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Towards the compilation of eSUT for Italian economy

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Summary

It is strongly agreed that a higher granularity within the SNA framework of accounting would boost the capability of identifying and interpreting globalisation and the increasing heterogeneity of structures, strategies and performances of different typologies of business units. In this context, the compilation of extended Supply and Use Tables (eSUT) represents a promising way to meet those emerging analytical needs. Moreover, the information included in eSUT framework may also provide a starting point for the compilation of extended Input-Output Tables (eIOT), which can be in turn used for impact and structural (relational) analyses.This work presents the state of art of the pilot to develop an eSUT framework for the Italian economy. The scheme considers a sectoral breakdown along three dimensions: governance status, market status and size-class. Several aggregates are taken into account, ranging from demography to employment, from production to operative margins, where the coverage with respect to total National Accounts ranges from 80% to 90% according on the given aggregate. This granularity has been obtained by exploiting firm-level information provided by different Istat databases (Frame-SBS, ASIA, COE-TEC and other), which allowed for a wide use of microdata in assigning the characteristics related to each business unit to the given strata.At the current stage, the pilot allowed to replicate a large part of the main supply-side aggregates by economic activity analyzing interesting issues related to the patterns of the Italian business system. Future developments aimed at completing the scheme should include: the representation of international trade in services (including merchanting and processing) from microdata; the inclusion of conceptual adjustments and balancing of SUT; the disaggregation by product and the representation of intermediate consumption and final demand (consumption and investments); the definition of eIOT framework following the eSUT disaggregation.

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[1] Prepared by Federico Sallusti and Stefania Cuicchio. Disclaimer: The opinions expressed in this work are the ones of the authors themselves and do not involve the responsibility of the Italian National Institute of Statistics.

I. Introduction

1.   In the last decades, the progressive removal of trade barriers and the development of communication technologies increased the process of integration of markets for trade and FDIs, and boosted the formation of Global Value-Chains (GVCs). This is strongly challenging the conventional framework of accounting for international trade flows and production processes that may not provide an adequate and comparable representation of countries' activity levels. Indeed, traditional gross measures of imports and exports are now less informative, while the increasing heterogeneity in structure, strategies and economic features of business units is hardly captured by sector-based Supply and Use (SUT) and/or Input-Output (IO) tables.

2.   New approaches, such as Trade-in-Value-Added (TiVA) or multi-regional Input-Output (e.g., WIOD, Figaro initiative, ICIO) in recent years to improve the effectiveness of macro-economic information in interpreting these emerging phenomena. These frameworks, however, suffer from the implicit assumption of homogeneity of business units within the same sector of economic activity (e.g., same technical coefficients). In other words, while TiVA and multi-regional IO provide a ''net" representation of international trade, which is more effective in accounting for the role of GVCs, they can hardly support the knowledge about the implications and impacts arising from the increasing heterogeneity of business units.

3.   In this context, three main patterns of firms' heterogeneity are considered the most relevant. The first one relates to their "trading status", i.e. the extent to which business units are oriented towards domestic or foreign markets in order to sell their output and/or to purchase production inputs. The second element of heterogeneity is connected with the size of the firm, while the third one is represented by the "governance status", i.e. the national or foreign ownership (belonging to domestic or foreign groups). Along these dimensions of heterogeneity, economic and strategic behaviors of firms strongly differ, this involving a reduced effectiveness of analyses based on some "representative" and/or "average" unit within industries.

4.   There is a wide agreement about the possibility that an extension of the traditional sector-based SUT/IOT scheme may represent a relevant improvement in accounting for firms' heterogeneity and, at the same time, a bridge between the national and global perspectives in the analysis of production. Indeed, the extension of SUT (eSUT) framework is aimed at providing a more granular description of production processes by accounting for the different dimensions of firms' heterogeneity. In particular, a finer breakdown of information that takes into account different types of enterprises based on trading status, size and governance status should improve the capability of SUT framework to capture the increasing complexity and integration of production processes.

5.   Obviously, the extension of the SUT framework entails several issues, ranging from the availability of micro-data to confidentiality, from the difficulty of breaking-down information by product, to the strong concern represented by the possibility of representing the role of trade intermediaries in foreign markets. That notwithstanding, eSUT represents a promising way to improve the capability to understand and represent the behavior of domestic business systems in a globalized economy.

6.   This paper presents the results of the pilot activity that Istat (the Italian National Statistical Office) is developing to obtain eSUT for the Italian economy. In fact, the wide availability of microdata related to business statistics, international trade and governance set-ups allows for comprehensive information on the different patterns of firms' heterogeneity and makes it possible to obtain a granular representation for a large part of the information contained in the traditional SUT scheme, at least from its "by-sector" component.

7.   At this stage, in particular, eSUT replicates a large share (about 90%) of the flows related to a wide set of aggregates (production, intermediate costs, value added and operative margins, employment, firms demography, structure of imports and exports of goods) for 48 typologies of business units, defined over 4 trading statuses, 4 size-classes and 3 governance statuses for each industry.

8.   Starting from this granular information, this paper provides a preliminary analysis of some phenomena characterizing the role played by Multi-National Enterprises (MNEs) in the Italian economy in comparison with that Small and Medium Enterprises (SMEs).Although the pilot represents a significant step forward, the eSUT for Italian economy should be completed. The main future improvements will include: a more detailed representation of international trade in services (including processing) from micro-data; the inclusion of conceptual adjustments and balancing of SUT; the analysis by product and the representation of intermediate consumption and domestic final demand (consumption and investments); the definition of IOT framework following the eSUT disaggregation.

9.   The paper is structured as follows. The second section is aimed at presenting the structure of eSUT, the aggregates that are included and the data used to compile it. The third section is devoted to present the results of the analyses carried out by using the information of eSUT. The last section concludes with some perspectives on future development of the analyses.

II.   Data sources, structure and aggregates

10.   In Italy, the SUT consists of 98 industries and 256 products. Information from micro-data covers a large share of the total National Accounts figures. On the supply-side, direct estimation methods – survey, census, administrative records – account for a large part of output (88.7%), intermediate costs (97.2%), value added (76.5%) and imports (100%) for observed economy, while extrapolation models are used for the remaining flows, including conceptual adjustments and supply-demand balancing. Exhaustiveness adjustments (accounting for about 20% of value added), on the other hand, are based on a wide range of different models, largely exploiting microdata. On the demand side, the flow of exports is measured by using direct estimates from surveys, census and administrative records, while a relevant use of indirect methods and extrapolation model is done in estimating final consumption and investments.

11.   The extensive use of micro-data allows for a detailed and reliable disaggregation of results for a relevant set of aggregates. In particular, in order to account for the aforementioned patterns of firms' heterogeneity, the extension with respect to the sector-based set-up of SUT have been obtained by considering different typologies of business units according to three dimensions: trading status, size- class, governance status.

12.   As for trading status, firms have been broken-down into four categories: not internationalized (i.e., business units that neither import nor export); only importers (i.e., business units that import but do not export); only exporters (i.e., business units that export but do not import); two-way traders (i.e., business units that both import and export). In this context, firms are considered as importers and/or exporters if they have a positive value of imports and/or exports in the reference year. The related information is gathered from TEC (Trade by Enterprise Characteristic) database.[2]

13.   Size-classes are defined over four categories that are intended to capture different organizational and behavioral set-ups: micro-enterprises (1 up to 10 workers); small enterprises (from 10 up to 50 workers); medium enterprises (from 50 up to 250 workers);

2 Alternative definitions of exporters/importers could be used, such as selecting foreign trade relationships only in presence of stronger signals based on the share of exports and imports in sales and total costs. For this pilot, however, the simplest definition is used, while more complex categorization may be used in future developments.

large enterprises (more than 250 workers).[3] The related information is gathered from the ASIA Archive, which reports about the size, location and demography of resident enterprises.

14.	Finally, governance status is defined over three categories, which are intended to grasp the typology and residence (national or foreign) of the ownership. In particular, the category of domestics includes business units that are owned by resident operators or that belong to domestic groups; Domestic MNEs are firms that belong to multinational groups with global decision centers in Italy; Foreign MNEs are domestic units that belong to multinational groups with foreign global decision center. The related information is gathered from the ASIA groups archive, which reports about the structure of domestic and multinational groups in which resident enterprises are involved as affiliate or parent.

15.	Interacting the categories over these three dimensions of heterogeneity, 48 typologies of business units are obtained that allows, considering 98 industries, to derive the matrix-like scheme in Figure 1 for a set of National Account aggregates. This matrix permits, for each aggregate taken into consideration, to breakdown the total of economic activities (the marginal column) into the different typologies (rows) and to obtain partial totals by typology (the marginal row).[4]

Figure 1
Activity-typology matrix scheme for breaking down National Account aggregates

Market status	Not internationalised												Only importer					Only exporte					Two-way trader					Total
Governance status	Domestic				Domestic MNE				Foreign MNE				Domestic				...	Domestic				...	Domestic				...	
Size-class	1-10	10-50	50-250	250+	1-10	10-50	50-250	250+	1-10	10-50	50-250	250+	1-10	10-50	50-250	250+	...	1-10	10-50	50-250	250+	...	1-10	10-50	50-250	250+	...	
Economic activity																												
1																	...					...					...	
2																	...					...					...	
3																	...					...					...	
...																	...					...					...	
55																	...					...					...	
56																	...					...					...	
57																	...					...					...	
...																	...					...					...	
96																	...					...					...	
97																	...					...					...	
98																	...					...					...	
Total																	...					...					...	

16.	In particular, this scheme is compiled for the following aggregates (information):

- Number of business units

- Output

- Intermediate consumption

- Value added

- Employment

- Compensation of employees

- Gross operating surplus

- Imports of goods

- Exports of goods[5]

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[3] Also in case of size class, more complex measures of firm size could be used that also take into accounts other characteristics (such as turnover, age, level of capitalisation). A break-down of firms based on such more complex measures of size could be used in further developments.
[4] At this stage, in which the structure by-product is not considered, the matrix in Figure 1 allows a more straightforward representation of results.
[5] For imports and exports, the scheme in Figure 1 can be widen by adding a third dimension which account for the origin of imports and destination of export in terms of country (geographical area).

17.   For each of these aggregates, both the observed economy and several adjustments for exhaustiveness are considered. In this context, Figure 2 shows the coverage of the pilot.[6]

Figure 2
Coverage of pilot

Covering	Not covering
Observed economy	Observed economy
Survey and census	*Conceptual adjustment (ESA2010)*
Administrative data	*Imports and exports of services*
Combined data	
Imports and exports of goods	
Adjustment for exhaustiveness	Adjustment for exhaustiveness
Value added from un-registered workers (N1)	*Illegal economy (N2)*
Business units outside the scope of SBS (N4)	*Statistical deficiencies of data (N7)*
Microfirms, outworkers (N5)	
Under-reporting (N6)	

18.   The coverage with respect to total National Accounts figure for each aggregate is obtained by exploiting a wide range of data sources, which refer to both micro- and meso-information. More in detail, Figure 3 show the correspondence between the database used as informative source and the given aggregate to be broken down according to the structure of eSUT.

19.   As for micro-database, Frame-SBS Register is an integrated database which, by integrating the information from surveys and administrative records (e.g., balance sheets, fiscal reports), contains a wide range of structural, demographic and economic information about the whole population of Italian active business units.

20.   The ASIA group register collects the information about the position of Italian firms within domestic and multinational groups (with both Italian and foreign global decision center).

21.   The TEC archive contains the information about the imports and exports of goods – including the country of origin/destination of trade flows – for the whole population of Italian business units.

22.   Frame NOE register includes, for the whole population of active firms, the information about possible under-reporting of value added.[7]

23.   The ASIA LeU Register is an extension of the ASIA register of active enterprises considering also the business units which, for their size and economic behavior, are excluded from Frame SBS.

24.   Finally, the Social security database contains information about the activity of outworkers.

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[6] At this stage, the pilot considers business units that operate within the economic activities that are in the scope of Structural Business Statistics (SBS). This involves the exclusion of agriculture, financial intermediaries and insurance companies and general government.

[7] The under-reporting of value added by business units is estimated at micro level by using different indirect methods according to the characteristics of the firms in terms of size-class and other structural characteristics, such as the presence of physical capital, the industry in which operates.

Figure 3
Correspondence between informative source and aggregates

Micro-data

Frame SBS Register	Output, costs, value added, compensation of employees, operative margin, employment for resident business units within the scope of SBS
ASIA Group Register	Structure and governance of domestic and multinational groups
TEC Archive	Imports and exports by resident business units and country of origin/destination
Frame NOE Register	Adjustment for under-reporting for treatable resident business units within the scope of SBS (N6)
ASIALeU Register	Adjustment for resident units outside the scope of SBS (N4)
Social security database	Outworkers (N5)

Meso-data

Employment database	Un-registered employees and self-employed, workers, positions, hours worked and FTEs
NOE database	Value added from un-registered workers, other underground components (N1)

25.   As for meso-database, the Employment database contains the information about the number of un-registered employees and self-employed within 4-digits NACE and size-class strata, also considering jobs, hours worked and FTEs.

26.   NOE database finally contains meso-information about the other component of NOE, where the most relevant is the value added generated by un-registered workers, which is estimated within industry-size class strata.

27.   Considering the information shown in Figures 2 and 3 is possible to define how the National Account aggregates taken into account are treated in order to breakdown industry-based figures according to the structure of the eSUT pilot.

28.   In particular, items included in observed economy are broken-down into each typology at micro- level, i.e. the values related to each business units is assigned to the relative typology according to the characteristics of the given firms.

29.   As for the adjustments for exhaustiveness, the values connected with business units outside the scope of SBS (N4), micro-firms and outworkers (N5), and under-reporting (N6) are assigned to typologies exploiting micro-data. The value added from un-registered workers is instead allocated using industry-size class strata (excluding by definition multinational enterprises – independently from the location of the decision center – and firms that are in some way internationalized).[8]

III.   Using eSUT for economic analysis

A.   Introduction

30.   As shown in the preceding section, by exploiting several data sources, a finer breakdown of National Account figures can be obtained in order to consider different dimensions of heterogeneity of business units. Indeed, the eSUT compiled according to the scheme of the pilot allows to shed light on a set of emerging phenomena, accounting for the role of different typologies of firms. In particular, in this work the focus has been put on three elements, which are separately coped with in the following sub-sections: the role of MNEs; the role of internationalized firms; the role of Small and Medium Enterprises (SMEs).

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[8] This information is normally produced at 4 digits NACE-size class level.

B.   The role of MNEs

31.   In 2019, more than 45K business units belong to multinational groups, where 40% (18.3K) are involved in multinational groups with foreign global decision center and 60% (27.5K) are involved in multinational groups with Italian global decision center. Even though MNEs represent slightly more that 1% of the whole population of Italian business units (about 4.3 million) in terms of number of firms, they are strongly relevant in terms of other economic indicators. Indeed, MNEs generate 25% of total value added, employ 20% of the whole workforce and represent 75% of international trade flows (imports and exports).

32.   In this context, Figure 4 displays economic and structural indicators by governance status that may help understand some features of MNEs with respect to domestic business units. In particular, MNEs are found to be less vertically integrated than domestic firms: the latter shows an average value added- to-output ratio of 0.52, while MNEs report largely lower values (0.31 for MNEs with Italian global decision center, 0.30 for MNEs with foreign global decision center). MNEs also show a higher profits-to-value added ratio (0.54 for both typologies) than domestic firms (0.43), but a lower profits-to-output ratio (0.16 for both kinds of MNEs vs. 0.23).

Figure 4
Economic and structural indicators by governance status

33.   As for the labour market, Figure 5 shows that MNEs show a higher productivity: their value added- per- worker is by far larger (94.8K euro per worker for both domestic and foreign MNEs) than in other business units (on average 72.9K euro per worker for domestics). However, average compensation of employees results to be higher for domestics (45.8K euro per worker) with respect to MNEs (43.9K euro for MNEs with Italian global decision center and 43.8K euro for MNEs with foreign global decision center). Consequently, MNEs show a higher mark-up on labour cost (that range from 2.16 to 2.17) than the one reported by domestic enterprises (1.59).

Figure 5
Labour productivity and labour market indicators by governance status
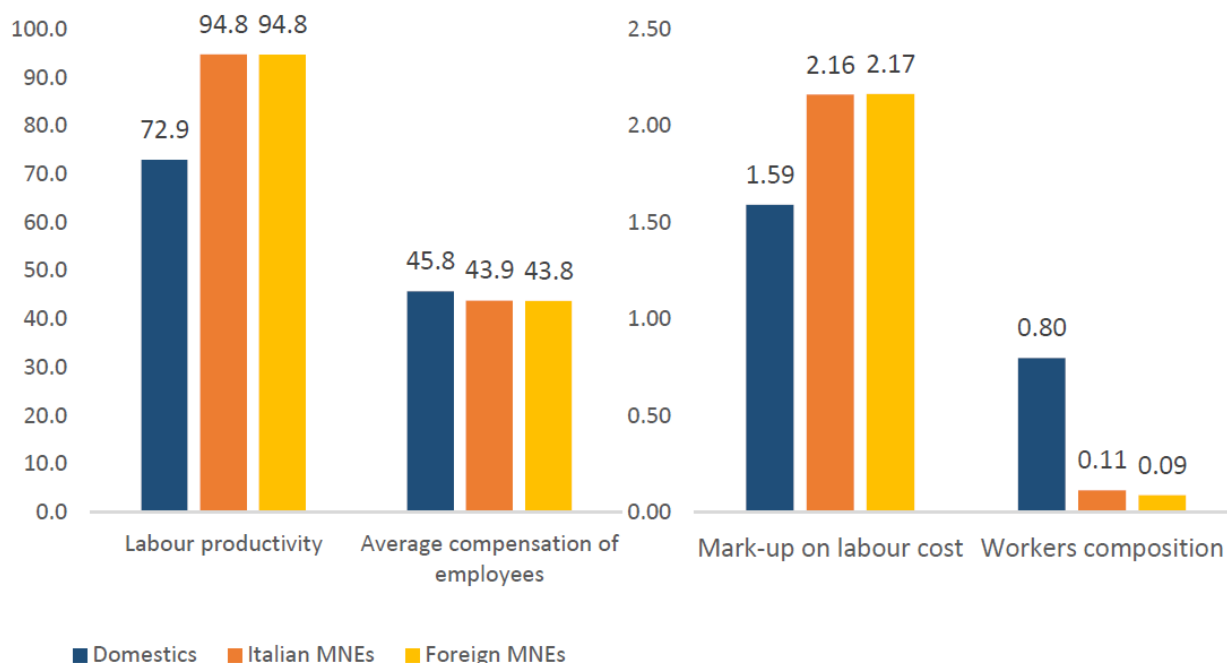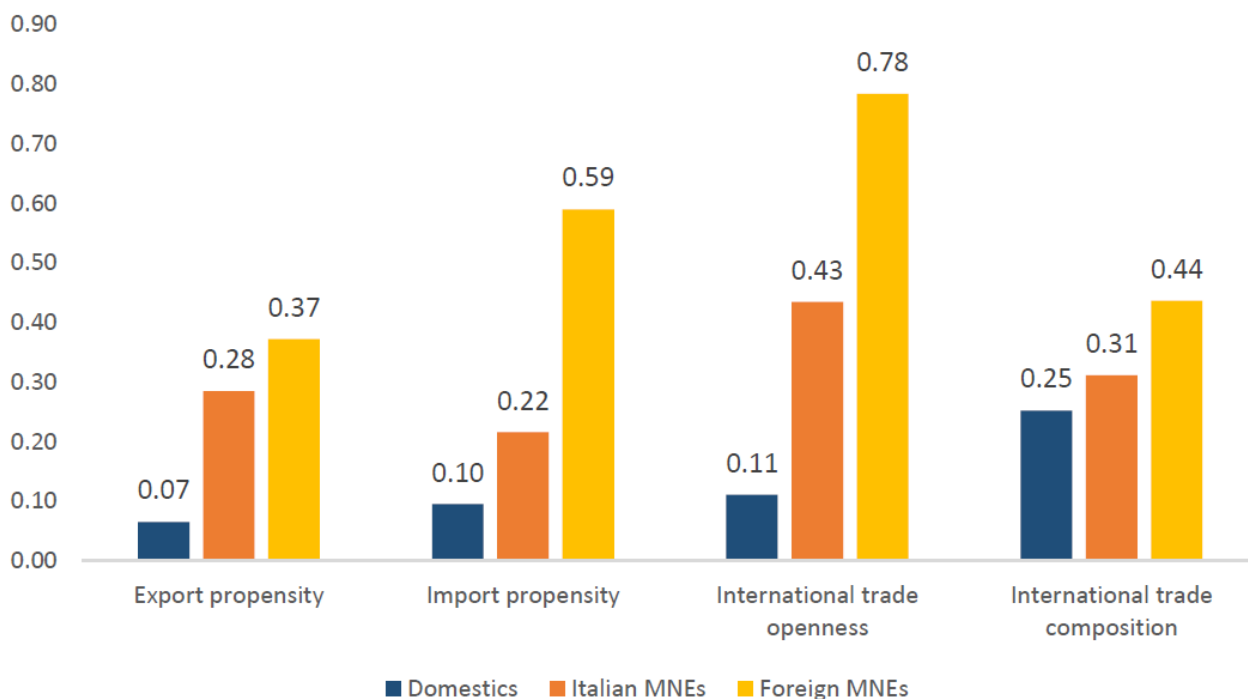

Figure 6
Internationalization indicators by governance status

34.   MNEs have a leading role also in international trade. As figure 6 displays, indeed, MNEs shows a higher level for all indicators of internationalization. Considering the international trade openness indicator – defined as the share of total imports and exports on output – domestic firms show a value of 11%, which is by far lower than 43% of Italian MNEs and 78% of foreign MNEs. This trend toward a higher openness is confirmed also looking at the decomposition of trade openness indicator: both for export and import propensities, MNEs have higher values than domestic: between 0.28 (Italian MNEs) and 0.37 (foreign MNEs) vs. 0.07 for exports and between 0.22 (Italian MNEs) and 0.59 (foreign MNEs) vs. 0.10 for imports.

## C. The role of internationalized firms

35. Considering trading status, domestic firms, i.e. business units that neither export nor import goods,[9] represent 96% of the whole population. In manufacturing, this share lowers to about 80%, where 8% of firms are two-way traders. In terms of employment, two-way traders account for slightly less than 19% of the total workforce, while domestics employ about 72% of workers.

36. As Figure 7 shows, 66% of total value added is produced by domestic firms, while 25% is generated by two-way trader; only importers and only exporters respectively account for 5% and 4% of the value added of the Italian business system.

37. The relevance of internationalized firms strongly change according to industry. Indeed, in manufacturing 68% of value added is generated by two-way traders, while only 20% is produced by domestics. The impact of internationalized firms is also important in trade, where they account for about 53% of value added (36% for two-way traders), and in transportation, where the share is 42% (23% for two-way traders).

Figure 7
**Value added composition by industry and market status**
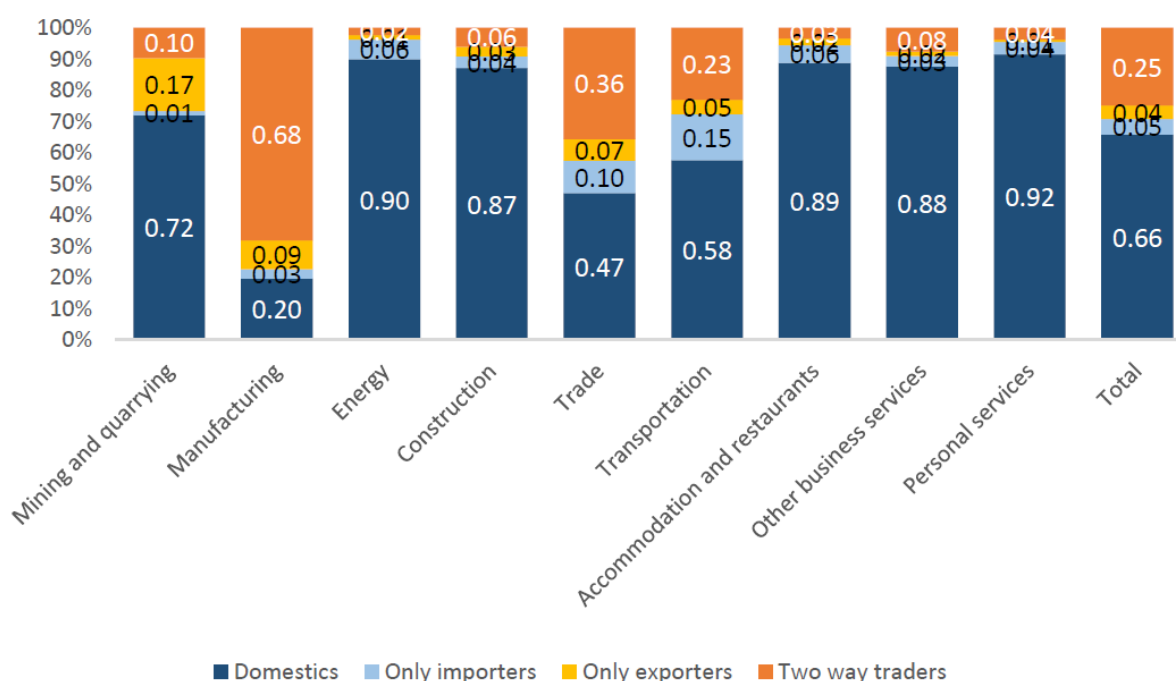
38. The trading status is an interesting perspective also to analyse the performance of firms. Indeed, there is a large agreement on the correlation between internationalization and labour productivity. As shown in Figure 8, even within a relevant sectoral heterogeneity, two-way traders are found to be more productive than other typologies of business units: overall, they generate 86.7K euros of value added per worker, while domestics show a labour productivity of 59.3K euro per worker, and only exporters and only importers, respectively 59.7K and 72.0 K euro.

39. Two-way traders are more productive than other typologies of business units in all industries but mining and quarrying and energy, where domestics have a leading role, and transportation, where instead only importers are the more productive typology of firms. The differential in productivity between two-way traders and domestics is particularly high in construction (74.3K vs. 40.0K euro per worker), trade (81.9K vs. 31.1K), hotel and restaurants (51.4K vs. 22.1K) and personal services (113.6K vs. 44.1K).

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[9] At the current stage, the pilot considers only imports and exports of goods.

Figure 8
Labour productivity by industry and market status
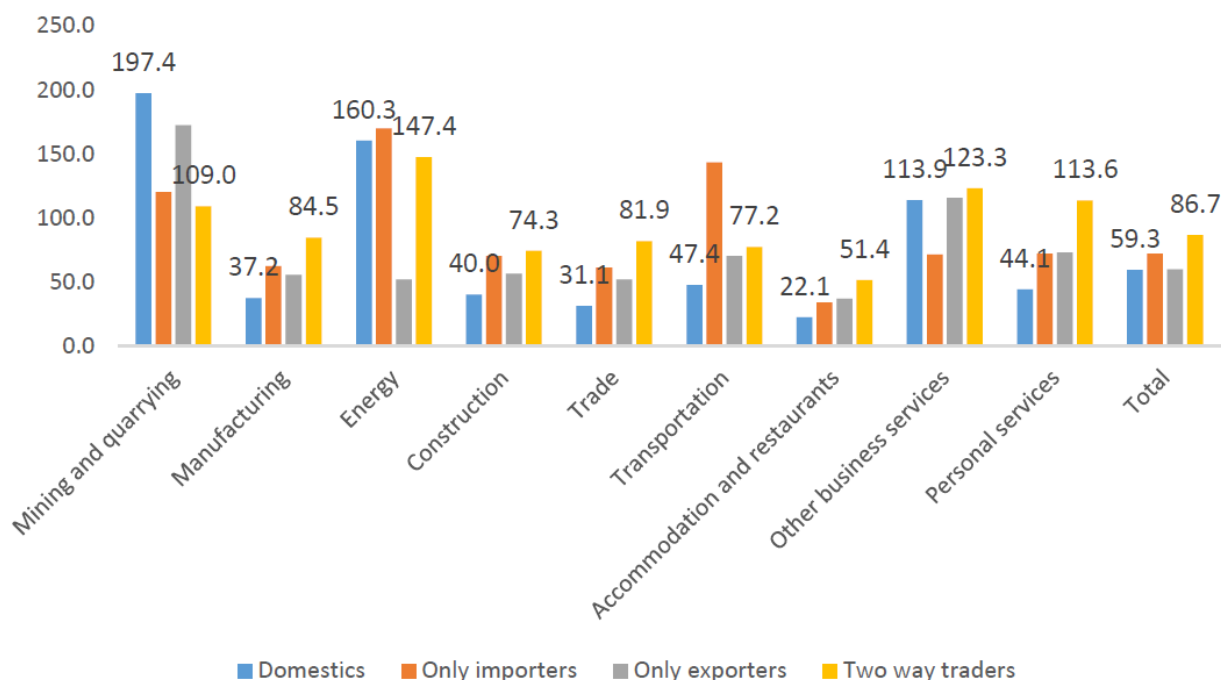
40.   Also in manufacturing, where the role of international trade is relevant, there is a remarkable difference in productivity among the typologies of business units. Indeed, two-way traders show an average labour productivity of 84.5K euro per worker, while domestics generate 37.2K euro per worker, only importers 62.5K and only exporters 55.4K.

D.   The role of small and medium enterprises

41.   The Italian business system is characterized by the high relevance of small and medium enterprises. As shown in Figure 9, micro-firms (1-10 workers) represent 95% of total business units. The prevalence is even higher in services, while in manufacturing, energy and mining and quarrying is slightly lower (respectively 81%, 85% and 78%).

42.   Considering the composition of value added displayed in Figure 10, micro-firms account for 51% of the total value added, while 21% is produced by large enterprises (firms with more than 250 workers). Small (10-50 workers) and medium (50-250 workers) generate respectively 16% and 12% of total value added. This general set-up hides a strong sectoral heterogeneity. Indeed, while micro-firms account for over 70% of value added in other business services and personal services, and more that 50% in constructions and accommodation and restaurants, they represent only a small share of value added in manufacturing (15%), energy (17%) and mining and quarrying (7%). In these latter industries, the role of large enterprises is relevant: they account for 56% of value added in mining and quarrying, 32% in manufacturing and 57% in energy. Large firms have also an important role in trade (21%) and transportation (39%). Furthermore, in manufacturing a large share of value added is generated by small and medium enterprises, which account for slightly less than 30%.

Figure 9
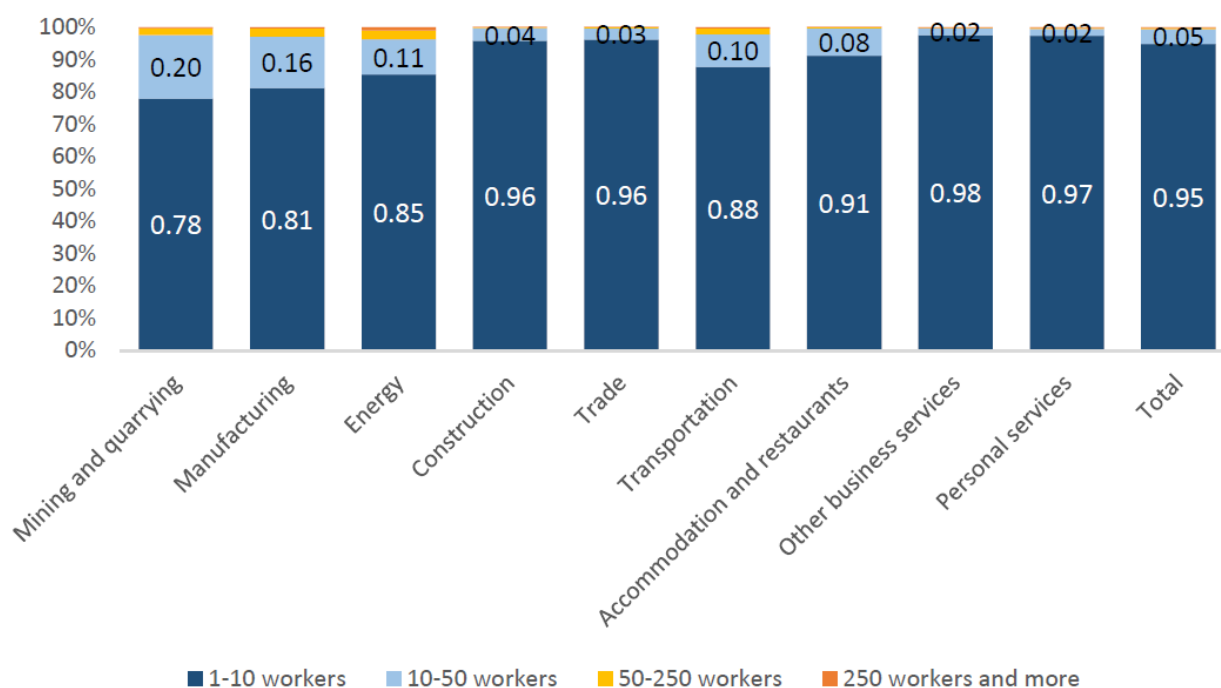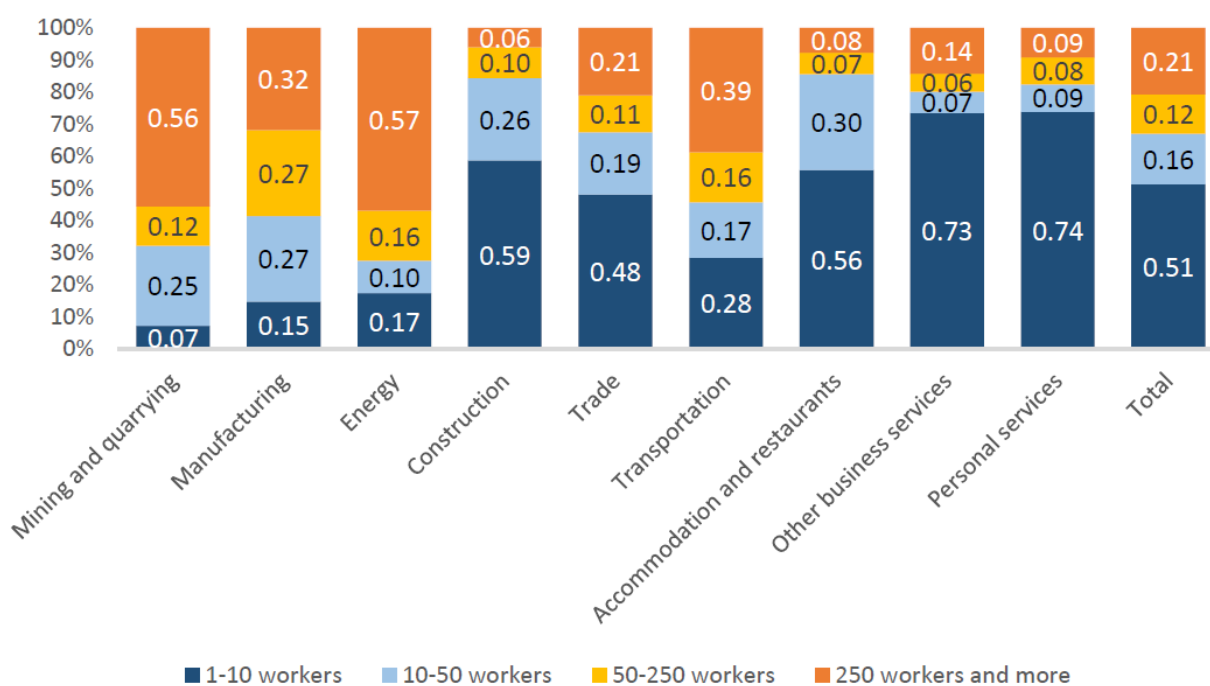**Number of business units composition by industry and size-class**

■ 1-10 workers ■ 10-50 workers ■ 50-250 workers ■ 250 workers and more

Figure 10
Value added composition by industry and size-class

■ 1-10 workers ■ 10-50 workers ■ 50-250 workers ■ 250 workers and more

43.	Finally, the size of firms is also relevant in analyzing under-ground economy. Indeed, about 88% of under-ground economy is connected with the activity of micro-firms (1-10 workers), while small (10- 50 workers) and medium (50-250 workers) enterprises account for, respectively, 11% and 2% of under- ground value added. The role of micro-firms in under-ground economy is particularly high in trade (94%), construction (91%), other business services (92%) and personal services (94%), while in manufacturing, mining and quarrying and accommodation and restaurants the role of small firms is also relevant (respectively 46%, 29% and 23%).

Figure 11
Underground value added composition by industry and size-class
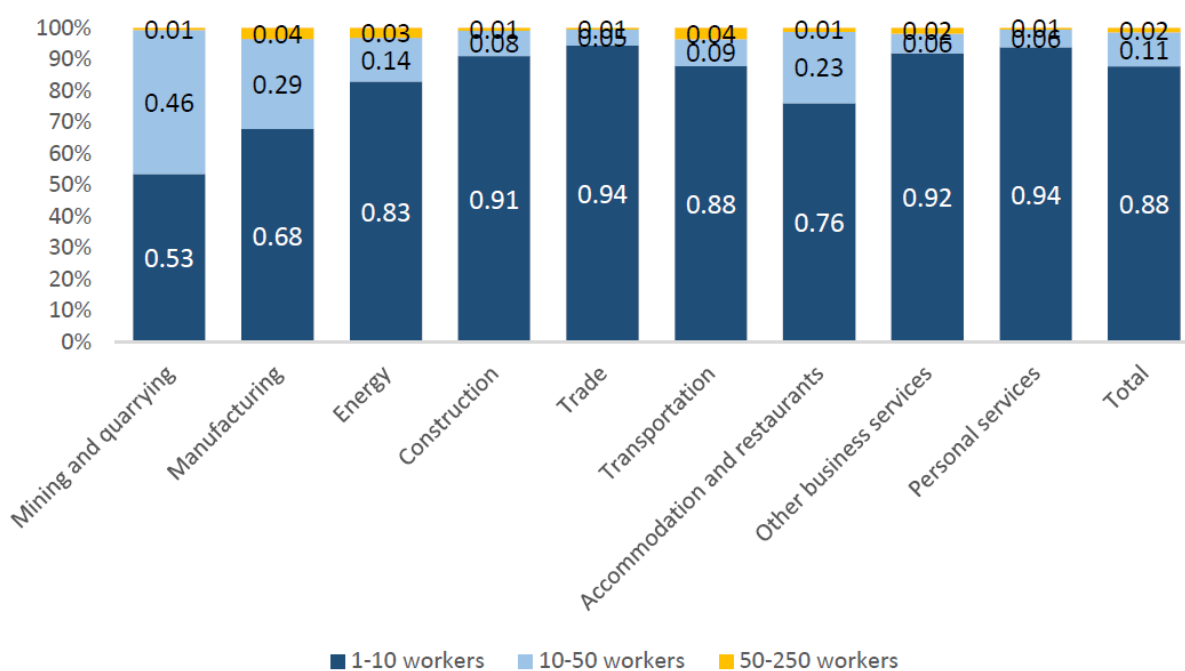
IV. Conclusions

44. The increasing integration of markets for trade and FDIs, and the increasing relevance of GVCs strongly challenged the conventional framework of accounting for international trade and production processes. Furthermore, traditional sector-based SUT and/or IOT can hardly represent the progressively higher heterogeneity in the strategic and economic behaviors of different typologies of firms.

45. There is a large agreement about the conceptual dimensions along which this heterogeneity can be accounted for. In particular, governance status, trading status and size are considered as the main elements in the definition of the relevant typologies of business units. In this context, an extension of the customary SUT-IOT framework that considers these dimensions of heterogeneity would allow for obtaining a more granular, and reliable, representation of production processes.

46. This paper presented the pilot that Istat carried out in order to compile an eSUT framework for Italian economy. Indeed, the wide use of micro-data in the compilation of the main aggregates of National Accounts opens the room for obtaining the relevant information for the different profiles of business units. In particular, the pilot scheme is compiled considering 48 typologies of business units for each industry, where typologies are defined by interacting the three dimensions of heterogeneity.

47. A wide set of aggregates and structural variables are taken into account, ranging from output, intermediate costs and value added, to the number of firms, employment and international trade. On average, the pilot covers about 90% of the whole information, including non-observed economy and adjustment for exhaustiveness. Most aggregates are treated directly from micro-data, this assuring both a strong consistency between the pilot and the general National Accounts scheme and a good representation of production processes.

48.   The eSUT framework obtained from the pilot allows for analyzing a wide range of phenomena, ranging from the role of MNEs in Italian economy, to the relevance of internationalization and the heterogeneity of firms along size classes.

49.   At this stage however, the compilation of a full extended scheme for Italian SUT is not completed. Indeed, relevant aggregates are not considered in the pilot, such as the imports and exports of services (including the treatment of merchanting and processing), illegal economy and conceptual adjustments (e.g. FISIM), further than the effect of the balancing of demand and supply.

50.   The inclusion of these aggregates represents the next step in the pilot, in order to complete their allocation along the categories of business units. A second step is related to the breakdown by typology of products and the compilation of domestic final demand aggregates (final consumption, investments) within the eSUT framework. Furthermore, more complex definitions of typologies of business units (in terms of internationalization and size class, see footnotes 1 and 3) can be experimented. Finally, once the eSUT scheme is completed (including valuation matrices and taxes and subsidies), the aim is to convert eSUT into eIOT in order to obtain a framework for analyses and simulations.

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