot be observed when considering the size classes. Italian manufacturing is characterized by a relatively large population of micro-firms which present a comparative disadvantage with respect to competitors. On the contrary, the size-classes where the Italian

technological advantages are the highest (medium- and small sized firms) appear relatively low populated. As a corollary to this evidence, the breakdown of the Italian productivity gap with Germany highlights that size is the most important factor explaining the remaining distance.

The productivity performance observed in the last decade has reflected the selection process among producers induced by global competition and the cleansing effects of the recessions. Italy lost more than 70.000 manufacturing firms between 2008 and 2016. This was a stark loss of productive capacity, but the shrinkage was also accompanied by a substantial reshuffling in the (reduced) population of producers. Recent evidence based on a dataset referring to the universe of manufacturing firms reveals that, contrary to former findings based on incomplete datasets, reallocation of workers from less towards more productive firms was prominent in sustaining productivity, particularly during the recession episodes. Information about exporting and non-exporting firms helps to point out that part of the reallocation involved an increase in the proportion of exporters that are characterized by a productivity advantage over domestic producers; such a productivity premium also rose in the observed period. The Italian manufacturing sector that came out from the recessions was smaller, but more efficient.

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