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# Structural statistics on enterprises with foreign production

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The transition from business accounting to national accounts is carried out in this paper. The institutional units having a predominant economic interest in Italy are identified in particular for the sectors linked to Construction, Civil engineering works and Trade activities. A multivariate analysis of the economic variables (production, labor costs, intermediate consumptions, investments) allows to measure effective performance, both economic and financial, for global enterprises. Fiscal and statistical data with a profiling of these enterprises make possible to select a sub-set of medium and large sized units potentially interested in the phenomenon of foreign branch offices.

**keywords:** foreign control, quasi-enterprises, centre of economic interest, breakdown of production, Gross fixed capital formation

## 1 Introduction

Corporate governance covers not only the relationships between corporate bodies, but those dealing with the organization of the entire company, which affect its economic and financial performance. The definition of enterprise used in this work is with reference to the EEC Council Regulation No 696/1993 on statistical units for the observation and analysis of the production system in the Community (Calzaroni and Pascarella, 1998), therefore the enterprise corresponds to the smallest combination of legal units constituting an organizational unit for the production of goods and services enjoy a certain amount of decision-making autonomy.

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The aforementioned Regulations provide a common framework for the collection, preparation, transmission and evaluation of Community statistics on the structure, activity, competitiveness and performance of the industrial sector, in order to measure the part of the institutional unit which has a centre of economic interest in Italy. The institutional units that make up a country's economy and whose flows and stocks are recorded in ESA 2010 (Eurostat, 2013) are those that are resident; the residence of a unit is defined as the economic territory in which its predominant centre of economic interest is situated. "Predominant centre of economic interest" means the existence within the economic territory of an area where a unit is active and carries out significant operations for at least one year. Where an undertaking operates within more than one economic territory for more than a year without setting up ad hoc subsidiary units (affiliated undertakings), a fictitious resident unit situated in the economic territory within which it carries out this activity should be identified for statistical purposes (International-Monetary-Fund, 2013). In this work, particular attention will be paid to the impact of these operations on value added, and therefore on the measurement of gross domestic product (GDP) and its components. This is due to its role in providing a measure of national economic activity (Piana et al., 2007) in relation to which the financial health of a country's economy can be assessed through ratios such as the government deficit (or public deficit) as a percentage of GDP.

The main objective of this work is to underline some methods of using statistical and administrative sources to estimate foreign production in the enterprise accounting system. The integrated use of statistical and administrative archives makes it possible to select a priori the sub-set of companies potentially interested in the phenomenon of foreign production as outlined in Frenda (2021). The methodological proposals of the work are also the result of the experience gained in during the first two years of the project initiative entitled "Foreign productions in the context of the economic accounts of enterprises". The study can be used by the public decision maker in order to and to highlight fiscal elusive strategies and to estimate the real share of domestic, foreign (through stable organizations) and export production. This makes it possible the knowledge regarding the impact of some economic incentive measures on GDP and national employment. This work therefore makes a contribution to the exploration of the dynamic relationships between the ownership structures, company strategies, and their choices related to the legal form, ownership structure and governance structures related to internationalization (Depoutot, 2003; Dervieux et al., 2002; Arvanitis et al., 2017). It is particularly focused with on the definition of tools, mechanisms and rules, both legal and technical, that are pre-ordered for improved implementation of the management process and the control of a company, based on the economic and territorial context in which it operates. The integrated use of the archives, statistical, administrative and tax sources and other information (administrative data, company sites, profiling of the main multinational groups) makes it possible to select a priori the sub-set of companies potentially interested in the phenomenon of foreign production (Amante et al., 2016).

The definition of the duration of the activity, as required in ESA 2010 (Eurostat, 2013), appears to be an element on which theoretical hypotheses can be made, but not systematically detectable from business economic data. However, the comparative

and integrated analysis of the economic variables and the breakdown by geographical area of revenues and receivables from customers, payables to suppliers and intermediate production costs, allow identification of methods to approximate the value of internal production and related intermediate costs. The estimate of relative production, for example in the Construction field in Italy, should therefore include activities of foreign companies operating in country and be filtered from the activities carried out by Italian companies abroad, which last at least twelve months. The economic and capital data on the activities of an enterprise in the economic territory of several countries are therefore processed and analysed: the subsequently produced value added is calculated as the difference between the variables included in the value of production and the intermediate costs of an initiative: the former contain the value of gross turnover, changes in finished product stocks, partially-finished products in process, increases in fixed assets for domestic work and ancillary operating revenues (Lajili et al., 2007). The latter include costs for gross purchases, various services and the utilisation of third-party services, changes in material inventories and the purchase of unprocessed/unfinished goods, along with different operating charges.

For firms, the following two different types of activity can therefore be distinguished (Frenda, 2021). The activity is carried out exclusively within the home country economic area: the units carrying out such activities are resident units. The activity shall be carried out in the economic territory of several countries for one year or more: only unit parts having an economic centre of interest in the economic territory of any country may be regarded as a resident unit of that country.

In ISTAT (2016), different approaches are described for the estimation of the production related to activities carried out by companies operating in several countries. In this paper is also outlined the relation for a legal unit between vertical integration, as implemented in Desyllas (2009) and Hutzschenreuter and Gröne (2009), and foreign production.

The paper proceeds as follows. In the next Section we explain some relevant sources for estimation of foreign production. In the Section 3, we show the data and a brief introduction to representing the results of a principal component analysis using biplot. The Section 4 focuses on results of our analysis. The final section summarizes the conclusions.

## **2 The estimation of foreign production**

We want to represent a set of economic units and activities to be considered and followed over time, useful in structural surveys for estimating foreign production of domestic enterprises.

The first source is ISTAT structural surveys of the economic accounts of enterprises: this survey is formed by a total survey (SCI, on legal units with 250 or more persons employed) which provides the definitive data for the larger units and a sample survey (SME, on legal units with less than 250 persons employed), which has an instrumental role for the construction of the Frame information system (Altarocca et al., 2016).

This is a thematic register on the main economic variables of companies, based on the priority use of data from administrative sources, and tax integrated with data from these structural surveys.

The financial statements and supplementary notes of capital companies with their websites (which present ad hoc information on the presence of permanent foreign organizations which, together with the national part, make up the enterprise under study).

The ISTAT/FATS survey (Survey on overseas foreign affiliate activities controlled by Italy) on the overseas activities of companies and local units that are resident abroad and subject to single national control. This includes secondary offices, which are local units without their own legal autonomy that are dependent on a nationally controlled undertaking and are considered "quasi-enterprises".

The fiscal models for the section relating to regional tax on productive activities (IRAP) on activities carried out abroad.

In particular, a record linkage activity can render it possible to define a domain of local units (without legal autonomy) permanently present abroad and controlled directly by a national company, in order to confirm the simultaneous presence of an enterprise in the datasets relating to Outward FATS and IRAP.

Among the sectors that appear most involved in this problem and clearly respond to the regulations indicated by the European System of Accounts (SEC 2010), are: Building construction (Nace Division 41), Civil engineering, in particular the construction of roads, railways, public utility works for electricity and telecommunications, hydraulic works (Nace 42), specialized construction works and, in particular, installation and maintenance of electrical and hydraulic systems and for gas distribution, drilling (Nace Division 43), architectural and engineering studies (Nace 71). The presence of permanent organizations, from the analyses carried out, however, also occurs in companies that deal with economic activities that are instrumental to the aforementioned, such as manufacture of equipment for civil engineering, manufacture of machinery and equipment for chemical and petrochemical plants and industries, construction of drilling platforms, manufacture and installation of elements relating to storage facilities (e.g. upgrading of hydroelectric plants, storage terminals), research and development activities. There are also companies integrated into the Commerce sector, with permanent organizations abroad, sometimes delegated to carry out management of individual points of sale with the aim of a more direct and incisive organisation of sales in these countries: the individual operations of the secondary offices are recorded chronologically by the Company in a special sectional journal and collated within the financial statements along with those made by local domestic units. In particular, the national companies that carry out the above-mentioned main or secondary production activities through foreign local units without legal representation appear to be relevant for the purposes of the analysis in question. The Italian entrepreneurial landscape, based on the high presence of small and medium-sized organisations and a few large enterprises in the territory, has production units that choose to build permanent organizations without legal autonomy. These belong to the parent company, also from an economic-company point of view, as their data is included in the economic and equity variables of the parent company's financial statements.

With regard to the assessment of foreign production, the methods used for the respective sources for the estimation of foreign production are detailed below.

Financial statements / Explanatory notes: the information included in this document concerns the breakdown of revenues from sales and services by geographical area, and may therefore concern a broader distribution than that of the purely productive foreign units (e.g. including exports made by unstable business and activities). In the presence of permanent foreign organizations (also defined as branches, and/or secondary offices) as outlined in the explanatory note, this information provides a significant signal of the foreign activity of the studied company, as required by ESA 2.07, 2.09 (to be evaluated through the sources below). When there is also a precise estimate relating to turnover / production (included in the financial statements data) for these foreign local units, this source appears to be the most appropriate for the estimation activity in question.

Tax models relating to the regional tax on production activities (IRAP): the section concerning activities carried out abroad allows for the attribution of national production. In the absence of precise data from the Explanatory Note on the production of the foreign local units referred to above, this source allows a timely and updated intervention on the Sci data. Among the problems, it should be noted that the IRAP time horizon established for the identification of activities abroad, is three months, while for the requirements envisaged by ESA 2010 (Eurostat, 2013) it is equal to one year; moreover, the IRAP production quota is proportional to the cost of labour and may be subject to tax mechanisms relating to deductions / deductions.

Through the data provided by Outward Fats (ISTAT, 2020), the presence of the units in question and direct control over the secondary foreign offices without legal autonomy was verified and ascertained for the years 2017 and 2018: for both years it was also possible to make an estimate of the 'foreign business with this source, which generally appears to converge with that from IRAP.

The value of production and intermediate costs, for the estimation of the added value related to the above activities carried out by companies operating in several countries, can be eliminated from the activities carried out permanently abroad by following different approaches.

Linear allocation of the levels for economic variables recorded in balance sheet accounts, supplementary notes, where there is only information on the geographical distribution of revenues.

Punctual allocation of the revenue and/or cost levels recorded in the financial statements, supplementary notes, Outward FATS Survey, to be carried out in particular when the internal added value, net of the foreign activity, appears anomalous (for example, negative added value - with respect to the other companies of the considered subset).

Use of adjustment coefficients derived from IRAP models (Regional tax on productive activities) and concerning the activities carried out abroad by joint-stock companies: the linear purification share of the value of production and intermediate costs calculated as a ratio is thus determined as a percentage between the value of production carried out abroad and the value of total production.

Breakdown of *sales revenues* or payables according to geographical areas, for companies in the maritime sector.

## 3 Material and Methods

### 3.1 Dataset

The indicators of this dataset, concerning data from 2017 included in ISTAT Structural Business Statistics (large enterprises), belong to the following economic sectors: Food Industry; Project Management; Informatics, Trade, Constructions, Air Transport and Shipyards, Machinery, Pharmaceuticals, Paper making, Mineral extraction.

The variables chosen to highlight the phenomenon are listed below.

Since we are interested in the presence of permanent foreign production (e.g. branch, local unit, secondary division) that is consolidated in the balance sheet accounts of domestic enterprises, we outline the number of branches per economic sector (indicated as Branches in the following) directly controlled by a national enterprise (local unit without its own legal autonomy that appears to depend on a company with national foreign control): they are stable businesses through which the non-resident company carries out all or part of its activities in the territory of the foreign state. These local units have not legal autonomy and they are considered an operational instrument of the non-resident company. Since the transition from business accounting to national accounts must be carried out as required by ESA 2010, and the institutional units having a predominant economic interest in a specific country shall be identified, we estimate the national production and the corresponding intermediate consumption, by trying to also include the foreign production for periods under 12 months. Investments in tangible and intangible fixed assets should therefore be evaluated because these acquired assets are intended to be used in production processes. Gross fixed capital formation includes acquisition less disposals of e.g. buildings, structures, machinery and equipment, mineral exploration, computer software, literary or artistic originals, and major improvements to land such as the clearance of forests (ESA 2010, 3.127).

Gross fixed capital formation per employee (indicated as Capital in the following): relationship between the acquisitions of fixed capital made during the year and the employees of the considered company; the investments also include the value of the capital assets produced by the company for its own use and the extraordinary repairs and maintenance performed by the company itself on the company plants.

Vertical integration is outlined by the following measurement approach: ratio between value-added and sales (Fimiani and Frenda, 2004), indicated as Vertical-Integration in the following.

The fourth variable used is the foreign production of companies from IRAP source (indicated as Foreign Production in the following). The IRAP source certainly appears leaner and simpler, from the point of view of the production process of company accounts (based on the purposes set out in the ESA 2010), which define the foreign production carried out by national companies when the activity exercised is recognized by this source, in particular for the construction and design sectors. As emerges from the instructions for completing the IRAP form, through this source it is possible to obtain information on the distribution of production in the economic territories belonging to several countries, based however on the value "of the salaries, fees and profits due, respectively, to employ-

ees". This can be a limit due to the variability of labour costs in different countries and continents, and in the event that it is necessary to estimate variables other than those present in the balance statement (i.e. tangible investments). In addition, the IRAP time horizon established for the identification of activities abroad is three months, while for the requirements provided for by ESA 2010 (Eurostat, 2013) it is equal to one year.

The last variable we used in the work was the ratio between general management costs and labour costs (indicated as Wages in the following): in SBS expenses for employees working abroad who are not resident in Italy must also be excluded, and the relative amounts must be reported in other management charges.

The dataset was created by aggregating data relating to companies with more than 250 employees and foreign branches, selected on the basis of a double and simultaneous signal of foreign production from IRAP sources and the presence of local units from the Outward Fats survey. Indicators were outlined to highlight the impact of foreign activities on global production, using the ATECO hierarchical classification (which presents the various economic activities of the reference company grouped from general to particular) and we considered the divisions (2 numerical digits ) belonging to the about 160 legal units present in Outward Fats and with stable secondary foreign offices included in the significant sample for the year of analysis, after a screening on the legal form of the controlling units (which had to be included among those defined by the Italian civil code) in order to identify only the direct control over the branches. It follows the dataset with calculated economic indicators (Table 1). The summary statistics are shown in Table 2.

Table 1: Main economic indicators for industrial Sectors

Industries	Branches	Capital	Vertical Integration	Wages	Foreign Production
Food Industry	10.0	17.4	0.3	4.8	14.9
Project Management	12.0	2.0	0.5	58.8	24.3
Informatics	5.0	5.2	0.5	13.1	1.1
Trade	31.0	5.3	0.2	1.3	13.4
Constructions	40.0	2.5	0.3	16.8	20.0
Air-Transport-Shipyards	13.0	3.8	0.3	32.8	1.6
Machinery	3.0	3.8	0.3	49.3	3.5
Pharmaceuticals	2.0	7.7	0.4	13.9	3.6
Paper-making	1.0	30.5	0.3	13.3	2.2
Mineral-extraction	3.0	42.1	0.1	0.1	0.1

The Shapiro-Wilk test for normality (Table 3) shows that three variables are not significantly normal with a 95% probability level: Gross fixed capital formation per



Table 2: Summary statistics of the main indicators

Variable	Mean	Standard deviation	Min	Max
log-Foreign Production	1.302	1.685	-2.302	3.190
log-Capital	1.962	1.044	0.678	3.738
log-Branches	1.897	1.198	0.000	3.688
Wages	20.430	20.127	0.139	58.843
Vertical integration	0.329	0.139	0.063	0.549

employee, foreign production, and number of foreign branches. Therefore these three variables have been transformed on a logarithmic scale and in the following will be indicated with prefix "log-".

Table 3: Shapiro-Wilk to test normality of variables

Variable	Obs	W	V	z	Prob > z
Foreign Production	10	0.83	2.53	1.75	0.04
Capital	10	0.74	3.97	2.76	0.00
Branches	10	0.79	3.18	2.25	0.00
Wages	10	0.85	2.17	1.44	0.07
Vertical integration	10	0.97	0.44	-1.29	0.90

Finally, the analysis of Pearson's correlation coefficients (Table 4) on the variables leads to interesting reflections. The log-Capital is a variable that is strongly and negatively correlated with all others; on the contrary the log-Branches variable (number of foreign branch from Outward Fats Source) is highly linked only to log-Foreign-production (foreign production from IRAP source): this result allows us to confirm the usefulness of a linkage between the IRAP dataset and the Outward Fats source in order to outline the local foreign units with a double (and therefore strong) signal of foreign activity, for the various economic sectors analyzed. The presence of a double signal of foreign activities, as explained in the introduction, allows definition of foreign branches permanently organized in other countries, without legal autonomy, but controlled by national units.

### 3.2 Principal Component Analysis and Biplot

The linear combination for the set of variables  $X_1 \dots X_p$  corresponding to the largest amount of variability is called the first principal component. The second principal com-

Table 4: Correlations

Variable	log-Foreign Production	log-Capital	log-Branches	Wages	Vertical Integration
log-Foreign Production	1.00				
log-Capital	-0.60	1.00			
log-Branches	0.57	-0.60	1.00		
Wages	0.30	-0.66	0.02	1.00	
Vertical integration	0.46	-0.68	0.08	0.61	1.00

ponent is the linear combination which has maximum variance and is uncorrelated with the first principal component, and so on. A significant part of the total variance is explained by the first principal components while the remaining components can be ignored (see, for further details: Jolliffe, 2002; Lebart et al., 1995; Hotelling, 1933).

The Biplot is a graphical simultaneous representation, in the cartesian plane, of the results of a Principal Component Analysis in which both the statistical units of  $\mathbf{X}$  (scores) and the variables (loadings) are showed (Gabriel, 1971). In a biplot, the length of each vector (rays) approximates the variance of the respective variable: the longer the ray, the greater the variance. The cosine of the angle between two rays approximates the correlation between the variables they represent. The point of contact of a perpendicular from a specific statistical unit (economic sector) to a vector approximates the value of that statistical unit with respect to the variable represented by the vector. If the contact point falls or is close to the origin, the observation value is roughly the mean of the respective variable. Contact points far from the origin indicate high values relative to the variable represented by that vector. The distance between two statistical units approximates the Euclidean distance between two sectors in the factorial space (see Gabriel, 1971, for further details).

## 4 Results and Discussion

The principal component analysis conducted on the dataset standardized (Table 5) shows that the first two eigenvalues represent 83% of the total variability. This means that the multivariate structure can be represented with a good approximation on the first factorial plane.

The first eigenvector is characterized by components of opposite sign but with values not very different from each other (Table 6). In other words, it represents a global measure of activities abroad: contrasting industries with high activity with respect to others (size factor). The second eigenvector also has opposite values: the second main

component highlights the differences in the type of activities of the industries. The first component is quite positive correlated with Foreign production and vertical integration, while the second is highly correlated with the Number of foreign branches (Table 6). The Kaiser-Meyer-Olkin measure (0.74) of sampling adequacy for the Foreign production variable is declared as *middling* (Kaiser, 1974).

Table 5: Eigenvalues (Principal Components)

Vector	Eigenvalue	Difference	Proportion	Cumulative
I	2.90	1.69	0.58	0.58
II	1.22	0.75	0.24	0.83
III	0.47	0.15	0.09	0.92
IV	0.32	0.25	0.06	0.98
V	0.07		0.01	1.00

Table 6: Eigenvectors (Principal Components)

Variable	Eigenvector				
	I	II	III	IV	V
log-Foreign Production	0.4512	0.3206	0.6360	0.5265	-0.1091
log-Capital	-0.5535	-0.0264	0.3334	0.2379	0.7247
log-Branches	0.3351	0.6928	-0.3504	-0.1816	0.5019
Wages	0.4142	-0.5068	-0.4275	0.5361	0.3185
Vertical integration	0.4542	-0.3996	0.4228	-0.5880	0.3308

The PCA results are showed by means of the graphical representation (Biplot) with the scores and the loadings (Fig. 1). The x and y axes represent the first and second principal components (the explained variance is equal to 83%).

Looking at the Biplot (Fig. 1) in the following, we highlight the main results. The logarithm of direct controlled branches (log-Branches) has by far the highest variance among the variables in the biplot, followed by logarithm of Gross fixed capital formation per employee (log-Capital); the remaining variables have a lower and similar variance. We note a very strong relationship (quasi-collinearity) between the variables Wages (ratio of general management costs on labour costs) and Vertical-Integration; we also observe a strong relationship between the logarithms of Branches and Foreign-Production. The correlation between logarithm Gross fixed capital formation per employee (log-Capital)

and each of the other analyzed variables is negative.

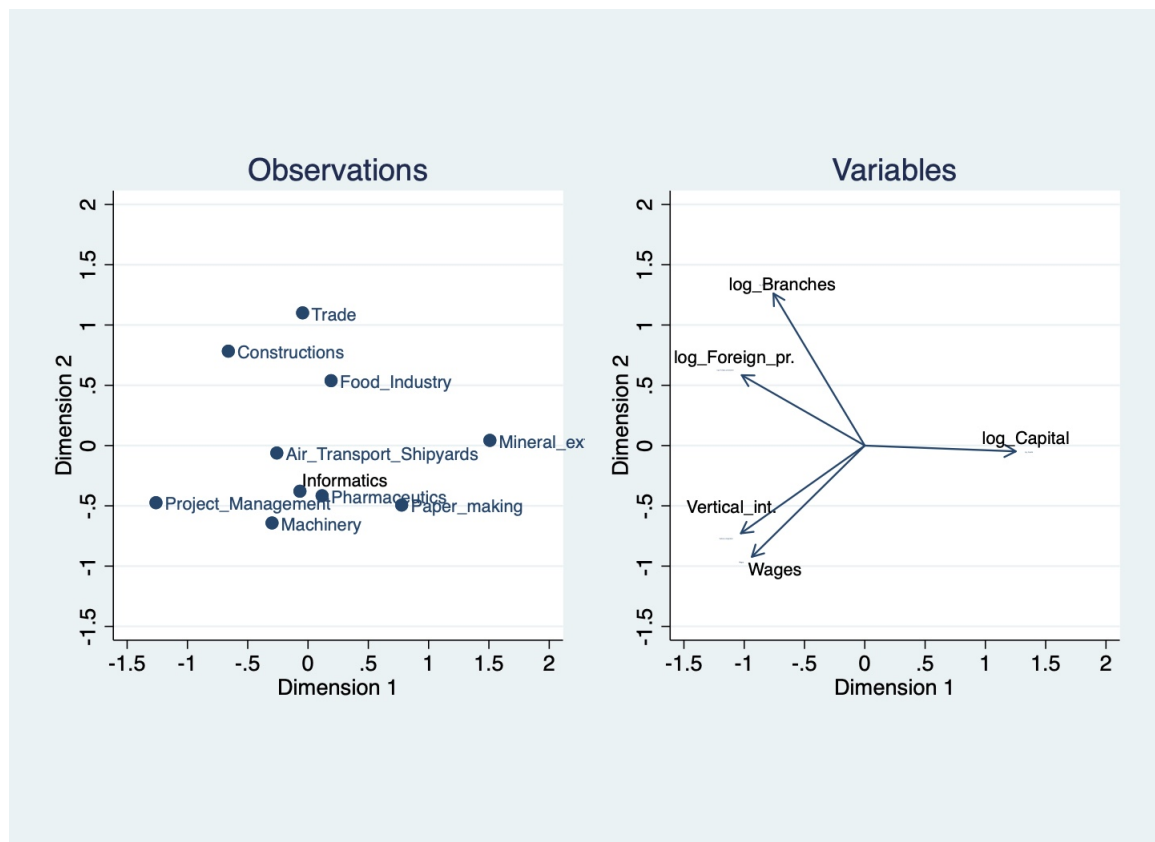


Figure 1: Biplot of Economic indicators and Economic Sectors

The Mineral Extraction sector stands out with the highest logarithm of Gross fixed capital formation per employee, followed by Paper-making Industry; on the contrary they are negatively correlated with foreign production. On the other side, Construction and Trade sectors stand out with the following variable values: the highest logarithmic number of direct controlled branches and foreign production. Finally, in our case, the highest Euclidean distance is observed between Project Management and Mineral extraction sectors, while Pharmaceuticals and Informatics are the other extremes.

The x and y axes represent the first and second principal components: y-axis explains the organizational structure of companies abroad; while x-axis represents the latent variable relating to the economic value of production carried out abroad. Furthermore, looking at Figure 1, it can be concluded that a slight rotation of the axes of the PCA would improve the ease of interpretation of both components.

Finally, in order to identify the similarities of behaviour of the sectors regard to foreign production, we proceeded to a cluster analysis (Figure 2), by using Ward approach and Euclidean squared distance. A cut of the dendrogram, using the ultrametric distance

(level 20 in Figure 2), identify three groups of Sectors.

The first includes Machinery, Air Transport Shipyards, Pharmaceuticals, Informatics and Project Management. This group identifies a set of instrumental activities with respect to Construction and Civil Engineering Works. The second group (Constructions, Trade and Food industry) includes activities, with high quotas of foreign production, represented by Constructions global enterprises, and Trade sector with permanent branches for the management of points of sale. The last group (Mineral extraction and Paper making) is characterized by activities linked to the extraction and trading of oil and gas products. Construction and trade have many branches and are relevant to overseas production, but they have less capital than the other sectors, no vertical integration and negligible wages. The food industry also has enough branches and is active in foreign production, it has more capital, there is no vertical integration and wages are low. The mining industry excels in capital but has very few branches and little foreign production, little vertical integration and low wages. Among all sectors, Project Management and Machinery with scarce capital, show an high vertical integration and wages. Project Management has a fair foreign production and some branches. The other sectors such as Informatics, Pharmaceuticals and Air Transport Shipyards located near the center of gravity of the biplot, show average characteristics for all the variables examined.

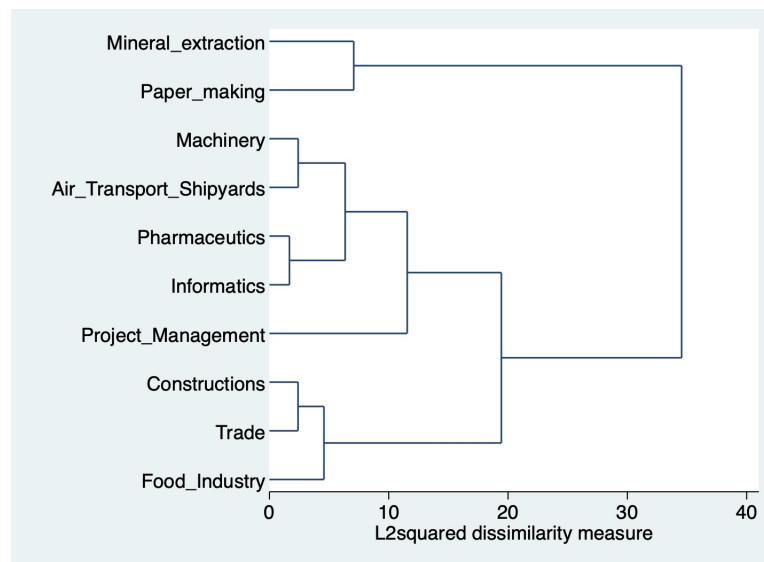


Figure 2: Dendrogram of the economic sectors classified according to the main indicators

## 5 Conclusions

A linkage of administrative and statistical survey data let the transition from corporate accounting to the concepts expressed by structural business statistics and national accounts. It is measured the part of institutional and the centres of economic interest to

identify the institutional units that make up the economy of a country and whose flows and stocks are registered in ESA 2010. From the results of our work, we know the share of foreign production is directly correlated to the number of secondary foreign offices belonging to the global company, on the contrary this share it is not directly linked to the investments in material goods, for which the national dimension is privileged, but the analysis shows that assets are used in the foreign or internal production processes and they must be estimated with ad hoc coefficients (different from the ones used for production). International production strategies of a firm appear also driven by the labour cost characteristics of the production. The multivariate analysis of the economic variables (production, employment, labor costs, intermediate consumptions) allows to measure effective performance, both economic and financial, for global enterprises. Fiscal and statistical data with a profiling of these enterprises make possible to select a sub-set of medium and large sized units potentially interested in the phenomenon of foreign branch offices.

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