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How to Estimate Unbiased and Consistent input-output Multipliers on the Basis of use and Make Matrices

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RESUMEN
En la literatura existente, la construcción de coeficientes técnicos está ligada a matrices de origen y destino aunque la aleatoriedad para el cálculo de multiplicadores a través de la matriz inversa de Leontief se impone sobre dichos coeficientes y no sobre dichas matrices. Debido a la no linealidad de la matriz inversa de Leontief, los multiplicadores así calculados se presumen sesgados (en particular, infraestimados). El objetivo de este artículo es dejar que la propia información sobre consumos intermedios y producciones a nivel de establecimientos sea la que nos sirva de base para el cálculo de multiplicadores de producción y empleo insesgados y consistentes para la economía andaluza. Las matrices de origen y destino no deben ser necesariamente cuadradas, no se emplea la matriz inversa de Leontief ni se producen los problemas asociados a la construcción de una matriz de coeficientes técnicos (tales como coeficientes negativos).

Palabras clave: Análisis input-output estocástico, multiplicadores de empleo, multiplicadores de producción, matrices de origen y destino.

ABSTRACT
In the literature, the construction of technical coefficients is linked to flow data (use and make matrices), but stochastics are imposed on the coefficients when multipliers are calculated, by means of the Leontief inverse. Due the nonlinearity of this operation, the multiplier estimates are biased (it is generally argued that the Leontief inverse underestimates input-output multipliers). By going back to the flow data, this paper provides unbiased and consistent employment and output multipliers estimates for the Andalusian economy. Rectangular use and make matrices are accommodated and technical coefficients, the Leontief inverse, and associated problems (such as negative coefficients) are circumvented.

Keywords: Stochastic input-output analysis, employment multipliers, output multipliers, use and make matrices.

JEL classification: C67; D57; C13; E27

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1. Introduction

Input-output analysis revolves around a matrix of technical coefficients $A = (a_{ij})_{i, j = 1, \ldots, n}$ (where n is the number of commodities). One body of literature links the A-matrix to flow data embedded in the national accounts (the use and make tables). Another body of literature uses A-matrices for economic analysis, particularly the determination of multipliers by means of the Leontief inverse, including the transmission of randomness. Unfortunately, the two bodies are quite disjunct. Stochastics imposed on the A-matrix in multiplier analysis is assumed, rather than derived from variations in the data on the basis of which it is constructed. Dietzenbacher (1995) relates information on flows to multiplier estimates, but the flows are inter-industry constructs rather than use and make data. Obviously, a reconciliation of the two bodies of literature is in order. We will analyze variations in the use and make tables and take them all the way to multiplier estimates.

A reason that this has not been done before may be that each of the previous steps has proven difficult. Both the construction of input-output coefficients and the derivation of multipliers constitute non-linear transformations. Not surprisingly, results are partial and problems persist, such as the problem of negatives in the construction of coefficients and the bias of the Leontief inverse in multiplier analysis. It seems a daunting task to compile these issues. To our pleasant surprise, however, the complications seem to neutralize each other. We will write out the reduced form of multipliers in terms of use and make tables (essentially solving out the input-output coefficients) and the issues dissolve. Two non-linearities kill each other and standard regression analysis finishes the job.

In next section, we review the body of literature which links technical coefficients to flow data, both in terms of construction and of stochastics on the A-matrix. Section 3 reviews the literature which uses the A-matrix for economic impact analysis by means of the Leontief inverse based on stochastic assumptions. Section 4 reconciles the analyses, taking variations in the use and make matrices all the way to confidence intervals for multipliers. Section 5 presents employment and output multipliers for the Andalusian economy and section 6 concludes.

2. From use and make matrices to technical coefficients

A *use* matrix $U = (u_{ij})_{i,\,j\,=\,1,\,\ldots,\,n}$ comprises commodities i consumed by sectors j, and a *make* matrix $V = (v_{ij})_{i,\,j\,=\,1,\,\ldots,\,n}$ shows the produce of sectors i in terms of commodities j.[1] The requirements of input i by industry j are proportional to its outputs v_{jk}. If we assume that the proportions, a_{ik}, are independent of the industry, (the so-called commodity technology assumption), we obtain for the technical coefficients:

$$u_{ij} = \sum_{k=1}^{n} a_{ik} v_{jk} \quad \forall i, j = 1, \ldots, n . \tag{1}$$

An input-output matrix A has to fulfill this equation to achieve full consistency with fundamentals of input-output analysis according to Konijn and Steenge (1995). Kop Jansen and ten Raa (1990) arrived at this conclusion on axiomatic grounds. They evaluated seven methods for the treatment of secondary products on the basis of four desirable properties (see also ten Raa and Rueda Cantuche, 2003a, 2003b). Firstly, supply and demand in the Leontief system must be equilibrated. Secondly, revenues and costs must also be balanced. The two other properties are price invariance and scale invariance. Price invariance requires that technical coefficients alter in a trivial way when units of measurement change and scale invariance requires that technical coefficients are constant if input requirements and outputs change proportionally. Two pairs of the four properties each pinpoint the commodity technology model. Moreover, ten Raa and Rueda Cantuche (2003a) proved that under certain data limitations, both financial and material balance properties hold when other constructs distinct from the commodity technology model are assumed.

However, the commodity technology model is not trouble free. Firstly, the output table must be a square make matrix, in order to invert it for calculating the technical coefficients, A. This requires matching numbers of commodities and of industries (or sectors). Secondly, non-negativity is not guaranteed. Several authors have addressed the problem of negative coefficients. Since Edmonston (1952), they have been ascribed to errors of measurement, coexisting technologies for the production of one single commodity or the aggregation problem. Ten Raa (1988) and ten Raa and van der Ploeg (1989) rejected the natural hypothesis that the negatives are due only to errors of measurement and concluded that a more reasonable approach seems to be to accept the coexistence of technologies. Konijn and Steenge (1995) argue that aggregation yields negative commodity

[1] The derivation of use and make matrices was first given by van Rijckeghem (1967) and similarly by Edmonston (1952).

technology coefficients as well. Almon (1970, 1998 and 2000) suggests an iterative numerical method to avoid negative coefficients and Rainer and Richter (1992) point out that some kind of data arrangement is required. These proposals are not free from criticism; see Armstrong (1975), Stahmer (1985) and ten Raa, Chakraborty and Small (1984, p. 93).

Stochastics are introduced to account for the impossibility of a full description of all factors that influence economic agents' decisions, the personal perception of the economic reality by economists, and the observed data (particularly errors of measurement), as stated by Kop Jansen (1994). Several studies have attempted to estimate technical coefficients from econometric models with cross-section data on firms' inputs and outputs: Briggs (1957), Gerking (1976a, 1976b, 1979), Gerking and Pleeter (1977), Brown and Giarratani (1979), Hanseman and Gustafson (1981) and Mattey and ten Raa (1997). In some cases, these studies reduce to statistical tests for the reasonableness of the commodity technology assumption with respect to negatives. For instance, Mattey and ten Raa (1997) proved for United States manufacturing that differences in material input factor intensities tend to reflect patterns of product specialization rather than coexisting technologies. The results support the assumption that material requirements for a product remain the same when it is produced as a secondary output.

Econometric models have also been used with the purpose to show how the level of uncertainty in measuring the technical coefficients may be quantified; see Gerking (1976b). Using input-output data from the West Virginia economy, Miernyk (1970) shows that ordinary least squares and two-stages least squares estimates may be preferred to Durbin and Wald-Bartlett methods. Arguing that time series approaches lack of available information, Gerking focuses on cross-sectional data. These statistical estimation methods for direct coefficients prompted further considerable discussion: Brown and Giarratani (1979), Hanseman and Gustafson (1981) and Hanseman (1982).

3. Stochastic input-output multipliers

In the literature on stochastic input-output analysis, technical coefficients are the point of departure for the analysis of the probabilistic properties of the Leontief inverse, $(I - A)^{-1}$. The Leontief inverse is used to model the multiplier effects of a final demand stimulus on outputs, as well as to analyze multiplier effects of factor cost increases on prices; see ten Raa (1995) for detail. Both types of multipliers are prominent in applied studies; see Kop Jansen (1994) for a review. How do stochastics affect the multipliers? In other words, what

are the distributional properties of the Leontief inverse? Pioneering studies in stochastic input-output analysis are Evans (1954), Christ (1955), Quandt (1958, 1959), Theil (1966), Yershov (1969) and Park (1973). For a more detailed review of these contributions, see Jackson and West (1989) and Kop Jansen (1994). All these studies make stochastic assumptions on the technical coefficients matrix, A. Simonovits (1975) proved that if all the elements of A are independent, random and symmetrically distributed, then the expected value of the Leontief inverse is underestimated by the Leontief inverse of the expected value of A:

$$\mathrm{E}\left[\left(I-A\right)^{-1}\right] \geq \left(I-\mathrm{E}\left[A\right]\right)^{-1}. \tag{2}$$

The independence assumption is not innocuous, since input-output coefficients are derived from use and make matrices, a point made by Kop Jansen (1994) and Dietzenbacher (1995). Several studies tried to overcome the independence hypothesis, assuming biproportionally stochastic errors, series of errors rectangles, or independent errors in diagonal elements. See, respectively, Lahiri (1983), Lahiri and Satchell (1985), Dietzenbacher (1991) and Kop Jansen (1994). In addition, Lahiri and Satchell (1985) analyzed the bias of the Leontief inverse by ascribing stochastic errors to the prices at which the technical coefficients are evaluated. Flåm and Thorlund-Petersen (1985) unify the results in Simonovits (1975) on independent errors and in Lahiri (1983) on biproportional errors. Finally, Kop Jansen (1994) specifies the error distribution that yields minimal lower bounds for the multipliers, which also yields minimal lower bounds for the bias, and shows that the bounds are easily calculable by Monte Carlo simulations; he proved that his formulas remain good approximations in the presence of interdependencies; see also ten Raa and Kop Jansen (1998).[2] West (1986) assumes that technical coefficients errors are independently and normally distributed with zero mean and known variance, and derives formulas for the approximation of the mean and variance of input-output multipliers as well as for their confidence intervals. However, ten Raa and Steel (1994) pointed out that normality on input coefficients does not admit finite moments for the elements of the Leontief inverse. Basically, normality attaches positive probability not only

[2] Dietzenbacher (1995) takes the transactions table as the source of random errors. He constructs the A matrix from industry-by-industry tables and proved that, under certain conditions and irrespective of the bias of the original errors and their independency, Simonovits (1975) results do not hold. Moreover, Roland-Holst (1989) uses empirical data and a Monte Carlo framework to obtain that linear multiplier estimates are unbiased.

to coefficients taking negative values, but also to the spectral radius exceeding unity. Instead the authors postulate a beta density function. Under the assumption that technical coefficients are independently and symmetrically distributed, Kop Jansen (1994) proved that maximal lower bounds for the first and second order moments of the Leontief inverse can be more widely applied than West's (1986) formulas.

The regional input-output literature has also dealt with stochastic input-output analysis. The main interest is errors in regional non-survey input-output models and the accuracy of non-survey techniques vs. survey-based models: Czamanski and Malizia (1969), Schaffer and Chu (1969), Morrison and Smith (1974), McMenamin and Haring (1974) and Round (1978). Several studies analyze the roles of errors in technical coefficients and of errors in regional purchase coefficients (RPCs) in regional output multipliers. Stevens and Treiner (1980) and Park, Mohtadi and Kubursi (1981) concluded that errors in RPCs were of greater significance than those in technical coefficients, assuming a multiplicative structure of errors, but Garhart (1985) and Giarratani (1986) concluded that these results should be interpreted with caution when errors are additive or combined additive-multiplicative.

4. Input-output multipliers: the relationship with flow data

An *output* multiplier is given by the total value of production needed to satisfy a euro worth of a particular component of final demand and *employment* multipliers measure the associated number of workers. In what follows, we will assume the commodity technology hypothesis for intermediate and labor inputs.

Employment multipliers

Commodity technology labor coefficients are determined by the following expression:

$$L = lV^{\mathrm{T}}, \tag{3}$$

where L represents a row vector of labor employment, l is the row vector of labor coefficients and V, the make matrix. Solving (3),

$$l = LV^{-\mathrm{T}} \tag{4}$$

and inflation by the Leontief inverse yields the employment multipliers (λ), following ten Raa (1995):

$$\lambda = l(I - A)^{-1}. \tag{5}$$

Using the commodity technology formula, we will prove that the estimation of employment multipliers becomes a matter of multiple linear regression analysis, with linear, unbiased and consistent multipliers estimates. We will calculate also confidence intervals for employment multipliers and rank them according to each commodity. The over- and under-estimation problem and its independency assumption on errors are avoided. Technical coefficients of the A matrix are not our point of departure, but the underlying use and make matrices. More precisely, on the basis of (4) and assuming the commodity technology assumption:

$$\lambda = LV^{-\mathrm{T}}(I - UV^{-\mathrm{T}})^{-1} = L[(I - UV^{-\mathrm{T}})V^{\mathrm{T}}]^{-1} = L(V^{\mathrm{T}} - U)^{-1}. \quad (6)$$

Then, by (6) and introducing rectangular use and make matrices, employment multipliers can be calculated as in multiple linear regression analysis,

$$L = \lambda(V^{\mathrm{T}} - U) + \varepsilon\ , \quad (7)$$

where n is the number of commodities, L is a row vector of order m with labor employment, λ is a row vector of order n with employment multipliers, V is a make matrix of order $m \times n$, U is a use matrix of order $n \times m$ and ε is a row vector of independently normally random disturbance errors with zero mean and constant variance, with order m. Notice that m is the number of firms involved or the number of observed values. In section 6, we estimate (7) for the Andalusian economy in the year 1995. All available data were provided by the Institute of Statistics of Andalusia (IEA).

Output multipliers

Output multipliers,

$$\mu = e^{\mathrm{T}}(I - A)^{-1} \quad (8)$$

are reduced similarly to the flow data, using the commodity technology hypothesis:

$$\mu = e^{\mathrm{T}}(I - UV^{-\mathrm{T}})^{-1} = e^{\mathrm{T}}V^{\mathrm{T}}[(I - UV^{-\mathrm{T}})V^{\mathrm{T}}]^{-1} = e^{\mathrm{T}}V^{\mathrm{T}}(V^{\mathrm{T}} - U)^{-1} \quad (9)$$

Using rectangular use and make matrices, standard regression analysis applies in order to calculate output multipliers:

$$e^{\mathrm{T}}V^{\mathrm{T}} = \mu(V^{\mathrm{T}} - U) + \varepsilon, \quad (10)$$

where $e^{\mathrm{T}}V^{\mathrm{T}}$ is the row vector of total outputs of establishments (of order m), μ is a row vector of output multipliers (of order n), V is a make matrix of order $m \times n$, U is the use matrix of order $n \times m$ and ε is a row vector of independently normally random disturbance errors with zero mean and constant variance, with order m. Analogously, notice that m is

the number of firms involved or the number of observed values. In section 5, we estimate (10) for the Andalusian economy in the year 1995.

5. Results

Employment multipliers

The number of firms considered is 18.084 and the employment multiplier estimates are presented in Table 1 (see Appendix). For comparison, the second column displays the employment multipliers based on published use and make matrices.

The model has been estimated for 87 commodities by means of ordinary least squares. Due to the presence of certain forms of unknown heteroscedasticity, the White estimate (White, 1980) is used for estimating the covariance matrix of estimated coefficients, which provide consistent standard errors. We find that problems of autocorrelation and multicollinearity do not plague our analysis. Only 12 out of 7.482 possible correlations were higher than 0.5 with only one higher than 0.75. 76 estimated multipliers are significant at the 95% confidence level and the R-squared is 0.9948, which is also satisfactory.

Two main contributions are provided by the results presented in Table 1. They are: (*a*) in most cases, published use and make matrices based employment multipliers are overestimated and not underestimated, contrary to Simonovits (1975) theoretical results and (*b*) generally, the bias of employment multipliers is positively related with the secondary products of an economy.

Firstly, it is remarkable that 57 out of 87 commodities have lower employment multipliers than those calculated with published use and make matrices. On the contrary, 19 commodities have higher employment multipliers.[3] Our findings may contradict the underestimation of the Leontief inverse found in the theoretical literature, see inequality (2). Since our estimated values are unbiased and consistent, it seems that most of the employment multipliers obtained by using published data are overestimated and not underestimated, confirming the intuition of Dietzenbacher (1995) and Roland-Holst (1989). Simonovits (1975) results rest upon some restrictive conditions (e.g. independence of technical coefficients) that we have not assumed at all.

[3] Notice that published use and make matrices based employment multipliers refer to the right hand side of (2).

Secondly, as shown in Table 2 (see Appendix), industries with sizeable secondary production and commodities for which most output is secondary product, have employment multipliers with a large bias, as measured by the difference between estimated and published data based employment multipliers.

From a theoretical view, when some industries with no secondary activities produce commodities for which other industries provide sizeable amounts, it is reasonable to assume that the technologies used by the rest of the economy for making such commodities should not match that of the industries for which they are primary products (actually, the latter industries' technology can be considered as commodities technology since no secondary products are produced). This could explain the sizeable bias of marketing services, computer services and public drainage and sewerage services.

On the contrary, when some commodities are produced by a single industry with large proportions of secondary outputs, it is reasonable to assume that these primary commodities are not produced according to a commodity technology hypothesis if the bias is sizeable. Such are the cases of cinema, video, radio and television services and printing, publishing and editing services.

Other business services have large proportions of secondary activities (42.74%) and their primary products are produced elsewhere in sizeable amounts (41.45%).

Household employers (115.2), private social services industry (40.2), cleaning services industry (32.7), personal services industry (31.9) and private education (31.8) are the industries that generate larger numbers of workers per 600.000 euros of their corresponding primary product final demand expenditure. On the contrary, metallurgy (0.8), petroleum refining (2.0), real estate (2.1) and basic chemicals industry (2.2) are the industries that generate fewer workers per 600.000 euros of their corresponding primary product final demand expenditure.

In terms of employment multipliers standard errors, we find that confidence intervals have different amplitudes. Household employers, electricity and irrigation services industry and public medical and hospitals services industry have very precise confidence intervals. On the contrary, architecture and engineering technical services industry, security services industry and social activities have less precise confidence intervals due to their high standard errors. Notice that, at a 95% confidence level, there are industries where no employment is generated.

Output multipliers

Maintaining the number of firms of the last section, the output multipliers are as presented in Table 3 (see Appendix).

The model has been estimated for 87 commodities by means of ordinary least squares. As for employment multipliers, the White estimate (White, 1980) is used for estimating the covariance matrix of estimated coefficients, which provide consistent standard errors. Autocorrelation and multicollinearity problems do not plague our analysis. 84 estimated multipliers are significant at the 95% confidence level and the R-squared is 0.9993.

The output multipliers results presented above provide similar employment multipliers contributions. That is: (*a*) mostly, published use and make matrices based output multipliers are overestimated and not underestimated; and (*b*) in general, the bias of output multipliers has a positive relationship with economy-wide secondary products. We dwell on these points.

Firstly, it is remarkable that 73 out of 87 commodities have lower output multipliers than published data based multipliers.[4] On the contrary, 11 commodities have higher output multipliers. Recall that since Simonovits (1975) results rest upon some restrictive conditions (e.g. independence of technical coefficients) that we have not assumed at all, our findings may not contradict the underestimation of the Leontief inverse found in the theoretical literature. Since our estimated values are unbiased and consistent, it seems that most of the output multipliers obtained by using published data are overestimated and not underestimated, confirming the intuition of Dietzenbacher (1995) and Roland-Holst (1989).

Secondly, as shown in Table 4 (see Appendix), those industries with relevant secondary productions and those commodities for which most of their outputs are secondary product, have output multipliers with larger bias, measured by the difference between estimated and published data based output multipliers.

Social activities; cinema, video, radio and television productions; air transportation; canned and preserved fish, fruits and vegetables; and insurance are industries with sizeable output multipliers. On the contrary, wholesale trade; retail trade; cork and wood products industry; and coal mining have lower output multipliers.

In terms of output multipliers standard errors, confidence intervals have different amplitudes. Other business services, computer activities and coal mining, have imprecise

[4] Notice that published data based output multipliers refer to the right hand side of (2).

confidence intervals. On the contrary, household employers, public hospital and medical services industry and post and telecommunications have more precise confidence intervals due to their low standard errors. Notice that, at the 95% confidence level, there are industries where no output is generated.

6. Conclusion

Technical coefficients are the subject of two disjunct bodies of literature. The construction of technical coefficients is linked to flow data (use and make matrices), but stochastics are imposed on the coefficients when multipliers are calculated, by means of the Leontief inverse. Due the nonlinearity of this operation, the multiplier estimates are biased (it is generally argued that the Leontief inverse underestimates input-output multipliers).

In this paper, we let the flow data tell the stochastics and take them all the way to confidence intervals for multipliers. We focus on the use and make matrices instead of the *A*-matrix to obtain unbiased and consistent multipliers estimates. Our output and employment multipliers are normally distributed and do not suffer from over- or underestimation. Our results for the Andalusian economy indicate that the Leontief inverse is not underestimated but overestimated in most of the cases.

Statistical offices combine use and make flow data (including inversion of the make matrix) to construct input-output coefficients and economists invert the Leontief matrix to determine the output and cost multipliers of the economy. The construction and the inversion are nonlinear operations with complicated errors transmission and have been studied in relative isolation. This paper shows, however, that a shortcut from the use and make data to the multipliers provides simple, unbiased and consistent estimates.

Appendix: Data and Results

The Andalusian Input-Output Framework 1995 (MIOAN95) is one of the first Spanish input-output tables based on the new European System of Accounts (ESA-95) published by EUROSTAT (1996). The use and make tables and the derived input-output table cover nearly 45% of total production and more than a third of total employment. The number of firms is approximately thirty thousand. All cross-section inputs and outputs firms' data were provided by the Institute of Statistics of Andalusia (IEA, regional statistical office). These data were also used for the elaboration of the Input-Output Andalusian Framework 1995 (IEA, 1999).

The Institute of Statistics of Andalusia (IEA) publishes two use tables, which differ by valuation. One is valued at purchasers' prices and the other at basic prices, which is the same as the former but excluding trade and transport margins and net commodity taxes; see Viet (1994, p.28). (Trade and transport margins are simply reallocated from the commodities where they are included, at purchasers' values, to the use matrix rows of trade and transport services.) The make table is published exclusively at basic prices. The United Nations System of National Accounts (SNA) recommends basic values; production costs of good and services are measured before they are conveyed to the market for consumption so that the effects of tax and subsidy policies as well as of differences in types of economic transactions are isolated.

Since all inputs and outputs firms' data provided by IEA were valued at purchasers' prices and at basic prices, respectively, trade and transport margins and also net commodity taxes must be subtracted from firms' inputs in order to have the same valuation (basic prices) for inputs and outputs. We applied the same formula as IEA does for the elaboration of the use matrix at basic prices and assumed equality of margins and net commodity taxes between those firms from industry j, which consume some commodity k.

According to the ESA-95, the intermediate uses at basic values are equal to the intermediate uses at purchasers' prices minus trade and transport margins and minus net commodity taxes. Let u^b_{kj} and u^p_{kj} be the total domestic inputs of commodity k by industry j at basic and at purchasers' prices, respectively. Then, we can write out that:

$$u^b_{kj} = u^p_{kj} - T^d_{kj} - T_{kj} - N_{kj} - H_{kj}\,, \tag{11}$$

where, for each use of commodity k by industry j, T^d_{kj} and T_{kj} are the total amount of trade and transport margins, respectively, N_{kj} is the total amount of net commodity taxes

(excluding not deductible value added tax, VAT) and H_{kj} is the total amount of not deductible value added tax.

We assume that the trade margins are proportional to the use data at purchasers' prices. The proportions are defined by:

$$T_{kj}^{d} = t_{kj}^{d} u_{kj}^{p}, \quad 0 < t_{kj}^{d} < 1. \tag{12}$$

We assume now that net commodity taxes (excluding not deductible VAT) and transport margins are proportional to the use data at basic prices:

$$N_{kj} = n_{kj} u_{kj}^{b}, \quad 0 < n_{kj} < 1; \tag{13}$$

$$T_{kj} = t_{kj} u_{kj}^{b}, \quad 0 < t_{kj} < 1. \tag{14}$$

With respect to the value added tax, the assumption is as follows:

$$H_{kj} = h_{kj} \left(\frac{u_{kj}^{p}}{1 + h_{kj}} \right), \qquad 0 < h_{kj} < 1. \tag{15}$$

Substituting (12), (13), (14) and (15) in (11), we obtain:

$$u_{kj}^{b} = u_{kj}^{p} \left(\frac{1 - t_{kj}^{d} - \dfrac{h_{kj}}{1 + h_{kj}}}{1 + t_{kj} + n_{kj}} \right), \tag{16}$$

This formula is used to transform use data from basic values to purchasers' values.

Our purpose is to estimate the unknown $u^{b}_{kji,}$ that is, the total use of commodity k by an establishment i from industry j at basic prices. Then, since survey available data is based on establishments of a particular industry and not on products, we denote u^{p}_{kji} and u^{b}_{kji} as purchasers' and basic prices use data, respectively. Based on (16), our objective would be to apply the following formula for each establishment, i:

$$u_{kji}^{b} = u_{kji}^{p} \left(\frac{1 - t_{kji}^{d} - \dfrac{h_{kji}}{1 + h_{kji}}}{1 + t_{kji} + n_{kji}} \right). \tag{17}$$

A problem arises when available information does not enable us to value establishment specific t^{d}_{kji}, h_{kji}, t_{kji} and n_{kji}. In this case, we assume equality of margins and net commodity taxes across firms in industry j, which consume some commodity k. We consequently use (16) with:

$$t^d_{kji} = t^d_{kj} \qquad for\ all\ i,$$
$$t_{kji} = t_{kj} \qquad for\ all\ i,$$
$$n_{kji} = n_{kj} \qquad for\ all\ i,$$
$$h_{kji} = h_{kj} \qquad for\ all\ i,$$

so that the formula becomes:

$$u^b_{kji} = u^p_{kji}\left(\frac{1 - t^d_{kj} - \dfrac{h_{kj}}{1+h_{kj}}}{1 + t_{kj} + n_{kj}}\right). \tag{18}$$

Once trade and transport margins and net commodity taxes have been subtracted from use flow data, the last step is to allocate the subtracted total trade and domestic transport margins to trade and transport industries, respectively. This was done with the help and technical support of IEA.

TABLE 1

EMPLOYMENT MULTIPLIERS (NUMBER OF WORKERS PER 600.000 EUROS)

	Description	Estimated multiplier	Multiplier (MIOAN95)	p value	Lower bound	Upper bound
89	Household employers services	116.2	116.2	0.0000	116.2	116.2
83	Private social services	40.2	40.6	0.0000	39.2	41.2
88	Personal services	31.9	32.6	0.0000	31.6	32.3
75	Cleaning services	32.7	32.1	0.0000	31.6	33.7
74	Security services	23.5	31.6	0.0004	10.5	36.4
5	Forestry and related services	30.0	30.3	0.0000	29.5	30.5
79	Private education services	31.8	28.1	0.0000	29.8	33.8
82	Public social services	25.6	25.7	0.0000	25.4	25.9
1	Fruits and vegetables	23.9	24.1	0.0000	23.3	24.6
44	Furniture	9.7	23.1	0.0017	3.7	15.8
24	Cork and wood products	8.0	22.6	0.0413	0.3	15.7
55	Retail trade and repair domestic and personal effects	42.9	22.1	0.1186	-11.0	96.8
73	Marketing services	1.5	21.5	0.3509	-1.7	4.7
4	Livestock and hunting	21.1	21.3	0.0000	20.7	21.5
2	Olive and vine	21.0	21.2	0.0000	20.5	21.5
70	Research and development	20.1	19.9	0.0000	19.5	20.6
76	Other business services	4.3	19.7	0.7309	-20.3	29.0
85	Social services	22.2	18.8	0.0000	14.2	30.2
57	Bars and restaurants services	31.1	18.8	0.0000	23.2	39.1
77	Public Administration	19.0	18.6	0.0000	18.2	19.8
23	Leather tanning, leather products and footwear	7.2	18.5	0.0013	2.8	11.5
22	Clothing products	4.4	18.4	0.0186	0.7	8.0
51	Preparing, installation and finishing construction services	18.3	18.4	0.0000	17.7	18.8
6	Fish and fishing products	11.0	18.3	0.0000	9.7	12.4
71	Accounting and law activity services	72.0	18.1	0.1060	-15.3	159.3
32	Ceramics, clay, bricks and other products for building	11.7	17.7	0.0000	8.6	14.7
52	Petrol and motor vehicles trade services	18.1	17.6	0.1137	-4.3	40.4
13	Canned and preserved fish, fruit and vegetables	15.0	17.5	0.0000	12.1	17.9
78	Public education services	18.3	17.5	0.0000	17.4	19.2
59	Other earthbound transportation services	17.0	17.1	0.0000	16.1	17.8
80	Public medical and hospitals services	16.6	16.8	0.0000	16.4	16.8
72	Engineering and architecture technical services	23.2	16.5	0.0203	3.6	42.8
84	Public drainage and sewerage services	23.8	16.5	0.0000	20.5	27.1
53	Repair motor vehicles services	15.9	16.3	0.0000	15.5	16.3
65	Insurance	12.1	15.9	0.0000	10.3	13.9
35	Fabricated metal products	6.6	15.6	0.0001	3.3	9.9
16	Grain mills, bakery, sugar mills, …	4.6	15.6	0.0000	2.7	6.5
33	Stone and glass products	7.1	15.5	0.0000	5.2	9.1
66	Allied financial services	6.4	15.4	0.0021	2.3	10.5
42	Naval transportation and repairing services	2.3	15.4	0.1319	-0.7	5.4
3	Other agriculture and related services	14.6	14.8	0.0000	14.2	15.1
45	Miscellaneous manufactured products	14.6	14.6	0.0000	13.9	15.3
14	Fats and oils	3.4	14.5	0.0000	2.2	4.7
56	Hotels services	19.4	14.1	0.0000	12.8	26.0
36	Machinery and mechanic equipment	14.1	14.0	0.0000	13.4	14.8
60	Sea and river transportation services	7.2	13.7	0.0000	5.0	9.4
7	Coal mining	7.2	13.7	0.0000	5.0	9.3
62	Allied transportation services	8.1	13.6	0.0007	3.4	12.8
69	Computer services	15.1	12.7	0.3185	-14.6	44.9

TABLE 1 (Continued)
EMPLOYMENT MULTIPLIERS (NUMBER OF WORKERS PER 600.000 EUROS)

	Description	Estimated multiplier	Multiplier (MIOAN95)	p value	Lower bound	Upper bound
54	Wholesale trade	3.4	12.4	0.3184	-3.3	10.2
87	Other amusement, cultural, sport and recreation services	9.6	12.4	0.0000	8.4	10.9
50	Constructions	7.0	12.2	0.0000	5.2	8.7
49	Water and sewerage services	10.8	11.8	0.0000	8.1	13.5
18	Wines and alcoholic beverages	7.7	11.7	0.0000	6.2	9.3
15	Milk and dairy products	11.5	11.6	0.0000	6.5	16.4
46	Recycling products	9.8	11.1	0.0000	8.0	11.5
58	Railway transportation services	10.6	11.1	0.0000	9.9	11.2
68	Machinery and equipment rental	8.8	11.0	0.0001	4.5	13.2
11	Non-metallic and non-energetic minerals	11.0	10.9	0.0000	10.1	12.0
26	Printing, publishing and editing services	33.9	10.7	0.0868	-4.9	72.7
43	Miscellaneous transportation equipment	1.5	10.5	0.2899	-1.2	4.2
21	Textile mill products	10.6	10.5	0.0000	10.2	11.0
63	Post and communications services	5.2	10.4	0.0000	4.7	5.8
31	Cement, lime and allied products	4.3	10.2	0.0018	1.6	7.0
12	Meat and meat products	6.4	9.8	0.0001	3.2	9.7
40	Professional and scientific instruments	3.6	9.2	0.0664	-0.2	7.4
64	Finances	8.7	9.1	0.0000	7.9	9.5
30	Rubber and plastic products	3.3	9.1	0.0001	1.6	4.9
10	Metallic minerals	7.0	8.8	0.0000	4.2	9.8
29	Other chemical products	5.0	8.7	0.0185	0.8	9.2
41	Motor vehicles transportation equipment	11.3	8.6	0.0000	6.4	16.2
38	Electrical and electronic machinery	3.6	8.6	0.0166	0.7	6.6
81	Private medical and hospitals services	4.9	7.6	0.0008	2.0	7.8
61	Air transportation services	8.4	7.6	0.0000	4.7	12.1
39	Electronic materials, radio and television equipments	7.7	7.5	0.0000	6.9	8.5
19	Beer and soft drinks	5.5	7.2	0.0000	4.7	6.3
25	Paper and allied products	3.6	7.1	0.0000	2.0	5.1
20	Tobacco products	5.4	7.0	0.0478	0.1	10.7
17	Miscellaneous food products	6.0	6.8	0.0010	2.4	9.5
37	Computers and office equipments	5.5	5.9	0.0000	4.7	6.3
86	Cinema, video, radio and television services	29.1	5.9	0.0000	25.2	33.0
28	Basic chemical products	2.2	5.1	0.0079	0.6	3.7
48	Gas and water steam and irrigation services	3.5	3.8	0.0000	2.1	5.0
47	Electricity and irrigations services	2.8	3.4	0.0000	2.6	2.9
34	Primary metal products	0.8	2.3	0.0050	0.2	1.3
67	Real Estate	2.1	2.0	0.0000	1.6	2.6
27	Petroleum refining products	2.0	1.6	0.0000	1.5	2.6

Source: Own elaboration.

TABLE 2
SECONDARY PRODUCTS AND BIAS OF EMPLOYMENT MULTIPLIERS

	Description	Over industry (%)	Over product (%)	Bias (absolute values)
73	Marketing services	3.17	81.91	21.49
76	Other business services	42.74	41.45	19.68
69	Computer services	12.77	40.30	12.75
86	Cinema, video, radio and television services	43.97	3.59	23.17
87	Other amusement, cultural, sport and recreation services	35.32	4.11	2.78
84	Public drainage and sewerage services	1.66	36.41	7.23
71	Accounting and law activity services	12.83	19.88	18.09
26	Printing, publishing and editing services	28.24	1.68	10.74
56	Hotels services	26.33	3.31	5.28
10	Metallic minerals	28.18	0.00	1.86
15	Milk and dairy products	5.63	21.72	0.10
85	Social services	25.80	0.00	3.36
6	Fish and fishing products	24.74	0.01	7.29
49	Water and sewerage services	6.53	18.19	0.98
61	Air transportation services	19.85	0.00	0.81
29	Other chemical products	15.43	3.64	3.69
3	Other agriculture and related services	2.87	15.94	0.25
74	Security services	1.61	16.71	8.16
17	Miscellaneous food products	12.62	4.77	0.84
59	Other earthbound transportation services	1.66	15.56	0.11
13	Canned and preserved fish, fruit and vegetables	3.80	12.54	2.55
52	Petrol and motor vehicles trade services	14.79	0.04	17.56
5	Forestry and related services	6.00	7.65	0.32
51	Preparing, installation and finishing construction services	9.43	4.12	0.12
79	Private education services	10.46	1.20	3.65
4	Livestock and hunting	1.42	10.17	0.24
12	Meat and meat products	7.98	2.35	3.32
28	Basic chemical products	2.19	7.20	2.90
72	Engineering and architecture technical services	0.52	8.85	6.63
57	Bars and restaurants services	1.20	7.49	12.25
18	Wines and alcoholic beverages	7.76	0.88	3.95
53	Repair motor vehicles services	1.97	6.40	0.46
62	Allied transportation services	4.41	3.22	5.53
77	Public Administration	7.62	0.00	0.35
16	Grain mills, bakery, sugar mills, …	3.31	4.00	11.01
63	Post and communications services	1.05	5.17	5.20
36	Machinery and mechanic equipment	4.20	1.85	0.12
30	Rubber and plastic products	3.21	2.43	5.79
11	Non-metallic and non-energetic minerals	3.44	2.19	0.12
67	Real Estate	0.87	4.71	0.11
21	Textile mill products	4.13	1.42	0.09
37	Computers and office equipments	0.21	5.01	0.42
2	Olive and vine	5.08	0.11	0.21
50	Constructions	1.78	3.42	5.20
55	Retail trade and repair domestic and personal effects	4.54	0.64	22.12
54	Wholesale trade	1.19	3.88	12.42
68	Machinery and equipment rental	3.00	2.05	2.21
25	Paper and allied products	2.54	2.33	3.57
35	Fabricated metal products	1.18	3.59	9.04

TABLE 2 (Continued)
SECONDARY PRODUCTS AND BIAS OF EMPLOYMENT MULTIPLIERS

	Description	Over industry (%)	Over product (%)	Bias (absolute values)
14	Fats and oils	3.70	1.03	11.03
88	Personal services	0.35	3.97	0.78
83	Private social services	2.82	1.49	0.46
32	Ceramics, clay, bricks and other products for building	1.49	2.57	5.99
19	Beer and soft drinks	0.71	3.28	1.72
38	Electrical and electronic machinery	0.75	3.08	4.93
24	Cork and wood products	2.81	0.97	14.63
7	Coal mining	3.58	0.00	6.54
23	Leather tanning, leather products and footwear	2.88	0.52	11.29
27	Petroleum refining products	2.86	0.48	0.47
44	Furniture	0.54	2.71	13.40
1	Fruits and vegetables	3.01	0.21	0.25
31	Cement, lime and allied products	2.07	1.13	5.91
45	Miscellaneous manufactured products	1.64	1.51	0.01
39	Electronic materials, radio and television equipments	3.13	0.02	0.24
40	Professional and scientific instruments	1.09	1.77	9.18
43	Miscellaneous transportation equipment	2.57	0.19	10.52
33	Stone and glass products	1.24	1.40	8.33
58	Railway transportation services	2.58	0.00	0.48
42	Naval transportation and repairing services	2.33	0.22	15.37
47	Electricity and irrigations services	1.82	0.57	0.65
34	Primary metal products	2.13	0.23	1.56
41	Motor vehicles transportation equipment	1.43	0.37	2.66
75	Cleaning services	1.37	0.28	0.51
22	Clothing products	1.42	0.16	14.06
48	Gas and water steam and irrigation services	1.11	0.21	0.24
66	Allied financial services	0.05	0.65	9.02
81	Private medical and hospitals services	0.32	0.09	2.73
78	Public education services	0.18	0.00	0.79
70	Research and development	0.04	0.00	0.12
60	Tobacco products	0.00	0.00	6.54
65	Recycling products	0.00	0.00	3.80
20	Sea and river transportation services	0.00	0.00	1.64
46	Finances	0.00	0.00	1.39
64	Insurance	0.00	0.00	0.42
89	Public medical and hospitals services	0.00	0.00	0.38
80	Public social services	0.00	0.00	0.20
82	Household employers services	0.00	0.00	0.14

Source: Own elaboration.

TABLE 3
OUTPUT MULTIPLIERS

	Description	Estimated multiplier	Multiplier (MIOAN95)	p value	Lower bound	Upper bound
60	Sea and river transportation services	1.876	2.256	0.0000	1.731	2.021
85	Social services	2.136	2.124	0.0000	1.911	2.361
14	Fats and oils	1.439	1.949	0.0000	1.335	1.544
13	Canned and preserved fish, fruit and vegetables	1.755	1.872	0.0000	1.557	1.952
7	Coal mining	0.724	1.799	0.0325	0.060	1.388
65	Insurance	1.711	1.740	0.0000	1.658	1.764
31	Cement, lime and allied products	1.183	1.739	0.0000	1.001	1.365
18	Wines and alcoholic beverages	1.433	1.696	0.0000	1.349	1.518
73	Marketing services	1.046	1.680	0.0000	0.923	1.170
50	Constructions	1.353	1.670	0.0000	1.240	1.467
12	Meat and meat products	1.447	1.664	0.0000	1.240	1.654
28	Basic chemical products	1.206	1.621	0.0000	1.049	1.363
62	Allied transportation services	1.106	1.607	0.0000	1.031	1.181
15	Milk and dairy products	1.654	1.603	0.0000	1.380	1.929
11	Non-metallic and non-energetic minerals	1.523	1.562	0.0000	1.491	1.555
33	Stone and glass products	1.299	1.546	0.0000	1.182	1.415
16	Grain mills, bakery, sugar mills, …	1.201	1.534	0.0000	1.070	1.333
83	Private social services	1.471	1.524	0.0000	1.442	1.499
57	Bars and restaurants services	1.355	1.523	0.0000	1.204	1.505
42	Naval transportation and repairing services	1.024	1.502	0.0000	0.999	1.049
46	Recycling products	1.346	1.493	0.0000	1.214	1.477
71	Accounting and law activity services	2.465	1.477	0.0690	-0.191	5.121
59	Other earthbound transportation services	1.422	1.465	0.0000	1.406	1.438
44	Furniture	1.210	1.464	0.0000	1.070	1.350
87	Other amusement, cultural, sport and recreation services	1.689	1.457	0.0000	1.651	1.727
49	Water and sewerage services	1.293	1.448	0.0000	1.100	1.486
88	Personal services	1.385	1.443	0.0000	1.370	1.400
47	Electricity and irrigations services	1.072	1.434	0.0000	1.064	1.080
24	Cork and wood products	0.679	1.431	0.0069	0.186	1.171
66	Allied financial services	1.421	1.431	0.0000	1.302	1.541
76	Other business services	1.002	1.427	0.0300	0.097	1.906
19	Beer and soft drinks	1.309	1.417	0.0000	1.204	1.414
32	Ceramics, clay, bricks and other products for building	1.182	1.415	0.0000	1.089	1.275
86	Cinema, video, radio and television services	2.097	1.411	0.0000	1.937	2.256
72	Engineering and architecture technical services	1.156	1.409	0.0000	0.784	1.528
17	Miscellaneous food products	1.300	1.402	0.0000	1.070	1.530
55	Retail trade and repair domestic and personal effects	0.917	1.391	0.0000	0.785	1.049
51	Preparing, installation and finishing construction services	1.352	1.374	0.0000	1.336	1.368
45	Miscellaneous manufactured products	1.340	1.367	0.0000	1.319	1.362
23	Leather tanning, leather products and footwear	1.177	1.366	0.0000	1.070	1.284
10	Metallic minerals	1.337	1.365	0.0000	1.291	1.383
4	Livestock and hunting	1.325	1.357	0.0000	1.307	1.343
37	Computers and office equipments	1.296	1.352	0.0000	1.281	1.310
84	Public drainage and sewerage services	1.165	1.346	0.0000	1.095	1.235
22	Clothing products	1.165	1.336	0.0000	0.969	1.361
56	Hotels services	1.264	1.329	0.0000	1.146	1.383
1	Fruits and vegetables	1.266	1.323	0.0000	1.253	1.280
77	Public Administration	1.309	1.317	0.0000	1.286	1.332
25	Paper and allied products	1.117	1.314	0.0000	1.040	1.193

TABLE 3 (Continued)
OUTPUT MULTIPLIERS

	Description	Estimated multiplier	Multiplier (MIOAN95)	p value	Lower bound	Upper bound
61	Air transportation services	1.321	1.304	0.0000	1.180	1.461
52	Petrol and motor vehicles trade services	-0.168	1.295	0.5752	-0.757	0.420
30	Rubber and plastic products	0.921	1.290	0.0000	0.760	1.082
21	Textile mill products	1.273	1.289	0.0000	1.260	1.286
29	Other chemical products	1.031	1.287	0.0000	0.959	1.103
79	Private education services	1.193	1.284	0.0000	1.141	1.245
36	Machinery and mechanic equipment	1.266	1.284	0.0000	1.241	1.290
35	Fabricated metal products	1.040	1.272	0.0000	0.928	1.151
3	Other agriculture and related services	1.226	1.264	0.0000	1.216	1.235
5	Forestry and related services	1.224	1.262	0.0000	1.212	1.235
54	Wholesale trade	0.593	1.253	0.0000	0.345	0.840
58	Railway transportation services	1.220	1.252	0.0000	1.202	1.238
27	Petroleum refining products	1.271	1.245	0.0000	1.233	1.309
26	Printing, publishing and editing services	0.507	1.243	0.1699	-0.217	1.231
41	Motor vehicles transportation equipment	1.318	1.243	0.0000	1.142	1.494
68	Machinery and equipment rental	1.151	1.236	0.0000	1.053	1.250
53	Repair motor vehicles services	1.197	1.232	0.0000	1.186	1.207
43	Miscellaneous transportation equipment	1.032	1.232	0.0000	1.000	1.065
69	Computer services	1.597	1.231	0.0001	0.796	2.398
6	Fish and fishing products	1.163	1.230	0.0000	1.003	1.323
81	Private medical and hospitals services	1.214	1.208	0.0000	1.169	1.259
39	Electronic materials, radio and television equipments	1.170	1.202	0.0000	1.154	1.186
34	Primary metal products	1.058	1.200	0.0000	1.015	1.101
82	Public social services	1.178	1.195	0.0000	1.171	1.185
64	Finances	1.183	1.193	0.0000	1.153	1.212
2	Olive and vine	1.142	1.179	0.0000	1.133	1.151
20	Tobacco products	1.117	1.159	0.0000	0.958	1.276
38	Electrical and electronic machinery	1.045	1.156	0.0000	1.007	1.083
40	Professional and scientific instruments	1.043	1.155	0.0000	0.975	1.111
48	Gas and water steam and irrigation services	1.050	1.147	0.0000	0.855	1.245
63	Post and communications services	1.069	1.145	0.0000	1.062	1.075
80	Public medical and hospitals services	1.130	1.142	0.0000	1.126	1.135
75	Cleaning services	1.104	1.110	0.0000	1.078	1.129
74	Security services	1.227	1.094	0.0000	0.801	1.654
67	Real Estate	1.082	1.088	0.0000	1.066	1.097
70	Research and development	1.076	1.086	0.0000	1.049	1.102
78	Public education services	1.027	1.051	0.0000	1.009	1.045
89	Household employers services	1.000	1.000	0.0000	1.000	1.000

Source: Own elaboration.

TABLE 4
SECONDARY PRODUCTS AND BIAS OF OUTPUT MULTIPLIERS

	Description	Over industry (%)	Over product (%)	Bias (absolute values)
73	Marketing services	3.17	81.91	0.634
76	Other business services	42.74	41.45	0.425
69	Computer services	12.77	40.30	0.366
86	Cinema, video, radio and television services	43.97	3.59	0.686
87	Other amusement, cultural, sport and recreation services	35.32	4.11	0.233
84	Public drainage and sewerage services	1.66	36.41	0.181
71	Accounting and law activity services	12.83	19.88	1.477
26	Printing, publishing and editing services	28.24	1.68	1.243
56	Hotels services	26.33	3.31	0.064
10	Metallic minerals	28.18	0.00	0.028
15	Milk and dairy products	5.63	21.72	0.051
85	Social services	25.80	0.00	0.012
6	Fish and fishing products	24.74	0.01	0.067
49	Water and sewerage services	6.53	18.19	0.155
61	Air transportation services	19.85	0.00	0.016
29	Other chemical products	15.43	3.64	0.256
3	Other agriculture and related services	2.87	15.94	0.039
74	Security services	1.61	16.71	0.134
17	Miscellaneous food products	12.62	4.77	0.102
59	Other earthbound transportation services	1.66	15.56	0.043
13	Canned and preserved fish, fruit and vegetables	3.80	12.54	0.118
52	Petrol and motor vehicles trade services	14.79	0.04	1.295
5	Forestry and related services	6.00	7.65	0.039
51	Preparing, installation and finishing construction services	9.43	4.12	0.022
79	Private education services	10.46	1.20	0.091
4	Livestock and hunting	1.42	10.17	0.032
12	Meat and meat products	7.98	2.35	0.217
28	Basic chemical products	2.19	7.20	0.414
72	Engineering and architecture technical services	0.52	8.85	0.253
57	Bars and restaurants services	1.20	7.49	0.169
18	Wines and alcoholic beverages	7.76	0.88	0.263
53	Repair motor vehicles services	1.97	6.40	0.035
62	Allied transportation services	4.41	3.22	0.501
77	Public Administration	7.62	0.00	0.008
16	Grain mills, bakery, sugar mills, …	3.31	4.00	0.333
63	Post and communications services	1.05	5.17	0.076
36	Machinery and mechanic equipment	4.20	1.85	0.018
30	Rubber and plastic products	3.21	2.43	0.369
11	Non-metallic and non-energetic minerals	3.44	2.19	0.039
67	Real Estate	0.87	4.71	0.007
21	Textile mill products	4.13	1.42	0.016
37	Computers and office equipments	0.21	5.01	0.057
2	Olive and vine	5.08	0.11	0.037
50	Constructions	1.78	3.42	0.317
55	Retail trade and repair domestic and personal effects	4.54	0.64	0.474
54	Wholesale trade	1.19	3.88	0.660
68	Machinery and equipment rental	3.00	2.05	0.084
25	Paper and allied products	2.54	2.33	0.197
35	Fabricated metal products	1.18	3.59	0.232

TABLE 4 (Continued)
SECONDARY PRODUCTS AND BIAS OF OUTPUT MULTIPLIERS

	Description	Over industry (%)	Over product (%)	Bias (absolute values)
14	Fats and oils	3.70	1.03	0.509
88	Personal services	0.35	3.97	0.058
83	Private social services	2.82	1.49	0.053
32	Ceramics, clay, bricks and other products for building	1.49	2.57	0.234
19	Beer and soft drinks	0.71	3.28	0.108
38	Electrical and electronic machinery	0.75	3.08	0.111
24	Cork and wood products	2.81	0.97	0.752
7	Coal mining	3.58	0.00	1.075
23	Leather tanning, leather products and footwear	2.88	0.52	0.190
27	Petroleum refining products	2.86	0.48	0.026
44	Furniture	0.54	2.71	0.254
1	Fruits and vegetables	3.01	0.21	0.057
31	Cement, lime and allied products	2.07	1.13	0.557
45	Miscellaneous manufactured products	1.64	1.51	0.027
39	Electronic materials, radio and television equipments	3.13	0.02	0.032
40	Professional and scientific instruments	1.09	1.77	0.112
43	Miscellaneous transportation equipment	2.57	0.19	0.199
33	Stone and glass products	1.24	1.40	0.247
58	Railway transportation services	2.58	0.00	0.032
42	Naval transportation and repairing services	2.33	0.22	0.478
47	Electricity and irrigations services	1.82	0.57	0.362
34	Primary metal products	2.13	0.23	0.142
41	Motor vehicles transportation equipment	1.43	0.37	0.075
75	Cleaning services	1.37	0.28	0.006
22	Clothing products	1.42	0.16	0.171
48	Gas and water steam and irrigation services	1.11	0.21	0.097
66	Allied financial services	0.05	0.65	0.010
81	Private medical and hospitals services	0.32	0.09	0.006
78	Public education services	0.18	0.00	0.024
70	Research and development	0.04	0.00	0.011
60	Tobacco products	0.00	0.00	0.380
46	Recycling products	0.00	0.00	0.148
20	Sea and river transportation services	0.00	0.00	0.042
65	Finances	0.00	0.00	0.029
82	Insurance	0.00	0.00	0.017
80	Public medical and hospitals services	0.00	0.00	0.012
64	Public social services	0.00	0.00	0.010
89	Household employers services	0.00	0.00	0.000

Source: Own elaboration.

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