THE ITALIAN EXPERIENCE FOR ESTIMATING A REGIONAL PRODUCTION TABLE

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Abstract

The present work shows preliminary results currently reached in Italy and related to the estimation of the table of production at sub-national level by the same basic information used for the construction of that at national level. The methodological approach used is substantially in line with that adopted at the national level, and the information base consists in the structural business surveys conducted annually by the National Institute of Statistics: business accounts surveys and industrial production survey. This information base, available at regional level, allows to distribute the output of each sector between the different kind of productions, principal and secondary, and thus to obtain an estimate of the matrix of production according to a simplified scheme compared to that provided at national level with regards to the level of disaggregation by industry and product. Although the case study presented relates to the table of production for Veneto Region, the approach followed has laid the methodological framework for its applicability for all Italian Regions. The compilation of the table of production is the first step for the implementation of the Supply and Use tables at regional level and at the same time it is binding for any subsequent development focused on a detailed depiction and analysis of the economic system at regional level.

In this regard an additional line of research for the production of official statistics is dedicated. It concerns the development of the Italian Tourism Satellite Account, released for the first time in 2012 by the Italian National Institute of Statistics at national level. Our next aim is to develop a regional Italian TSA, by the contribution of a regional table production.

Keywords: *National Accounts (NA); Supply and Use Tables (SUT); Tourism Satellite Account (TSA); branch of economic activity.*

1. INTRODUCTION

The Italian Input-Output tables have been "formalized" by the National Institute of Statistics (ISTAT) in 1959 and produced at intervals generally three years until 2002; from that year Istat began to make available supply and use tables annually (Supply and Use tables). These tables provide a detailed picture of the supply of goods and services, both domestically produced and imported and their use for intermediate and final uses (Eurostat, 1996). They are therefore matrices that show the relationships between the homogeneous branches and branches of economic activity through a careful description of the domestic production processes and operations on the products of the national economy (Mantegazza S. and C. Pascarella, 2006). Under this scheme supply / use the matrix shows the availability of the

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production of goods and services produced domestically classified by product and by branch of economic activity. In Italy this matrix is obtained by the sum of six matrices belonging to three distinct groupings of institutional sectors and according to the destination of their production for sale (market production); for own final use; for offering free or at prices that are not economically significant (non-market production . For the first group, relating to financial and non-financial corporations and households as producers - institutional units which, by definition, do not produce goods and services provided free or at not economically significant - is built a matrix on the production market, and a relative to that for its final use. For each of the other two groups, the government (PA) and non-profit institutions serving households (NIPSH), are built, however, a matrix related to the production market and a matrix for the production non-market and for their own use (S. Maresca C. Squarcio, 2011). This work represents an advance for estimating of the total production table in sub-national level with reference to a region: Veneto[2]. The methodological approach used is substantially in line with that adopted at the national level as well as the information base is mainly composed of the structural business surveys conducted annually by Istat. This information base is available at the regional level, allows you to distribute the output of each sector between the different productions, primary and secondary, by which to obtain an estimate of the matrix of production according to a simplified scheme, in terms of the level of disaggregation by industry and product, compared to that provided at the national level.

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[2] S. Maresca, .C. Squarcio (2013) refers to market production table in Veneto.

2   THE MAIN SOURCES OF DATA

The main statistical sources used to estimate the matrix of production for market enterprises are structural business surveys conducted annually by ISTAT: small- and medium sized enterprise survey (SME), for enterprises up to 99 employees, Istat business account survey data (SCI), for enterprises with 100 employees and over, and the survey of industrial production (PRODCOM).

The annual surveys on the economic performance of firms (SCI and SME) are conducted in accordance with EU regulation no. 295/2008 for structural business statistics (SBS - Structural Business Statistics) in order to provide harmonized statistics to assess the structure, activity and the competitiveness of enterprises in the European Union. The production of statistical data covering the classes of NACE Rev. 2 (NACE 2007 to 4 digits) from Section B to S excluding financial and insurance activities (section K), public administration, defense and compulsory social security (Section O) and activities of membership organizations (Division 94). In particular, business account survey SCI is a survey that collects total annual detailed information on the balance sheet, employment, the personal cost, investment and other relevant characteristics of all Italian companies with 100 employees and beyond. The survey unit is the enterprise and for those with 200 or more employees with significant secondary activities are collected separate information for their different activity.

The survey of small and medium-sized enterprises (SME) is a sample survey that collects information annually on economic accounts, employment, personnel costs and investment with up to 99 workers. The collection unit of analysis is the enterprises. The sampling design is stratified with one-stage selection with equal probability of unity: the strata are identified by sectors of economic activity (NACE Rev.2 4-digit code), by classes of employees and the regions of business location. The sample of SME consists of approximately 2.5% of all the companies belonging to the specific field of observation.

The survey Prodcom finally offers information on the types of industrial products made in Italy and on production levels achieved, in terms of quantity and value, as detailed for each product item in the list Prodcom. This list is made up of a collection of product entries harmonized at European level and includes primarily the goods but also processing well as repairs and maintenance and assembly and installation, called industrial services. The survey was carried out according to the criteria laid down in Regulation Prodcom which is the legal instrument adopted by the European Union to harmonize the statistical observation of industrial production in member states. The application of this Regulation has led to the definition of a complex survey design. The regulation provides that the survey is conducted by companies that represent at least 90 % of national production at the level of NACE Rev. 2

class. To ensure these constraints the survey covers all companies with at least 20 employees (constraint imposed expressly by the Regulation) and a representative sample of enterprises in the size class 3-19 workers.

2 THE METHODOLOGY OF ESTIMATING THE TABLE OF PRODUCTION FOR THE REGION VENETO

The production matrix for market enterprises estimated for the region Veneto is divided into 44 rows that identify "homogeneous branches", and 44 columns that indicate the "industries", i.e. kind of activity unit (KAU) consistent with the classification Ateco2007 (Italian version of Nace Rev. 2). In the cells on the main diagonal we obviously find the value of the "typical" branch output, that we will call "main output"; in the remaining cells of each column, we find the value of the "secondary output", i.e. the value of the production of goods and services that are not typical for that branch and cannot be separated on the base of enterprise accounting elements and information on their workers in local producer units.

If P denotes the matrix of production of market enterprises divided into 44 rows and 44 columns, we have:

p_{kk} for $k=1,44$ is the generic matrix cell that contains the value of primary production;

p_{jk}, for $j{\neq}k$, and j and $k=1,44$ contains the value of the production of the good or service j produced by industry k, which is secondary production for this industry;

$p_{j.} = \Sigma_k\, p_{jk}$ is the value of production for the product j;
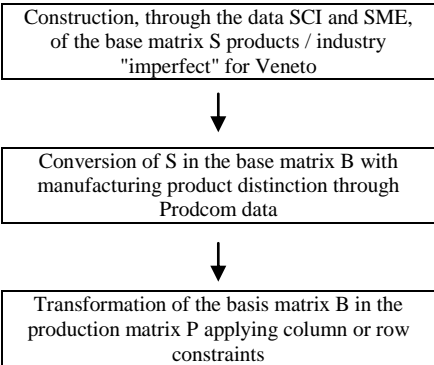
$p_{.k} = \Sigma_j\, p_{jk}$ is the value of total production (primary and secondary) of the branch k;

$p_{..} = \Sigma_j\Sigma_k\, p_{jk}$ is the total production.

In analogy with what has been achieved at the national level, the estimate of the production table for market enterprises for the region Veneto was based on the integration of data from structural business surveys SCI and SME with those derived from the survey of industrial production (Prodcom) selecting only companies that carry out their production activities in the territory of Veneto. Through the accounting data provided by SCI and PMI has been possible to evaluate the production relating to the various activities carried out by companies operating in the region Veneto, while the linkage between survey data and structural SCI SMEs and those Prodcom survey, it was necessary to obtain an estimate of the matrix of production by showing the breakdown by product and KAU of the value of production of industrial products.

The figure below shows schematically the construction phases of the production table for enterprises.

Figure 1: Stages of the business market production matrix construction in Veneto.

Construction, through the data SCI and SME, of the base matrix S products / industry "imperfect" for Veneto

$$\downarrow$$

Conversion of S in the base matrix B with manufacturing product distinction through Prodcom data

$$\downarrow$$

| Transformation of the basis matrix B in the production matrix P applying column or row constraints |

In general, the matrix production was estimated by dividing the production of each branch in the column cells afferent to it of a matrix of the base (**B**), articulated in products and branch of economic activity, constructed to locate the part of the secondary production and achieved in stages by using and integrating the different data sources available.

The first step in building the table of production consists in the exploitation of information on the various items of economic account of companies, measured through surveys SCI and SME, in order to identify the output for each firm on the production of goods and services. The company accounts data collected by these surveys have a level of detail that allows the assessment of production relating to the various economic activities carried out by each company, distinguishing among eight types of activities as regards the production market.

To build the matrix structure of (**S**) has been suggested a close connection between the technical and commodity class Nace Rev. 2, which identifies the main economic activity of the enterprise and the output of the various activities carried out by it. In this way it has been given a code relating to the production of homogeneous product at eight types of activities identified through the accounting data, referring to the classification to 44 products and 44 industries used in the construction of the matrix in accordance with the adopted aggregation for the elaboration of ISTAT regional estimates.

The following table shows business accounting items that make up business market production, preceded by algebraic symbols indicating the way they contribute to calculations (column 1), the type of economic activity they refer to (column 2).

Figure 1 –Items of enterprise economic accounts as obtained from SCI and SME surveys used to estimate market production

Items of enterprise economic accounts	Type of economic activity
(+) Revenues from Sale of goods produced by the enterprise Processing on behalf of third parties Processing following orders of third parties (+) Changes in inventories (final less initial) of Finished products Products undergoing processing	Production of goods
(+) Revenues from production of raw materials and semi-finished for third parties	Subcontracting
(+) Revenues from sold and purchased unprocessed goods (−) Purchase of unprocessed market goods (−) Changes in inventories (final less initial) of unprocessed market goods	Trade margins
(+) Revenues from intermediation activity	Intermediation and agency activity
(+)Gross traffic profits	Transport of goods and persons
(+) Revenues from services offered to third parties	Supply of other services
(+) Revenues from Royalties, patents, etc.	Rights linked to industrial property
(+) Actual rents	Letting

Of these eight types of activities in which they can be articulated production of the enterprise market, only one concerns the production of goods so that the output resulting from the transformation of manufacturing industries that can not be placed all on the main diagonal, as if the KAU grouped into these industries would produce only homogeneous output. What you get is a matrix S product by branch of economic activity "imperfect" as the output resulting from the transformation of manufacturing industries is not disaggregated between main and secondary products but all assigned to the typical production.

The breakdown in different products output that results from the production of industrial goods by the KAU, was made on the basis of the distribution of production among different products detected by the survey Prodcom that allows you to collect the value of the business at production of industrial products at the elementary level (according to the CPA to 8 digits

of the products). In particular, denoting by **S** (44x44), the basic matrix "imperfect" constructed from survey data SCI and SME and **R** (44x44) data organized in a matrix form (product x branch of economic activity) of industrial production resulting by Prodcom survey, the output for the production of goods of the branches of industrial transformation, initially attributed to the typical activities of the corresponding branch, was distributed among the various products manufactured on the basis of product distribution for each column of the matrix of industrial production **R**. You can get the basic matrix "correct " **B** where, indicating with j^k the typical product of branch k , we have:

$$b_{jk} = s_{j^k k} \frac{r_{jk}}{\sum_j r_{jk}} \qquad \text{for } j, k = 7,\dots,19 \text{ (respectively products and branches of}$$

industrial sector)

$$b_{jk} = s_{jk} \text{ elsewhere;}$$

where s_{jk} indicates the generic element of the base matrix **S**.

The last step consists in the construction of the domestic production matrix of enterprises in the Veneto region by dividing the level of production of each of the 44 branches of economic activity in the cells of column **B** relating to it.

For the region Veneto elements of the vector of marginal row $p_{.k}$, which represent the regional branch of production, were estimated by applying national ratio of production/ value added to the regional value added. The latter was obtained by the technique of expansion the universe, through the full-time equivalent labor units classified by the 44 industries considered, the value of per capita value added resulting from the Istat survey on structural surveys (SCI and SME) and corrected for underreporting of value added:

$$p_{.k} = \frac{p_{.k}^N}{va_{.k}^N} * va_{.k} = \frac{p_{.k}^N}{va_{.k}^N} * vapc_k * ula_{.k}.$$

where:

$p_{.k}^N$ and va_k^N represent the production and value added of the industry k at national level and $vapc_k$ and $ula_{.k}$ gives the value added per capita (per worker) and full-time equivalent labor units of branch k for the region Veneto.

From the structure of the matrix **B** is obtained enterprises production matrix **P** by dividing the level of production of each branch $p_{.k}$ in the cells of column **B** corresponding to it:

$$p_{jk} = p_{.k} \frac{b_{jk}}{\sum\limits_{j=1}^{44} b_{jk}}$$

where b_{jk} is the value in the cell of the generic k-th branch of the base matrix $\mathbf{B}$.

This procedure for the column is the main one, since the matrix of the production is built precisely to locate the part of the secondary production value included in the value "known" of the overall production of branch, to attribute it to the specific product. The total production of the j-th product is obtained by summing j-th row of the matrix ex post.

For energy products, agricultural, livestock and fisheries products, as well as rental services, providing basic data information in view of the product, the total production of goods or services p_j is estimated regardless of which branch of the economic activity has produced.

In particular in the field of agriculture, forestry and fisheries information base available allows you to directly estimate the production for each of the products[3]. For energy products and service rental, however, it is necessary to make assumptions. The figure for the production of such products for the Veneto region has been obtained by applying a correction factor to the production of branch obtained by applying the same ratio of production / value added to the national figure of regional added value:

$$p_{j.} = \frac{p_{pr,.j}^{N}}{p_{br,.j}^{N}} \frac{p_{.j}^{N}}{va_{.j}^{N}} * va_{.j} .$$

where :

$\dfrac{p_{pr,.j}^{N}}{p_{br,.j}^{N}}$ is the ratio between the production of the product j and that of branch j at national level;

$p_{.j}^{N}$ and $va_{.j}^{N}$ represent the national production and added value to the branch j-th and

$va_{.j}$ is the value added of industry j to the region Veneto.

The total estimate of the production of such goods and services is, therefore, a constraint row, and in the construction of the matrix, it is to spread the estimate of $p_{j.}$ between the cell corresponding to the branch k that produces the product j as his trademark and other cells in the row, containing the production of product j made from branches that have as a secondary activity. The value of the typical product of the branch k is obtained as the difference between the constraint row and the cells in the same row already determined:

$$p_{jk} = p_{j.} - \left(\sum\limits_{k=1}^{k-1} p_{jk} + \sum\limits_{k=k+1}^{44} p_{jk} \right)$$

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[3] For the estimation of agricultural products, livestock and fisheries sources available are varied and allow you to obtain reliable estimates territorial.

The total production of the industry is thus obtained a posteriori by adding the value placed in different cells of the corresponding column.

Regarding the non-market component, the estimation of the matrix of production for the Veneto region was based on the matrix structure of the national not-market production. At the national level the matrix of non-market production is strongly diagonal to the concentration of production of non-market sectors in the cell that identifies the typical product. Also for the regional matrix has been hypothesized this phenomenon.

The consistency with the constraint of the regional accounts has been reached in a manner equivalent to market segment: the relationship between the production and the added value of the non-market sector nationally known has been used, in this case, to constrain the production of the region Veneto.

3   MAIN RESULTS

While stressing the purely methodological framework of this research, this section shows the results by relating the structure of the output table for the region Veneto with the national equivalent.

For this purpose are presented two tables of production formed products / industries, with the distribution of the production of branch originated in Veneto and in Italy in 2010. Dimension chosen for the presentation of the results, 12 products / branches, is among those laid down by European classifications and provides an effective detail of the industrial and services sectors.

Table 1 – Domestic production matrix for region Veneto - Year 2010 (percentage distribution by product)

	1- Agriculture, forestry and fishing	2- Mining and quarrying	3- Manufacturing	4- Electricity, gas, water, waste management and remediation	5- Construction	6- Wholesale and retail trade, transportation and storage, accommodation and food service activities	7- Information and communication	8- Financial and insurance activities	9- Real estate activities	10- Professional, scientific, technical, administration and support service activities	11- Public administration, defence, education, human health and social work activities	12- Other services	Total
1- Agriculture, forestry and fishing	**97.6**	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	**1.5**
2- Mining and quarrying	0.0	**79.5**	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**
3- Manufacturing	1.0	8.5	**95.2**	0.2	0.0	4.0	3.0	0.0	0.0	0.6	0.3	2.2	**37.6**
4- Electricity, gas, water, waste management and remediation	0.0	0.0	0.0	**98.2**	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	**4.4**
5- Construction	0.0	0.6	0.1	0.1	**96.5**	0.0	0.4	0.0	0.3	0.1	0.0	0.1	**6.5**
6- Wholesale and retail trade, transportation and storage, accommodation and food service activities	1.3	2.3	2.8	1.4	1.1	**92.6**	0.6	0.0	0.2	2.2	0.0	5.1	**18.2**
7- Information and communication	0.0	0.0	0.2	0.0	0.0	0.2	**94.9**	0.3	0.0	1.0	0.2	0.3	**2.7**
8-Financial and insurance activities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**99.0**	0.0	0.0	0.0	0.0	**2.9**
9- Real estate activities	0.0	0.2	0.1	0.0	0.1	0.3	0.0	0.5	**99.0**	0.1	0.0	0.1	**9.7**
10- Professional, scientific, technical, administration and support service activities	0.0	9.0	1.5	0.0	2.2	2.2	1.1	0.2	0.3	**96.1**	0.1	0.0	**7.3**
11- Public administration, defence, education, human health and social work activities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**99.3**	0.0	**7.2**
12- Other services	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	**92.1**	**1.8**
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 2 – Italian domestic production matrix - Year 2010 (percentage distribution by product)

	1- Agriculture, forestry and fishing	2- Mining and quarrying	3- Manufacturing	4- Electricity, gas, water, waste management and remediation	5- Construction	6- Wholesale and retail trade, transportation and storage, accommodation and food service activities	7- Information and communication	8- Financial and insurance activities	9- Real estate activities	10- Professional, scientific, technical, administration and support service activities	11- Public administration, defence, education, human health and social work activities	12- Other services	Total
1- Agriculture, forestry and fishing	**97.0**	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	**1.5**
2- Mining and quarrying	0.0	**79.8**	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.3**
3- Manufacturing	1.3	7.8	**95.6**	0.8	0.0	2.4	3.1	0.0	0.0	1.4	0.1	1.3	**30.9**
4- Electricity, gas, water, waste management and remediation	0.0	0.0	0.2	**97.3**	0.0	0.1	0.0	0.0	0.0	0.3	0.0	0.0	**4.2**
5- Construction	0.0	0.1	0.1	0.4	**96.3**	0.2	0.7	0.0	0.1	0.1	0.0	0.1	**6.8**
6- Wholesale and retail trade, transportation and storage, accommodation and food service activities	1.7	0.3	1.6	1.4	0.3	**93.3**	1.5	0.0	0.0	1.0	0.0	5.2	**18.9**
7- Information and communication	0.0	0.0	0.2	0.0	0.0	0.2	**90.8**	0.3	0.0	0.8	0.1	0.9	**3.8**
8-Financial and insurance activities	0.0	0.0	0.0	0.0	0.0	0.1	0.0	**98.9**	0.3	0.0	0.0	0.0	**4.3**
9- Real estate activities	0.0	0.4	0.1	0.1	0.3	0.3	0.1	0.5	**99.5**	0.3	0.0	0.1	**6.8**
10- Professional, scientific, technical, administration and support service activities	0.0	11.5	2.0	0.0	3.1	2.8	2.6	0.3	0.1	**95.5**	0.2	0.3	**8.9**
11- Public administration, defence, education, human health and social work activities	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.6	**99.5**	0.2	**10.9**
12- Other services	0.0	0.0	0.0	0.0	0.0	0.4	0.6	0.0	0.0	0.0	0.0	**91.9**	**2.6**
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

What is evident from Table 1 is the concentration of production on the main diagonal of the matrix except for mining, in all other economic sectors, and over 90% of production coincides with the characteristic product of the industry.

Given the concentration of production in the Veneto on the main diagonal, with the remainder being distributed in the secondary output does not affect the distribution of production in the logic of the product compared to that branch. Only in two cases, the manufacturing industry and the professional activities, travel agencies and support services to businesses recorded a decrease, respectively, in the first, and an increase in the second, about 1 % of the weight on the regional production.

Compared to the national board, the concentration of production on the main diagonal, it differs substantially only in communications services and information: and education and health, in the first case in Veneto manufacturing sector is less dispersed in other not typical productions, such as trade and other professional services, while in the second case the result is contrary.

The Veneto is a region in which the weight of the industry is approximately 40% of total production (both in the product and branch approach), and compared to Italy, in this area has a lead of about 6 percentage points. By contrast, the service sector is less important than the national average. The result is similar when looking at the distributions for the product.

4   CONCLUSION AND FUTURE DEVELOPMENTS

In the present work we wanted to first activate a line of research in order to identify possible solutions and then experiment to estimate the table of production at sub-national level from the same information base used for building the national table, now fully operational.

The estimates preserve the quality of statistical data and meet the requirements of high reliability; they have been obtained favoring evaluations of consistency from existing sources.

In the future this system could be extended to all Italian regions and to complete the missing parts, such as the use table, so that you can hypothesize for Italy, accounts based on a territorial SUT regional system.

The compilation of the table of production is only a first step for the implementation of the SUT system at the regional level but at the same time, the conditioning is with respect to any development of economic impact analysis.

In this context includes another line of research and production of official statistics regarding the Tourism Satellite Account (TSA) that Istat released in 2012.

For the specific purposes of the TSA, the compilation of the table of the production is a prerequisite to get to the quantification of the value-added tourism which in this case would assume a strong regional dimension waiting for the programming of local policies.

This work has the contribution of having laid the foundations and methodological information and insights for further development and is at the same time acquired a structural foundation for the feasibility of the methodology for the whole of the Italian regions.

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