

A new Social Accounting Matrix for Spain with investment disaggregated by capital goods^(*)

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Abstract

The aim of this paper is to provide researchers in applied economics with a new approximation to an accurate and disaggregated Social Accounting Matrix for Spain in 2000 (SAMES-00). The SAMES-00 is consistent with Input-Output tables and National Accounts. It includes unpublished information kindly provided by the Spanish National Statistics office (INE) on taxes and subsidies that is very useful to evaluate the impact of tax reforms with SAM and AGE/CGE (Applied/Computable General Equilibrium) models. Additionally, this is the first SAM that presents investment disaggregated by capital goods based on the data of the Gross Fixed Capital Formation (GFCF) Matrix elaborated by the INE.

Keywords: Social Accounting Matrix, National Accounts

JEL Classification: D57, D58

AMS Classification: 91B82

Una nueva matriz de contabilidad social para España con la inversión desagregada en bienes de capital

Resumen

El objetivo de este trabajo es suministrar a los investigadores en economía aplicada una nueva aproximación a una matriz de contabilidad social para España en el año 2000 (SAMES-00) precisa y desagregada. La SAMES-00 es coherente

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con las Tablas Input Output y con la Contabilidad Nacional. Esta matriz incluye información no publicada amablemente suministrada por el Instituto Nacional de Estadística (INE) sobre impuestos y subvenciones que es muy útil para evaluar el impacto de reformas fiscales con modelos SAM of MEGAs (Modelos de Equilibrio General Aplicado). Además, esta es la primera SAM que presenta la inversión desagregada por bienes de capital al utilizar la información incluida en la matriz de Formación Bruta de Capital Fijo elaborada por el INE.

Palabras clave: Matriz de Contabilidad Social, Cuentas Nacionales

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1. Introduction

A Social Accounting Matrix (SAM) can be defined as a double entry table that reflects the circular flow of income of an economy during a given period of time. Each row of a SAM shows the incomes accruing to an account from all accounts in the system and the corresponding column the expenditures of that account. A SAM can be viewed as a natural integration of input-output (I-O) tables into the national accounts framework.

The pioneering works of Meade and Stone (1944) and Stone (1947, 1956) set up the basis of the *Standardized System of National Accounts* published by the United Nations in 1953 and its revised 1957 version. Stone (1959) is also credited for developing the concept of social accounts, an efficient and transparent way to present national accounts as a double entry square table. In his report *Input-Output and National Accounts*, Stone (1961) completed the subdivision of national accounts on an industry basis to integrate IO tables into national accounting. All of these advances were incorporated into *A System of National Accounts*, United Nations (1968).

Since 1985 there has been an increasingly growing interest in the construction of social matrices in Spain, both for regional and national economies. Besides providing a consistent picture of the structure of an economy, SAMs are used in computable general equilibrium (CGE) models, which evaluate the impacts of economic shocks. The main objective of this paper is to provide applied economics researchers with a new approximation to a disaggregated SAM for Spain in 2000 (SAMES-00) that should be very useful to elaborate SAM and CGE models. This matrix incorporates disaggregated tax data and other detailed data on public and private investment obtained from the gross fixed capital formation matrix elaborated by the Spanish national statistics office (INE) and other information provided by the INE. In the SAMES-00, nonresident consumption from the European Union (EU) and the rest of the world (ROW) are detailed by consumption commodities and public and private investment are disaggregated by capital goods. Consumption commodities are subject to value added tax rates, as are public investment and residential private investment. The availability of new disaggregated data makes it possible to improve the mechanisms of estimation of the SAM and should lead to more accurate CGE model results

The rest of the paper is divided in three Sections. The main characteristic of previous SAMs elaborated for Spain and the most recent ones for 2000 are presented in Section 2. The procedure used to elaborate the SAMES-00 is fully described in Section 3. Finally, Section 4 provides some concluding remarks.

2. A short review of other SAMs for Spain

The first SAM for the Spanish economy was elaborated by Kehoe *et al.* (1988) for the year 1980. This matrix was used to specify a CGE model developed by Kehoe *et al.* (1989) to estimate the effects of the introduction of the value added tax (VAT) when Spain joined the European Community in 1986. A somewhat simpler square version of the matrix was used by Polo, Roland-Holst and Sancho (1990). Polo and Sancho (1993a, 1993b) updated the 1980 matrix to 1987, and Uriel *et al.* (1997) constructed a new SAM for 1990, which was later disaggregated and improved by Fernández and Polo (2001).

2.1 The ESA-95 framework

More recent SAMs for Spain have been constructed following the guidelines set in the *European System Accounts 1995* (ESA-95). In the ESA-95, the I-O framework provides information on how available commodities (distinguished by origin) are produced and used by different sectors (heterogeneous or homogeneous) to satisfy intermediate and final demands. It includes three separate matrices: the Supply table, the Use table and the Symmetric I-O table.

The Supply table published by the National Institute of Statistics (INE) reports the amounts of different commodities produced by each sector valued at basic prices. It also includes three columns for transport margins, trade margins and net taxes on products and possibly several additional columns (one for each trading area, the EU and the ROW) to account for equivalent imports. The Use table resembles a standard I-O table and includes arrays of intermediate transactions, primary factors and final demand. It indicates how commodities (distinguished by origin), labor and capital are used by economic sectors or final demand operations. Finally, the Symmetric I-O table provides the same information as the Use table for homogeneous (non-observed) sectors.

A SAM closes the circular flow of income by allocating incomes generated in production among institutional sectors (households, businesses, government and external sectors). They use income to pay taxes and finance current expenditures or the accumulation of capital. An important drawback for researchers that use the ESA-95 I-O framework to build up a SAM is that the framework published by the INE only provides a figure for taxes net of subsidies on products. This is a serious drawback for researches interested in simulating fiscal policies.

Most matrices constructed for the Spanish economy (Kehoe *et al.*, 1988; Polo, Roland-Holst and Sancho, 1990; and Fernández and Polo, 2001) in the 1990s present a satisfactory disaggregation of taxes, subsidies and transfers. However, some matrices built up in the last decade either overlook this problem (see, the 1995 SAM of Uriel,

Ferri and Molto, 2005) or use some *ad hoc* procedures (see, the 1995 SAM of Cardenete and Sancho, 2005) to disaggregate taxes on products among VAT, import tariffs and other taxes on products.

2.2 Recent social accounting matrices for 2000

The development of SAMs has gone hand-in-hand with the development of general equilibrium models. Since most matrices have been constructed with the intention to be used to specify SAM models and CGE models, their structure is typically designed to fit particular research objectives (United Nations, 1993). This is also true in the Spanish case where several SAMs with very different characteristics and scopes have been constructed recently for the year 2000.

Lucena and Serrano (2006)

The SAM constructed by Lucena and Serrano (2006) for Spain in 2000 is a 32-by-32 square matrix. It includes 14 productive sectors, 2 primary factors (labor and capital), 8 types of taxes (social contributions of employers and employees, Other net taxes on production, VAT, Tariffs on imports from the EU and other countries, Other net taxes on products and Income tax), 2 types of transfers (Social and Other transfers), 3 institutional sectors (a representative household, the corporate sector and government), the capital account and 2 foreign sectors.

Their goal was to establish a standard procedure to transform flows valued at basic prices into purchasers and producers' prices when a Symmetric I-O table is not available and to disaggregate taxes on products. As to the first task, they calculate rates for other taxes on products by dividing the column of these taxes included in the Supply table by the column of total production at basic prices also included in the Supply table. A Use table at producers' prices is obtained when all transactions registered in this table at basic prices are multiplied by the aforementioned rates. Transport and trade margins are included as intermediate consumption in the corresponding sectors. Finally, the Symmetric I-O table is constructed using the "industry-technology assumption". Regarding the second task, they obtain VAT rates using the information provided by BADESPE, a fiscal data base elaborated by the Institute of Fiscal Studies,¹ and estimate non-deductible VAT. Tariffs on EU and other countries' imports are estimated using the information of the official 1994 I-O table, as in Cardenete and Sancho (2005). Those estimates are adjusted to fit national accounts figures using a biproportional adjustment technique. Finally, the figures corresponding to Other net taxes on products are calculated as a residual.

In the end, there are discrepancies among the figures in Lucena and Serrano's SAM and national accounts that are likely due to the authors used of provisional data and/or to the adjustments carried out in the construction procedure.

¹ The Institute of Fiscal Studies is an organism dependent of the Ministry of Economics and the Treasury.

Rubio and Perdiz (2009)

Rubio and Perdiz (2009) built a SAM in order to analyze the distributional effects of final demand shocks. Theirs is a highly detailed square matrix with 104 accounts. It follows quite closely the ESA-95 and provides a detailed view of production, income generation, income (distinguishing primary and secondary) distribution and the way disposable income is used. It includes 18 productive sectors and 24 produced commodities; primary income is subdivided into 8 types of labor, 4 categories of the gross operating surplus and 6 categories of self-employed gross mixed income and social contributions by employers. However, taxes and subsidies on products are presented as net of subsidies and not disaggregated among VAT, tariffs and other taxes on products.

The authors, however, pay great attention to the distribution of primary income among 25 representative households grouped into five quintiles for each source of income: employees, self-employees, property income, retired and recipients of other current transfers. It also includes one account each for the government, corporations, non-profit organizations and the rest of the world. However, the secondary distribution of income account considers only one representative household and transfers among the four agents (household, corporations, government and the rest of the world) are in net terms. The matrix includes also four accounts to register accumulation transaction flows and four more for the acquisition of non-financial assets accounts. The authors pay great attention to the allocation of primary income among households. Their effort is, however, to some extent blurred by their use of a single representative household and the lack of attention to a disaggregation of taxes.

Cardenete and Fuentes (2009)

Cardenete and Fuentes (2009) provide a straightforward extension of the 2000 Symmetric I-O table with 39 accounts included in the SAM of which 27 are productive sectors. The other accounts are: labor and capital, households, government, the capital account, six types of taxes (social contributions of employers, value added, tariffs, other indirect taxes, social contributions of employees and an income tax) and the rest of the world.

Taking as their starting point the Symmetric I-O table at basic prices elaborated by the INE, Cardenete and Fuentes aggregate the 73 homogeneous sectors into 27 production sectors and disaggregate compensation of employees into wages and salaries and social security contributions of employers using ratios drawn from the Use table. This procedure does not guarantee that total wages and salaries and contributions equal the totals reported in the national accounts. As to the social contributions paid by households, the authors do not indicate whether they include contributions of the self-employed, unemployed, or those paid from/to the foreign sector.

3. Structure of the SAMES-00

Although there are several SAMs of the Spanish economy for 2000, none of them seems appropriate for evaluating the impacts of tax reforms, such as those recently

implemented by the Spanish Government and/or the impact of residential/non residential investment. Some of them value flows at basic prices and others present an incomplete disaggregation of taxes. Moreover, none of them disaggregates private and public investment by commodities and capital goods.

The new SAM (SAMES-00) is based on the I-O framework that was elaborated by the INE following the ESA-95 guidelines. An interesting feature of SAMES-00 is that it incorporates unpublished information kindly provided by INE officers in charge of National Accounts. Hence, it is consistent with both I-O and available National accounts data. The additional information includes sectoral taxes and subsidies on products, a gross fixed capital formation matrix disaggregated by commodities and sectors and vectors of non-residents consumption for the EU and ROW.

SAMES-00 is a 128-by-128 balanced square matrix valued at purchasers' prices. It includes 30 production sectors and 30 total supply sectors, 2 primary factors (labor and capital), 30 consumption goods, 6 private and 6 public capital goods, a representative household, the corporate sector, the government, 2 non-resident consumers (EU and ROW), 2 foreign sectors (EU and ROW) and some auxiliary transfer, tax and subsidy accounts. The block structure of SAMES-00 appears in Figure 1. Numbers in parenthesis indicate the number of accounts included in each block, and shadowed cells indicate matrices that have been adjusted from published or unpublished National Accounts data.

Productive sectors (30)

There are 30 productive sectors. Table 1 shows the correspondences between SAMES-00 accounts, I-O Supply and Use tables and National Accounts CNAE-93 classification of economic activities.

Figure 2.1

Structure of SAMES-00

(Continue)

	<i>Production</i> (30)	<i>Total supply</i> (30)	<i>Consumption commodities and services</i> (30)	<i>Primary factors</i> (2)	<i>Auxiliary accounts</i> (15)	<i>Institutions</i> (5)	<i>Capital account</i> (1)	<i>Private capital goods</i> (7)	<i>Public capital goods</i> (6)	<i>Foreign sectors</i> (2)
Production		Production net of subsidies			Other subsidies on production and Other subsidies on products					
Total supply	Intermediate consumption		Consumption net of VAT					Private gross fixed capital	Public gross fixed capital	Exports
Consumption commodities and services						Residents and non-residents consumption				
Primary factors	Labor and capital income									Labor and capital income
Auxiliary accounts	Contributions, Other taxes on production and Other taxes on products	Import taxes	Value added tax			Taxes and current transfers		Value added tax	Value added tax	Taxes and transfers received

Figure 2.1

Structure of SAMES-00

(Continue)

	<i>Production</i>	<i>Total supply</i>	<i>Consumption commodities and services</i>	<i>Primary factors</i>	<i>Auxiliary accounts</i>	<i>Institutions</i>	<i>Capital account</i>	<i>Private capital goods</i>	<i>Public capital goods</i>	<i>Foreign sectors</i>
	(30)	(30)	(30)	(2)	(15)	(5)	(1)	(7)	(6)	(2)
Institutions				Residents labor and capital income	Current Transfers					Current transfers
Capital account						Resident institutions savings				Non-residents savings
Private capital goods							Private investment in capital goods			
Public capital goods							Public investment in capital goods			
Foreign sectors		Imports		Non-residents income	Taxes and transfers paid to foreigners					

Table 1

Correspondences between SAM accounts and National Accounts classifications

(Continue)

<i>SAMES-00</i>	<i>Symmetric I-O table</i>	<i>Supply table</i>	CNAE-93
1 Agriculture, hunting and forestry exploitation, Fishing and aquaculture	1,2, 3	1-5	01,02, 05
2 Extraction of other mining and quarrying	6,7	9-11	13,14
3 Extraction of energy products of coke, refined petroleum products and nuclear fuel	4,5,8	6-8, 12	10-12, 23
4 Electricity, gas and water	9-11	13-15	401-403,41
5 Food, beverages and tobacco	12-16	16- 23	151,155,152-154,156-158, 159,16
6 Textile and dressing	17,18	24,25	17,18
7 Leather products	19	26,27	19
8 Wood	20	28	20
9 Paper, publishing and printing	21,22	29-31	21,22
10 Chemical industry, rubber and plastic products	23,24	32-37	24,25
11 Non-metallic mineral products	25-28	38-41	265,261,262-264,266-,268
12 Metallurgy and metal products	29,30	42,43	27,28
13 Mechanical machinery and equipment	31	44-46	29
14 Manufacture of electrical machinery, electronic material and precision instruments	32-35	47-51	30-33
15 Manufacture of vehicles and other transport material	36,37	52-57	34,35
16 Other manufacturing industries	38,39	58-60	36,37
17 Construction	40	61-64	45
18 Wholesale trade and retail trade	41-43	65-68	50-52
19 Accommodation and catering	44,45	69,70	55.1-55.5
20 Transport and communications	46-52	71-82	601-603,61,62,63.1-63.4,64
21 Financial intermediation	53-55	83-85	65-67
22 Real estate activities	56- 60	86-99	70- 74
23 Market Education	61	101	80(P)
24 Market Healthcare and Social services	62	103,105,106,	85(P)

Table 1

Correspondences between SAM accounts and National Accounts classifications

SAMES-00	Symmetric I-O table	Supply table	(Conclusion)
			CNAE-93
25 Other activities and associative market services	63-66	108,110,112, 114,116	90(P)91(P)92(P) 93
26 Households which employ household personnel	73	118	95
27 Public Administration	67	100	75
28 Non market Education	68	102	80(P)
29 Non market healthcare and Social services	69	104,107	85(P)
30 Other activities and associative non market services	70-72	109,111,113, 115	90(P)91(P)92(P)

Source: Input-Output ESA-95 framework (INE).

Revenues are accrued by institutions (subsidies) and sales to total supply. They are used to pay for taxes (social security contributions, Other taxes on production and Other taxes on products), intermediate purchases and primary factors' income. Gross capital income figures in the SAM coincide with the corresponding values in the Symmetric I-O table. In the case of labor, the Symmetric I-O table provides for each sector only the compensation to employees, a figure that includes wages and salaries and social security contributions paid by employers and employees.²

In the Symmetric I-O table published by the INE, intermediate consumption flows are valued at basic prices. The following adjustments have been made to obtain the intermediate matrix of SAMES-00 at purchasers' prices. First, net taxes on products (associated with intermediate consumption) in the Symmetric I-O table have been allocated to value intermediate consumptions at purchasers' prices using the cross entropy method of Robinson, Cattaneo and El-Said (2000).³ In the resulting matrix, taxes on products associated with total intermediate consumption are distributed across columns in order to include in every cell the taxes paid by each industry for the intermediate consumption of every specific commodity/service.⁴ However, in the transformation from basic prices to purchasers' prices, trade and transportation margins are also distributed across columns and included as part of intermediate and final

² The procedure to calculate wages and salaries net of contributions is explained in the section entitled *Auxiliary accounts*.

³ Starting with the intermediate matrix at basic prices, the cross entropy method is applied imposing two restrictions. One: The total of the columns of the matrix at purchasers' prices has to be equal to the sum of the total of the columns at basic prices plus net taxes on products associated to intermediate inputs. Two: The sum of the figures in any row of the table at purchasers' prices has to be equal to intermediate demand in the Use table at purchasers' prices. The cross entropy method minimizes the difference between the figures in the initial and final tables subject to the aforementioned restrictions.

⁴ Taxes net of subsidies in the symmetry IO table at basic prices are those associated to the industries total intermediate consumption of the different commodities/services used in the production process.

demand of all industries. Final demand, as it is described in what follows, is valued at purchasers' prices, but the trade and transport margins associated with final demand are not included as production in the new symmetric I-O table. Additionally, there is no reason why the aggregation of the margins included across the columns of this new Symmetric I-O table (plus those of final demand) must match the aggregation of the margins included in the cells across rows. Hence, trade and transportation margins in the Supply table are introduced in the resulting matrix of the cross entropy program as intermediate consumption. These margins are allocated to the corresponding rows of trade and transport sectors⁵ in the intermediate matrix as part of the output of these industries.⁶ Next, the small intermediate flows corresponding to NPISH have been aggregated with those of the general public administration sector. Finally, the 74 sectors are aggregated into the 30 accounts of SAMES-00.

Total supply (30)

There are 30 total supply sectors. Revenues come from purchases of intermediate commodities by production sectors, consumption commodities, private and public capital goods accounts and exports to the EU and ROW. The matrices identified in Figure 1 as Consumption and Private and Public gross fixed capital formation have entries that are net of value added taxes. Although most private capital goods do not bear value added, residential investment does.

Consumption commodities and services (30)

The 30 consumption accounts draw revenues from institutions, resident and nonresident consumers and the Government. These revenues pay for acquiring the consumed commodities and services provided by total supply accounts as well as for the value added tax borne by these commodities and services⁷. The cross tabulation of consumption commodities and services with total supply accounts in Table 1 is a 30-by-30 matrix.

Auxiliary accounts (15)

SAMES-00 has 15 auxiliary accounts for taxes (contributions of employers, employees and self-employed, income and corporate tax, Other taxes on production, VAT, tariffs and Other taxes on products) subsidies (on production and on products) and transfers

⁵ The new estimated Symmetric I-O table presents certain limitations because of the double accounting of trade and transport margins. First, these margins are distributed across columns so that industries receive the margins associated with the commodity/service they produce and that is demanded by other industries. Later they send these margins to the corresponding industries of trade and transportation. This double accounting raises total output. This problem could have been avoided by constructing a Symmetric table at producer prices, where trade and transportation margins are not distributed across columns. Unfortunately, data of intermediate demand at producer prices requested to elaborate the cross entropy program are not available.

⁶ The main idea is that the aggregation of intermediate demand and final demand, both at purchasers' prices, equals total supply derived from the aggregation of intermediate consumption (which includes taxes on production associated to intermediate inputs and margins on trade and transport), value added (at basic prices), taxes on products net of subsidies (obtained from the Supply table and disaggregated into VAT, tariffs and Other taxes on products as mention in the previous section) and imports

⁷ The presentation of consumption commodities and services as a diagonal matrix with figures net of VAT facilitates the construction of CGE models where only final consumption is taxed with VAT.

(property income, capital gains (losses) in pension funds, unemployment benefits, other social transfers, other current transfers). Tax revenues paid by institutions and production sectors are allocated to resident institutions (government) and foreign sectors. Subsidies are revenues for production sectors and expenditures for institutions. Finally, transfers redistribute rents among institutions.

An effort has been made to disaggregate as two items the various taxes and subsidies on production and products that appear aggregated in the Symmetric I-O table and Supply table, respectively, Other net taxes on production and Other net taxes on products. The task of disentangling taxes from subsidies and different types of taxes was accomplished via the unpublished information kindly provided by the INE.

1. Other taxes (OTP) and subsidies (SBOTP) on production: The INE provided separate figures for 36 sectors of the Supply table. The problem is that the net values did not coincide with the corresponding ones in the Symmetric I-O table, although differences were relatively small. Biproportional adjustment methods were used to eliminate the discrepancies.
2. Value added tax (VAT) and tariffs on imports: The INE provided figures for 60 sectors of the Use table. For tariffs, the figures were assigned to imports from the ROW.
3. Other taxes (OTPR) and subsidies (SBOTPR) on products⁸ are basically excise taxes on energy products, alcohol and tobacco. As in the other cases, the INE supplied separate data for each of the 60 sectors of the Use table.
4. Income tax (DIRTAX) paid by households and the corporate sector were taken from National Accounts.
5. In the SAMES-00 both employers and employees' contributions appear disaggregated by sector. The contributions of employers have been calculated using the proportions obtained from the Use table and have been applied to the Symmetric I-O totals. These intermediate figures have been adjusted using the RAS algorithm to fit the row sums to the values of total contributions by employers and gross wages paid by all sectors and the column totals to the compensation of employees of each sector.

⁸ The Symmetric I-O table and final demand are valued at purchasers' prices. Consequently every industry collects taxes on products associated to the homogenous commodity/service they produce. They send these taxes to the account of Other taxes on products in the SAMES-00. These tax revenues are later distributed between the Government and the EU account.

Table 2

Social contributions by type received from residents sectors (in million euro)			
	<i>Actual</i>	<i>Imputed</i>	<i>Total</i>
Employers contributions	56,790	9,997	66,787
Non-financial corporations	410	3,841	4,251
Financial corporations	1,743	572	2,315
General government	54,637	5,301	59,938
NPISH		17	
Households		266	266
Employees contributions	13,577		13,577
Non-financial corporations	235		235
Financial corporations	1,218		1,218
General government	12,124		12,124
Self-employed and unemployed	10,330		10,330
Financial corporations	1,246		1,246
General government	9,084		9,084
Self-employed	6,985		6,985
Unemployed	2,099		2,099

Source: Contributions by type and sector of destination. An nex table: National Accounts (INE)

- 6 The allocation of social security (SS) contributions among resident and nonresident institutions was effected using National Accounts. Table 2 indicates the actual and imputed contributions received by resident institutions. Table 3 sums up that information in a double entry table that shows how contributions by type (employers, employees, self-employed and unemployed) are allocated among residents' sectors (corporations, government, non-profit institutions and households).

Table 3

Distribution of social contributions by type among resident institutions (in million euro)

	<i>Employers</i>	<i>Employees</i>	<i>Self-employed</i>	<i>Unemployed</i>	<i>Total</i>
Corporations	6,566	1,453	1,246		9,265
Non-financial	4,251	235			4,486
Financial	2,315	1,218	1,246		4,779
Government	59,938	12,124	6,985	2,099	81,146
NPISH	17	0	0	0	17
Households	266	0	0	0	266
Total	66,787	13,577	8,231	2,099	

Source: National Accounts (INE)

Table 4 is a cross tabulation of information on resident sectors in Table 3 with the data on contributions paid by productive sectors and the two foreign sectors. An inconsistency arises since contributions of employers paid by production branches and the foreign sectors, 66.951 million Euros, does not match the sum of those received by residents and foreign sectors 67.010 million Euros. The imbalance is 59 million Euros, a pretty small figure. The inconsistency arises because contributions by employers in the I-O framework, 66.787 million Euros, coincide with the figure of contributions by employers received by residents. One solution is to reduce the imputed contributions by employers received by households in 59 million Euros or, equivalently, to assume that households pay 59 million more Euros.

- 7 Finally, social contributions of employees have been distributed among sectors to obtain labor income net of all social security contributions. Since contributions paid by employers and employees are determined by applying fix tax rates to the same contribution base, the ratio of social contributions by employers over compensation to employees has been used to distribute total contributions by employees across sectors.

Table 4

Social contributions collected and distributed by type (in millions euro)

	<i>Collected</i>				<i>Distributed</i>				
	<i>Total collected</i>	<i>Input-output branches</i>	<i>EU</i>	<i>ROW</i>	<i>Households</i>	<i>Total distributed</i>	<i>Resident institutions</i>	<i>EU</i>	<i>ROW</i>
Employers	66,951	66,787	92	72		67,010	66,787	97	126
Employees	13,812		- 234	161	13,417	13,812	13,577	134	101
Self-employed	8,231		- 0	0	8,231	8,231	8,231	0	0
Unemployed	2,099		- 0	0	2,099	2,099	2,099	0	0

Source: Input-Output and National Accounts (INE).

8. All transfer figures proceed from the National Accounts. An exception is unemployment benefits, which come from the *Labor Statistics Yearbook* edited by the Spain's Ministry of Labor. The official figure was reduced by 2.099 million Euros, the amount paid by the Employment office (INEM) to the Social Security administration.⁹ Current transfers included in the SAMES-00 are property income, unemployment benefits, social benefits and other current transfers and an adjustment for the change in the value of pension funds.

Institutions (5)

There are three domestic institutions: a representative household, the corporate sector and the government. Since Non-Profit Institutions Serving Households (NPISH) produce non-market services, they have been aggregated with the Government account. In addition, this block includes two accounts for non-resident consumers corresponding to the EU and ROW, respectively. Institutions draw income from the auxiliary accounts

⁹ The Public Service of State Employment better known as Employment National Institute (INEM).

(current transfers), primary factors (labor and capital income) net of contributions by employers and employees and transfers from the external sectors to nonresident consumers. Their income goes to auxiliary accounts (income tax, self-employed contributions and current transfers) and consumption expenditures. Savings of resident institutions are a residual in the capital account. Although nonresident consumption expenditures are very important to the Spanish economy, the I-O framework does not include disaggregated data of this figure. Total nonresidents consumption has been disaggregated among consumption commodities by assuming the consumption pattern observed in the 2004 I-O table of the Balearic economy (IBESTAT, 2009) is valid for the Spanish economy. This was the most recent table with disaggregated data of nonresident consumption we could find when we started this research. Further the Balearic Islands are an important tourist destination for Spain. Thus, we believe the information provided by this table is pertinent for disaggregating nonresident consumption figures in Spain.

Savings-Investment (capital account)

Public and private gross savings together with the current account balance of the EU and ROW finance gross capital accumulation. National Accounts provide the value of gross investment and row totals of the matrix of gross fixed capital formation (GFCF) and the way gross fixed capital formation is distributed among six capital goods: Agricultural products, Metallic products and machinery, Transportation equipment, Residential investment, Other constructions and Other capital goods¹⁰. The disaggregation between private and public investment was performed using unpublished data of the GFCF matrix facilitated by the INE, where investments of market and non-market sectors are distinguished.

Private (6) and public (6) capital goods accounts

Private and public capital goods accounts (Agricultural products, Machinery and mechanical products, Transport equipment, Residential investment, Other constructions and Other products) obtain their revenues from the capital account (residents and foreign sectors savings). The figures have been obtained aggregating gross investment figures for private and public branches in the unpublished GFCF matrix provided by the INE. The data are valued at purchasers' prices of the year 2000.

The capital goods accounts use their revenues to pay VAT to the government and for capital goods delivered by the total supply accounts. The following steps have been followed to calculate the two value added tax vectors paid by private and public capital goods and the two 30-by-6 matrices of production of capital goods. First, the 117-by-1 vector of gross investment in fixed capital in the Use table at purchasers' prices has been aggregated into the 30-by-1 vector in the SAMES-00. Second, this vector has been disaggregated into a 30-by-6 matrix using the correspondences of Table 5 among

¹⁰ GFCF are rectangular matrices where rows register the investment of a particular capital good done by every branch in the National Accounts.

production sectors in the SAMES-00 and the six capital goods in National Accounts.¹¹ This matrix can be interpreted as production technology whereby capital goods are produced with total supply goods and services. Third, the resulting 30-by-6 matrix has been split into two 30-by-6 matrices, one for private capital goods and the other for public capital goods, assuming capital goods are produced with the same technology regardless. The column totals of both matrices are obtained from the GFCF matrix provided by the INE that separates private and public service branches. Finally, value added paid has been calculated discounting private and public investment with the tax factor defined by the corresponding value added tax rates for private (7%) and public (4%) residential housing and for other public investment (16%)

Table 5

Correspondence between total supply commodities and services in the SAMES-00 and capital goods in National Accounts

<i>Capital goods</i>	<i>Total supply SAMES-00</i>
Agricultural products	Agriculture, hunting and forestry exploitation, Fishing and aquaculture
Machinery and mechanical products	Metallurgy and metal products Mechanical machinery and equipment Manufacture of electrical machinery, electronic material and precision instruments Other manufacturing industries
Transport equipment	Manufacture of vehicles and other transport material
Residential investment	Construction
Other constructions	Construction
Other products	Textile and dressing Leather products Wood Chemical industry, rubber and plastic products Non-metallic mineral products Real estate activities Other activities and associative market services

Source: own elaboration

Foreign sectors (2)

The foreign sectors draw revenues from taxes and transfers paid by residents, labor income and imports. They use income to pay for taxes and transfers to residents, residents labor located out of the territory and exports. The difference between revenues and payments is non-residents savings which is allocated to the capital account. Tax, transfers and primary factor incomes come from National Accounts. Export and import data available in the Symmetric I-O table are not disaggregated between the EU and the ROW. As in other cases, the information in the Supply table has been used to

¹¹ For instance, the production of the Metallurgy and metal products sector in the SAMES-00 absorbed as gross investment appears in the column of Machinery and metal products.

disaggregate imports. First, import data in the Supply table have been aggregated to the 30 commodities and services in the SAM. Then, the import shares from the EU and ROW have been applied to total imports from the Symmetric I-O table. Finally, RAS has been used to assure that total imports from each trading area coincides with National Accounts total imports from the EU and ROW.

4. Conclusions

In this paper, we have presented a new social accounting matrix, the SAMES-00, of the Spanish economy. Although there are several matrices available for 2000, none of them has features needed when evaluating the impact of tax reforms or capital investment options, very relevant questions nowadays in Spain. Moreover, the available SAMs use *ad hoc* and rather arbitrary hypothesis to separate several product taxes (VAT, tariffs and other taxes on products) and subsidies that appear aggregated in the I-O framework.

The starting point of the SAMES-00 are the Supply table, the Use tables at basic and purchasers' prices, the Symmetric I-O table at basic prices and National Accounts published by the INE. In addition, INE officers in charge of National Accounts provided some unpublished supplementary information on tax revenues and subsidies and a gross capital formation matrix where private and public service sectors are disaggregated. As a result, SAMES-00 presents the first cut at disaggregating investment by commodities and more reliable information on taxes on products (VAT, Tariffs and Other taxes on products) and subsidies. SAMES-00 also disaggregates the account of Other net taxes on production in the Symmetric I-O table into Other taxes on production and subsidies on production and the disaggregation of Other net taxes on products in the Supply table into Other subsidies on products and VAT, Other taxes on products and tariffs. This makes the SAMES-00 particularly suitable for evaluating the effects tax reforms on the final demand. As Tables 6-9 make clear, the main aggregates in the SAMES-00 match official National Accounts data.¹²

¹² <http://www.ine.es>

Table 6

Gross domestic product (millions of Euro)

<i>Demand</i>	
Households final consumption expenditure	397,750
Final consumption expenditure of NPISH and Government	113,786
Private Gross Fixed Capital Formation	142,505
Public Gross Fixed Capital Formation	20,301
Changes in inventories	2,812
Exports of goods and services to EU	105,674
Exports of goods and services to ROW	46,885
Imports of goods and services from EU (-)	127,712
Imports of goods and services from ROW (-)	71,738
Gross domestic product at market prices	630,263
<i>Supply</i>	
Wages and salaries + Social contributions (employees)	245,389
Gross Operating surplus	255,488
Social contributions (employers)	66,787
Value Added Tax	38,380
Other taxes on production	7,851
Other taxes on products	27,883
Import taxes	1,073
Other subsidies on production (-)	4,955
Other subsidies on products (-)	7,633
Gross domestic product at market prices	630,263

Source: SAMES-00

Table 7

Households (millions of Euro)

	<i>Resources</i>	<i>Uses</i>
Wages and salaries	231,875	-
Gross Operating surplus	124,227	-
Property Income	38,008	9,941
Direct taxes	-	43,939
Social Contributions (employers)	207	-
Social Contributions (self-employees)	-	8,231
Unemployment benefits	12,419.6	-
Welfare benefits	69,018.4	266
Current transfers	38,209	35,714
Gross Disposable Income	415,873	
Households consumption (in the territory)	-	365,012
Households consumption (in the EU)	-	2,964
Households consumption (in the ROW)	-	2,597
Variation in pension funds reserves	1,445	-
Gross Savings	46,745	

Source: SAMES-00

Table 8

Corporations (millions of Euro)

	<i>Resources</i>	<i>Uses</i>
Corporations		-
Gross Operating surplus	121,063	-
Property Income	83,863	105,694
Direct taxes	-	20,255
Social Contributions (employers)	6,566	-
Social Contributions (employees)	1,453	-
Social Contributions (self-employees)	1,246	-
Welfare benefits	-	7,820
Current transfers	16,498	21,344
Gross Disposable Income	75,576	
Variation in pension funds reserves	-	1,445
Gross Savings	74,131	

Source: SAMES-00

Table 9

Government (millions of Euro)

<i>Government (Public Administrations and NPISH)</i>	<i>Resources</i>	<i>Uses</i>
Gross Operating surplus	10,198	-
Property Income	7,363	-
Direct taxes	64,002	-
Social Contributions (employers)	59,955	-
Social Contributions (employees)	12,124	-
Social Contributions (self-employees)	6,985	-
Unemployment benefits	-	12,419.6
Welfare benefits	-	60981.4
Current transfers	101,373	99,245
Value Added Tax	35,795	-
Other taxes on production	7,851	-
Other taxes on products	27,806	-
Import taxes	103	-
Other subsidies on production	-	3,975
Other subsidies on products	-	3,150
Gross Disposable Income	133,202	-
Government consumption	-	113,375
Gross Savings	19,416	-

Source: SAMES-00

SAMES-00 is a 128-by-128 matrix that includes ten major blocks: Production sectors, Total supply, Consumption commodities and Services, Primary factors, Auxiliary accounts, Institutions, Capital account, Private capital goods, Public capital goods and Foreign sectors. The three production blocks, domestic production, total supply and consumption commodities and services each have 30 accounts obtained via aggregation of the 73 homogeneous sectors in the Symmetric IO table. The auxiliary block includes 15 auxiliary accounts for main taxes, subsidies and transfers. It is worth noting the SAMES-00 includes, along with the resident household, the corporate sector and the government, two foreign consumers, EU and ROW. The capital account captures how savings are allocated to finance private and public investment in six capital goods. The next two blocks, Private and public capital goods, show how total supply delivers the capital goods invested by private and public branches. Finally, the foreign sector block reflects transactions between the EU and ROW with resident units.

As usual, row entries show the sources of income and column entrances the disbursements and total income equals total expenditure for each account. This equality can be interpreted as budget constraints in the case of institutions and as zero-profit conditions for production sectors. We have explained the procedures followed to construct nonresident consumption vectors, the intermediate consumption matrix at purchasers' prices, the vectors of social security contributions by employers and employees and labor income net of social security contributions, the VAT vectors, the public and private gross fixed investment vectors, the capital goods production matrices and the imports from and exports to the EU and ROW.

The result is a more disaggregated and reliable SAM than those constructed to date. It is fair to say that the SAMES-00 provides researchers with an appropriate data base to analyze exogenous shocks and fiscal policies using multi-sectoral SAM and CGE models. On the other hand, the information included in the SAMES-00 can be quite useful for constructing future SAMs. Although sufficient for evaluating the impact of fiscal reforms, it would be desirable to extend SAMES-00 in at least two interrelated directions. First, the SAMES-00 only considers two sources of income (leaving aside taxes on products), compensation of employees and gross surplus, as if all workers or capital goods were homogenous. Second, a true SAM should include multiple representative resident household types. None of these aspirations is an easy task to implement and both features are shared by all existing matrices of the Spanish economy for the year 2000.

Appendix. An aggregated version of the SAMES-00

Table A.1

SAMES-00 (5 productive sectors)

(Continue)

	<i>ID1</i>	<i>ID2</i>	<i>ID3</i>	<i>ID4</i>	<i>ID5</i>
ID1					
ID2					
ID3					
ID4					
ID5					
II1	3.245.5	23.570.6	444.4	2.655.1	138.7
II2	9.859.4	214.326.4	40.627.4	71.870.2	10.596.9
II3	206.9	1.250.1	27.573.6	134.79.3	1.617.5
II4	12.568.0	137.594.7	10.821.5	125.420.7	14.306.8
II5					
C1					
C2					
C3					
C4					
C5					
WS	3.299.6	46.250.4	21.991.9	114.117.2	46.312.9
OSMIG	20.634.2	47.713.0	14.912.9	163.700.3	8.527.6
PINC					
AJ					
DITAX					
SSCE	469.4	16.081.7	7.141.2	28.419.0	14.675.7
SSCH	94.3	3.230.6	1.434.6	5.709.2	2.948.3
SSCS					
UB					
WBF					
TR					
OTP	141.5	1.034.4	749.9	5.792.9	132.3
SBOTP					
IMT					
VAT					
OTPR	32.0	18.032.0	1.117.0	8.702.0	
SBOTPR					
H					
NREUC					
NRROWC					
CORP					
GOV					
SA					
K					
KG					
VE					
EU					
ROW					

Table A.1

SAMES-00 (5 productive sectors)		(Continue)			
	<i>III1</i>	<i>III2</i>	<i>III3</i>	<i>III4</i>	<i>III5</i>
ID1	46.563.5				
ID2		505.219.4			
ID3			126.478.6		
ID4				535.469.7	
ID5					99.252.5
II1					
II2					
II3					
II4					
II5					
C1					
C2					
C3					
C4					
C5					
WS					
OSMIG					
PINC					
AJ					
DITAX					
SSCE					
SSCH					
SSCS					
UB					
WBF					
TR					
OTP					
SBOTP					
IMT	56.4	1.016.2			
VAT					
OTPR					
SBOTPR					
H					
NREUC					
NRROWC					
CORP					
GOV					
SA					
K					
KG					
VE					
EU	2.831.6	108.183.4	7.0	16.690.0	
ROW	3.361.3	58.692.7	11.0	9.673.0	

Table A.1

SAMES-00 (5 productive sectors)

(Continue)

	<i>C1</i>	<i>C2</i>	<i>C3</i>	<i>C4</i>	<i>C5</i>
ID1					
ID2					
ID3					
ID4					
ID5					
II1	14.023.6				
II2		154.803.8			
II3			2.934.9		
II4				207.281.1	
II5					99.252.5
C1					
C2					
C3					
C4					
C5					
WS					
OSMIG					
PINC					
AJ					
DITAX					
SSCE					
SSCH					
SSCS					
UB					
WBF					
TR					
OTP					
SBOTP					
IMT					
VAT	624.4	19.518.0	455.6	12.632.5	9.6
OTPR					
SBOTPR					
H					
NREUC					
NRROWC					
CORP					
GOV					
SA					
K					
KG					
VE					
EU					
ROW					

Table A.1

SAMES-00 (5 productive sectors)		<i>(Continue)</i>			
	<i>WS</i>	<i>OSMIG</i>	<i>PINC</i>	<i>AJ</i>	<i>DITAX</i>
ID1					
ID2					
ID3					
ID4					
ID5					
II1					
II2					
II3					
II4					
II5					
C1					
C2					
C3					
C4					
C5					
WS					
OSMIG					
PINC					
AJ					
DITAX					
SSCE					
SSCH					
SSCS					
UB					
WBF					
TR					
OTP					
SBOTP					
IMT					
VAT					
OTPR					
SBOTPR					
H	231.875.0	124.227.0	38.008.0	1.445.0	
NREUC					
NRROWC					
CORP		121.063.0	83.863.0		
GOV		10.198.0	7.363.0		64.002.0
SA					
K					
KG					
VE					
EU	301.0		25.239.0		105.0
ROW	391.0		3.785.0		136.0

Table A.1

SAMES-00 (5 productive sectors)

(Continue)

	<i>SSCE</i>	<i>SSCH</i>	<i>SSCS</i>	<i>UB</i>	<i>WBF</i>
ID1					
ID2					
ID3					
ID4					
ID5					
II1					
II2					
II3					
II4					
II5					
C1					
C2					
C3					
C4					
C5					
WS					
OSMIG					
PINC					
AJ					
DITAX					
SSCE					
SSCH					
SSCS					
UB					
WBF					
TR					
OTP					
SBOTP					
IMT					
VAT					
OTPR					
SBOTPR					
H	266.0			12.419.6	69.018.4
NREUC					
NRROWC					
CORP	6.566.0	1.453.0	1.246.0		
GOV	59.955.0	12.124.0	6.985.0		
SA					
K					
KG					
VE					
EU	97.0	134.0			49.0
ROW	126.0	101.0			77.0

Table A.1

SAMES-00 (5 productive sectors)		(Continue)			
	<i>TR</i>	<i>OTP</i>	<i>SBOTP</i>	<i>IMT</i>	<i>VAT</i>
ID1			1.112.6		
ID2			1.425.6		
ID3			204.8		
ID4			2.207.8		
ID5			4.2		
II1					
II2					
II3					
II4					
II5					
C1					
C2					
C3					
C4					
C5					
WS					
OSMIG					
PINC					
AJ					
DITAX					
SSCE					
SSCH					
SSCS					
UB					
WBF					
TR					
OTP					
SBOTP					
IMT					
VAT					
OTPR					
SBOTPR					
H	38.209.0				
NREUC					
NRROWC					
CORP	16.498.0				
GOV	101.373.0	7.851.0		103.0	35.795.0
SA					
K					
KG					
VE					
EU	3.812.0			970.0	2.585.0
ROW	2.626.0				

Table A.1

SAMES-00 (5 productive sectors)

(Continue)

	<i>OTPR</i>	<i>SBOTPR</i>	<i>H</i>	<i>NREUC</i>	<i>NRROWC</i>
ID1		2.874.7			
ID2		2.438.9			
ID3		131.0			
ID4		2.188.4			
ID5					
II1					
II2					
II3					
II4					
II5					
C1			14.514.9	108.7	24.4
C2			164.016.5	2.500.7	561.6
C3			3.390.5		
C4			181.502.5	24.124.6	5.418.0
C5			1.587.6		
WS					
OSMIG					
PINC			9.941.0		
AJ					
DITAX			43.939.0		
SSCE			59.0		
SSCH					
SSCS			8.231.0		
UB					
WBF			266.0		
TR			35.714.0		
OTP					
SBOTP					
IMT					
VAT					
OTPR					
SBOTPR					
H					
NREUC					
NRROWC					
CORP					
GOV	27.806.0				
SA			46.745.0		
K					
KG					
VE					
EU	77.0		2.964.0		
ROW			2.597.0		

Table A.1

SAMES-00 (5 productive sectors)		(Continue)			
	<i>CORP</i>	<i>GOV</i>	<i>SA</i>	<i>K</i>	<i>KG</i>
ID1					
ID2					
ID3					
ID4					
ID5					
II1				515.2	25.9
II2				48.022.9	2.980.5
II3				66.014.5	13.410.8
II4				25.481.7	1.214.6
II5					
C1					
C2		7.243.0			
C3					
C4		8.868.5			
C5		97.674.5			
WS					
OSMIG					
PINC	105.694.0	20.582.0			
AJ	1.445.0				
DITAX	20.255.0				
SSCE					
SSCH					
SSCS					
UB		12.419.6			
WBF	7.820.0	60.981.4			
TR	21.344.0	99.245.0			
OTP					
SBOTP		3.975.0			
IMT					
VAT				2.470.7	2.669.2
OTPR					
SBOTPR		3.150.0			
H					
NREUC					
NRROWC					
CORP					
GOV					
SA	74.131.0	19.416.0			
K			142.505.0		
KG			20.301.0		
VE			2.812.0		
EU					
ROW					

Table A.1

SAMES-00 (5 productive sectors)		(Conclusion)	
	<i>VE</i>	<i>EU</i>	<i>ROW</i>
ID1			
ID2			
ID3			
ID4			
ID5			
II1	555.1	6.635.3	1.003.4
II2	2.256.9	82.401.7	35.365.6
II3		3.0	6.0
II4		16.634.0	10.510.0
II5			
C1			
C2			
C3			
C4			
C5			
WS		335.0	260.0
OSMIG			
PINC		15.290.0	6.751.0
AJ			
DITAX		23.0	26.0
SSCE		92.0	72.0
SSCH		234.0	161.0
SSCS			
UB			
WBF		29.0	48.0
TR		3.495.0	2.720.0
OTP			
SBOTP		980.0	
IMT			
VAT			
OTPR			
SBOTPR		4.483.0	
H			
NREUC		26.734.0	
NRROWC			6.004.0
CORP			
GOV			
SA		6.676.0	18.650.0
K			
KG			
VE			
EU			
ROW			

Table A.2

Acronyms used in Table A.1

Domestic Supply	ID1	Agriculture
	ID2	Manufactures
	ID3	Construction
	ID4	Market services
	ID5	Non-Market services
Total Supply	II1	Agriculture
	II2	Manufactures
	II3	Construction
	II4	Market services
	II5	Non-Market services
Consumption goods and Services	C1	Agriculture
	C2	Manufactures
	C3	Construction
	C4	Market services
	C5	Non-Market services
WS	Wages and Salaries	
OSMIG	Operating Surplus/Gross Mixed Income	
PINC	Property income	
AJ	Variation in pension funds reserves	
DITAX	Direct taxes	
SSCE	Social Security Contributions (employers)	
SSCH	Social Security Contributions (employees)	
SSCS	Social Security Contributions (self-employees)	
UB	Unemployment benefits	
WBF	Welfare benefits	
TR	Current transfers	
OTP	Other taxes on production	
SBOTP	Other subsidies to production	
IMT	Import taxes	
VAT	Value Added Taxes	
OTPR	Other taxes on products	
SBOTPR	Other subsidies to products	
H	Households	
NREUC	EU nonresident consumption	
NRROWC	ROW nonresident consumption	
CORP	Corporate sector	
GOV	Government	
SA	Savings	
K	Private investment	
KG	Public investment	
VE	Stocks Variation	
EU	European Union	
ROW	Rest of the World	

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