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Profiling and Globalisation

**The implementation of ISTAT automatic profiling  
to support the delineation of complex enterprises**

**Abstract**

*Globalisation calls for comparable statistics in Europe and around the world, thus necessarily implying a combination between the pure economic view of business groups and the statistical treatment of enterprises groups. Manual and automatic profiling techniques go in this direction. The major aim of profiling is indeed to examine complex enterprise groups (MNEs) in order to ensure high qualitative standards and suitable data comparability at international level and to establish a new statistical unit (the so-called ENT) within the group. However a similar approach is to be used to analyze also truncated and domestic enterprise groups at national level. Some economies such as Italy are characterized by the presence of a large number of complex enterprises, that can not all be delineated with only manual profiling approaches. Automatic profiling is a good method too, if all the necessary information on the organizational structure of the groups are available from the system of BR, while the manual profiling is applied only to a selection of very complex groups and with a meaningful impact on global economy. Depending on the structure of the groups of enterprises to be profiled, automatic algorithms slightly differ in the treatment and delineation of the statistical units. The automatic profiling developed by ISTAT exploits the organizational structures of organizations in line with a theme first explored by Chandler (1962), the existence of an intimate relationship between the strategy of the firm and its organizational structure. This activity implies a large investment on the Business Register system in term of information interoperability, accuracy and timeliness of data; the introduction of the new statistical unit (ENT) de facto involves the need to define and introduce a new concept, 'the representative unit,' that assigns to the enterprise its identifying characters.*

*Keywords: Globalization, Automatic profiling, Groups' structures, Business register*

## **1 Introduction**

Globalization calls for comparable statistics in Europe and around the world, thus necessarily implying a combination between the pure economic view of business groups and the statistical treatment of enterprises groups. Manual and automatic profiling techniques go in this direction. The major aim of profiling is indeed to examine complex enterprise groups (MNEs) in order to ensure high qualitative standards and suitable data comparability at international level and to establish a new statistical unit (the so-called ENT) within the group. However, a similar approach is to be used to analyse also truncated and domestic enterprise groups at national level. Some economies such as Italy are characterized by the presence of a large number of complex enterprises, that can not all be delineated with only manual profiling approaches. Automatic profiling is a good method too, if all the necessary information on the organizational structure of the groups are available from the system of Business Registers (BR), while the manual profiling is applied only to a selection of very complex groups and with a meaningful impact on global economy. Depending on the structure of the groups of enterprises to be profiled, automatic algorithms slightly differ in the treatment and delineation of the statistical units. In such a way, the groups' morphology, in an economic perspective, is the base for the statistical interpretation of the phenomenon, since it implies distinguishing the groups with a 'mainly vertical structure' and the groups with 'predominantly horizontal structure' from the groups with a matrix structure, articulated both horizontally and vertically. In this case, for particularly complex groups, there is the need to automatically identify, where possible, the existence of sub-groups able of representing autonomous enterprises. Profiling is also aimed at the identification of substantial dependence among legal units belonging to the same group, thus looking for ancillary and integrated units. The automatic profiling developed by ISTAT exploits the organizational structures of organizations in line with a theme first explored by Chandler (1962), the existence of an intimate relationship between the strategy of the firm and its organizational structure. This activity implies a large investment on the Business Register system in terms of information interoperability, accuracy and timeliness of data; the introduction of the new statistical unit (ENT) de facto involves the need to define and introduce a new concept, 'the representative unit,' that assigns to the enterprise some of its characters and main BR variables. This paper is organised as follows. Paragraph 2 offers an overview on the legal, economic and statistical framework on complex enterprises with the aim of providing the reader with a reference background on the phenomenon. The third paragraph describes the methodology, developed by ISTAT, to automatically delineate the new statistical units. In the fourth paragraph, the strategy adopted by ISTAT to automatically identify the representative unit of each ENT is presented. Finally, some conclusive remarks are offered in paragraph 5.

## **2 What complex enterprises are: legal, economic and statistical framework**

Business groups play significant economic roles in many countries (Cheong et al., 2010). In particular, as properly stressed by Colli and Colpan (2016), they have been the dominant form of large enterprise in many emerging markets (Colpan et al., 2010; Khanna and Palepu, 2010), but they are also important players in a number of developed markets as well (Colpan and Hikino, 2016; Shiba and Shimotani, 1997). In Italy business groups are a permanent feature of the corporate landscape in almost every sector (Colli et al., 2015).

Yiu et al. (2005) have defined a business group as a collection of legally independent firms that are bound by economic (such as ownership, financial, and commercial) and social (such as family, kinship, and friendship) ties. More recently, Colpan et al. (2010), have described business groups as "clusters of coordinate activities carried out by interlinked but legally independent enterprises". The phenomenon

is associated with the recognition that business groups exist in many countries with some variations (Cheong et al., 2010). In effect, business groups have recently emerged as a distinct theme in the economic literature (Cuervo-Cazurra, 2006) which is however frequently guided by the legal framework. In effect, both economic and juridical studies have identified the key elements of the “group” as an organizational structure: the presence of a plurality of legal entities and the control of such entities by a sole entity (Di Carlo, 2009). However, while the economic literature tries to define the “business group” (*gruppo di aziende*), the legal framework only refers to the “group of enterprises” (*gruppo di società*).

Indeed, from an economic perspective, various definitions of what a business group is have been provided. One of the most complete has been offered by Granovetter (1994) according to whom business groups are collections of firms bound together in some formal and/or informal ways. Other definitions have proposed interesting narrower views of such phenomenon. For instance, business groups are networks that exhibit unrelated diversification under common ownership (Cuervo-Cazurra, 2006) or gatherings of formally independent firms under single common administrative and financial control (Chang and Hong, 2002). In such a way, the business group is considered as a single economic entity (Di Carlo, 2014).

From a statistical point of view, the business group is known as “Enterprise Group” and recognized as a statistical unit from the Council Regulation (EEC) No 696/93 on Statistical Units. The Enterprise Group is “an association of enterprises bound together by legal and/or financial links. A group of enterprises can have more than one decision-making centre, especially for policy on production, sales and profits. It may centralise certain aspects of financial management and taxation. It constitutes an economic entity which is empowered to make choices, particularly concerning the unit it comprises”.

Globalization, which has an economic nature, calls for comparable statistics in Europe and around the world, thus necessary implying a combination between the pure economic view of business groups and the statistical treatment of enterprises groups. Profiling technique goes in this direction.

According to the Business Register Recommendations Manual (edition 2010), profiling is “a method to analyse the legal, operational and accounting structure of an enterprise group at national and world level, in order to establish the statistical units within that group, their links, and the most efficient structures for the collection of statistical data”. Profiling activity guarantees that all related statistical units are delineated at the same time, above all the enterprise defined in the Statistical Units Regulation as “the smallest combination of legal units that is an organisational unit producing goods or services which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations”. In effect, the way the enterprise groups organise their production is the best approach to correctly define the enterprise.

The major aim of profiling is to examine large and complex enterprise groups (MNEs<sup>1</sup>) in order to ensure high qualitative standards and suitable data comparability at international level. However, a similar approach is to be used to analyse national enterprise groups and even small and medium sized. Generally, for reasons of resource constraints, these groups are recommended to be profiled through algorithms; this method is called “automatic profiling”.

Depending on the structure of the groups of enterprises to be profiled, such algorithms slightly differ in the treatment and delineation of the statistical units. In such a way, the groups’ morphology, in an economic perspective, is the base for the statistical interpretation of the phenomenon. Profiling is also

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<sup>1</sup> MNEs have been defined by Dunning (1977) as companies which undertake productive activities outside the country in which they are incorporated.

aimed at the identification of substantial dependence among legal units belonging to the same group, thus looking for ancillary and integrated units. To reach such an objective, automatic profiling developed by ISTAT to delineate the Enterprise by linking together not autonomous resident legal units belonging to the same group, exploits the organizational structures of organizations in line with a theme first explored by Chandler (1962), the existence of an intimate relationship between the strategy of the firm and its organizational structure.

The literature and the economic management theory have identified various types of business groups even if vigorous academic discourse about this organizational form is ongoing (Khanna and Palepu, 2000); for example, as noted by Yiu et al. (2005), recent studies have traced the evolution of business groups in regard to pattern of diversification and organizational structure over time (Kim et al., 2004; Kock and Guillén, 2001). This paper takes into consideration: the structure (simple, complex and chain structures) and the degree of integration between the legal units (horizontal, vertical and diversified structures).

With regards to the first feature, groups with a simple structure are characterized by investments which are all directly held by a parent company or a physical person; if they are formed by a relevant number of legal units, they are usually represented as a star or a comb. In particular, the comb type structure is common in mono-activity groups with an easy management structure where one of the unit, usually the holding, provides operational directions. Groups with a complex structure also contain indirectly links between the legal units; such groups are commonly identified by the presence of sub-holdings which create proper sub-groups. Generally, such structure describes the segments in which the group operates in terms of regions or economic activities; thus, they are suitable for multi-activity groups. Finally, groups with a chain structure consist of reciprocal relationships which may be both direct or indirect. A special attention is usually paid for those organizational structures arranged as pyramids, in which an individual or a family controls a firm, which in turn controls another firm, which could itself control another firm, etc (Bena and Ortiz-Molina, 2013).

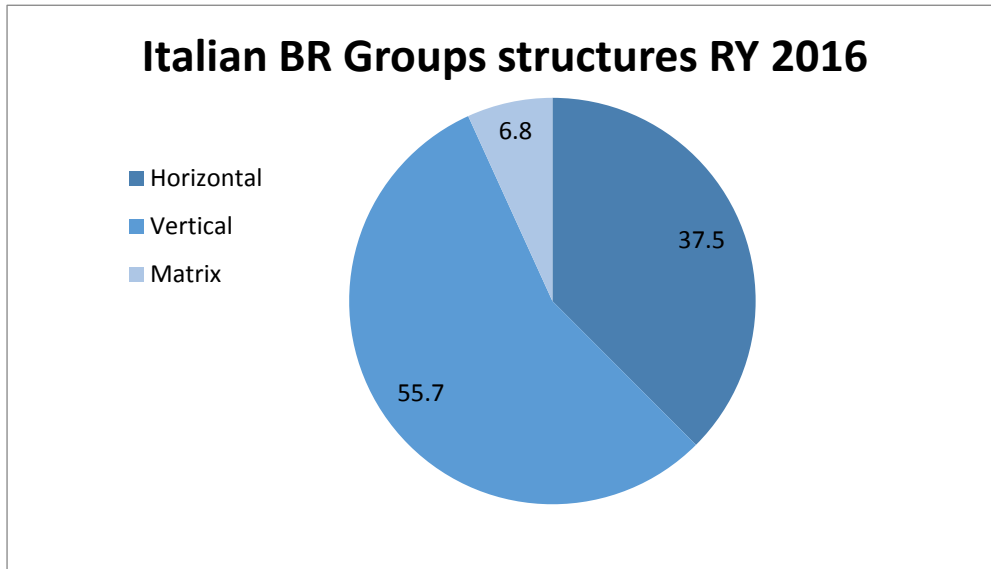
The analysis on the degree of integration between the legal units allows for a distinction between vertical, horizontal and diversified business groups. In vertical structured groups (or almost-vertical ones) different legal units run different phases of the production path so they may expand into diverse activities, known as upstream or downstream activities. In line with the well-known works by Coase (1960) and Williamsons (1975) vertical integration can help companies to reduce costs and improve efficiencies by decreasing the so-called transactional costs. From this perspective, business groups have typically been viewed through a transaction cost economics perspective where they are perceived as responses to inefficiencies in the market (Yiu et al., 2005).

On the contrary, horizontal integrated groups denote collections of firms operating the same or similar economic activities; horizontal integration offers several advantages, including favourable economies of scale, economies of scope, increased market power and reduction in the costs associated with international trade by operating in foreign markets. In such a way, business groups exist to scale down internal management costs associated with a single, large enterprise (Zhang et al., 2016).

Finally, diversified or matrix structures combine horizontally and vertically configurations in order to answer more effectively and timely to environmental changes. More specifically, diversified business groups are defined as an organizational form characterized by diversification across a wide range of businesses, partial financial interlocks among them, and, in many cases, familial control; diversified business groups dominate private-sector industrial and service activity in many of the world's economies (Ghemawat and Khanna, 1998).

Figure 1 presents the distribution of Italian Enterprise Groups by type of structure: horizontal, vertical and matrix.

Figure 1: Italian SBS Groups by structure (RY 2016)



Source: Italian BR of Enterprises Groups (ISTAT)

### 3 Automatic profiling: developing the algorithm for the delineation of complex enterprises

ISTAT annually produces, since 2005, data on Enterprise Groups (EGs) in accordance with the European Regulation 177/2008 on Business Registers and the operational criteria defined by the Recommendation Manual on Business Registers. The Italian Business Register on EGs reconstructs the Enterprise Groups defined as “an association of enterprises bound together by legal and/or financial links [...]”. The Italian Business Register of EGs is built up by integrating different administrative and statistical sources, such as the results of the Inward FATS Survey and the foreign relationships of control derived from EGR (Eurogroups Register).

Such a register is the starting point for the establishment of a new statistical unit (the so-called ENT) within the group in order to correctly satisfy the Council Regulation (EEC) No 696/93 on Statistical Units. The methodology of automatic profiling, implemented by ISTAT, aims at automatically identifying the ENTs as sets of resident legal units under joint control. This method is built up on an integrated base of micro-data which link together different national data sources. The Italian Business Register of EGs is the core one; in addition, the following are used: (1) the Italian BR of Enterprises, (2) the statistical register Frame SBS<sup>2</sup> which provides the main economic aggregates, and better the key

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<sup>2</sup> Since 2012, ISTAT has been compliant with SBS regulation by developing a new statistical register, called Frame SBS, for the annual production of profit-and-loss accounts of small and medium enterprises (SMEs); such a register massively uses firm-level admin and fiscal data as primary sources of information to estimate key SBS, while sample data on SMEs are used for estimating those items which are not available in the admin archives (Luzi and Monducci, 2016).

SBS (Structural Business Statistics) variables such as value added, revenues and costs, and (3) economic information from financial statements.

The choice of the most appropriate method to delineate enterprises consisting of several legal units is strictly linked to the characteristics of the structure and size of the enterprise groups. If all necessary information of the groups is available, the automatic profiling is a correct method also for LARGE groups. Instead the intensive and desk profiling may be applied only for a selection of very complex groups and with a meaningful impact on global economy.

The automatic approach is applied to all enterprise groups baptized as 'SBS groups' that are groups whose principal economic activity is consistent with the SBS target population which covers sections B to S of NACE Rev. 2 (Statistical classification of economic activities in the European Community), excluding financial and insurance activities, which are investigated by the National Bank (Section K), the sector of public administration and defence, and compulsory social security (Section O) and Division 94 (Activities of membership organisations). The choice to be focused on 'SBS groups population' strictly depends on the final scope of profiling that is consolidating economic variables for the new statistical unit ENT that involves the planning of a new data collection process and, as a consequence, production of final estimates. In particular those legal units, which are part of SBS target population, but belonging to groups out of SBS scope, will be considered as single enterprises (1 legal unit = 1 ENT); in the same way, all legal units out of SBS scope which belong to 'SBS groups' are considered single enterprises.

The ISTAT automatic methodology, improved in 2015, has also introduced a new approach to better identify ancillary and vertical integrated units inside. Generally, manuals and regulations include definitions and lists of possible ancillary and integrated activities but an exhaustive and standard list is not available. The effort has been addressed to build *ad hoc* correspondence matrices to link potential ancillary and integrated activities to the principal activity at 4-digit NACE code.

The automatic profiling methodology described in this document is limited to the "national" border of the enterprise group and to the automatic identification of the enterprise institutional unit (ENT) seen as a set of legal units under common control. The methodology is based on two main steps; in the first step the group's structure in terms of legal units and organization control level are considered, while the second step is focused on measuring a set of economic aggregates to identifying the new potential ENTs.

The analysis of Italian SBS groups by looking at their structure show that more than 80% of them have an elementary structure with a maximum of 3 resident active legal units in SBS target population; for this reason, the population of enterprise groups is divided into two segments:

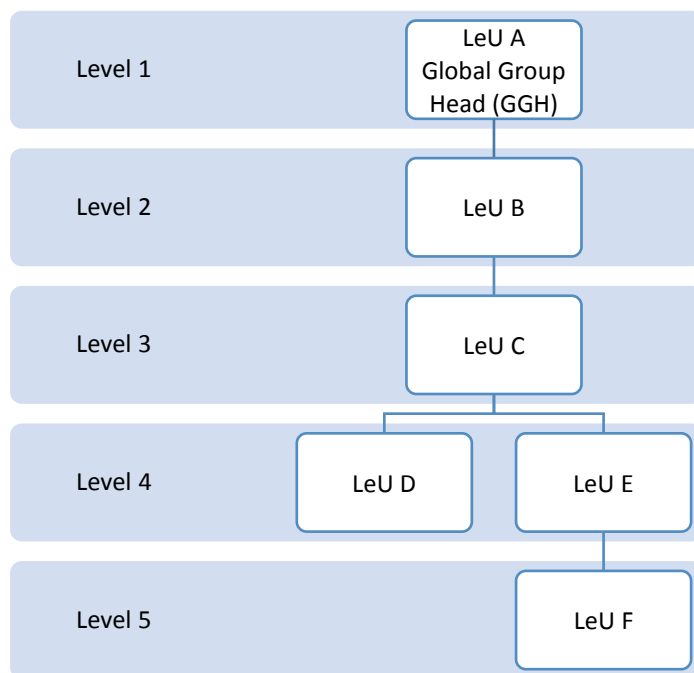
- Simple Groups - if the total number of SBS legal units is  $\leq 3$ ;
- Complex Groups - if the total number of SBS legal units is  $> 3$ .

The basic assumption of this choice lies on the fact that the internal structure of groups in terms of relationships and control level is not relevant for simple groups, while it may be significant in the case of complex groups. For complex groups, for which no intensive or desk profiling activity is planned due to internal/organizational constraints, automatic profiling has to be undertaken; the aim is evaluating the existence or not of more autonomous companies within the group, taking into account the complexity of the organizational structure of the whole group. In this case, the algorithm requires the registration, in the BR of EGs, of all control links (direct and indirect) between legal units (LeUs). The potential enterprises will be looked for as subsets of LeUs linked together by direct and indirect relationships of control. The basic idea is to break the structure of complex groups as to create potential

ENTs when a number of conditions is not satisfied, and to iterate the algorithm re-starting from the level below.

In order to consider the structure of groups, an indicator called “Group Structure Type” has been created. This indicator gives a measure of the complexity of the group structure by analysing the various levels of control; the purpose is to classify enterprise groups in vertical, horizontal and diversified business groups (matrix groups) according to a number of motives. On the one hand, in a group which presents a vertical structure, the parent company, being at the top of the structure (Global Group Head), has greater control of the whole production process, due to the vertically integration of upstream or downstream activities. This integration can be seen as an indication of the lack of autonomy of the individual legal units. Scheme 1 illustrates the structure of a group with a predominantly vertical structure.

*Scheme 1: Example of a group with a predominantly vertical structure*

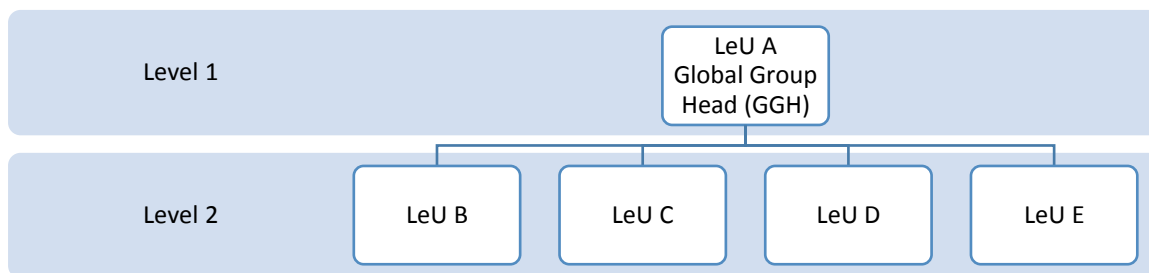


*Source: own elaboration*

On the other hand, in groups with a horizontal structure (Scheme 2), controlled units tend to perform similar or equal activities, such as textile-clothing groups, where all affiliates carry out a phase of the supply chain. If the group has a pure horizontal structure (also known as comb structure) with all subsidiaries at the second level, through direct control by the top unit in the group, looking for autonomous sub-groups would be unfounded.

Finally, a group can also have a matrix structure that is being articulated both horizontally and vertically. In this case, there is the need to automatically identify the existence of sub-groups able of representing autonomous enterprises when possible.

*Scheme 2: Example of a group with a pure horizontal structure*



*Source: own elaboration*

Once the flag on the structure typology is assigned, a number of economic considerations have to be done to correctly define national enterprises. In particular, a set of operational steps are performed in order to reach such aim.

The first step of the methodology consists in the identification of those groups, called ‘mono-activity groups’, that can be considered as 1 single SBS enterprise, on the basis of the principal economic activity undertaken by the group (at 4-digit level of NACE classification). For the estimation of the principal economic activity at group level, a method, called “Hierarchical multi-step methodology”, has been developed; it makes use of three economic variables, being in order: Value added (VA), Turnover and Persons employed, all being considered at group level. The choice of using VA as the first variable instead of Turnover variable avoids the risk of overestimating some NACE classes, such as wholesale activities. The Turnover variable is used only if the VA (at group level) is missing or if it assumes a negative value for at least one of the legal units. Finally, when even the Turnover at group level is missing the main economic activity at group level is estimated using the Persons employed variable. In general, a group is considered as a mono-activity group (1 Group = 1 SBS ENT) if at least 90% of the value of the chosen economic variable (in order VA, Turnover, Persons employed) is concentrated in only one economic activity at NACE four-digit level. When the threshold is lower than 90%, ancillary or vertical integrated activities have to be considered in order to move from potential mono-activity groups to real mono-activity groups; if the sum of the principal activity, the ancillary or/and the integrated activity is  $\geq 90\%$ , the groups can be considered as being mono-activity groups. In effect, some legal units perform activities exclusively for other legal units within the same enterprise group; the outputs of these legal units have to be considered as inputs for the other units belonging to the same enterprise group and their data have to be consolidated.

The list of possible ancillary and support units, appropriately defined by Eurostat, has been modified and adapted at national level taking into account the needs of the Italian production system. The rule of belonging to the list is necessary but not sufficient, since potential ancillary activities must be tested with respect to the group to which they belong and become effective only if they satisfy certain conditions that determine the transition from potentially ancillary units to real ancillary units for that group. In order to map the legal units as real ancillary units, three conditions must be met:

- condition 1: if the NACE code of the ancillary unit (A) is included in the national correspondence tables of ancillary units with respect to the principal economic activity assigned to the group;
- condition 2: if the weight of A in the group is lower than 10%;
- condition 3: if  $\text{Turnover (A)} \leq K \cdot \text{purchases of services (production unit)}$ ; where the production unit is the unit or units carrying out the main economic activity at 4-digit level linked to the ancillary unit; K is a threshold.



A vertically integrated enterprise is one in which different stages of production are carried out in succession by different legal units of the same enterprise. The output of one stage becomes an input into the next stage, and only the output from the final stage is actually sold on the market. Also for vertically integrated activities, a study was conducted at national level leading to the development of several correspondence tables for integrated activities that follow the following main directions: vertically integration within the same sector of economic activity and vertically integration between different economic sectors.

In order to map legal units as vertical integrated units, two conditions must be met:

- condition 1: if there is a relationship among the Upstream (UP) NACE code and the Downstream (DW) NACE code in the correspondence matrices;
- condition 2: if the weight of the integrated legal unit in the group is lower than a threshold of 30%.

Simple groups which are not solved as mono-activity groups are considered as multi-activities groups (1 Group = more than 1 SBS ENT).

On a similar line, complex groups may be flagged as mono-activity and multi-activity. In case of mono-activity complex groups, the complex enterprise (ENT) will be easily created (1 Group = 1 ENT), otherwise the indicator on the groups' structure has to be considered. Groups with vertical and horizontal structures are treated as simple groups and considered as multi-activity groups (1 Group = more than 1 SBS ENT), while groups with a matrix structure (articulated both horizontally and vertically) there is the need to automatically identify the existence of vertical or horizontal sub-groups able of representing autonomous enterprises. If, and only if the condition of mono-activity groups tests that the group is multi-activity, the group has to be broken in sub-groups, by an iterative algorithm; starting from the second level of the group's structures, such algorithm turns and breaks the structures up to bring them back to horizontal or vertical structures. Finally, the condition of mono-activity groups will be re-applied on the new sub-structures.

Table 1 presents the main results (reference year 2016) of the application of the automatic algorithm to enterprise groups.

*Table 1: Impact of automatic profiling by sector of activity – Reference year 2016*

Sector of activity	As Is		To be		Impact (var %)	
	Number of LeUs (a)	Employment of LeUs (c)	Number of ENTs (b)	Employment of ENTs (d)	Impact on LeUs (b-a)/a*100	Impact on Employment (d-c)/c*100
Industry	76,716	1,935,738	56,056	1,955,402	-26.9	1.0
Wholesale	43,091	901,796	32,299	917,939	-25.0	1.8
Services	125,107	1,748,392	73,395	1,715,144	-41.3	-1.9
Holding	11,631	4,175	2,289	1,617	-80.3	-61.3
<b>Total</b>	<b>256,545</b>	<b>4,590,102</b>	<b>164,039</b>	<b>4,590,102</b>	<b>-36.1</b>	<b>0.0</b>

*Source: BR of Enterprises Groups and new BR of ENTs (Istat)*

#### 4 Defining the representative unit

After the delineation of the enterprise units (ENTs) as sets of legal units under joint control, the potential *representative unit* should be identified for each ENT. The algorithm of automatic profiling, above described, individuates the representative unit as the legal unit carrying out the principal economic activity measured in terms of economic variables; the general rule is that the representative unit is determined through the relative weight of the economic variables used for the delineation of the ENT being in order: value added, turnover and number of persons employed. In this way, the ENT can be easily identified through the main economic characteristics of the representative unit.

However, when more legal units are possible representative units and the above conditions are not sufficient, some further investigation is needed. For instance, other indicators such as the level in the group structure, the legal form, and the economic activity at 5-digit level (ATECO 2007, the Italian national version of NACE Rev. 2), should be investigated. Such indicators have been tested by the Italian profiling team and a set of rules have been developed; in effect, these rules result from accurate manual checks which have been undertaken by expert profilers in order to find rationales and recurring situations to explain the structure of the ENTs and the representative unit selection.

This paragraph is intended to provide evidence on the analysis carried out to confirm the automatic choice of the representative unit by applying some of the considerations generally faced by the team of profilers when they are involved in manual intensive profiling activity.

As introduced in the previous paragraph, the hierarchical multi-step methodology developed by ISTAT makes use of three economic variables for the estimation of the principal economic activity at group level, being in order value added, turnover and persons employed. In effect, when more legal units contribute to define the principal economic activity, the algorithm chooses the unit with a higher value. Even if the representative unit is supposed to be the one which weighs more (having the most noteworthy weight) an ex-post evaluation on the gap between the weights has been necessary to confirm the reliability of the methodology. Starting from the results of the application of the automatic algorithm the first operation has been the definition of an indicator to investigate if the representative unit chosen through the automatic algorithm can be considered reliable. In particular, an indicator (indicator 1: *ratio between the highest value and the lowest*), has been provided according to the economic variable used (value added, turnover and persons employed). The threshold of 1,27 (indicator 1), in the case of value added and turnover, splits off the lowest 10% of data from the highest 90% with the intent of considering them acceptable. The methodology supposed to be suitable to confirm the results of the automatic algorithm has been considered successful only when the choice has been done according to the value added and turnover; in effect, according to the hierarchical multi-step methodology, the analysis of persons employed is the last choice with respect to value added and turnover methods. As a consequence, in the case of persons employed, it is necessary to evaluate only the distance between the two values (indicator 2: *weight distance between the values*), not the ratio, and some other deterministic rules, based on qualitative checks involving variables such as level of control, economic activity performed, have to be applied.

These rules are currently being examined and improved by the team of profilers, but some initial results may be described. The idea is looking for administrative, statistical or economical signals able to assess the relevance of a legal unit in an ENT than the other legal units belonging to the same enterprise; in this way, the representative unit is the legal unit which present a higher number of signals. Each signal is related to a different attribute of the legal unit.

Status of activity – If only one of the legal units is active, it is considered to be the representative. If all the legal units have the same status, this information is not useful to define the representative unit.

Legal form – A comparative analysis has been undertaken to compare the legal forms of the legal units and some rules have been applied. However, the results may not be replicable since that the study has been based on the classification of the Italian legal forms. In general, when the legal units have different legal forms, it is preferred the legal unit which is a limited company; in effect, partnerships and sole proprietors (that can be only at the top of the group) are not chosen to be the representatives.

Level – If the legal units occupy different levels in the group structure, the representative unit may be the one with the highest level. If the legal units have the same level, this information is not useful to define the representative unit.

NACE code at 5 digits – Even if the classification ATECO 2007, the national version of NACE Rev. 2, doesn't follow a hierarchical structure, in some cases the higher is the category (5<sup>th</sup> digit) the less important is the economic activity. For example, in an ENT formed by a legal unit with ATECO 47.11.1 (Superstore) or ATECO 47.11.2 (Supermarket) and a legal unit with ATECO 47.11.4 (Mini-market), the representative unit could be the first one. Another example is when one of the legal units carries on a residual activity of the class; in this situation the 5<sup>th</sup> digit of ATECO is generally a 9 as in the case of NACE class 46.41 Wholesale of textile: ATECO 46.41.1 (Wholesale of fabrics) and 46.41.9 (Wholesale of textiles not elsewhere classified).

The analysis described above has not been standardized for all the possible cases, yet. Anyway, if the representative unit chosen through the automatic algorithm is also confirmed by some of the conditions considered, it may be accepted. However, if it is not the case, some clerical checks would be necessary.

## 5 Conclusions and future developments

This paper is intended to describe the methodology, developed by ISTAT, to automatically delineate the new statistical units (ENTs) by exploiting economic theories on groups' structures and to offer a first contribution on the identification of a 'representative legal unit' among the set of legal units combined together to form the ENT, able to donate principal attributes to the ENT. However, such issues are part of a more complex question on the implementation of the new ENT inside the Italian system of the economic units' registers. In effect, the whole set of stages that Eurostat has outlined to guide the Member States towards the implementation of the new ENT inside the system of the economic units' registers has two important effects: primarily it involves the introduction of a new statistical unit in the information system; furthermore it also implies a 'rethinking' of the structure of the relations among all the units belonging to the system of registers Asia as well as of the entire flow of data among the elements of the system.

In the statistical register ASIA-Enterprises there is currently a one-to-one correspondence between legal units and enterprises. Although in the past the information on the basis of which legal units could be combined to form an enterprise were not available in many cases, the Information System has nevertheless supported the separate registration of legal units and enterprises as separate units.

The relationship between the legal unit and the enterprise (or between the two id codes *Legal\_unit\_code* and *Enterprise\_code*) is currently a 1:1 correspondence and it is recognized inside the BR Information System by a "relationship" character that joins the two components of the couple. Over time this theoretical model had already appeared to be no longer realistic, not only in view of a correct application of the definition of enterprise, but already from the moment the administrative base was enlarged to include economic units belonging to the sphere of public institutions, as well as for the growing number of sources that feed this identification process.

The revision of the assumptions underlying the Information System de facto involved the need to define a new process for assigning the enterprise identification code, that previously was not necessary as it always logically coincides with the legal unit code. The related impacts on the BR updating process have been assessed in statistical terms, both in terms of changes to the current PL/SQL procedures that allow the advancement of the BR process, and in terms of the web applications interacting with the Information System, especially the software used by the BR expert staff to view and update the BR microdata, which is now able to directly display the relationship between legal units and enterprises, allowing the insertion of new relationships or the adjustment of the ones already existing.

Given the statistical significance of the new theoretical model and its related impacts, both conceptual-statistical and IT, it was decided to adopt the new relationship model between the two components, the legal unit and the enterprise, allowing the 1:N and N:1 relationships.

This relevant change in the definition of the relationships has to be combined with the definition of the ENT's new variables, to be as well stored in the Information System and a set of other necessary attributes related to legal units. In effect, in order to complete the information on the association of each legal unit to one or more ENTs, there is the need to add new variables for legal units, in addition to the required variables specified in the Annex to Regulation (EC) N.177/2008 and the newly representative unit signal, to better characterize the legal unit:

- a. the percentage of economic participation of the legal unit into the enterprise;
- b. the number of legal units belonging to the enterprise;
- c. potential ancillary flag: to mark the legal unit having the features of an ancillary unit (e.g. based on economic activity);
- d. real ancillary flag: to mark the legal unit (among the potential ones) having actually the features of an ancillary unit, once the automatic profiling activity confirm it;
- e. vertical integration flag: to mark the legal unit that is vertically integrated, once the automatic or manual profiling activity confirm it.

In addition, the creation of a whole range of information variables on the profiling activities has to be provided, useful to understand how the definition of the ENT has been reached; the most intuitive are the following:

- f. profiling type: type of profiling (automatic or manual);
- g. reference year of the last profiling activity.

To conclude, this contribution only represents an initial, but satisfied, step in the implementation of the new statistical unit inside the system of the economic units' registers; the Italian profiling team is still heavily working on building up the new theoretical framework which should be able to embrace the new ENT.

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