A multidimensional approach for the measurement of competitiveness and economic resilience: the design, production and exploitation of integrated micro level data[1]

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Abstract

The Istat new approach to the compilation of official business statistics, integrating into a single "statistical package" many information sources on firms' structure, strategies and performance, gives an answer to the demand for high-quality microdata to assess the vulnerability and resilience of the economic system. In this work we give some examples on how the new statistical package allows analysis of the heterogeneity within the economic system and helps measure at a very high level of disaggregation the performance of many segments of the production system, e.g. allowing to analyse the recent trends of firms' performance through the lenses of their structure and strategies.

Keywords: Frame-Sbs, heterogeneity, economic performance

1. Introduction

The assessment of the impact and the identification of the possible solutions in order to recover from the worst economic crisis since World War II have pushed researchers and policy-makers to intensify their efforts in understanding the determinants of competitiveness as well as the sources and the degree of resilience of economic systems in advanced countries.

The availability of reliable data clearly plays a crucial role in detecting the vulnerabilities (e.g. through effective "warning" indicators, see Röhn et al., 2015), in evaluating adjustment capability and structural change of an economic system (see Canova et al., 2014) and in assessing the effectiveness of policy measures (Garda and Zieman, 2014; Caldera et al., 2015). In particular, high-quality microdata are needed, that widen and deepen statistical information on the economic resilience, making it possible for example to take fully account of the heterogeneity within the production system. This goal may be attained by developing and enhancing the scope of Official Statistics in measuring business structure and performance.

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In this respect, a new approach for the compilation of official business statistics has been designed and implemented in recent years by Istat. This approach allows the production of high-quality official statistics according to the requirements of the EU regulations and, at the same time, statistical data to support the micro-meso and macro level of analysis of factors affecting the competitiveness of modern industrial systems. The latter task increasingly requires complex statistical information, able to combine aggregated measurements with quantitative evidence on the degree of heterogeneity within the system of enterprises. The greater the complexity and heterogeneity of the structure of a given economy, the greater the loss of information associated to an analysis based solely on aggregated figures. This particularly applies to the analysis of the Italian production system, which is characterized by highly specialized sectors and especially by an overwhelming role of small enterprises – the firms with less than 10 persons employed account for 95% of total units and for nearly 50% of total employment (compared to 29% on average in the EU).

The new Istat approach has two main components: on one hand, it heavily relies on a massive and intensive use of already available administrative data on Italian enterprises (e.g. fiscal, balance-sheets and social security data); on the other hand it complements this information with data collected through specialized statistical surveys. The aim is to develop a high-quality, consistent system of business statistics and economic indicators founded on the availability of good quality and timely business register, which represents a cornerstone for all information on the Italian productive system. This is particularly important when facing the need of detecting the factors of vulnerability and resilience of business systems, as is the case since the international crisis began.

As far as the first component is concerned, the result of the effort was the so-called Frame-SBS information system, including firm-level structural and economic information for each of the over 4.4 million Italian enterprises. In other terms, the mere sum of all firm's value added gives the official value added of the whole business system. More in general, the Frame-SBS dataset is aimed at playing a multifaceted role. Firstly, as just mentioned, it provides information on main profit-and-loss accounting data for each enterprise active in Italy in a given year, acting as the reference framework for the SBS annual statistics. Moreover, it is the cornerstone for further integration with other administrative and statistical microdata sources, referring to both structural and short-term trends. Finally, it is the reference framework for the convergence and consistency of many surveys on specific topics (e.g. the surveys on the industrial firms' turnover, the business climate or the perceived competitiveness factors of business units).

As expected, the new production system has determined substantial gains in terms of accuracy (as estimates of the main variables are free of sampling errors), consistency of business statistics over time and among business statistics domains (including National Accounts), and in perspective lower costs and respondent's burden.

The second component of the new approach to the production of business statistics encompasses a dedicated system of direct reporting surveys based on highly qualified samples focusing on well-targeted business populations. The aim of such surveys is to capture complementary (mostly qualitative) aspects of firms' activities (such as strategies, competitiveness strength points, possible participations in inter-enterprises relationships etc.). In doing so, they are particularly informative for multidimensional

analyses on the competitiveness of Italian firms and provide useful information for policy-making purposes.[4]

The availability of new and detailed quantitative and qualitative structural data on Italian businesses is a key factor for assessing the competitiveness and the performance of the economic system, and plays a central role to set up or fine tune policy measures oriented to boost productivity and employment growth. High quality information at high level of detail is essential in order to allow business analysts and policy makers to better analyse the characteristics and behaviour of sub-populations of firms, taking into account the fact that the Italian economic system is characterized by large heterogeneity in business performance.

In what follows, we use this "statistical package" to investigate some aspects of the performance (and vulnerability) of Italian firms from 2010 to 2014, namely in one of the most severe recessions of the Italian modern economic history. In particular, in Section 2 we describe the package (Section 2.1), showing how its first pillar – the Frame-SBS dataset – has been designed and implemented, and giving some examples about how it may take into account firm-level heterogeneity in order to investigate the vulnerable segments of the Italian productive system. Then (Section 2.2), the second pillar of the statistical package is illustrated, whose main component is at present the MultiPurpose Survey (MPS) carried out by Istat in the occasion of the 9th Italian Business Census (2012) on a very large set of firms' strategies. This survey allows to enhance the (structural) informative power of the first pillar taking into account the multidimensional nature of the firm's behaviour and performance. In Section 3 we show how the statistical package may be integrated with other short-term surveys, in order to analyse the persistence of the robustness and vulnerability factors over time, and to explain the most recent firms' performance – notably in such a difficult period as the 2011-2014 recession – on the basis of the structural and strategic "profiles" prevailing in the Italian business system. Section 4 concludes.

2. A "statistical package" for the analysis of competitiveness, resilience and vulnerability of Italian firms

The package is based on two pillars: the Frame-SBS dataset and the microdata of the MPS on firms' strategies. It needs to be reminded that, following a trend started in the last decade at Istat (see Giovannini, 2012), both datasets are made available also for research purposes through the Istat "Elementary data analyses laboratory − Adele". The next sections illustrate how the two pillars are designed.

2.1 Frame-SBS

The state-of-the-art of statistical tools and methods for the measurement of business phenomena makes it feasible the development of new indicators on the business structure and performance of specific sub-populations of businesses, consistent with the Business

[4] One recent example of such initiatives is the Think Tank on Competitiveness, Competition, Industry and Internal market, established by the Italian Presidency of the Council of Ministers Council and chaired by Enrico Giovannini (University of Tor Vergata, Rome), Gianluigi Tosato (LUISS, Rome) and Monica Frassoni (co-president of the European Green Party).

Register (BR) frame and Structural Business Statistics (SBS) figures, such as enterprises engaged in international activities, with limited costs and in a relatively short time span.

In Italy, SBS has been traditionally estimated using data collected through two direct annual surveys: the sample survey on Small and Medium Enterprises (SMEs; about 100,000 sampled enterprises with less than 99 persons employed representing a population of about 4.4 million of units), and the total survey on Large Enterprises (LEs; about 11,000 enterprises with 100 or more persons employed). Both surveys estimate totals of profit-and-loss accounts variables, employment, investments etc. in the industrial, construction, trade and non-financial services sectors. A large number of secondary variables are also included, mainly for National Accounts estimation purposes.

The development of new methodologies finalised to the statistical processing, and the quality improvement of administrative data sources has opened the floor to substantial information gains in the structural business domain. In particular, the applied and theoretical methodological research in this area increasingly focuses on the exploitation of micro-level data from available administrative data sources consistently with statistical standards and procedures. The increasing availability of business data from administrative sources also led to reconsidering and improving the use of direct reporting for the compilation of business statistics.

At Istat, the traditional SBS estimation strategy has been completely reversed from 2010 as reference year with the development of the Frame-SBS (Figure 1). In the new system, administrative and fiscal data are used as primary source of information (after due harmonization, they cover about 95% of the whole target population), while SMEs and LEs data essentially play a complementary role.[5]

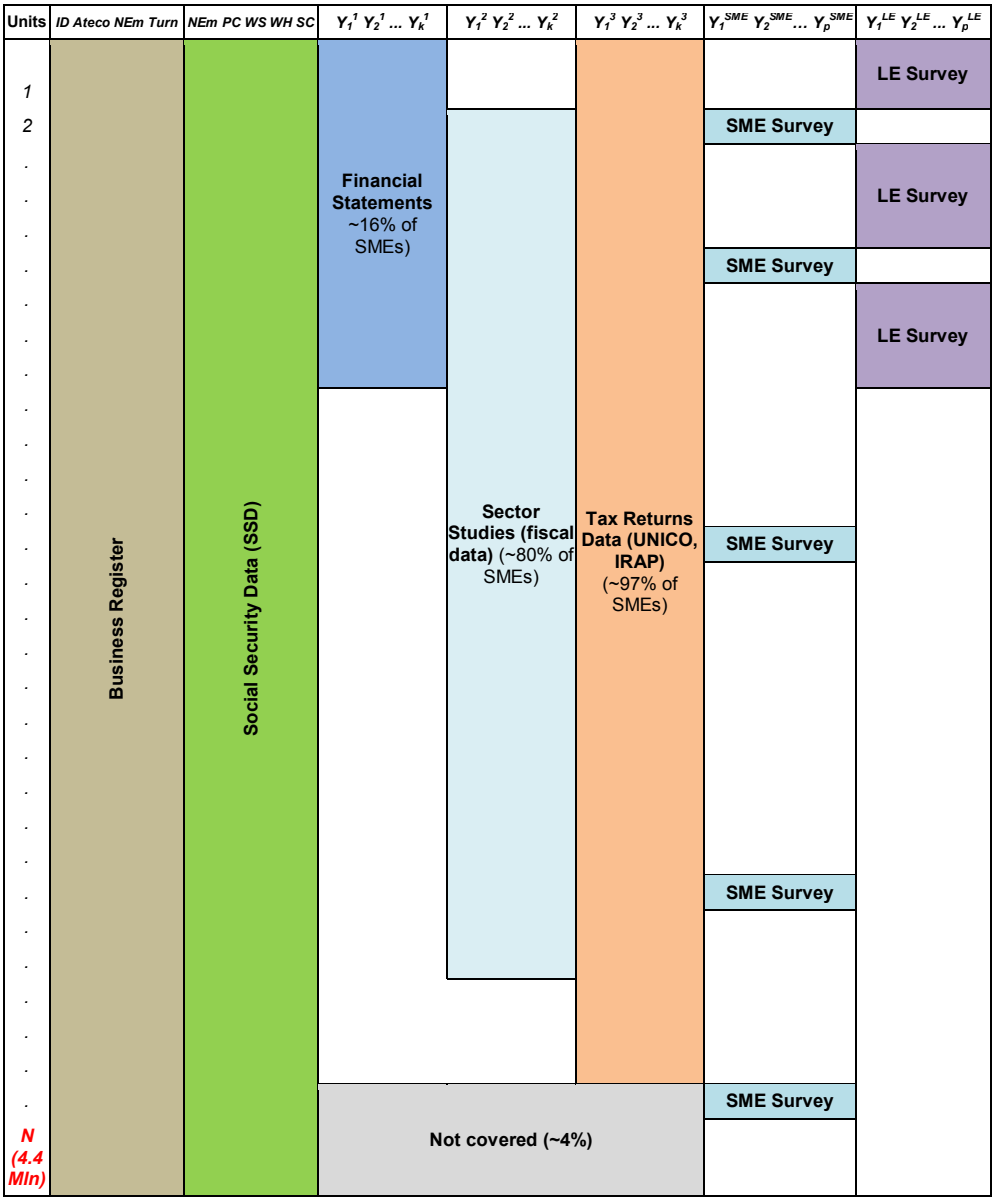
Fiscal data represent the most important administrative source: “Sector Studies” on smallest enterprises account the basic economic data for 67% of total enterprises (2.9 Mln); balance sheets on companies account for 16% (700,000); fiscal declarations data are used to estimate the main variables for 14% of businesses (600,000). Social security data on employment and wages are used for all the enterprises with employees (about 1.3 Mln). For the largest enterprises all the variables are collected by the LE survey.

As a consequence, a number of key economic variables (including turnover value added, labour cost, wage, export) are available at firm-level for the overall SBS population, namely the whole Italian business system (about 4,4 million of units in 2013; over 16 million of persons employed). The corresponding totals can be obtained at any level of detail (e.g. 4-digit Nace sectors) by merely summing-up firm-level data.[6]

[5] Each combined source actually covers different - yet partially overlapping - sub-populations of enterprises, and some sources provide information on (partially overlapping) variables:. Therefore for each source, this “common” information has been used for assessing the quality of input data, for harmonizing classifications and definitions with SBS concepts described by the SBS regulation, and for editing micro-data (identification of logical inconsistencies/measurement errors, removal of duplicated units, etc.).

[6] It has to be mentioned here that for some additional variables (such as many types of intermediate costs) statistical imputation is adopted to compensate for the sources under-coverage (see Luzi *et al.*, 2014 and 2015).

Figure 1 – Coverage and components of the Frame-SBS dataset



The "core" variables of the Frame-SBS represent the main aggregates requested by the SBS Regulation; the other SBS variables included in the statistical (components of the main economic variables etc.) are estimated at pre-defined levels of detail using a design based/model assisted approach (known as "projection estimator"), which exploits the randomization process of the SME sample selection under consistency constraints (as the

estimated totals of the components variables which contribute to a given main economic variable are to be coherent with respect to the estimated total of the aggregate itself, at domain level).[7]

The Frame-SBS is now the pillar of the new system of economic statistics in Italy, according to the innovation strategy launched in 2011 (Monducci, 2010), successively reinforced by a new modernization project started in 2014 (Alleva, 2014).

What is more, Frame-SBS is also the basis for a number of other uses. Allowing estimates for key economic account variables at a very detailed level, it facilitates the dissemination to end-users of larger, more detailed and better focused data. Furthermore, the Frame-SBS is currently used to estimate official SBS variables as well as aggregates of National Accounts at sector level.

Finally, the availability, on an annual basis, of main profit-and-loss accounts data on all companies active in Italy allows to carry out insightful analyses on both business structure and dynamics. As for the former, it is possible to assess the degree of heterogeneity within the business system, identifying the better- and worse- performing segments (e.g. sectors, clusters, etc.).

With regard to the dynamic analysis, the statistical register Frame-SBS allows to longitudinally evaluate the performance of single production units, pointing out for example the firm- and sector-level developments underlying the aggregate dynamics. This latter element is particularly important for an assessment of the resilience and vulnerability of the Italian business system, as the Frame-SBS dataset makes it possible to monitor on an annual basis the relative competitive position of all the Italian firms within their own sector or across the entire business system, in terms of profitability, productivity and other economic performance indicators. At the same time, it helps evaluate the economic features of entrant and exiting firms.[8]

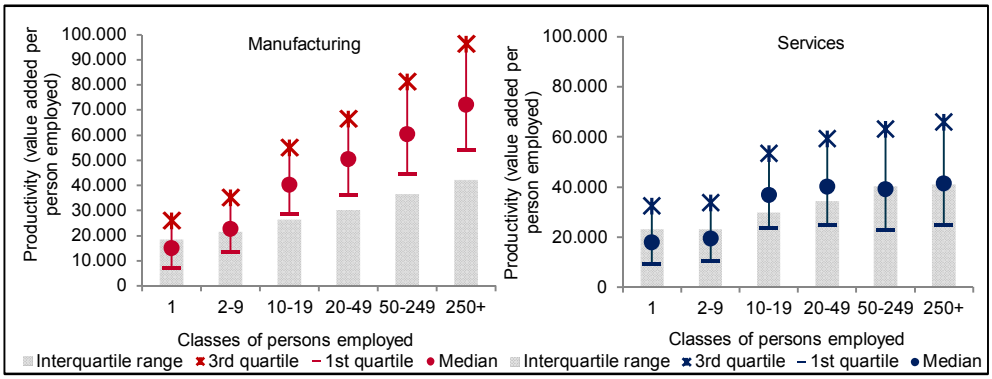
In order to better illustrate the informative potential of the Frame-SBS register, Figure 2 reports some statistics about the distribution of the labour productivity by firms' size classes in 2013, in manufacturing and services sectors.

Besides confirming the well-known positive correlation between firm's size and productivity, the data show the heterogeneity within all size classes, revealing for instance that with the exception of the micro enterprises segment, in any other size class the most productive firms (i.e. the ones belonging to the fourth quartile of the productive distribution) perform better than the median firm of the next higher size class. This is even more evident in the services sectors, where the third quartile of labour productivity in the 10-19 class is about 30% higher (and the third quartile of 20-49 class is over 40% higher) than the median value of the productivity of large firms (250+ persons employed).

[7] For further details on the methodology of construction and estimates of Frame-SBS see Luzi *et al.* (2014 and 2015).

[8] But see below for some important caveats regarding the difference between such "entry and exit" aspects and "true" business demography.

Figure 2 – Value added per person employed, by size classes – 2013 (euros)

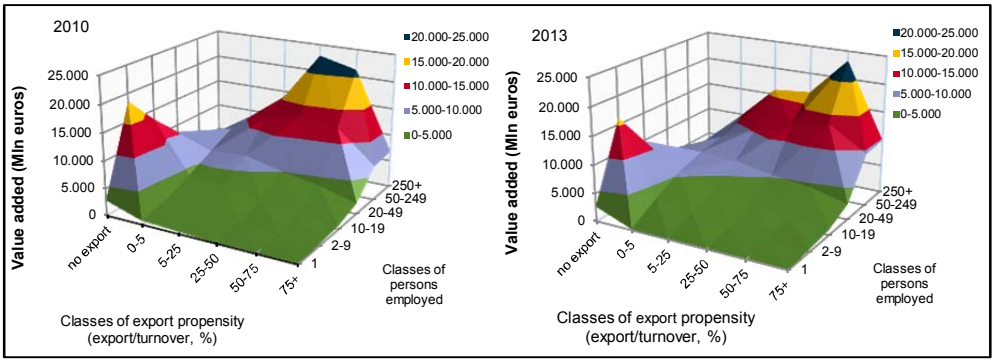


Source: Authors' calculations on Frame-SBS dataset.

Furthermore, the Frame-SBS is particularly powerful in the analysis of the structure and competitiveness of the Italian exporting firms. It is also the basis for the production of the official statistical information on the performance of Italian exporting firms, thanks to the integration with the *Trade by Enterprises Characteristics* (TEC) database (see e.g. Istat and ICE, 2015).

On such bases, Figure 3 reports the composition of value added in manufacturing sector by classes of firms' size and export propensity (measured by the export to turnover ratio). The relevant role of the exporting firms in shaping the overall performance of the Italian business system clearly emerges: in 2013 the value added of these firms (about 80.000 units) accounted for 82% of the total (it was 81% in 2012 and 77% in 2010), and the "Highly exporting" (i.e. firms with export over 50% of their turnover) accounted for 31.2%. What is more, between 2010 and 2013, also following a demand gap between foreign and domestic demand, the value added of exporting firms increased by 9 Billion euros, while the value added of non exporting firms decreased by nearly 10 Billion euros. The largest increase occurred in firms exporting over 75% of their turnover: +42% on average in all size classes with 10+ persons employed.

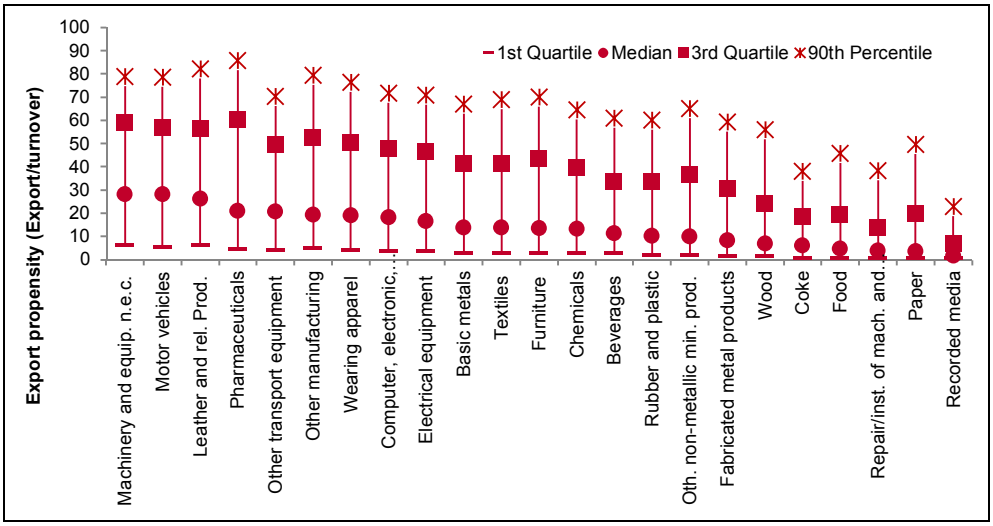
Figure 3 – Value added, by size classes and classes of export propensity; Manufacturing sector – 2010 and 2013



Source: Authors' calculations on Frame-SBS dataset.

The possibility of studying the export propensity of the Italian economy, both in cross-section and longitudinal analyses, is particularly relevant when considering periods when the foreign demand has been basically the only source of economic growth for Italian firms, like in 2010-2013.[9] In this respect, the Figure 4 reports the 2013 distribution of the export-to-turnover ratio within manufacturing sectors (only exporting firms are considered).

Figure 4 – Export propensity by Division of economic activity (2-Digit Nace). Manufacturing sector – 2013 (Only exporting firms considered; export to turnover ratio; percentages)



Source: Authors' calculations on Frame-SBS dataset.

On the one hand, it can be noted that among the most export-oriented activities there are some important industries of the Italian specialization model (Machinery, Motor vehicles, Leathers and Other transport equipment). On the other hand, it clearly emerges that even in these sectors − and all the more in less internationalized activities – the firms' export revenues generally account for just a fraction of their total turnover. In no industry, for example, the median export-to-turnover ratio reaches 30%, and in most cases it barely reach 20%. In other terms, notwithstanding Italy stands out among main European countries for its high number of exporting firms (nearly 200.000 units, in EU only Germany has a larger number; see Istat, 2014 and 2015a), these are basically "low-intensity exporters", and in 2013 even the overall performance of the Italian exporters was largely shaped by the domestic demand dynamics.

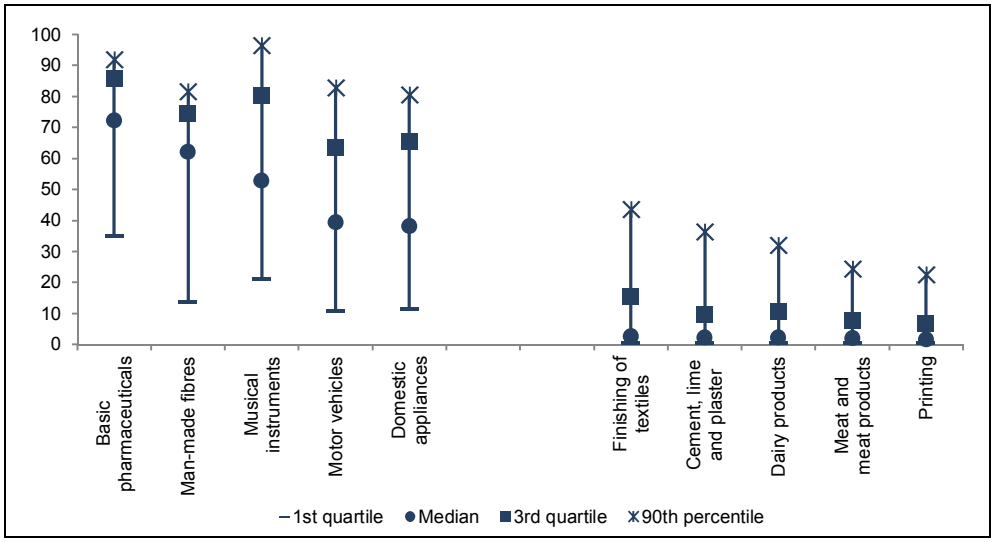
Moreover, due to the additive nature of the new dataset, these results can be verified also at a more disaggregate level (Figure 5): taking into consideration 3-digit Nace activities (but even 4-digit Nace might be considered), the median export-to-turnover ratio

[9] For further examples of the use of Frame-SBS in the analysis of the internationalization of Italian firms, see Istat (2015), and Costa *et al.* (2015b).

ranges from 53 to over 70% in sectors where the presence of foreign-owned enterprises is relatively frequent (Basic pharmaceuticals, Man-made fibres and Musical instruments), while in the remaining two sectors out of the top five export-oriented ones – Motor vehicles and Domestic appliances – it is around 40%, i.e. slightly more than the overall SBS average (34%). In this respect, therefore, the Frame-SBS provides a valuable basis for further investigations on the very sources of resilience and vulnerability of the Italian economy during the second phase of the Great Recession (2010-2013), when the business system had to deal with a growing foreign demand and a falling domestic demand.[10]

The new integrated dataset, allowing to assess export performance at a very disaggregate level, also makes it possible to calibrate policy measures aimed at improving the competitiveness of the Italian business system on foreign markets. In this respect, for example, the interquartile range of the export-to-turnover ratio may become a policy target for increasing the export propensity of the (numerous) already exporting firms.

Figure 5 – Export propensity by Groups of economic activity (3-Digit Nace): top and bottom values. Manufacturing sector – 2013 (Only exporting firms considered; export to turnover ratio; percentages)



Source: Authors' calculations on Frame-SBS dataset.

2.2 MultiPurpose Survey on Competitiveness of Italian firms - MPS

As regards the system of direct reporting surveys for the analysis of business competitiveness, the starting point has been the launch of a first, large scale survey (MultiPurpose Survey on Competitiveness of Italian firms - MPS) on the main factors of competitiveness of Italian firms, carried out in the occasion of the 9th Italian Business Census.

[10] See Section 3 for further details and examples on this.

As the purpose is to obtain a "map" of the firms' strategic choices and behaviour, in order to maximize the informative power of the survey the reference universe included only units with a "minimal organizational structure", i.e. with decision-making processes involving more business functions, ruling out, for example, almost all individual units.[11] In doing so, the survey (sample for the units with 3-19 persons employed, and a census for those with at least 20 persons employed; 250.000 enterprises surveyed in total) has collected qualitative data on a number of aspects of firms' behaviour, in particular entrepreneurship, governance, human capital management, inter-enterprise relationships, market orientation and competitiveness, innovation, internationalization, finance. Moreover, this type of surveys will be replicated in the future (even though on smaller samples of firms) on a periodic basis so as to monitor the evolution of structural competitiveness factors of the production system and the evolution in terms of modernization, competitiveness and growth potential.

The MPS 7-section questionnaire focused on the following thematic fields:[12]

a. *Entrepreneurship, control and governance*. The section addresses the "firms' identity", i.e. collects information on the firm's ownership structure, the management responsibilities, and decision-making processes. A subsection investigated the entrepreneurship in firms with less than 10 persons employed, in order to provide complementary information on a production segment which is still not covered by official business statistics. In particular, this subsection focuses on the main features of micro-entrepreneurship, such as the entrepreneur's age, nationality, gender, educational qualifications or previous working experience, as well as the effects of possible generational transitions of the business ownership.
b. *Human capital*. In the light of the importance of human capital as a strategic resource for a firm's competitiveness, gathered information refer mainly to the endowment of (and investment in) high-skilled human resources, staff training and caring for specific technical and specialized competences.
c. *Inter-enterprises relationships*. Since in such a fragmented and networked system as the Italian one business competitiveness depends not only on competitive strategies but also on firms' ability to activate productive relationships with other enterprises or institutions, this section investigates whether and to what extent Italian firms participate in business network.[13] Information are gathered on the type of relationship (subcontracting, network, joint ventures, consortia, informal relationships etc.), their goals, and the possible difficulties in activating them.
d. *Market*. Questions in this section position the company in its markets, gathering information – among others – on the extension of the market the firm operates in (local,

[11] The reference universe was identified in all the companies with no less than 3 persons employed (about 1.1 million units), that in 2011 employed almost 12.5 million persons employed (more than three fourths of the whole production system). Firms below a minimum complexity threshold were excluded. Due to the large observation field, a mixed investigation technique was adopted, with a census coverage for the over 75,000 companies with at least 20 persons employed and a sample survey on more than 180,000 entities with 3-19 persons employed.

[12] Other aspects, such as the provision and the use of ICT, since they are instrumental and pervasive in the business activities, were not investigated in a specific section of the questionnaire but were analyzed through single questions in different thematic sections.

[13] Here and in what follows the terms "Firms network" and "inter-enterprise relationships" are used as synonymous.

national, international), the location of firm's competitors, the firm's competitiveness strength points (price, quality, product diversification, production flexibility, location, etc.).

e. *Innovation*. This section addresses the complexity of innovation process, detecting the complementarity of different forms of innovation (product, process, organizational and marketing) and the main strategies adopted to support the innovative activity (e.g. R&D; acquisition of patents and licenses; marketing). The section also collects information about the ICT use in firms with less than 10 persons employed.
f. *Finance*. The questions of this section focus on the various firms' financing sources, both internal (e.g. self-financing) and external (such bank loans, risk capital etc.). Further information was also gathered about some aspects of the bank-firms relationships (such as the possible presence and role of a main bank).
g. *Internationalization*. This section aims at identifying the possible productive internationalization of firms, in terms of foreign direct investment, international productive agreements or both, collecting information also on motives and obstacles.

However, the main added value offered by the MPS survey is the possibility of adopting a cross-thematic perspective, for example to create a "map of strategies" of the Italian enterprises. In this respect, a two-step clustering procedure made it possible to group all the Italian firms in the following five strategic profiles.[14]

1. *Conservative firms*. It is the largest cluster (670 thousand entities, almost 64% of the total, almost 6 million persons employed). It includes firms with an average size of 8.9 persons employed, mostly operating in services and construction. These units are scarcely innovative (only 20% of them do innovate) and mainly focusing on sub-national markets (almost 67%). "Conservative" firms operate generally in Italian Southern and (to a lesser extent) Central regions. Finally, it is noteworthy that even though this group largely includes micro-enterprises, it also contains large firms, so that the profile of "conservative firm" characterizes a substantial portion of the overall Italian production system.
2. *Pocket-sized dynamic firms*. This cluster includes almost 205 thousand entities (nearly 20% of companies, with 2.6 million persons employed), with an average size of almost 13 persons employed and no strong connotation in terms of firm size. Such firms mainly compete on production diversification and product innovation (more than half of them are innovation oriented), but their strategies are mostly focused on sub-national markets (55.8%).
3. *Open firms*. This cluster includes 75 thousand entities with 1.7 million persons employed. The firms' size distribution is quite uniform (5% of the total of micro-enterprises, 12% of small firms, 15% of medium-sized firms, 17% of large ones), with an average size of 22.8 persons employed. Open firms mostly operate in industrial sectors (42.7%) and on international markets (almost 70%), innovate (59.1%) and activate inter-enterprises relationships (100%).

[14] In particular, the procedure proceeded as follows. Firstly, a multiple correspondence analysis was carried out in order to synthesize over 100 variables on firms' strategies included in the MPS1 survey. This led to identifying three "basic profiles" (factorial axes) associated with various dimensions the competitiveness of domestic firm. These profiles were mainly characterized by firms attitude towards innovation, internationalization, networking. Then, a mixed (i.e. with both hierarchical methods and non hierarchical algorithms) clustering procedure was carried out on these profiles, leading to the five groups illustrated in the text. For further detail see Istat (2013).

4. *Innovative firms*. This cluster includes 74 thousand companies with 1.5 million persons employed (average size of nearly 20 persons employed). Strategies of these units are mostly focused on the product and process innovations, but also on marketing innovation. Moreover, almost all firms in this group participate in productive inter-enterprise relationships and mostly compete on price and product quality, but their activity is mainly domestic-market oriented.
5. *Highly internationalized*. This cluster includes "only" 27 thousand units (2.6% of thee total)and 1.1 million employees, (average size of 40 employees). There are 1.9% of the whole micro enterprises, 5% of small ones, 11% of middle ones and 15% of large firms. These units mostly belong to enterprise groups and industrial sectors (while services are scarcely present), operate internationally ((over 90%), are strongly networked (100% of them participate in an inter-enterprise relationship) innovate (68.9%), and compete mainly on production flexibility and product diversification. Almost 50% of these firms are located in the Italian North-Western regions.

As a consequence, the MPS survey helps add some insights about the capability of resilience and competitiveness of the Italian production system, for example disentangling at firm-level the strategies leading to growth from the ones leading to "fatness". In particular, notwithstanding an extremely fragmented business structure, "truly" competitive behaviours and strategies seem within reach (and are actually undertaken) also for a segment of small-sized enterprises. At the same time, conservative and defensive attitudes are still widespread, also among medium and large companies.

3. Testing the pack in the scrum: an analysis of Italian firms' performance during the "double-dip" period (2010-2014) through the Frame-SBS and MPS dataset

The two-pillar statistical package represents the backbone of a number of possible analyses about the resilience and competitiveness of the Italian business system, allowing to properly consider not only the quantitative aspects – such as changes in employment, turnover, productivity etc. – but also the qualitative factors underlying the capability for Italian firms to survive or even thrive during a crisis. Some analyses of this kind have been already carried out and published by Istat (2014, 2015a and 2015b).

In this section we give some additional examples of such information potential for analyses of the resilience of the Italian production system. Firstly, we use the Istat data on business demography and Frame-SBS dataset to point out how the structural characteristics of the business system changed during the last recession (in terms of entry and exit from the business register, shifts along size distribution and so on). In this case the time span is limited by the availability of data on structural business statistics, namely the 2010-2013 period.

Then, the Frame-SBS and Business Census MPS datasets are integrated with the information from the Monthly Survey on the turnover dynamics of manufacturing firms, in order to depict the microeconomic developments underlying the performance of the business system in 2012-2014. This is particularly important in analysing the vulnerability and strength points of the system in a period characterized by two relevant factors: an increasing gap between domestic and non- domestic markets (which made the capability of

competing on international markets a survival matter for Italian firms) and the beginning of recovery (in last quarter 2014).

3.1 The Italian business system through the 2010-2013 recession: structural aspects

The information potential of Frame-SBS is remarkable also in the light of the business demography prevailing in Italy (see Istat, 2015c). Italian business system typically shows a noteworthy stability and persistence of active enterprises over time, with very low birth and death rates. This is accompanied by a gross annual rate of employment turnover (ratio of the total number of jobs involved in firms' births and deaths and the total number of persons employed in the firms) of about 5% (some 800 thousand employees).

This is important, as actually by its nature the Frame-SBS does not allows to analyse "real" business demography. The appearance of a firm in the business register for the first time – i.e. something usually defined as an "entrant" firm − does not necessarily indicate a genuine birth of a new business (see e.g. Criscuolo et al., 2014). It may also reflect an array of other possible events that may give rise to new legal entities, such as company spinoffs, the establishing of new firms within an enterprise group; mergers of more companies; the restructuring of existing firms, the renaming of companies .

Similar issues apply to the definition of "exiting" firm. For the same reasons, the presence of a firm in the business register in two or more years does not necessarily rule out the possibility that during that period some corporate events took place without any change in the firm's name or statistical code. Therefore, in analysing phenomena such as firm's employment dynamics it has to take into account that the possible change observed in the number of persons employed can be the result of an internal as well an external growth (e.g. through an acquisition of another company).

Considering all these caveats, the Frame-SBS dataset allows to assess the changes occurred in the Italian business system during the last recession. Including information on firms' structure and behaviour, the dataset makes it possible to evaluate whether (and how) the Italian productive system that is coming out from the crisis differ from the one that entered it, for example in terms of number and size of the units, employment, and (labour) productivity.

In this vein, considering only the enterprises with at least 1 person employed, some 3.3 million units resulted active both in 2010 and 2013 (about 75% of the 2010 total, accounting for 87% of total employment), with an overwhelming presence of micro-enterprises (95% of the Italian firms have less than 10 persons employed) that is one peculiarity of the Italian business system (see e.g. Istat, 2014).

In 2010-2013 about 21% of the firms increased the number of persons employed. The share is 19.8% for the micro-enterprises and much higher in the small and medium sized enterprises (about 40%). From a sector perspective, the share of firms with a net job creation is higher in manufacturing (30%) than in the service sector (19,7%). These changes have partially modified the structure of Italian firms by size. In particular, the transition matrix in Table 1 shows how in 2010-2013 Italian firms moved across the size classes (in terms of persons employed): the main diagonal indicates the persistence in the same employment class, while the cells below (above) that diagonal show the transitions towards higher (lower) size classes.

A noticeable persistence emerges, especially in the lower size classes that are traditionally more stable (also during the first phase crisis; see Istat, 2011). Of the nearly 3,3 million firms included in the business register both in 2010 and 2013, 2.9 millions (about 87.5%) remained in the same classes; over 190,000 (6% of the total) moved towards higher classes and a similar amount (about 216.000, 6.6% of the total) shifted downward. This net movement downwards involved over 2.3 million persons employed (16% of the total): nearly 680 thousands (almost 5% of the total) employed in the firms moving upwards, and over twice as much (1.5 millions, 11.1% of the total) involved in the shifts downward.

Table 1 – Transition matrix: shifts and persistence of firms in the classes of persons employed between 2010 and 2013 (firms with at least one person employed)

2010 size class	2013 size class						Total
	1	2-9	10-19	20-49	50-249	250+	
1	**1.630.708**	150.264	1.218	330	52	5	1.782.577
2-9	165.821	**1.105.768**	26.502	1.825	292	19	1.300.227
10-19	3.299	31.100	**79.087**	7.954	366	9	121.815
20-49	1.000	2.906	7.770	**33.081**	2.787	27	47.571
50-249	217	515	378	2.328	**14.838**	427	18.703
250+	15	25	7	38	369	**2.700**	3.154
Total	1.801.060	1.290.578	114.962	45.556	18.704	3.187	**3.274.047**

Source: Authors' calculation on Frame-SBS dataset.

Despite this, in the same period over 50% of firms increased their value added, and 15% showed a simultaneous increase in value added and employment. On the other side, 43% of firms have experienced a fall both in value added and employment. The share of these "declining" firms is quite stable across the different size classes, while the share of the "growing" enterprises is very low in micro-enterprises (13%) and higher in the other classes (28%-31%).

Such developments resulted in changes in labour productivity distribution.[15] The new transition matrix in Tables 2a-2b reports how in 2010-2013 firms either remained within the same quartile of labour productivity or moved into higher/lower quartiles, with respect to the whole economy (Table 2a) and firms' size classes (Table 2b). As for the former, the persistence is much lower with respect to the previous transition matrix: among the firms included in the business register both in 2010 and 2013, 51.6% of the units (about 1.7 million firms) remained in the same quartile of productivity.

[15] In order to take account of the technological differences between the sectors, each firm is classified on the basis of the quartiles of the 2-digit Nace industry it operates in. In this respect, for example, two firms both assigned to the second quartile but operating in two separate sectors may have very different levels of productivity, because each of them belongs to the second quartile of its own industry.

Table 2a − Number of enterprises by quartile of Labour productivity (value added per person employed). Years 2010-2013 (firms with at least one person employed)

Quartiles of Productivity (2010)	Quartiles of labour Productivity (2013)				Total
	Q1	Q2	Q3	Q4	
Q1	**342.797**	187.079	84.677	39.471	654.024
Q2	209.548	**346.020**	200.951	60.954	817.473
Q3	98.793	208.627	**400.308**	185.681	893.409
Q4	56.419	64.707	188.909	**599.106**	909.141
Total	**707.557**	**806.433**	**874.845**	**885.212**	**3.274.047**

Source: Authors' calculation on Frame-SBS dataset.

As far as firms' size classes are concerned, the persistence in the same quartile of productivity during (most of) the "double dip" period increases as we move towards the highest size classes, from 50% of micro firms to 75% of large-sized enterprises. More importantly, in every size class a "net movement" towards lower quartiles of labour productivity is observed: 1.8 percentage points among the micro enterprises (i.e. the downward shifts outnumbered the upward ones by over 57,000 units), 5.7 p.p. for the small-sized ones (about 9,700 units), 5.9 p.p. among the medium-sized firms (1,000 units), and only 0.9 p.p. among the large-sized enterprises (29 units).

Table 2b − Number of enterprises by quartile of Labour productivity (value added per person employed) and firms' size classes. Years 2010-2013 (firms with at least one person employed)

2010	2013					2013				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
Q1	**340.140**	185.728	83.800	38.374	648.042	**2.240**	1.202	763	940	5.145
Q2	206.788	**338.828**	195.217	58.870	799.703	2.422	**6.432**	5.167	1.858	15.879
Q3	94.813	202.646	**374.452**	170.729	842.640	3.588	5.514	**23.326**	13.613	46.041
Q4	50.043	61.617	174.179	**506.580**	792.419	5.567	2.772	13.377	**80.605**	102.321
Total	691.784	788.819	827.648	774.553	**3.082.804**	13.817	15.920	42.633	97.016	**169.386**

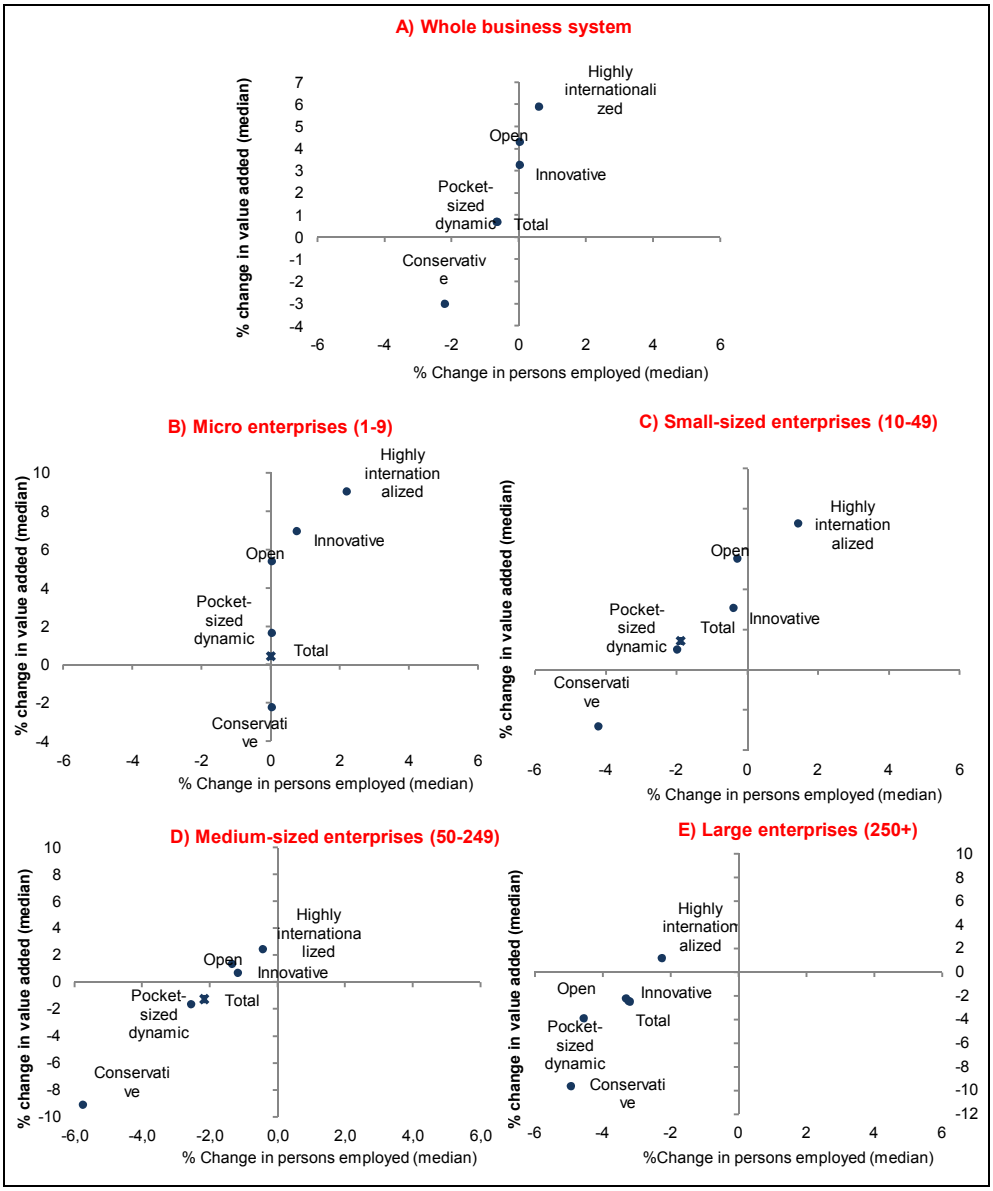
	Medium-sized enterprises (50-249 persons employed)					**Large-sized enterprises** (250+ persons employed)				
2010	2013					2013				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
Q1	**370**	126	90	135	721	**47**	23	24	22	116
Q2	296	**656**	463	206	1.621	42	**104**	104	20	270
Q3	343	406	**2.144**	1.162	4.055	49	61	**386**	177	673
Q4	753	285	1.195	**10.073**	12.306	56	33	158	**1.848**	2.095
Total	1.762	1.473	3.892	11.576	**18.703**	194	221	672	2.067	**3.154**

Source: Authors' calculation on Frame-SBS dataset.

The integration between the two pillars of the statistical package allows to further investigate these trends, analysing how the "strategic profiles" defined in Section 3

contributed to the firms' economic resistance during the crisis, in terms of firms' ability to generate value added and jobs. Some results are reported in Figures 6A-E, referring to the whole business system and four main firms' size classes. Again, only the units appearing in the Frame-SBS register both in 2010 and 2013 are considered.

Figure 6 – Median changes in value added and persons employed by strategic cluster, Years



Source: Authors' calculation on Frame-SBS and MPS1 datasets.

Three main facts come out. Firstly, on the overall, as well as in all the size classes, a general weakness in labour demand emerges, as opposed to better (in some cases good) performance in terms of value added growth. In this context, the evolution of business performance in the 2010-2013 recession appeared somehow more favourable among the smaller units.

Secondly, it is confirmed that in 2010-2013 the resilience of the Italian production system – in terms of ability to create value added and employment – depended on the firms' ability to operate on international markets. With reference to the whole business system, the total number of persons employed decreased by almost 1% (over 143 thousand people), while the overall value added rose by 0.8%. Within this context, the "highly internationalised" cluster (including many exporting firms that belongs to enterprise groups) was the only one in which during the period considered one firm out of two saw an increase both in value added and employment (respectively +6% and +0.6%). In turn, other strategic profiles oriented to export, innovation, and participation in inter-enterprise productive relationships – i.e. the "Innovative" and the "Open" ones – were much more effective in increasing value added (+3.3% and +4.3% respectively) than in creating jobs (the median percentage change is null for both of them), while the "Pocket-sized dynamic" firms, focusing on the product innovation and diversification but relying on the domestic market, experienced a very small median increase in value added (+0.7%) and a reduction in the number of persons employed (at least -0.7% for half of firms). Finally, the "Conservative" firms, less innovative, internationalised and networked, suffered on both fields (-3% in value added, -2.2% in employment).

The further integration of the two pillars of the statistical package with other short-term statistic sources makes it possible to analyse more in depth how such aspects accompanied the performance of the Italian business system during the very last years.

3.2 Facing the demand gap: the Italian firms' performance in 2012-2014

As stated before, one of the main functions of the statistical package is to provide a "structure information cornerstone" for further integrations with other firm-level datasets, referring both to structural and short-term economic events. This feature allows to identify the developments underlying some important recent trends, also taking account, in a multidimensional way, the structural features and the strategic choices by which firms cope with those trends. The possibility of shedding light on the effects of the 2011-2014 "demand gap" is an example.

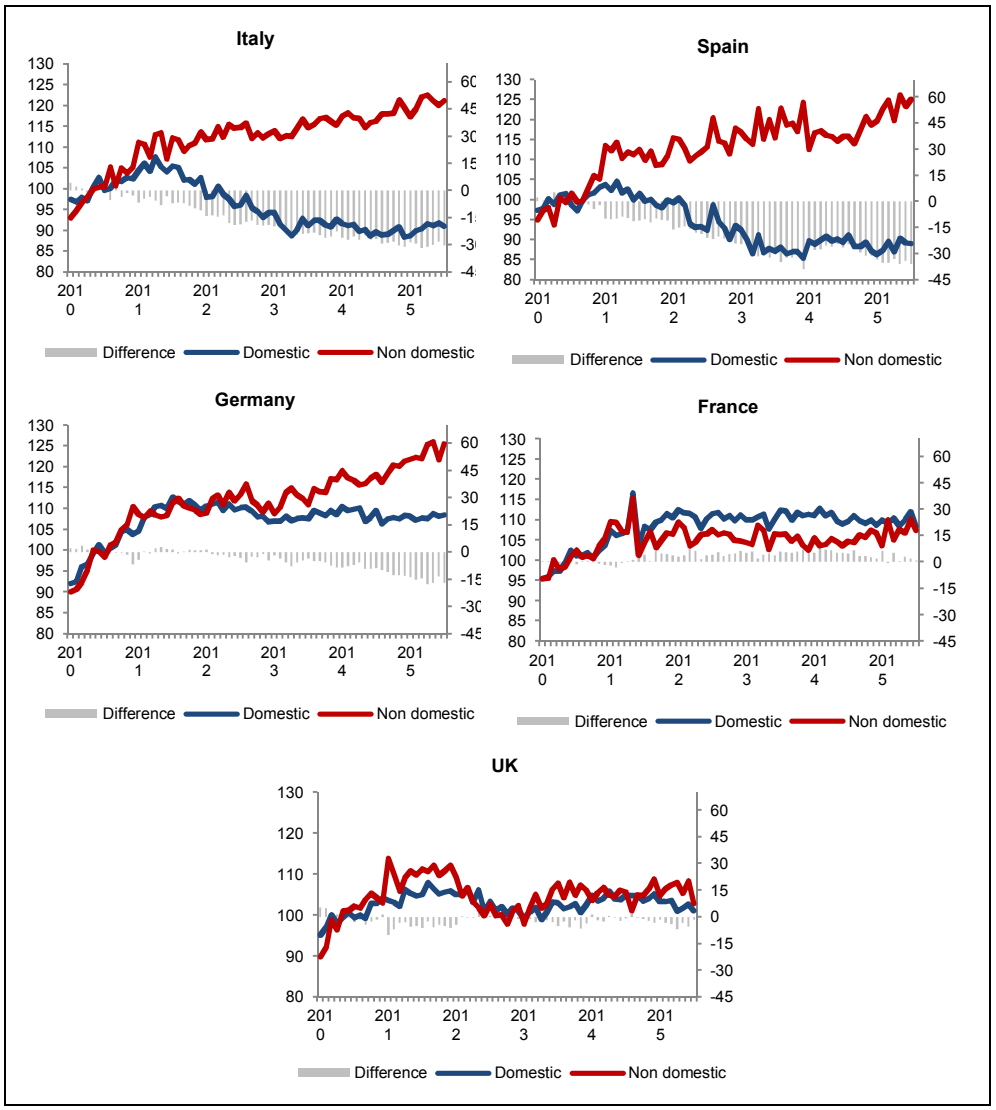
Since 2011 the Italian economy have been experiencing the opening up of a large and persistent gap between domestic and non-domestic demand (see Figure 7), with no comparable examples among main European countries except Spain.

This evolution forced Italian firms to deal with new economic scenarios, so stimulating new research and measurement of firms' multidimensional strategic profiles. Being able to monitor and analyse how the Italian firms face this type of developments is of great importance also for policy-making purposes, because scenarios may not be stable. The most recent data show in fact that during 2015 the demand gap slightly reduced, mainly due to a slowing down in the foreign demand (see Istat, 2015d).

The integration of the two above-mentioned pillars of the statistical package with one of the most important short-term source of information – the Istat monthly survey on the turnover of manufacturing firms – allows to investigate the micro-foundations of such developments, as it links the recent performance of industrial firms to the qualitative

information about their structure and behaviour, identifying the key factors that allowed many of them to survive.

Figure 7 – Domestic and non-domestic turnover in manufacturing sector (index 2010=100)



Source: Eurostat.

The monthly survey on firms' turnover focuses on units with no less than 20 persons employed. This is an important segment of the Italian economy: though relatively few in number (about 30,000 units, nearly 7% of the total manufacturing sector and 0.6% of the total business system), in 2013 these enterprises accounted for over 75% of the value added

in manufacturing (21.5% of total value added of the whole business system) and over 92% of the export.

When read through the lenses of the five strategic clusters defined in Section 3 ("Highly internationalized", "Open", "Conservative", "Innovative", "Pocket-sized dynamic"), this sub-population of the Italian industry appears quite heterogeneous in terms of structure and economic performance (Table 3).

Table 3 – Structure and performance of strategic profiles in the Italian manufacturing sector (2011) Enterprises with no less than 20 persons employed

Strategic profiles	Units (%)	Average size	Labour productivity (Value added/persons employed; thousands euros)	Share of Managerial firms	Network index (median)
Highly internationalized	19,3	124,7	65,9	20,8	43,9
Open	27	92,1	60,5	19,6	28,8
Innovative	10,2	91,3	60,7	15,7	11,5
Pocket-sized dynamic	18,1	90,8	57,5	19,4	10,6
Conservative	25,4	55,9	54,6	14,9	10,2
Total	100	88,9	59,4	18,2	21,9

Source: authors' calculation on Frame-SBS, MPS1.

First of all, in accordance with the theoretical and empirical literature, which has widely shown that to overcome the export entry barriers and successfully operate on international markets firms need to reach adequate levels of productivity,[16] the cluster of "highly internationalized" firms shows the highest values of firm's average size and productivity. Moreover, these units are strongly networked − so confirming that international activity is associated to more complex forms of business organization[17] − and are the ones among which the managerial governance is more frequent (nearly 21, as opposed to the 14.2% among the "Conservative" firms and the 5.3% in the overall manufacturing industry).

At the other extreme, 25% of firms in the sample here considered belong to the "Conservative" cluster. This segment basically includes the less dynamic firms of the sub-population of industrial firms with no less than 20 persons employed: the units in this cluster are in fact relatively smaller, less productive and most rarely managerially run than those of any other cluster. Finally, they are also less networked (network index is 10.2, compared to the average of 21.9 and 15.7 for the sample and entire business system respectively).

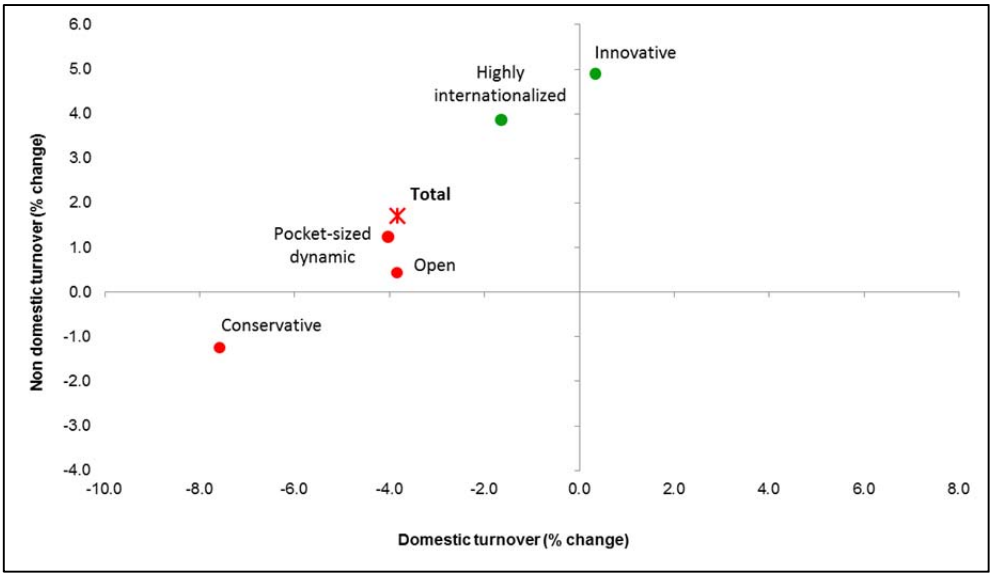
Such heterogeneity in competitiveness factors in 2011 seems to be able to explain substantial differences in firms' performance and competitiveness in the 2012-2014 period.

[16] See, among others, Melitz e Ottaviano (2008) for a theoretical framework; Wagner (2012) for a comprehensive review of empirical studies; Altomonte *et al.* (2012) for a cross-country comparison of firms' performance associated to different internationalization forms; Hollenstein (2005) for a study on the determinants of internationalization of (Swiss) SMEs; Costa *et al.* (2015) for an analysis of how the choices of different internationalization models affected the performance of Italian firms during the first phase of the crisis (2007-2010).

[17] The network index summarizes three dimensions of inter-enterprises relationships: the range of firms' relationship forms (e.g. subcontracting, joint ventures, other formal agreements, informal relationships etc.), the number of firm's counterparts involved in the relationships, the geographical extent of the relationships (especially if this involves counterparts abroad) Its values range from 0 to 100. For more details on the construction of the index, see Istat (2013c).

In this context, the clusters illustrated in section 3 draw a "strategy profile" for each different performances during the "double dip" period (Figure 8).

Figure 8 – Median percentage changes of domestic and non-domestic turnover in 2012-2014 by cluster (manufacturing firms with no less than 20 persons employed) (a)



Source: authors' calculation on Frame-SBS, MPS1, and Monthly Survey on turnover of manufacturing industry.
Green: clusters with positive changes in total turnover; **Red**: cluster with negative changes in total turnover.

First and foremost, in line with the prevailing literature, innovation and internationalization stand out as crucial factors in determining firms' capability to preserve their competitiveness on domestic and foreign markets. The "Innovative" cluster is the only one with positive turnover dynamics on both markets (median values: +0.3% for domestic turnover and +4.9% for export); in other terms, the choice of innovating products and processes (but also marketing strategies), as well as the participation in intense inter-enterprises relationships and strategies mainly relying on price competitiveness and product quality, allowed these firms to avoid the harsher consequences of the recent crisis and even keep prospering not only on international markets,[18] but also on a virtually stagnant domestic market.

In the same period also half of the "Highly internationalized" firms increased export (no less than +3.9%) and this performance offset the domestic turnover fall (median -1.6%), leading to a positive dynamics of total turnover (at least +2.3% for one firms out of two). In this case too, the firms' behaviour are mainly oriented to access new (international) markets adopting complex strategies of product positioning, based on product innovation, flexibility

[18] Actually, during the last recession these very strategies made it possible for many Italian manufacturing firms to successfully face the growing competitive pressure also on medium- and low-technology products (the "Made in Italy" goods), see Costa and Luchetti (2015).

in production and the establishment of many and intense relationships with other firms and institutions.

No other cluster showed such a good performance in terms of total turnover in the period considered: the "Open" and the "Pocket-sized dynamic" firms increased their sales abroad (median values: +0.4% and +1.2% respectively), but the fall in domestic turnover (-3.8% and -4.0% respectively) led to a total turnover decline by 1.5 and 1.8% respectively.

Finally, the "Conservative" firms had the poorest performance, with fall in domestic (median -7.6%), non-domestic (-1.2%) and consequently total turnover (-5.5%). These firms, in fact, show a very simple strategic profile, have a low propensity to innovate and focus their activity essentially on sub-national markets, that is on the field most severely hit by the recession.

The Italian manufacturing firms with at least 20 persons employed recently showed signs of recovery: in 2014, one out of two of them increased its total turnover by no less than 0.8% with respect to 2013. The revenues grew on the foreign markets (median 1.6%, compared with 0.2% in 2013) and were substantially unchanged on the domestic ones (less than +0.1%; it was -2.7% in 2013).[19]

This result, after three years of falling demand, is the main novelty, and largely explains the general upward shift in the distribution of performance of enterprises (in 2014, 53% of companies posted an increase in total turnover with respect to 2013, compared with 46% in 2012-2013).

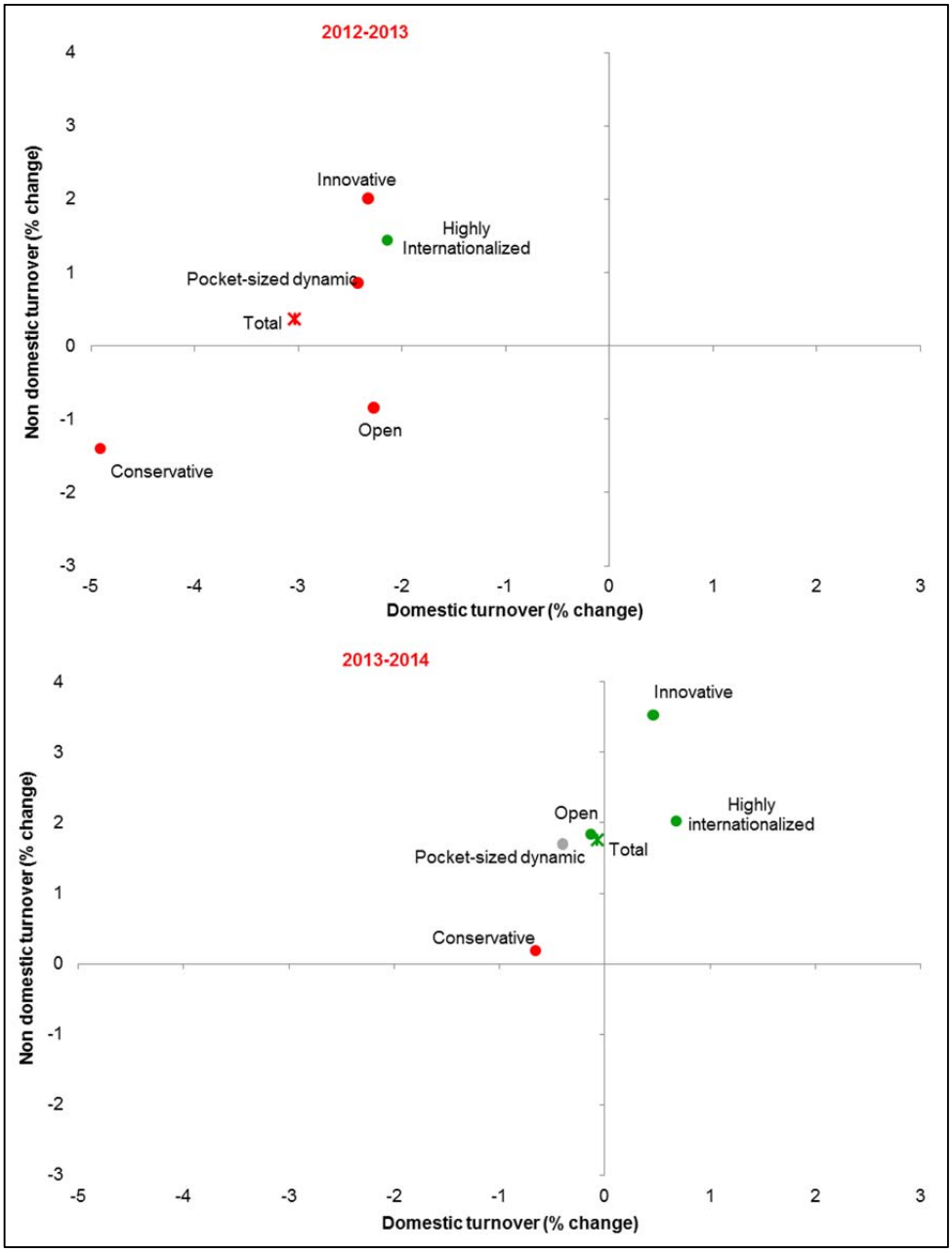
Figure 9 shows how these trends of turnover differ according to the firms' strategic profiles, even in presence of a general improvement between 2013 and 2014.

In 2012-2013, when any possibility to recover basically relied on the ability to compete on international markets, in no cluster the median dynamics of sales on domestic markets was positive; in three of them half of the firms increase saw their export, but only the "highly internationalized" firms benefited from a growth in the total turnover.

The 2013-2014 period saw a general upward and rightward shift of the distribution of firms' performance, with just the "Conservative" firms lagging behind, despite the increase in export.

[19] For further details on these dynamics, see Istat (2014, 2015).

Figure 9 – Median percentage changes of domestic and non-domestic turnover in 2012-2013 and 2013-2014, by cluster (manufacturing firms with no less than 20 persons employed) (a)



Source: authors' calculation on Frame-SBS, MPS1, and Monthly Survey on turnover of manufacturing industry.
Green: clusters with positive changes in total turnover; **Red**: cluster with negative changes in total turnover;
Grey: cluster with total turnover unchanged (i.e. the change was less than 0.1% in absolute value).

4. Conclusion

In this work we illustrated how the Istat new approach to the compilation of official business statistics provides an answer to the demand for reliable, high-quality microdata to assess the economic resilience and competitiveness of the economic system. The integration into a single "statistical package" of administrative and statistical sources on firms' structure and strategies significantly refines the basis for the production of official statistics, while providing an (accessible) firm-level dataset to support economic analyses consistent with official aggregated data.

This allows to measure economic resilience taking particularly into account a number of relevant elements. Firstly, it is possible to properly take in consideration the degree of heterogeneity within the economic system in terms of firms' structure, strategies and performance. In this respect, we were able to observe how some specific "strategic profiles" kept fostering the firms' performance even during such a severe recession as the 2010-2013 one, which determined non negligible changes in the structure of Italian business system (e.g. in terms of size and value added distribution).

This leads to important developments both from a positive (i.e. descriptive) and a normative (i.e. prescriptive) point of view. On the positive side, the new framework enhances the available economic information and (therefore) the ability to isolate at a very high level of disaggregation the "top" and "bottom" performing segments of the production system (especially in such a fragmented economic structure as the Italian one). On the normative side, the new statistical package enhances the possibility of more evidence-based policies for economic growth.

Finally, the new approach to business statistics establishes a cornerstone for further integrations with other short-term information, both from administrative and statistical sources. This helps analyse the "deep transformations" underlying the most recent developments and scenarios that the Italian business system has been facing, such as the firms' domestic and foreign performance during the recovery phase; the firm-level effects of labour market policies; the effects of changes in international trade scenarios on exporting firms' performance; the changes in import demand at firm-level.

Moreover, an implementation plan has been designed to further develop the "Statistical package". The main action points are: a) an enhanced use of administrative and statistical sources already available and already embodied in high-quality statistical processes, b) the design of new special surveys taking into account the needs of economic analysis for evidence-based policies.

As regards the first action, the aim is to support more in-depth micro-founded analyses of the Italian business system. To do so, Istat has launched a high-level task force including also researchers from Bank of Italy, universities and research centers. The task force is expected to develop in 2016 a set of further indicators aimed at assessing the competitiveness of Italian firms within their sectors and markets according to three relevant dimensions of enterprise's activity: employment and wages, participation in foreign trade, business location. For example, as regards the labour demand, the availability of individual data on all employees employed by Italian companies allows to evaluate the characteristics of labour input employed by businesses, in terms of socio-demographic characteristics, position and wage of each employee.

The second action will provide information from survey data on firms' governance, organization and strategies: a dedicated census survey on large and medium size businesses for a total of three thousand five hundred units has been carried out in 2015. This survey is devoted to shed light on the business organisation and competitiveness drivers of the so called complex business units. In particular, it adopts an innovative approach both in terms of identification of statistical units and information collected through the questionnaire. The questions focus on the managerial capability to project, develop and currently implement complex business strategies such ad internationalization and knowledge creation.

Furthermore, an update of MPS has been planned in order to evaluate the progress of Italian firms in the recent period, comparing the current situation with the 2012 one. In particular, the seven MPS topics will be updated by using ad hoc web-surveys on selected samples of firms, representative of the different clusters selected in 2012 (persistent firms) and of the business demography (new firms).

Finally, the innovative Istat approach to the business statistics is coherent with the need for high-quality and relevant official information to measure firms' competitiveness in a policy-oriented framework. This was also stated in the conclusions of the recent Lisbon Memorandum (2015 DGINS Conference) with reference to the main drivers for the development of the ESS.

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