THE VALUATION SYSTEM OF THE INPUT-OUTPUT TABLES WITHIN THE SAM AND AGEMS FRAMEWORK

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ABSTRACT

The aggregation of the indirect taxes in the input-output framework of the current "European System Account", ESA-95, has generated some difficulties in order to calibrate "applied general equilibrium models", AGEMS. This work presents a new methodology, based upon the supply and use tables contained in the input-output ESA-95 framework, aimed to solve this problem. Specifically, it is developed a simple model that allows break up the "net taxes on products" into three main components: "VAT", "import taxes" and "other indirect taxes". This decomposition is subject to the prior value transformation of the symmetric input-output table's flows. Finally, it is presented a Social Accounting Matrix estimation for Spain corresponding to 2000, SAM_SP00, valued at producers' prices, which is the best criterion for calibrating AGEMS.

Keywords: input-output, valuation change, social accounting matrix, applied general equilibrium models, value-added tax.

1. INTRODUCTION

The development of the “applied general equilibrium models”, (AGEMS), has meant to adapt the walrasian model developed by Arrow and Debreu in a way that its structure provides foundations for public policies evaluation. The empirical character of these models is sustained in the fact that its computation is based upon different data bases, which can be organized systematically in the so called “Social Accounting Matrix”, (SAM). It is important to emphasize that the SAM is elaborated considering an important economic principle; that is: "for each income generated within the economy, a corresponding expenditure must exist". This fact is totally consistent with the Walras’ Law, which facilitates the establishment of an important link between the general equilibrium theoretical models and the data grouped in a SAM.

Accordingly, AGEMS allow evaluating the effects caused by the implementation of public policies by the specification of a set of parameters considered in them. The determination of such parameters obeys to the calibration process which depends in turn on the information contained in the SAM. Consequently, if it is required to analyze the effects of a certain fiscal policy on the economic agents’ behaviour, it will be necessary to consider, in the elaboration of the SAM, the information related to which parameters in such models will be calibrated. Thus the information contained in the SAM plays such a significant role in the modelling and valuation of public policies.

By taking into account what is mentioned above, the aim of this research is to present the results of Social Accounting Matrix estimation for Spain corresponding to 2000, SAM_SP00. The main feature of this SAM_SP00 is that the input-output table’s flows are valued at producers’ prices. This estimation has been motivated by the fact that the input-output framework in the current “European System Account of 1995”, ESA-95, has prompted some difficulties regarding the way in which tax information is presented (EUROSTAT, 1995). Unlike previous versions, now the input-output table format shows the set of indirect taxes in one category labelled “net taxes on products”, (NTOP). On the contrary, the Spanish input-output table for year 1994 specified tax information into the following categories: “net value-added tax on products, (VAT), “taxes and duties on imports excluding VAT” and “taxes on products, except VAT and import taxes” (INE, 1994). Undoubtedly, this structure facilitated the adaptation of the SAM information to the format required in the AGEMS’ calibration.

On the other hand, the current ESA-95 guidelines imply to adopt a new convention concerning the valuation of the input-output table’s transactions. In such sense, with the purpose of purifying the measurement of concepts such as the "technical coefficients", from the ESA-95 the input-output flows are valued at “basic prices”. This means that the monetary value in each transaction registered in the input-output table is divided up in three components. For instance, when the industry *“j”* purchases the input *“i”*, the following operations are accounted at the input-output table: the intermediate consumption itself, the indirect imposition associated with input *“i”*, and the trade and transport margins caused by the transaction. When these three elements are registered separately in an input-output table, the derived technical coefficients will represent technical production structure more accurately. Nevertheless, this kind of valuation is not always the most suitable schedule in order to study the taxes effects on the economic agents’ decisions.

Accordingly, this research develops a methodology that allows recovering the taxes structure prevailing in older ESA frameworks. In order to reach this objective, it is necessary to change the flows’ valuation of current ESA-95 input-output framework. For doing so, we have to consider two alternatives, namely: to value the transactions at purchasers’ prices or at producers’ one. In general, we think that the valuation criterion election must be subordinated to the researcher’s purposes. For instance, if the final end is to evaluate the application of some fiscal policy, it will be possible to calibrate an AGEM. However, if the ESA-95 framework is used, for doing that it will be necessary to divide up previously the net taxes on products information. In this case, we consider the producers’ prices valuation as the best criterion. This statement is based on the following arguments:

- Producers’ prices valuation makes the AGEM calibration from the data contained in the SAM easier. Under this criterion, the calibration of the parameters related to the taxes is relatively simple. On the contrary, the purchasers’ prices valuation requires adapting the information regarding trade and transports margins. In particular, under the ESA-95 precepts in order to evaluate total uses at the same way to supply, it is necessary to deem these margins, what supposes to model them.
- The producers’ prices are the most suitable option in order to analyse the taxes effects on the economic agents’ consumption decisions. This is so because each input-output transaction incorporates tax information at the same time as other elements are isolated.

In relation to prior researches, it must be said that, before ESA-95 framework establishment, the social accounting matrices presented in Spain were elaborated including input-output table valued at producers’ prices. Thus, from the first Spanish SAM developed by Kehoe *et al.* (1988), to those elaborated for the year 1990 by Uriel *et al.* (1997), Gómez (2001) and Fernández & Polo (2001), input-output tables were valued in these terms.

Once the ESA-95 methodology has been implemented, new matrices recently published in Spain have adopted plenty both the new “symmetric input-output table”, (SIOT) and the valuation implied in the basic prices conception. For instance, the SAM for the year 1995 elaborated by Uriel *et al.* (2005) includes the ESA-95 valuation criterion. Consequently, this table does not contain the net taxes on products classified by the traditional categories used in older versions.

On the other hand, we should highlight the work of Cardenete & Sancho (2004) who explicitly deal with the problem of the input-output transaction valuation change. Such as it is suggested here, these authors point out the convenience of transforming the SIOT's flows in order to get tax figures decomposition, which allows analyzing the effects of certain fiscal policies. Hence, the authors present a methodology based on the Leontief's price model that let value the SIOT for year 1995 at purchasers' prices. Moreover, they achieve to estimate taxes such as VAT and import taxes. Nevertheless, these authors do not explicitly mention to trade and transport margins treatment, which is a fundamental element so as to value the SIOT's flows at purchasers' prices. In particular, it seems these authors assume that such margins have been already incorporated into the SIOT's flows. However, we think that the methodology followed by the Spanish statistical institute explicitly does not suppose that.

In contrast to Cardenete & Sancho's suggestions, since the purchasers' prices valuation hampers the trade and transport margins modelling, in our work we consider the producers' prices valuation as the best option. In this sense, we present and develop an alternative methodology based upon the supply and use tables contained in the input-output ESA-95 framework. Additionally, we present an alternative VAT on product estimation, which implies that the use table properly valued constitutes a suitable approach of the VAT base. Indeed, this estimation will facilitate the decomposition of the tax figures that will be integrated later into the SIOT and consequently in the SAM_SP00.

Finally, we think that a SAM estimated for the year 2000 represents an important updating regarding the data available in it. Even though similar matrices have been already computed for the year 2000 (Rodríguez & Llanes, 2004), the SAM_SP00 presented in this research constitutes the first intending to reconcile the valuation of the SIOT's flows at producers' prices with the methodology adopted by the ESA-95.

The rest of the work is as follows. In the next section, the input-output ESA-95 framework is described, emphasizing those aspects related to valuation changes. Next, in order to spell out the principle under which valuation changes will be applied, we shall develop a simple model. Then, the assumptions applied so as to estimate both the VAT and the SIOT are considered. Finally, the SAM_SP00 is completed and some conclusions will be presented.

2. THE INPUT-OUTPUT SYSTEM IN THE ESA-95

In contrast to previous European System of Account, the input-output framework in the current ESA-95 consists of two types of tables: supply and use tables (SUT) as well as the symmetric input-output table (SIOT). The latter contains fundamental information that allows researchers to establish links between input-output tables and the basic Leontief's model. However, it must be said that the ESA-95 methodology has associated two problems: first, the SIOT is estimated by some specific years, and then for those years in which the table is not available, we have to estimate it. Secondly, although we had the SIOT at hand, if our final goal were to study fiscal policy issues, we would have to adjust it for making it compatible with some tax applied models, i.e. AGEMS.

Accordingly, the purpose of this section is not to describe input-output framework at great length, but to stand out those necessary elements to achieve our goal. That is, to compute a symmetric input-output table at producers' prices that allows us to avoid the problems regarding to model some public policy throughout AGEMS. Thus, the rest of the section describes the tables of the current input-output framework emphasizing those aspects related with the valuation change issues.

2.1 Use Table

A use table describes where the products and primary inputs are used. By columns, it provides a picture of an industry cost function in which are included the inputs as well as the value added components used in the production of commodities. In addition, by rows it records the destination of the commodities deliveries to both industries and elements of the final demand[1] composing the economy.

Given the use table characteristics, we can define it in matrix terms. Thus, let us consider that $D = \left[Z^{BP} \middle| F^{BP} \right] = \left[d_{ij} \right]_{nx(p+h)}$ is the matrix that shows the uses of the "n" commodities offered to both the "p" industries and the "h" final demand components included in the economy. Such as is indicated, D can be made up by: $Z^{BP} = \left[z_{ij}^{BP} \right]_{nxp}$, which is the interindustrial flows matrix. That is z_{ij}^{BP} represents the monetary value of the amount of commodity "i" used by industry "j". Likewise, $F^{BP} = \left[f_{ik}^{BP} \right]_{nxh}$, which is the matrix of

[1] As final demand components we have the following: final consumption expenditure by household, by non-profit institutions serving household –NPISH–, by government; gross capital formation and exports.

commodity deliveries to final demand components. Then f_{ik}^{BP} stands for the monetary value of the amount of commodity "i" used by final demand component "k". Finally, in order to complete the use table definition, we have to consider the valued added matrix: $V^{BP} = \left[v_{ij}^{BP} \right]_{sxp}$. See *Figure 1* for looking at a simplified structure of this table.

[Insert Figure 1]

By summing down the NACE industry columns, we obtain the total inputs by industry TIn^{BP} . Whereas, adding by row we obtain total uses at basic prices, U^{BP} . As can be noticed in *Figure 1*, the supra index "BP" indicates us that flows in the table are valued at basic prices. Regarding this issue, it has to be mentioned that total uses are valued at basic prices as well as total inputs. When this is the case, then monetary value in each transaction at the table does not include any portion referring to either indirect taxes or total margins. For that reason, the table contains a particular row for registering the net taxes on product, NTOP: T^Z and T^F . The same happens in the case of margins. As we shall see lately, depending on how NTOP and margins are registered, a particular valuation will be employed. Thus, the valuation changes have to do with the convention followed in order to present NTOP as well as total margins.

As we have noticed above, the information concerning with total margins and NTOP turns out to be relevant for changing valuation flows, we have to go into that deeply. Since a change of valuation will require classifying NTOP and margins information by product instead of by industry/demand final component, we have to go for that information in the supply table.

2.2 Supply Table

A supply table describes the products' supply sources to the economy. Similar to the use table, we can regard this table by using the matrix arranges. As *Figure 2* shows, x_{ij}^{BP} is the output of commodity "i" produced by industry "j". The on-diagonal elements of this matrix are the primary products of an industry, while the off-diagonal elements are the secondary products. Adding up by column and by row we obtain the total output by industry and the total domestic supply by product respectively. Adding imports to the latter, we get the total supply of the economy.

On the other side, it is said that the supply table also shows two important column-vectors, one registering total trade and transport margins, M , and the other grouping NTOP, NT . These vectors have the information we shall consider below for changing the valuation of the use table and consequently of the SIOT. In particular, such as we have been suggesting so far, M and NT establish differences among total supply at basic prices, producers' prices and purchasers' prices. Thus, if we add up total margins and NTOP to total supply at basic prices, then the resulting supply will be valued at purchaser's prices. By the same token, if we add only NTOP to total supply at basic prices, the outcome will be to value total supply at producer's prices. By using these principles, we will be able to define a model containing the assumption followed for changing the flows into the input-output framework.

[Insert Figure 2]

2.3 Symmetric Input-Output Table

A symmetric input-output table contains the fundamental information with which one deals in input-output analysis. Although the SIOT is the most important table of the ESA input-output framework, it is not always computed by statistics institutes and thus, it is necessary to compile it by converting the SUT in a threefold process (INE: 2001).

The first step is the allocation of secondary products in the supply table to the industries of which they are principal products. After doing so, the columns of the use table should be rearranged from inputs to industries to inputs into homogeneous branches without aggregation of the rows. And finally, if it is appropriate the rows of the new use table should be aggregated to the homogeneous branches shown in the columns.

The most complicated pace is the rearrangement of the use table into homogeneous branches, as the basic data on inputs relate to industries and not to each individual commodity produced by each industry. Regarding this, there are two well-established hypotheses in order to calculate a SIOT from the SUT framework. The first one is the "industry technology assumption" in which technical coefficients are estimated vertically. The second option is the "product technology assumption". In this case, all the columns *per* row are expressed as a percentage of total use.

Next, a simplified structure of symmetric input-output table is given in *Figure 3*. In more detail, section 4.4 will show the process for deriving a SIOT from SUT.

[Insert Figure 3]

Before going to the next section, a set of identities should be highlighted. These indicate us the relationships established among the tables included in the ESA-95 input-output framework. In addition, we have to mention that some of these identities will be used below in order to support our estimations. Then, we have:

- By industry, output by industry (ST) should be equal to input by industry (UT):

$$X_j^{BP} = TIn_j^{BP}; \qquad \forall j = 1,\ 2,\ \ldots.\ \ n \tag{I.1}$$

- By products, total supply by product (US) should be equal to total use by product (ST):

$$S_i^v = U_i^v; \qquad \forall v = BP, PRP, PUP \quad \forall i = 1,\ 2,\ \ldots\ \ n \tag{I.2}$$

- In SIOT, total by column should be equal to total by row:

$$U_i^v = S_j^v; \qquad \forall v = BP, PRP, PUP \quad \forall i = j \tag{I.3}$$

- Total net taxes on products from ST should be equal to total net taxes on products from UT:

$$\sum_i T_i = \sum_j T_j^Z + \sum_j T_j^F \tag{I.4}$$

Before describing the process followed to derive a SIOT at producers' prices for Spain in 2000, a simplified model is developed in next section. The purpose of doing so is to spell out the principle under which valuation changes will be applied.

3. THE MODEL

As suggested above, the transactions collected in *D* could be valued at different types of prices. In this section we define three types of prices and we clarify the determinants that will allow us to change valuation conveniently. For doing this, a model is developed establishing the set of basic principles followed in next sections.

Bearing in mind that *D* is the matrix of all deliveries of goods and services in an economy, let tr_{ij}^v the monetary value of the transactions in which commodity *"i"* is purchased by agent *"j"*. In addition, this transaction is valued at *"v"* prices. Accordingly, we assume that *"v"* set include the following cases:

- **Basic prices** (BP): it is the amount payable by the purchaser for a unit of a good or services *"i"* produced as output including production cost and excluding both trade and transport margins and net taxes on products.

- **Producers' prices** (PRP): it is the amount payable by the purchaser for a unit of a good or service *"i"* produced as output including net taxes on products, but excluding trade and transport margins.
- **Purchasers' prices** (PUP): it is the amount payable by the purchaser for a unit of a good or services *"i"* produced as output including net taxes on products and trade and transport margins. The latter are includes any transport charges paid separately by the purchaser to take delivery at the required time and place.

Additionally, we can classify tr_{ij}^{v} depending on the *"j"* agent's activities:

- If *"j"* is a producer, tr_{ij}^{v} is an intermediate consumption. Then, $tr_{ij}^{v} \in Z^{v}$.
- If *"j"* is a component of the final demand, tr_{ij}^{v} is final consumption expenditure. Then, $tr_{ij}^{v} \in F^{v}$.

On the basis of these definitions we shall express how to transform the transaction valuation from basic prices to producers' prices. Let consider the following definition:

Definition 1*: A transaction tr_{ij}^{v} is valued at PRP when the net taxes on products rate, τ_i, is applied on the amount of this transaction at BP. Then:*

$$tr_{ij}^{PRP} = \left(1+\tau_i\right) tr_{ij}^{BP} \tag{D.1}$$

In such a case, if we follow this equation, we have to eliminate the row-vectors T^{Z} and T^{F} at *Figure* 1. On the other hand, let define when a transaction is valued at purchasers' prices:

Definition 2: *A transaction tr_{ij}^{v} is valued at PUP when besides the net taxes on products rate τ_i, it is applied the margin rate, η_i, on the amount of this transaction at BP. Then:*

$$tr_{ij}^{PUP} = \left(1+\eta_i\right)\left(1+\tau_i\right) tr_{ij}^{BP} \tag{D.2}$$

If we follow this equation, we should eliminate both the row-vectors T^{Z} and T^{F}, and transform rows Z_{c}^{BP} and Z_{t}^{BP} at *Figure 1*.

From (D.1) and (D.2) we can establish a relation between the valuation at PRP and PUP:

$$tr_{ij}^{PRP} = \frac{tr_{ij}^{PUP}}{\left(1+\eta_i\right)} \tag{D.3}$$

This last equation is meaningful in our research. This is so, because we have two big tasks to be aimed. One is to estimate the SIOT valued at PRP, and related to divide up tax information in the same way it was presented in the previous ESA schedules. In the next section we develop a methodology in order to achieve both outcomes from the same procedure.

4. DERIVATION OF SPANISH SIOT_00 AT PRODUCERS' PRICES

In this section we explain the previous process followed so as to calculate the 2000 SIOT at PRP for the Spanish economy taking into account net taxes on products categories separately. For doing this, we have applied the model commented above as well as have developed a methodology to estimate the net VAT on products. Once net VAT is obtained, we are able to divide up net taxes on products into three components: net VAT on products, imports net taxes and other net taxes on products.

Figure 4 shows a schedule of the full process that we have divided into four steps:

- 1st. Derivation of a UT at Purchasers' prices from a UT at Basic prices.
- 2nd. Net VAT valuation from the UT at Purchasers' prices.
- 3rd. Derivation of a UT at Producers' prices from the UT at Purchasers' prices.
- 4th. Derivation of a SIOT at Producers' prices from the UT at Producers' prices.

This structure could raise the question why the use table at PRP is derived from the PUP one and not from the BP use table. Actually, it is by convenience. That is, as net VAT on product should be calculated on the purchasers' prices basis, then it will be straightforward to estimate the SIOT from a use table at purchasers' prices.

[Insert Figure 4]

4.1 Use Table at Purchasers' Prices from the Use Table at Basic Prices

The aim of this section is to value *D* matrix at purchasers' prices. In such case, element d_{ij} will represent the transaction worth including production cost, trade and transport margins as well as net taxes on products. It is important to bear in mind that when *D* is valued at basic prices both margins and net taxes are allocated to specific rows such as it is indicated in *Figure 1*. So, changing the value of *D* means to reallocate the amount registered in these rows to the corresponding d_{ij}. Because of it, net taxes on products row will be equal to zero and the margins rows will be modified. The latter will not be necessarily equal to zero because they include other output different from margins but related with trade and transport.

Bearing in mind **definition 2** and identities (I.2) and (I.4), we can define the net taxes on products rate τ_i and the margin rate η_i in order to transform a UT^{BP} into UT^{PUP}. Let consider the following equations:

$$\tau_i = \frac{T_i}{U_i^{BP}} = \frac{U_i^{PRP}}{U_i^{BP}} - 1; \quad \forall i = 1,\ 2,\ \ldots\ n \tag{1}$$

$$\eta_i = \frac{M_i}{U_i^{PRP}} = \frac{U_i^{PUP}}{U_i^{PRP}} - 1; \quad \forall i = 1,\ 2,\ \ldots\ n \tag{2}$$

Where:

U_i^{PUP} is the total uses of the row *"i"* valued at PUP.
U_i^{PRP} is the total uses of the row *"i"* valued at PRP.
U_i^{BP} is the total uses of the row *"i"* at BP.
T_i is the total amount of net taxes on products associated with product *"i"*.
M_i is the total margins, both trade and transport, generated by the related transactions of product *"i"*.

Let us define $\widehat{T}$ as the diagonal-matrix of dimension *(nxn)* of net taxes on products rate and $\widehat{M}$ as the diagonal-matrix of dimension *(nxn)* of margins rate. According to equation (1) and (2):

$$\widehat{T} = \begin{bmatrix} 1+\tau_1 & 0 & \cdots & 0 \\ 0 & 1+\tau_2 & \cdots & \vdots \\ \vdots & & \ddots & \\ & & & \\ 0 & & \cdots & 1+\tau_n \end{bmatrix} \qquad \widehat{M} = \begin{bmatrix} 1+\eta_1 & 0 & \cdots & 0 \\ 0 & 1+\eta_2 & \cdots & \vdots \\ \vdots & & \ddots & \\ & & & \\ 0 & & \cdots & 1+\eta_n \end{bmatrix}$$

Then, we can transform matrix *D* applying the next equations. In matrix terms:

$$Z^{PUP} = \widehat{M}\,\widehat{T}\,Z^{BP} = \left[z_{ij}^{PUP} \right]_{nxp} \tag{3}$$

$$F^{PUP} = \widehat{M}\,\widehat{T}\,F^{BP} = \left[f_{ik}^{PUP} \right]_{nxh} \tag{4}$$

If we put together the information contained in matrices Z^{PUP}, F^{PUP} and V^{BP}, we can construct a new use table at purchasers' prices, see *Figure 5*.

[Insert Figure 5]

4.2 Value-added tax estimation

Having calculated the use table at purchases' prices, we can estimate the net value-added tax on products. For doing so, we have taken account the ESA criterion for recording this tax. To be precise, what it is recorded in the ESA schedule is the net VAT. This is defined as the difference between the invoiced VAT and the deductible VAT. The former is the tax charged by sellers when product *"i"* is transacted. As a general rule, sellers collect the tax and record it using the invoices, but they do not pay the total amount invoiced because they can deduce the part corresponding to inputs as well as capital goods bought.

By considering the net VAT definition, the idea is to estimate the invoiced VAT generated per transaction along with the corresponding deductions. This is possible if we regard the use table at purchasers' price as a complete record of the entire transaction made in the economy. When a transaction is valued at purchasers' prices, then the VAT is already included in the price. Accordingly, if we knew the rate of the tax per product charged in each transaction, then it would be likely to estimate the transaction value before the VAT application. Finally, the difference between the transaction at purchasers' prices and that before the application of the VAT would be equivalent to the invoiced VAT associated with.

Definition 3*: Let consider that TR_i^{PUP} stands for the value perceived by final buyers and recorded in the use table, while TR_i^{BVAT} represents the value of such transaction before the VAT application. Thus, we assume that the invoiced VAT can be determined according to:*

$$VAT_i^{IN} = TR_i^{PUP} - TR_i^{BVAT} \tag{5}$$

Where:

$$TR_i^{BVAT} = \frac{TR_i^{PUP}}{\left(1+\tau_i^{VAT}\right)}; \quad \forall i = 1,\ 2,\ \ldots\ n \tag{6}$$

In our setting, τ_i^{VAT} is the VAT rate charged on product *"i"* when it is sold. As stand out above, the next step is to determine TR_i^{BVAT}. For doing so, we have employed the information included in a database provided by the "Studies Fiscal Institute". It collects the evolution of the VAT rate by CPA products from 1993 to 2002 in Spain. Once we have assigned the corresponding VAT rate to each product, it is possible to define TR_i^{BVAT} as in (6).

Let consider a diagonal matrix that arranges the VAT rates by product of matrix D. Then, we have that:

$$\widehat{VAT} = \begin{bmatrix} 1+\tau_1^{VAT} & 0 & \ldots & 0 \\ 0 & 1+\tau_2^{VAT} & \ldots & 0 \\ & & & \\ 0 & 0 & \ldots & 1+\tau_n^{VAT} \end{bmatrix} \tag{7}$$

By means of $\widehat{VAT}$, and considering the use table at purchasers' prices, it is possible to estimate matrices recording the invoiced VAT caused in each transaction registered in the D matrix. The computations are as follows:

$$VAT_Z^{IN} = Z^{PUP} - \left(\widehat{VAT}\right)^{-1} Z^{PUP} = \left[vat_{ij}^{IN} \right]_{nxp} \tag{8}$$

$$VAT_F^{IN} = F^{PUP} - \left(\widehat{VAT}\right)^{-1} F^{PUP} = \left[vat_{ik}^{IN} \right]_{nxh} \tag{9}$$

The first equation determines the invoiced VAT generated by the transactions associated with intermediate consumption. In the second equation, we have the matrix recording the invoiced VAT on the final expenditures due to households, government, the NPISH, the gross capital formation and exports.

Nevertheless, in order to get the net VAT on products, we have to consider the deductions, associated basically with the intermediate consumption. As mentioned before, this tax charged the final consumption and then when a sector belongs to a non-exempted one, it can deduce the invoiced VAT caused by their purchases. On the contrary, when a sector is an exempted one, the possibility of deduction is not permitted. In this case, it is considered as if it were the final consumer.

In our setting, and taking into account the information provided by the "Spanish Fiscal Studies Institute", we have to include the following products and sectors as exempts:

[Insert Figure 6]

For computing the deductions regarding intermediate consumption, we are assuming that all the possible combinations can be resumed in the following table:

[Insert Figure 7]

Taking into account this configuration, we have built a matrix containing the deductions, per sector and per product. Hence, we have the following equation:

$$VAT_Z^{DED} = \left[vat_{ij}^{DED} \right]_{nxp} \tag{10}$$

Where:

$$\begin{cases} vat_{ij}^{DED} = vat_{ij}^{IN}, & \text{if } i\text{=non-exempted product and } j\text{=non-exempted sector.} \\ vat_{ij}^{DED} = 0, & \text{if } i\text{=exempted product and/or } j\text{=exempted sector.} \end{cases}$$

As a result, we can notice that a deduction, vat_{ij}^{DED}, coincides with the invoiced VAT, vat_{ij}^{IN}, only in those cases in which the product and the sector are classified as a non-exempted one.

In the case of the final demand case, we have assumed the following:

- Households, government and the NPISH cannot make deductions because the VAT charged their final consumption.
- Regarding the gross capital formation and changes in inventories, we assume that deductions are allows as if both were intermediate consumption.
- The exports are charged at “zero” rates, then we consider that a complete deduction is allowed.

Considering these assumptions, we can resume the deduction options in the following table:

[Insert Figure 8]

As in the previous case, we can build a deduction matrix containing the criteria shown in this table. Thus, we have:

$$VAT_F^{DED} = \left[vat_{ik}^{DED} \right]_{nxh} \tag{11}$$

Where:

$$\begin{cases} vat_{ik}^{DED} = vat_{ik}^{IN}, & \text{if } i\text{=non-exempted product and } k\text{=gross capital formation,} \\ & \quad \text{change in variation, export.} \\ vat_{ik}^{DED} = 0, & \text{if } k\text{=household, goverment, NPISH.} \end{cases}$$

Finally, we can estimate a matrix containing the net VAT per transaction recorded in the use table:

$$VAT_Z^{NET} = VAT_Z^{IN} - VAT_Z^{DED} \tag{12}$$

$$VAT_F^{NET} = VAT_F^{IN} - VAT_F^{DED} \tag{13}$$

Since we are interested in the total net VAT on products, we can express it as follows:

$$VAT^{NET} = VAT_Z^{NET} i + VAT_F^{NET} k = \left[vat_i^{NET} \right]_{nx1} \tag{14}$$

Where **i** is a *(px1)* column vector and **k** is a *(kx1)* column vector containing ones as elements. As a consequence of equation (14), if we sum up all its elements, we will get an estimation of the total VAT collected by the government. Thus we have:

$$VAT = l \; VAT^{NET} \tag{15}$$

Where **l** is a *(1xn)* row vector containing ones as elements. This figure should be a suitable estimation of the total amount registered at the National Account and received by the government as a consequence of the VAT. Nonetheless, we are more interested in the VAT^{NET}

vector in (14) because it will allow us to divide up the information referring to net taxes on products presented in the ESA-95.

In next section, it will be estimated a use table valued at producers' prices from the previous use table in purchasers' prices. For doing so, we will have that the SIOT will be valued at the same price criterion as the use table, and this is precisely our goal.

4.3 Use Table at Producers' Prices

Bear in mind that both trade and transport margins and net taxes on products are excluded in d_{ij} when *D* is valued at basic prices, while they are included in *D* when valuing at purchasers' prices. In this section we will present *D* matrix at producers' prices. This means reallocating margins and net taxes on products in such way that we subtract the former from and hold the latter in each element d_{ij}. According to equation (D.3), we will have sub-matrices in *D* at PRP applying the followings equations:

$$Z^{PRP} = \left(\widehat{M}\right)^{-1} Z^{PUP} \tag{16}$$

$$F^{PRP} = \left(\widehat{M}\right)^{-1} F^{PUP} \tag{17}$$

The inverse of $\widehat{M}$ allows us to distribute the margins associated with each transaction reported in Z^{PUP}. Once the margins are reallocated from each transaction to the rows corresponding to transport and trade, the resulting table, Z^{PRP}, constitutes our estimation of intermediate consumption table at producers' prices. Analogously, we can express the final demand matrix at PRP according to equation (17).

After getting these matrices, we can complete the use table at the new valuation only adding to it the information related to the value added components. It is resumed in the next *Figure 9*:

[Insert Figure 9]

We can notice that although Z^{PRP} is valued at producers' prices, total output keep being valued at basic prices. On the other side, total uses do change their valuation after applying this procedure.

Accordingly, if we wanted to get the total output at producers' prices, we would have to add the rows containing tax information. This implies to incorporate the net taxes on imports, the net VAT on products and other indirect taxes different from import and value-added taxes. With the information contained in the supply table, this is possible. However, these taxes are aggregated under the label total net taxes on products.

Taking into account these issues, our next step is to compute a symmetric input-output table valued at producers' prices from supply and use tables.

4.4 Valuation of the SIOT_00 at Producers' Prices

Once the assumptions and calculations we have used in order to change the valuation of the transactions have been described, this section shows what method has been used to convert supply and used tables into a symmetric input-output table valued at producers' prices containing decomposed net taxes on products.

For achieving our goals, we have to bear in mind the following issues:

- The columns in the use table have to be rearranged in such a way that each column stands for a homogenous production function. This should be done using additional statistics information. Nevertheless, since this is not always possible, then we are going to adopt non-statistical approaches.
- Since we are interested in computing a symmetric table, we have to guarantee the equivalent between total supply and total uses. It must be said that this requires including information regarding total imports by sectors, and finally, the rows containing the decomposed taxes. This last operation will allow us to estimate the total supply at producers' prices.

As *Figure 10* shows, before computing the SIOT it should be added three rows to the use table at PRP. These are:

- Value-added tax (VAT), which has been estimated in the above section.
- Taxes and duties on imports excluding VAT, which will be derived from the information included in the Spanish input-output table of 1994 (INE: 1994). It is the last SIOT that has information about decomposed taxes on products.
- Taxes on products except VAT and import taxes, which will be calculated as a difference.

This may raise the question why we should added information related with net taxes on products if every transaction z_{ij}^{PRP} and f_{ik}^{PRP} included it. However, the matrix Z^{PRP} contains those net taxes on products due to the intermediate consumption, while the added rows are connected with the net taxes on products from the supply table.

[Insert Figure 10]

From this new use table, we are in a position to calculate a symmetric input-output table. Since the most complicated pace for the researchers is to get additional demanding statistical information in order to get homogeneous branches, the approach more commonly used by them is to resort to simple theoretical assumptions. In fact, there are two technology assumptions in that regard: the industry and the product technology assumption. The industry technology assumption supposes that all commodities produced in an industry are made with the same input structure, whereas the product technology assumption supposes that all products in a product group have the same input structure, whichever industry produces them.

Since that the first hypothesis is easier to be implemented, and it avoids some undesired outcomes, i.e. negative technical coefficients, we adopt such approach during our computations. Next on, we will describe the steps to be followed so as to get a SIOT under the industry technology assumption. Specifically, we have estimated a 41x41 SIOT for the 2000 Spanish economy. The SIOT dimension has been versed in the dimension of the 1994 input-output table, which provides the information related with import taxes. From now on both product dimension and industry dimension will be *r*.

Let us consider $\widehat{TIn}^{PRP}$ the diagonal matrix *(rxr)* of total input from the use table at PRP:

$$\widehat{TIn}^{PRP} = \begin{bmatrix} tin_1^{PRP} & 0 & \cdots & 0 \\ 0 & tin_2^{PRP} & \cdots & \vdots \\ \vdots & & \ddots & \\ & & & \\ 0 & & \cdots & tin_n^{PRP} \end{bmatrix} \tag{18}$$

We can define an expanded matrix ZA^{PRP} of dimension *[(r+q)xr]* as follows:

$$ZA^{PRP} = \begin{bmatrix} Z^{PRP} \\ V^{BP} \\ T^{P} \\ T^{IMP} \\ VAT^{NET} \end{bmatrix} \tag{19}$$

Where:

$V^{BP} =$ is the value added matrix.
$T^{P} =$ is the taxes on products, except VAT and import taxes matrix.
$T^{IMP} =$ is the taxes and duties on imports excluding VAT matrix.
$VAT^{NET} =$ is the net value added tax matrix.

Then, the technical coefficients matrix *[(r+q)xr]* could be calculated as:

$$A = ZA^{PRP}\left(\widehat{TIn}^{PRP}\right)^{-1} \tag{20}$$

Take into account the next step is to estimate a ZA^{PRP} matrix that represents homogenous industry branches, from the supply table we define $\hat{S}^{PRP}$ as a diagonal matrix of total supply at producers' prices:

$$\hat{S}^{PRP} = \begin{bmatrix} s_1^{PRP} & 0 & & \cdots & 0 \\ 0 & s_2^{PRP} & & \cdots & \vdots \\ \vdots & & \ddots & & \\ & & & & \\ 0 & & & \cdots & s_n^{PRP} \end{bmatrix} \tag{21}$$

Multiplying (20) and (21) we can express the new expanded matrix. Thus, we have:

$$\widetilde{ZAS}^{PRP} = A\hat{S}^{PRP} \tag{22}$$

At this point, we have the first approximation of the SIOT at PRP. However, we need to balance $\widetilde{ZAS}^{PRP}$ before getting the final estimation. We update this matrix by using "RAS" technique (Schneider & Zenios, 1990). The basis of this approach consists in finding a set of multipliers to adjust the rows of a given matrix, i.e. $\widetilde{ZAS}^{PRP}$, and a set of multipliers to adjust the columns. For doing so, a new matrix is generated, ZAS^{PRP}, such that their cells will sum up a prior defined target: one by row and other by column totals. We implement an algorithm in order to implement this method in *"Matlab"* so:

$$ZAS^{PRP} = R\widetilde{ZAS}^{PRP}S \tag{23}$$

Finally, joining ZAS^{PRP}, F^{PRP} matrices and the imports row vector IM from the supply table we can build the definitive Spanish SIOT at producers' prices (see *Figure 11*).

[Insert Figure 11]

The following section sets out how to complete the SAM_SP00 from the above SIOT and other information included in the Spanish National Accounts.

5. THE SPANISH SOCIAL ACCOUNT MATRIX

Once the SIOT valued at producers' prices has been estimated for the 2000 Spanish economy, we can build the respective SAM, SAM_SP00, following the structure suggested by *Figure 12*. As it shows, the SIOT constituted the first row and column of the SAM. On the other hand, the remainder information could be extracted by Spanish National Account, especially from:

- **Total economy and institutional sectors accounts**: they concern the generation of income of the agents considered in the SAM.
- **Rest of the World accounts**: they record transactions between residents and non-resident units. We have divided up the "rest of the world" in "European Union" and "Other countries".
- **Integrated economic accounts**: they give a concise overview of the accounts of an economy.

Taking into account the above accounts and following the *Figure 12* structure, a simplified version of the SAM_SP00 is shown in *Table 1*. Following, we describe the main features of this version.

- **Homogeneous industries:** the first 8 columns represent the production cost of the homogeneous branches. On the other hand, from the 1st to the 8th row the intermediate consumption structure is shown. Rows 9-12 represent the value added components; that is, "employees' compensation", "employers' actual social contributions", "other taxes less subsidies on production" and "net operating surplus". The next three rows consist on the net taxes on products: "value-added tax", "taxes and duties on imports excluding VAT" and "other taxes on products". And finally, the last row number 16 shows the imports.
- **Households:** The households' expenditures and incomes are gathered in column 21 and row 21 respectively.
- **Corporations:** The corporations do not constitute an institutional sector as such, but in the structure of the SAM system it plays a similar role. Thus, column and row number 22 allow registering the expenditures and incomes of the firms.
- **Non-Profit Institutions serving household (NPISH):** The regarding expenditures and incomes are recorded at column 23 and row 23, respectively.
- **Government:** The expenditure of the government is recorded at column 24, while its incomes at row 24. The cell (F25, C24) shows its balance item.
- **Gross Capital Formation:** As it is usual, we incorporate the assumption that there is an economic agent in charge of the investment. In that sense, column 25 records the investment in gross capital formation. Additionally, the "rest of the world" saving has been include. It represents the current transactions with the rest of the world balancing item. See cells (F25, C26) and (F25, C27).
- **Rest of the World**: In that case we have differentiated the following items. By rows, 26 and 27, we have included the goods and services exports and other current transactions included in the National Account. In that way, these columns record the income related with exports,

from the domestic economy point of view, and expenditures from the rest of the world sector. On the other hand, rows 26 and 27 record imports and other current transaction. They are expenditures from the domestic point of view and incomes from the rest of the world perspective. Moreover, the transactions of this sector have been divided up into European Union's countries and third countries.

Finally, a set of different operations have been considered for every one of these agents or institutions. Thus:

- Those from which the income due to work and capital is obtained: "employees' compensation", "employers' actual social contributions" and "net operating surplus".
- Those related with the income distribution in which the payment of net taxes and transfers are included. With regard to the taxes, besides the net taxes on products, it has been considered also the "income tax". In relation to the transfers, it is supposed agents pay and receive "social transfers" and pay "social contributions". Furthermore, the payments and receipts about "property income".
- Finally, it is important to take into account the next question. The ESA-95 included some adjustments related with the households' consumption expenditures. This fact is an additional difficulty in order to build a SAM. In this case, we have followed the convention adopted by Cardenete & Sancho (2004). Like these authors, the positive balance between abroad residents' consumption and non-residents' consumption get in our study, is considered as a transfer received from the rest of the world. So, it is as households may have an "extra-income". See cells (F21,C26) and (F21, C27).

6. CONCLUSION

So far we have developed a methodology that allows us transforming the valuation of the flows recorded in a symmetric input-output table valued at basic prices. Specifically, this method is based on a simple model that is upheld by the ESA-95 conventions. Once criteria have been defined, it has been possible to estimate a SIOT valued at producers' prices. However, it has been necessary to derive a use table valued both at purchasers' prices and at producers' prices before getting the SIOT at producers' prices.

On the other hand, this study illustrates that in some cases it is useful to change the valuation of the tables included in the input-output framework. For instance, in this work it is shown that a use table in purchasers' prices is a reasonable approximation for the VAT tax base. At the same time, this paper displays that a suitable valued SIOT facilitates the integration of a SAM into the AGEMS' conventional structure. In particular, a SAM built from a SIOT at producers' prices provides information regarding net taxes on products associated with every industry. This fact allows the tax parameters calibration, which would permit analyse the effects of certain public policies on the economic agents' behaviour.

Accordingly, it is indispensable that researchers could make valuation changes as those that this work has referred to. Nevertheless, we consider this possibility involves arranging additional demanding statistical information. At least, the former is true for Spain. For instance, the estimation of the net VAT has meant to compile some information about the different tax rates, since the current input-output framework does not give this sort of data. As a matter of fact, the ESA-95 suggests complement the supply and use table as well as the symmetric input-output table with two additional by product and by industry tables, one for trade and transport margins and the other on net taxes on product. With these new tables it was easier to transform the input-output tables' valuation. Otherwise, it is necessary to get external data base in order to dividing up the taxes.

Finally, we should indicate some limitations of our research:

- With regard to the VAT, the estimation of the gross capital formation's deductible VAT could be improved using additional information. In fact, there is not true that the VAT involved in the capital goods' purchases could always fully deductible.
- In relation to the valuation transformations, when we defined the same rate for different taxes grouping in the net taxes on products, we are supposing that they have the same nature and they are applied in the same way and at the same time. Obviously, it is not true, but this simplification is required if we aim to use the net taxes on products information in order to change the use table's flows valuation.
- In order to divide up the net taxes on products, we had to use the import taxes structure from the year 1994. Although, we have updated these data by RAS method, there might be some lack of precision in the product and industry aggregation. However, it is important to say that it is the last available information nowadays.
- From an economic point of view, the industry technology assumption is not the most recommendable hypothesis. As an alternative, it would be possible to estimate a SIOT using the product technology assumption. However, the former implies getting additional statistical information and solving some technical troubles.

Nevertheless, in general terms we consider that the results emerging from this research are a satisfactory approximation to the associated flows of the Spanish SAM corresponding to 2000. Considering this, we regard that the next action is to improve the current methodology and extend it to other analysis, for instance, to the table that connect COICOP products to CPA products. This possibility may allow us to divide up the households into different groups depending on the criteria chosen (income, studies…). The former would entail an important advance in the use of the AGEMS to study the distributive effects of certain public policies.

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FIGURES AND TABLES:

Figure 1: Use table at basic prices:

	Industries (NACE)	**Total Intermediate Demand**	Final Demand components	**Total Final Demand**	**Total Uses at basic prices**
Products (CPA)	z_{11}^{BP} z_{12}^{BP} … z_{1p}^{BP}	$\sum_j Z_{1j}^{BP}$	f_{11}^{BP} f_{12}^{BP} … f_{1h}^{BP}	$\sum_h F_{1h}^{BP}$	u_1^{BP}
	z_{21}^{BP} z_{22}^{BP} … z_{2p}^{BP}	$\sum_j Z_{2j}^{BP}$	f_{21}^{BP} f_{22}^{BP} … f_{2h}^{BP}	$\sum_h F_{2h}^{BP}$	u_2^{BP}
	Margins: z_{c1}^{BP} z_{c2}^{BP} … z_{cp}^{BP}	$\sum_j Z_{cj}^{BP}$	Margins: f_{c1}^{BP} f_{c2}^{BP} … f_{ch}^{BP}	$\sum_h F_{ch}^{BP}$	u_c^{BP}
	z_{t1}^{BP} z_{t2}^{BP} … z_{tp}^{BP}	$\sum_j Z_{tp}^{BP}$	f_{t1}^{BP} f_{t2}^{BP} … f_{th}^{BP}	$\sum_h F_{th}^{BP}$	u_t^{BP}
	. .	. .	. .		
	z_{n1}^{BP} z_{n2}^{BP} ... z_{np}^{BP}	$\sum_j Z_{nj}^{BP}$	f_{n1}^{BP} f_{n2}^{BP} … f_{nh}^{BP}	$\sum_h F_{nh}^{BP}$	u_n^{BP}
	Net Taxes on Products (NTOP) t_1^Z t_2^Z … t_p^Z		Net Taxes on Products (NTOP) t_1^F t_2^F … t_h^F		**Total NTOP** $\sum_{j=1}^{p} T_j^Z + \sum_{j=1}^{h} T_j^F$
	Value Added V_1 V_2 … V_p				
	Total Inputs at basic prices tin_1^{BP} tin_2^{BP} … tin_p^{BP}				

Figure 2: Supply table

	Industries (NACE)	**Total Domestic Supply**	Imports	**Total Supply at basic prices**	Trade and Transport Margins	Net taxes on products	**Total Supply at producers' prices**	**Total Supply at purchasers' prices**
Products (CPA)	x_{11}^{BP} x_{12}^{BP} ... x_{1p}^{BP}	$\sum_j x_{1j}^{BP}$	imp_1	s_1^{BP}	m_1	t_1	$s_1^{BP} + t_1$	$s_1^{BP} + t_1 + m_1$
	x_{21}^{BP} x_{22}^{BP} ... x_{2p}^{BP}	$\sum_j x_{2j}^{BP}$	imp_2	s_2^{BP}	m_2	t_2	$s_2^{BP} + t_2$	$s_2^{BP} + t_2 + m_2$
	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. .
	x_{n1}^{BP} x_{n2}^{BP} ... x_{np}^{BP}	$\sum_j x_{nj}^{BP}$	imp_n	s_n^{BP}	m_n	t_n	$s_n^{BP} + t_n$	$s_n^{BP} + t_n + m_n$
	Total Output at basic prices x_1^{BP} x_2^{BP} … x_p^{BP}					$\sum_{i=1}^{n} T_i$		

Figure 3: Symmetric Input-Output Table (SIOT) at basic prices

	Homogeneous Industries/Products	Final Demand components	**Total Uses at basic prices**
Products (CPA)	zS_{11}^{BP} zS_{12}^{BP} … zS_{1r}^{BP} zS_{21}^{BP} zS_{22}^{BP} … zS_{2r}^{BP}	f_{11}^{BP} f_{12}^{BP} … f_{1h}^{BP} f_{21}^{BP} f_{22}^{BP} … f_{2h}^{BP}	u_{1}^{BP} u_{2}^{BP}
	Margins: zS_{c1}^{BP} zS_{c2}^{BP} … zS_{cr}^{BP} zS_{t1}^{BP} zS_{t2}^{BP} … zS_{tr}^{BP}	Margins: f_{c1}^{BP} f_{c2}^{BP} … f_{ch}^{BP} f_{t1}^{BP} f_{t2}^{BP} … f_{th}^{BP}	u_{c}^{BP} u_{t}^{BP}
	. . zS_{r1}^{BP} zS_{r2}^{BP} … zS_{rr}^{BP}	f_{r1}^{BP} f_{r2}^{BP} … f_{rh}^{BP}	u_{r}^{BP}
	Net taxes on products tS_{1}^{Z} tS_{2}^{Z} … tS_{r}^{Z}	Net taxes on products t_{1}^{Z} t_{2}^{Z} … t_{h}^{Z}	
	Value Added VS_1 VS_2 … VS_r		
	Imports imp_1 imp_2 … imp_r		
	Total Supply/Output at basic prices s_{1}^{BP} s_{2}^{BP} … s_{r}^{BP}		

From use table
From supply table
Estimated by theoretical assumptions and/or supplementary statistical information

Figure 4: Description of the process followed for estimating the symmetric input-output table of 2000 at producers' prices and the VAT

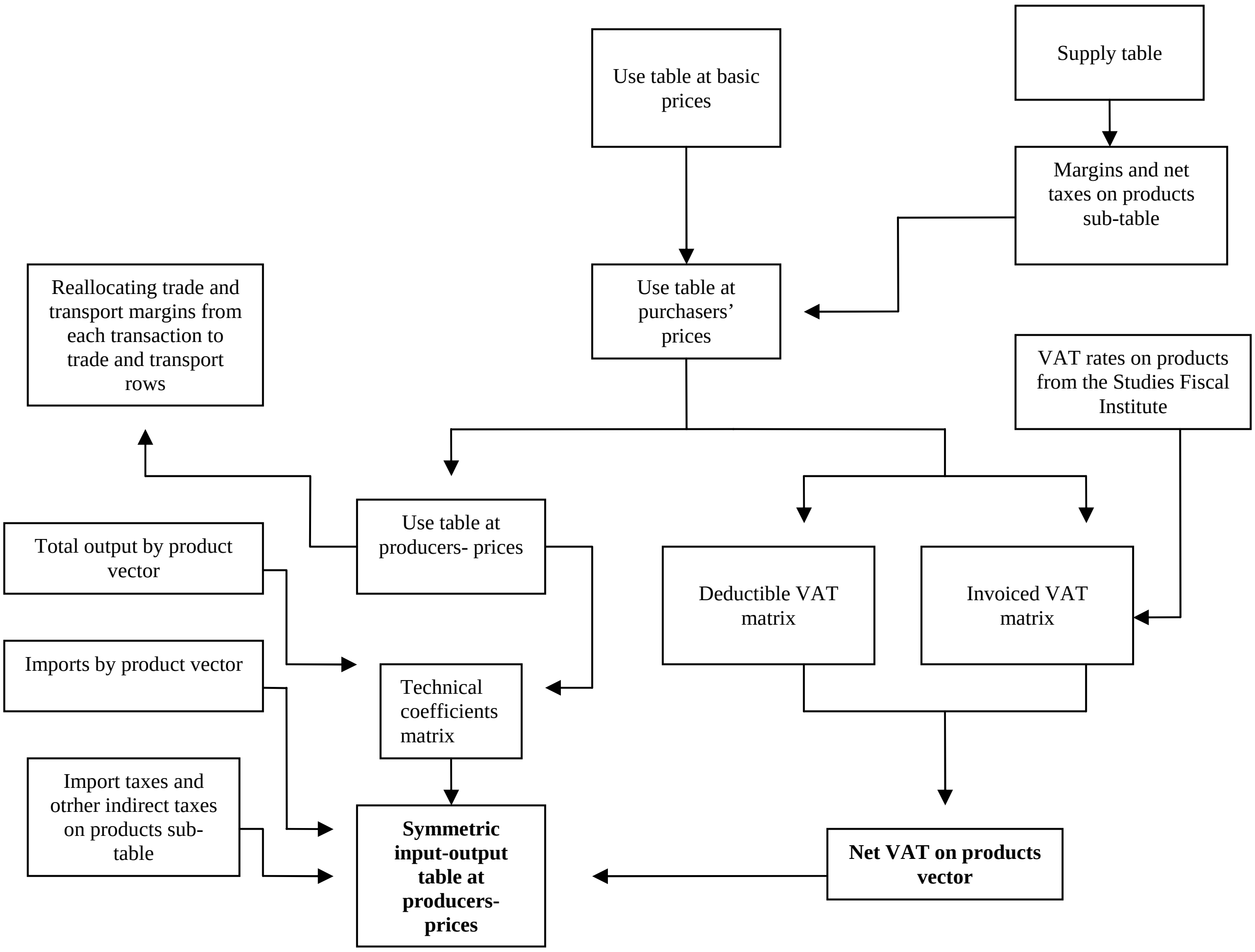

Figure 5: Use Table at purchasers' prices

	Industries (NACE)	**Intermediate Demand**	Final Demand components	**Total Final Demand**	**Total Uses at purchasers' prices**
Products (CNPA)	z_{11}^{PUP} z_{12}^{PUP} … z_{1p}^{PUP}	$\sum_j Z_{1j}^{PUP}$	f_{11}^{PUP} f_{12}^{PUP} … f_{1h}^{PUP}	$\sum_j F_{1j}^{PUP}$	u_1^{PUP}
	z_{21}^{PUP} z_{22}^{PUP} … z_{2p}^{PUP}	$\sum_j Z_{2j}^{PUP}$	f_{21}^{PUP} f_{22}^{PUP} … f_{2h}^{PUP}	$\sum_j F_{2j}^{PUP}$	u_2^{PUP}
	. . .		. . .		. . .
	z_{n1}^{PUP} z_{n2}^{PUP} … z_{np}^{PUP}	$\sum_j Z_{nj}^{PUP}$	f_{n1}^{PUP} f_{n2}^{PUP} … f_{nh}^{PUP}	$\sum_j F_{nj}^{PUP}$	u_n^{PUP}
	Value Added V_1 V_2 … V_p				
	Total Inputs at basic prices tin_1^{BP} tin_2^{BP} … tin_p^{BP}				

Figure 6: Not applicable VAT Products and Industries

Products (CPA)	Sectors (NACE)
- Electrical energy - Insurance and pension funding - Public Administration services - Non market research and development activities - Non market education services - Non market sanitation services - Non market health and social work services - Membership association, n.e.c. - Recreational, cultural and sporting services - Others services - Private household with employed persons	- Electricity production - Insurance and pension funding services - Public administration services - Non market education services - Non market sanitation services, NPISH - Non market health and social work services, NPISH. - Recreational, cultural services and sporting services, NPISH - Private household with employed persons

Source: Spanish Fiscal Studies Institute

Figure 7: Intermediate Consumption Deductions

The buyer / **The supplier**	Non-exempted	Exempted
Non-exempted	The invoiced VAT is caused. The deduction is produced	The invoiced VAT is caused. The deduction is not produced.
Exempted	The invoiced VAT is not caused.	The invoiced VAT is not caused.

Figure 8: Final Consumption Deductions

The buyer / **The supplier**	Households	NPISH	Government	Gross capital formation	Changes in inventories	Exports
Non-exempted product	Deduction is not allowed	Deduction is not allowed	Deduction is not allowed	Complete deduction is allowed	Complete deduction is allowed	A complete deduction is allowed
Exempted product	As invoiced is not caused, deduction is not calculated					

Figure 9: Use Table at producers' prices

	Industries (NACE)	Total Intermediate Demand	Final Demand components	**Total Final Demand**	**Total Uses at producers' prices**
Products (CPA)	z_{11}^{PSF} z_{12}^{PSF} … z_{1p}^{PSF}	$\sum_j Z_{1j}^{PSF}$	f_{11}^{PSF} f_{12}^{PSF} … f_{1h}^{PSF}	$\sum_j F_{1j}^{PSF}$	u_1^{PSF}
	z_{21}^{PSF} z_{22}^{PSF} … z_{2p}^{PSF}	$\sum_j Z_{2j}^{PSF}$	f_{21}^{PSF} f_{22}^{PSF} … f_{2h}^{PSF}	$\sum_j F_{2j}^{PSF}$	u_2^{PSF}
	.				
	Margins:		Margins:		
	z_{c1}^{PSF} z_{c2}^{PSF} … z_{cp}^{PSF}	$\sum_j Z_{cj}^{PSF}$	f_{c1}^{PSF} f_{c2}^{PSF} … f_{ch}^{PSF}	$\sum_j F_{cj}^{PSF}$	u_c^{PSF}
	z_{t1}^{PSF} z_{t2}^{PSF} … z_{tp}^{PSF}	$\sum_j Z_{tj}^{PSF}$	f_{t1}^{PSF} f_{t2}^{PSF} … f_{th}^{PSF}	$\sum_j F_{tj}^{PSF}$	u_t^{PSF}
	. .	. .	. .		. .
	z_{n1}^{PSF} z_{n2}^{PSF} ... z_{np}^{PSF}	$\sum_j Z_{nj}^{PSF}$	f_{n1}^{PSF} f_{n2}^{PSF} … f_{nh}^{PSF}	$\sum_j F_{nj}^{PSF}$	u_n^{PSF}
	Value Added: V_1 V_2 … V_p				
	Total Inputs at basic prices tin_1^{BP} tin_2^{BP} … tin_p^{BP}				

Figure n. 10. Use Table aggregated (*r*x*r*) at producers' prices

	Industries (NACE)	**Total Intermediate Demand**	Final Demand components	**Total Final Demand**	**Total Uses at producers' prices**
Products (CPA)	z_{11}^{PRP} z_{12}^{PRP} … z_{1r}^{PRP}	$\sum_j Z_{1j}^{PRP}$	f_{11}^{PRP} f_{12}^{PRP} … f_{1h}^{PRP}	$\sum_j F_{1j}^{PRP}$	u_1^{PRP}
	z_{21}^{PRP} z_{22}^{PRP} … z_{2r}^{PRP}	$\sum_j Z_{2j}^{PRP}$	f_{21}^{PRP} f_{22}^{PRP} … f_{2h}^{PRP}	$\sum_j F_{2j}^{PRP}$	u_2^{PRP}
	Margins:		Margins:		
	z_{c1}^{PRP} z_{c2}^{PRP} … z_{cr}^{PRP}	$\sum_j Z_{cj}^{PRP}$	f_{c1}^{PRP} f_{c2}^{PRP} … f_{ch}^{PRP}	$\sum_j F_{cj}^{PRP}$	u_c^{PRP}
	z_{t1}^{PRP} z_{t2}^{PRP} … z_{tr}^{PRP}	$\sum_j Z_{tj}^{PRP}$	f_{t1}^{PRP} f_{t2}^{PRP} … f_{th}^{PRP}	$\sum_j F_{tj}^{PRP}$	u_t^{PRP}
	. .	. . .	. .		. .
	z_{r1}^{PRP} z_{r2}^{PRP} ... z_{rr}^{PRP}	$\sum_j Z_{rj}^{PRP}$	f_{r1}^{PRP} f_{r2}^{PRP} … f_{rh}^{PRP}	$\sum_j F_{rj}^{PRP}$	u_r^{PRP}
	Value Added: V_1 V_2 … V_r				
	Total Inputs at basic prices tin_1^{BP} tin_2^{BP} … tin_p^{BP}				
	Other net taxes on products: t_1^p t_2^p … t_r^p				
	Net import taxes: t_1^{imp} t_2^{imp} … t_r^{imp}				
	VAT: vat_1^{NET} vat_2^{NET} … vat_r^{NET}				
	Total Inputs at producers' prices tin_1^{PRP} tin_2^{PRP} … tin_p^{PRP}				

Decomposition from NTOP column vector *t*, supply table

Figure 11: Schedule of the Symmetric Input-Output Table at producers' prices

	Homogeneous branches (NACE)	**Final Demand components**	**Total Uses producers' prices**
Products (CPA)	zS_{11}^{PRP} zS_{12}^{PRP} … zS_{1r}^{PRP} zS_{21}^{PRP} zS_{22}^{PRP} … zS_{2r}^{PRP} .	F_{11}^{PRP} F_{12}^{PRP} … F_{1h}^{PRP} F_{21}^{PRP} F_{22}^{PRP} … F_{2h}^{PRP}	u_1^{PRP} u_2^{PRP}
	Margins: zS_{c1}^{PRP} zS_{c2}^{PRP} … zS_{cr}^{PRP} zS_{t1}^{PRP} zS_{t2}^{PRP} … zS_{tr}^{PRP}	Margins: F_{c1}^{PRP} F_{c2}^{PRP} … F_{ch}^{PRP} F_{t1}^{PRP} F_{t2}^{PRP} … F_{th}^{PRP}	u_c^{PRP} u_t^{PRP}
	zS_{r1}^{PRP} zS_{r2}^{PRP} ... zS_{rr}^{PRP}	. . F_{r1}^{PRP} F_{r1}^{PRP} … F_{rh}^{PRP}	. . u_r^{PRP}
	Value Added VS_1 VS_2 … VS_r		
	Other net taxes on products tS_1^p tS_2^p … tS_r^p		
	Net imports taxes tS_1^{imp} tS_2^{imp} … tS_r^{imp}		
	Imports imp_1 imp_2 … imp_r		
	VAT vat_1^{NET} vat_2^{NET} … vat_r^{NET}		
	Total Supply at producers' prices s_1^{PRP} s_2^{PRP} **…** s_r^{PRP}		

Figure 12: Social Accounting Matrix Structure for Spain, year 2000

	Industries	Work	Net operating surplus	Net taxes on domestic output	Net import taxes	VAT on products	Property income	Income tax	Social contributions
Industries	Intermediate consumption								
Work	Compensation of employees								
Net operating surplus	Compensation of capital								
Net taxes on domestic output	Net taxes on domestic output								
Net import taxes	Net import taxes								
VAT on products	VAT on products								
Property income									
Income tax									
Social contributions									
Social transfers									
Households		Total compensation of employees	Household Surplus				Household income		Social contributions received
Corporations			Corporation Surplus				Corporations income		Social contributions received
NPISH			NPISH Surplus				NPISH income		
Government			Government Surplus	Tax income	Tax income	Tax income	Government income	Tax income	Social contributions received
Savings									
Rest of the World	Imports						Rest of the World income	Tax income	Social contributions income
	Total Supply	**Total employees' compensation payment**	**Total capital's compensation payment**	**Total net taxes on domestic output payment**	**Total net import taxes payment**	**Total VAT payment**	**Total property income payment**	**Total income tax payment**	**Total Social contribution payment**

(Continuation Figure 12)

	Social transfers	Households	Corporations	NPISH	Government	Savings/Investment	Rest of the World	
Industries		Final consumption expenditure		Final consumption expenditure	Final consumption expenditure	Gross capital formation	Exports	**Total uses**
Work								**Total employees' compensation**
Net operating surplus								**Total capital income**
Net taxes on domestic output								**Total net taxes on domestic output**
Net import taxes								**Total net import taxes**
VAT on products								**Total VAT**
Property income		Income paid	Income paid	Income paid	Income paid		Income paid	**Total property income payment**
Income tax		Taxes' payment	Taxes' payment				Taxes' payment	**Total income tax payment**
Social contributions		Social contributions paid					Social contributions paid	**Total social contribution payment**
Social transfers		Transfers' payment	Transfers' payment	Transfers' payment	Transfers' payment		Transfers' payment	**Total social transfer payment**
Households	Transfers received							**Total households' income**
Corporations	Transfers received							**Total corporations' income**
NPISH	Transfers received							**Total NPISH's income**
Government	Transfers received							**Total government's income**
Savings		Household savings	Corporations savings	NPISH savings	Public saving			**Total savings**
Rest of the World	Transfers received						Balance of the rest of the World	**Total imports**
	Total transfers payments	**Total households' expenditure**	**Total corporations' payment**	**Total NPISH's expenditure**	**Total government's payment**	**Investment**	**Total exports**	

Table 1: Social Accounting Matrix for Spain, year 2000
(Millions Euro)

	Homogeneous branches								Primary Input				Net taxes on products			
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**	**C16**
F1	2854,19	21078,85	0,25	449,61	1884,77	3,06	1,74	289,19								
F2	9709,38	174051,50	7820,72	32735,63	35174,43	1668,16	7810,65	14806,12								
F3	720,74	7368,09	2293,04	352,25	3628,21	250,07	1089,50	2519,43								
F4	191,25	957,93	240,52	15580,89	2141,81	162,39	11702,06	1871,20								
F5	2612,14	28056,12	245,61	8062,78	25143,61	870,65	3327,25	3899,89								
F6	78,13	2668,80	196,64	535,46	1963,21	4370,24	3147,11	2775,16								
F7	538,42	23576,62	1312,82	7606,62	19557,46	2493,79	42482,50	11010,42								
F8	278,53	1405,82	85,41	278,12	1347,72	211,91	1919,10	5814,31								
F9	3487,52	52159,74	2327,44	25388,62	48942,47	3773,20	32644,05	71836,96								
F10	458,07	15326,48	813,14	6504,65	12334,23	1721,76	9680,91	18784,76								
F11	-758,98	-492,55	200,76	544,57	375,89	117,61	3330,31	232,40								
F12	15700,70	34268,61	8896,15	15784,10	82142,30	6903,07	55460,11	22546,96								
F13	-2853,68	19641,94	1663,38	5684,83	-1616,10	274,20	1863,06	-1145,64								
F14	0,07	14,23	0,26	15,79	0,67	0,14	0,36	0,00								
F15	1,01	53,35	0,72	0,00	9,33	0,41	5,66	0,00								
F16	675,70	14934,97	245,54	468,78	7031,60	1168,55	7714,92	3250,94								
F17																
F18																
F19																
F20																
F21									240463,00	65566,00		126224,00				
F22												105805,00				
F23												226,00				
F24											4530,00	9447,00	24059,00	31,52	70,48	35491,00
F25																
F26	2793,20	106256,80	116,00	4,00	3154,00	522,00	9230,00	832,00		13,00						
F27	3347,90	57851,90	2,20	5,00	2134,00	290,00	5187,00	1218,00	130,00	45,00						
TOTAL	**39834,30**	**559179,20**	**26460,60**	**120001,70**	**245349,60**	**24801,20**	**196596,30**	**160542,10**	**240593,00**	**65624,00**	**4530,00**	**241702,00**	**24059,00**	**31,52**	**70,48**	**35491,00**

(Continuation Table 1)

	Income distributive transactions				Institutions				Savings/Investments	Rest of the World		
	C17	**C18**	**C19**	**C20**	**C21**	**C22**	**C23**	**C24**	**C25**	**C26**	**C27**	**TOTAL**
F1					6070,81		0,00	0,00	375,50	5939,17	887,16	**39834,30**
F2					109921,18		0,00	4713,50	47910,90	79616,05	33240,97	**559179,20**
F3					8035,87		0,00	0,00	76,35	27,04	100,01	**26460,60**
F4					3073,28		0,00	0,00	84072,84	2,84	4,70	**120001,70**
F5					149204,39		0,00	3340,59	2950,26	11516,44	6119,89	**245349,60**
F6					8345,51		0,00	0,00	0,00	539,26	181,67	**24801,20**
F7					53661,84		0,00	1347,56	20440,91	7680,45	4886,89	**196596,30**
F8					45048,12		4300,00	98378,35	786,25	326,76	361,70	**160542,10**
F9										33,00		**240593,00**
F10												**65624,00**
F11										980,00		**4530,00**
F12												**241702,00**
F13										547,00		**24059,00**
F14												**31,52**
F15												**70,48**
F16												**35491,00**
F17					15480,00	98219,00	67,00	20327,00			1270,00	**135363,00**
F18					43753,00	20022,00				71,00	10,00	**63856,00**
F19					91136,00					131,00	75,00	**91342,00**
F20					36118,00	29725,00	1087,00	154330,00			78,00	**221338,00**
F21	29266,00		97,00	122679,00						24703,00	3329,00	**612327,00**
F22	89846,00		10085,00	16526,00								**222262,00**
F23	154,00			5479,00								**5859,00**
F24	6478,00	63856,00	81160,00	76420,00								**301543,00**
F25					42479,00	74296,00	405,00	19106,00		661,00	19666,00	**156613,00**
F26	9619,00			234,00								**132774,00**
F27												**70211,00**
TOTAL	**135363,00**	**63856,00**	**91342,00**	**221338,00**	**612327,00**	**222262,00**	**5859,00**	**301543,00**	**156613,00**	**132774,00**	**70211,00**	