School of Economics and Management

TECHNICAL UNIVERSITY OF LISBON

Department of Economics

Susana Santos

Macro-SAMs for modeling purposes. An application to Portugal in 2003

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Macro-SAMs for modelling purposes. An application to Portugal in 2003[*].

Susana Santos

ISEG (School of Economics and Management)/TULisboa - Technical University of Lisbon;

DE – Department of Economics, UECE – Research Unit on Complexity in Economics

Rua Miguel Lupi, 20, 1249-078 Lisboa, Portugal.

Tel. +351 21 392 59 53; Fax: + 351 21 392 28 08; E-mail: ssantos@iseg.utl.pt.

Abstract

Knowledge of the quantifiable side of a market economy greatly depends on the form of macro-economic modelling that is used. This, in turn, should have an underlying database.

Such a database should include the interrelated subsystems that exist within that economy and, at the same time, it should be adaptable for modelling purposes, whilst also being flexible and consistent, in order to allow for aggregations and disaggregations.

Based on the geographical limits of a European country and the time limit of one year (1 January to 31 December), this paper proposes, as a possible database, a Social Accounting Matrix (SAM) constructed from the national accounts, operating within the framework of the European System of National and Regional Accounts in the European Community of 1995 (ESA 95).

Using a numerical version of a SAM, constructed from the Portuguese national accounts for 2003, at a highly aggregated level, the aim of this paper is to show the differences between a matrix format of the national accounts, as proposed by the ESA 95 and the United Nations System of National Accounts for 1993 (SNA 93), from which it is constructed, and the SAM, emphasizing its potentialities as a database for modelling purposes.

Some considerations will also be made about the relationship between SAMs and Input-Output tables.

Key words: Social Accounting Matrix; National Accounts; Economic Modelling

JEL classification: C68; C82; E01

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1. Introduction

The results of economic modelling could be more efficient if developed with an underlying database.

In macroeconomic modelling, such a database should comprise the interrelated subsystems that exist within the economy as a whole and be adapted to the methodology chosen by the modeller. In the case of general equilibrium methodology, and for computable general equilibrium modelling in particular, a suitable database may be the Social Accounting Matrix (SAM). This statement is justified by the specific characteristics of such a matrix, namely the fact that it describes the whole circular flow of a market economy and is considered to be a flexible accounting framework. Working with the SAM makes it possible to use either top-down or bottom-up methods to break down or aggregate each account into categories without losing the consistency of the whole system.

The SAM is a square matrix in which, by convention, the entries made in rows represent resources, incomes, receipts or changes in liabilities and net worth, whilst the entries made in columns represent uses, outlays, expenditures or changes in assets. Each transaction is recorded only once in a cell of its own. These figures include both production accounts and institutional accounts, which are further subdivided into yet other accounts, defined in accordance with the modelling purposes and the available information.

An application will be made of this method to Portugal, at a highly aggregated level, to show how a SAM can be constructed from the national accounts and to explain the main differences between a SAM and a National Accounting Matrix (NAM) – the matrix format of national accounts.

After specifying the possibilities offered by the national accounts for the disaggregation of both NAM and SAM accounts, and before drawing some concluding remarks, this paper will also analyse the relationship between SAMs and Input-Output tables.

2. SAMs as databases for economic modelling

Each SAM can be expressed in two versions: numerical or algebraic. In the numerical version, each cell assumes a specific numerical value, with the sums of the rows being equal to the sums of the columns. In the algebraic version, each cell is represented by algebraic expressions that, together with those of all the other cells, represent a SAM-based model, the calibration of which involves a replication of the numerical version.

At the same time, as Pyatt (1991) stressed, "a SAM is a framework both for models of how the economy works as well as for data which monitor its workings. Recognition of this duality is of basic importance for quantitative analysis. It implies, *inter alia*, that the accounting identities which are captured by a SAM are not to be regarded simply as consistency requirements which must be imposed on a model, but rather they should be seen as a logical consequence of the paradigms which economists have adopted for analyzing society."

When working at a macroeconomic level, national accounts are the most convenient source of basic information, although additional sources can also be used to support the disaggregation of the SAM values and several methodologies can be used to complement each other. Moreover, the basic structure of the macro-SAM, which is constructed from the national accounts, provides all the consistency required for such a database. It is possible to extract from this all the macroaggregates and other economic indicators that are essential for improving our knowledge of the quantifiable side of the economy. Furthermore, it is also possible to identify the national accounting transactions included in each cell in some detail, representing an important advantage in the use of the algebraic SAM version.

For the algebraic version, additional complementary data can also be used. One such example is population, which can be classified or not by categories (educational level, gender, occupational status, etc.).

3. The Social Accounting Matrix (SAM) and the National Accounting Matrix (NAM)

This paper will consider national accounts within the framework of the European Union, based on the European System of National and Regional Accounts in the European Community of 1995 – ESA 95 (Eurostat, 1996), which is an application of the 1993 version of the United Nations System of National Accounts – SNA 93, prepared by the Inter-Secretariat Working Group and published by the United Nations Statistical Office (ISWG, 1993). The matrix format is presented by ¶ 8.100 – 8.155 of the former system (ESA 95) and Chapter XX of the latter system (SNA 93).

Being applied to the case of Portugal in 2003, at a highly aggregated level, the above-mentioned matrix format of the national accounts, as shown in Table 1, will be associated with the National Accounting Matrix (NAM) in order to distinguish it from the SAM, as shown in Table 2, which was constructed for macro-modelling purposes in accordance with the work of Graham Pyatt and his associates (Pyatt, 1988 and 1991; Pyatt and Roe, 1977; Pyatt and Round, 1985) and was itself inspired upon Sir Richard Stone's works, pioneered by his 1954 article "Input-Output and the Social Accounts" .

Table 1. The NAM (National Accounting Matrix) for Portugal in 2003 (in millions of euros)

SNA Account		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0. Goods and services	(1)	Trade and transport margins $(0 = t_{0,0})$	Intermediate consumption $(133\ 219 = t_{0,I})$			Final consumption $(115\ 951 = t_{0,II.4})$	Gross capital formation $(31\ 715 = t_{0,\ III.1})$		Exports of goods and services $(38\ 790 = t_{0,V})$
I. Production	(2)	Output of goods and services + Net taxes on products $(253\ 683+18\ 118=t_{I,\ 0})$							
II.1. Primary distribution of income	(3)		Gross added value $(138\ 582 =t_{II.1,I})$	Property income $(18\ 508 = t_{II.1,II.1})$					Primary income from the RW $(6\ 733=t_{II.1,V})$
II.2, II.3. Secondary distribution of income and redistribution of income in kind	(4)			Gross national income $(136\ 630 = t_{II.2\&3,II.1})$	Current transfers $(67\ 704 = t_{II.2\&3,II.2\&3})$				Current transfers from the RW $(5\ 554= t_{II.2\&3,V})$
II.4. Use of income	(5)				Gross disposable income $(139\ 037 = t_{II.4,II.2\&3})$	Adjustment for the change in the net equity of households in the pension fund reserve $(273 = t_{II.4,II.4})$			
III.1. Capital	(6)					Gross saving $(23\ 087 = t_{III.1,II.4})$	Capital transfers $(6\ 575 = t_{III.1,III.1})$		Capital transfers from the RW $(3\ 433 = t_{III.1,V})$
III.2. Financial	(7)						Net borrowing $(- 5\ 352= t_{III.2,III.1})$	Financial transactions $(55\ 871= t_{III.2,\ II.2})$	Financial transactions from the RW $(35\ 266= t_{III.2,V})$
V. Rest of the world (RW)	(8)	Imports of goods and services $(47\ 874 = t_{V,0})$		Primary income to the RW $(9\ 007- 80 - 242 = t_{V,II.1})$	Current transfers to the RW $(3\ 148 = t_{V,II.2\&3})$		Capital transfers to the RW $(156= t_{V,III.1})$	Financial transactions to the RW $(29\ 914=t_{V\ III.2})$	
Total		319 675	271 801	163 823	209 889	139 311	33 094	85 785	89 776

Source: Round (2003); ESA (1995); SNA93 (ISWG, 1993); Portuguese National Accounts (Appendix).
Row totals match column totals (differences between the two are caused by their being rounded up or down).

Table 2. The SAM (Social Accounting Matrix) for Portugal in 2003 (in millions of euros)

Incomes (receipts) \ Outlays (expenditures)	Production and Trade			(di.) Institutions			rw. Rest of the World (7)	TOTAL
	p. Products (1)	a. Activities (2)	f. Factors (3)	dic. Current A. (4)	dik. Capital A. (5)	dif. Financial A. (6)		
p. Products (1)	Trade and transport margins $(0 = t_{p,p})$	Intermediate consumption $(133\ 219 = t_{p,a})$	0	Final consumption $(115\ 951 = t_{p,dic})$	Gross capital formation $(31\ 715 = t_{p,dik})$	0	Exports $(38\ 790 = t_{p,rw})$	Aggregate demand (319 675)
a. Activities (2)	Production $(253\ 683 = t_{a,p})$	0	0	0	0	0	0	Production value (253 683)
f. Factors (3)	0	Gross added value $(120\ 944 = t_{f,a})$	0	0	0	0	Compensation of factors from the RW $(6\ 733 = t_{f,rw})$	Aggregate factors income (127 677)
dic. Current Account (4)	Net taxes on products $(18\ 198 = t_{dic,p})$	Net taxes on production $(-238 = t_{dic,a})$	Gross national Income $(118\ 670 = t_{dic,f})$	Current transfers $(67\ 704 + 273 = t_{dic,dic})$	0	0	Current transfers from the RW $(5\ 554 = t_{dic,rw})$	Aggregate income (210 161)
dik. Capital Account (5)	0	0	0	Gross saving $(23\ 087 = t_{dik,dic})$	Capital transfers $(6\ 575 = t_{dik,dik})$	- Net borrowing $(5\ 352 = t_{dik,dif})$	Capital transfers from the RW $(3\ 433 = t_{dik,rw})$	Investment funds (38 447)
dif. Financial Account (6)	0	0	0	0	0	Financial transactions $(55\ 871 = t_{dif,dif})$	Financial transactions from the RW $(35\ 266 = t_{dif,rw})$	Total financial transactions (91 137)
rw. Rest of the World (7)	Imports + net taxes on products $(47\ 874 – 80 = t_{rw,p})$	Net taxes on production $(-242 = t_{rw,a})$	Compensation of factors to the RW $(9\ 007 = t_{rw,f})$	Current transfers to the RW $(3\ 148 = t_{rw,dic})$	Capital transfers to the RW $(156 = t_{rw,dik})$	Financial transactions to the RW $(29\ 914 = t_{rw,dif})$		Value of transactions to the RW (89 777)
TOTAL	Aggregate supply (319 675)	Total costs (253 683)	Aggregate factors income (127 677)	Aggregate income (210 163)	Aggregate investment (38 446)	Total financial transactions (91 137)	Value of transactions from the RW (89 776)	

Source: Pyatt (1988 and 1991); Santos (2006, 2006a and 2007); Portuguese National Accounts (Appendix)
Note: Differences between row-column totals are caused by their being rounded up or down.

In accordance with the "SAM terminology", the first three accounts of both matrices are the production and trade accounts, while the others, except in the case of the rest of the world, are the (domestic) institutional accounts. There is direct correspondence for all the accounts, except for the secondary distribution of income account, the redistribution of income in kind account (II.2&3) and the use of income account (II.4), which are all included in the current account of the institutions (dic). As shown in Table 3, a correspondence is established between the cells and the identification of the national accounting transactions (the respective codes and valuation systems are shown in brackets), which can in turn be complemented or justified through observation of the corresponding T-accounts, given by the traditional tables of national accounts. All of these are joined together, with the Integrated National Accounts Table (Appendix), which shows a highly aggregated level of transactions, being the one that is adopted here.

Table 3: Correspondence between the cells of the SAM and the NAM for Portugal in 2003 (in millions of euros)

Cell		Description (ESA – SNA code; valuation)
SAM	NAM	
$0 = t_{p,p}$	$0 = t_{0,0}$	trade and transport margins
$253\ 683 = t_{a,p}$	$253\ 683 = t_{I,0}$	output of goods and services (P1; basic prices)
$133\ 219 = t_{p,a}$	$133\ 219 = t_{0,I}$	intermediate consumption (P2; purchasers' prices)
$115\ 951 = t_{p,dic}$	$115\ 951 = t_{0,II4}$	final consumption (P3; purchasers' prices)
$31\ 715 = t_{p,dik}$	$31\ 715 = t_{0,III1}$	gross capital formation (P5; purchasers' prices)
$47\ 874 = t_{rw,p}$	$47\ 874 = t_{V,0}$	imports (P7; cif prices)
$38\ 790 = t_{p,rw}$	$38\ 790 = t_{0,V}$	exports (P6; fob prices)
$120\ 944 = t_{f,a}$	$138\ 582 = t_{III1,I}$	gross added value or gross domestic product (B1g; D1, D4; factor cost in the SAM; purchasers' prices in the NAM)
$118\ 670 = t_{dic,f}$	$136\ 630 = t_{II.2\&3,II.1}$	gross national income (B5g; factor cost in the SAM; purchasers' prices in the NAM)
-	$18\ 508 = t_{II.1\ II.1}$	net property income (D4)
$9\ 007 = t_{rw,f}$	$9\ 007 = t_{V,II.1}$	compensation of factors or primary income (D1, D4) paid to the rest of the world
$6\ 733 = t_{f,rw}$	$6\ 733 = t_{II.1,V}$	compensation of factors or primary income (D1, D4) received from the rest of the world
$67\ 977 = t_{dic,dic}$	$67\ 704 = t_{II.2\&3,II.2\&3}$ $273 = t_{II.4\ II.4}$ Sum = 67 977	current transfers (including adjustments made for the change in the net equity of households in pension fund reserves) within domestic institutions (D5, D6, D7, D8)
$3\ 148 = t_{rw,dic}$	$3\ 148 = t_{V,II.2\&3}$	current transfers to the rest of the world (D5, D6, D7)
$5\ 554 = t_{dic,rw}$	$5\ 554 = t_{II.2\&3,V}$	current transfers from the rest of the world (D5, D6, D7)

Cell		Description (ESA – SNA code; valuation)
SAM	NAM	
$23\ 087 = t_{dik,dic}$	$23\ 087 = t_{III.1,II.4}$	gross saving (B8g)
$6\ 575 = t_{dik,dik}$	$6\ 575 = t_{III.1,III.1}$	capital transfers within domestic institutions (D9)
$156 = t_{rw,di\ k}$	$156 = t_{V,III.1}$	capital transfers to the rest of the world (D9, K2)
$3\ 433 = t_{dik,\ rw}$	$3\ 433 = t_{III.1,V}$	capital transfers from the rest of the world (D9, K2)
$55\ 871 = t_{dif,dif}$	$55\ 871 = t_{III.2,III.2}$	financial transactions within domestic institutions (F1, …, F7)
$29\ 914 = t_{rw,dif}$	$29\ 914 = t_{V,III.2}$	financial transactions to the rest of the world (F1, …, F7) + statistical discrepancy
$35\ 266 = t_{dif,rw}$	$35\ 266 = t_{III.2,V}$	financial transactions from the rest of the world (F1, …, F7) + statistical discrepancy
$5\ 352 = t_{dik,dif}$	$-\ 5\ 352 = t_{III.2,III.1}$	net borrowing/lending (B9)
-	$139\ 037 = t_{II.4,II.2\&3}$	gross disposable income (B6/7g)
$-\ 238 = t_{dic,a}$	-	net taxes on production paid to domestic institutions (general government) (D29-D39)
$-\ 242 = t_{rw,a}$	$-\ 242 = t_{V,II.1}$	net taxes on production paid to the rest of the world (D29-D39)
$18\ 198 = t_{dic,p}$	$18\ 198 = t_{I,0}$	net taxes on products paid to domestic institutions (general government) (D21-D31)
$-\ 80 = t_{rw,p}$	$-\ 80 = t_{I,0}, t_{V,II.1}$	net taxes on products paid to the rest of the world (D21-D31)

Source: Santos (2006a and 2007); Tables 1 and 2

Because of the modelling purposes of the SAM, its main differences in relation to the NAM have to do with the valuation system underlying production and trade. Three levels can be distinguished in that system: factor cost; basic/cif/fob prices and purchasers' or market prices.

The first of these levels is that of the compensation of the factors used in the production process of the domestic economy in the accounting period. In analysing those factors, one can distinguish between labour (employees and own-account workers and/or employers) and capital. In this case, compensation is respectively the compensation of employees (wages and salaries and employers' social contributions – transactions D11 and D12 of the National Accounts), mixed income (balance B3 of the National Accounts) and the gross operating surplus (balance B2 of the National Accounts).

At the second level, one can distinguish between the production of the domestic economy and imports. In the first case, this is measured by the factor cost from the previous level, plus (other) taxes on production (transaction D29 of the National Account) net of subsidies on production (transaction D39 of the National Accounts), as well as by intermediate consumption. This represents the basic price level of the (domestic) production that will be

transacted in the domestic market and the fob (free on board) price level of the production that will be exported. Imports, valued at cif (cost-insurance-freight included) prices, are added, at this level, to the above-mentioned unexported part of domestic production that will be transacted in the domestic market.

The third level relates to products, either domestically produced or imported, that are transacted in the domestic market. Here, the basic/cif prices (referred to in the previous level) will be increased by adding to them the trade and transport margins and the taxes on products (transaction D21 of the National Accounts) net of subsidies (transaction D31 of the National Accounts.

The identification of these three levels will make it possible to break down the values of domestically transacted products and can be useful for analysing the causes of their evolution in real and nominal terms, as well as in terms of their implicit prices, since the national accounts provide information about these through current and previous year prices.

In the SAM, the net indirect taxes (on production and products) have their own submatrices, so that it is perfectly possible to work upon these in isolation, something that is not possible in the case of the NAM.

On the other hand, the current account of (domestic) institutions in the SAM, which takes into consideration almost all of the flows shown in the III.2-III.4 accounts of the NAM, benefits from a much more simplified treatment, with obvious repercussions at the modelling level.

The remaining differences are not relevant, since they essentially have to do with the modeller's way of working and interpreting reality, as, for example, in the case of "net lending/borrowing". This item is considered in the SAM's capital account to be a resource or a component of the investment funds required/not required to cover aggregate investment, whereas it is considered as a use in the NAM. In the SAM's financial account, however, it is considered as a use, because it is used to cover/absorb the financing requirement/capacity of the economy, with financial transactions from/to the rest of the world, whereas it is considered as a resource in the NAM.

Table 4 systematizes the relevant differences between these two matrix approaches to the recording of macro-data.

Table 4. The differences between the accounts of the SAM and the NAM for Portugal in 2003 (in millions of euros)

NAM			SAM			Account description (SNA93; ESA95)	NAM-SAM	
Account	index	Row-column Total	Account	index	Row-column Total		Row-column. Total difference	Description of difference
goods and services	0	319 675	Products	p	319 675	shows how available products are used	0	–
Production	I	271 801	Activities	*a*	253 683	describes the transactions that constitute the appropriately named production process	18 118	net taxes on products paid to domestic institutions
primary distribution of income	II.1	163 823	factors of production	f	127 677	shows how incomes accruing as a result of involvement in processes of production or the ownership of assets, and which may be needed for production purposes, are distributed among institutions and activities	36 146	net indirect taxes + net property income
secondary distribution of income, redistribution of income in kind account	II.2&3;	209 889	Current account of (domestic) institutions	dic	210 163	shows, on the one hand, how the balance of primary income (national income) is transformed into disposable income through the receipt and payment of current transfers, and, on the other hand, how gross disposable income is distributed between final consumption and saving	139 033	gross disposable income
use of income	II.4	139 311						
capital	III.1	33 094	Capital account of (domestic) institutions	dik	38 446	records transactions linked to acquisitions of non-financial assets and capital transfers involving the redistribution of wealth	- 5 352	net borrowing/ lending
financial	III.2	85 785	Financial account of (domestic) institutions	dif	91 137	records transactions in financial assets and liabilities between institutional units, and between these and the rest of the world	- 5 352	net borrowing/ lending
rest of the world	V	89 776	rest of the world	rw	89 776	records transactions between resident and non-resident units	0	–

Source: Santos (2006a)

4. Possible disaggregations

By either top-down or bottom-up methods, it is possible to break down or aggregate each account into categories, using on occasion sources of information other than the SNA, without losing the consistency of the whole system. In other words, "a crucial feature is the wide range of possibilities for expanding or condensing such a matrix in accordance with specific circumstances and needs" (ISWG, 1993, ¶ 20.6).

Nowadays, the ESA in general and the Portuguese National Accounts in particular provide several (mutually exclusive) possibilities for the disaggregation of products and activities, a few possibilities for the disaggregation of the institutional accounts and a very limited number of opportunities for the disaggregation of the factors of production.

Therefore, production accounts, which are drawn from supply and use tables, can be broken down into 60 activities and products, which in the case of some transactions can have yet more levels of disaggregation. In the case of production and trade accounts, however, the factors of production may only be broken down into labour (employees) and others. This includes compensation of own-account workers and/or employers, interest, profits, rents…. This is why the classification of "other" has been preferred here to the term "capital", which is also used frequently.

In turn, the institutional accounts can be disaggregated into five institutional sectors, each with similar economic behaviour: households, non-financial corporations, financial corporations, general government, and non-profit institutions serving households (NPISHs).

General government can be further disaggregated into central government, local government and social security funds, whilst financial corporations can be disaggregated into the central bank, other monetary financial institutions, other financial intermediaries (except insurance corporations and pension funds), financial auxiliaries, and insurance corporations and pension funds. The rest of the world can also be broken down into the European Union (member states and institutions), non-member countries and international organisations.

It is therefore easy to conclude that "a SAM applies the properties of a matrix format to incorporate specific details on various economic flows" (ISWG, 1993, ¶ 20.26).

One can therefore consider that an important step forward in SAM-based modelling is provided by the possibility, on the one hand, of constructing a consistent macro-SAM from the national accounts, with the necessary disaggregation required for specific modelling purposes, and, on the other hand, of identifying the SNA transactions within each of its cells, which can be considered as a grand total (SNA 93, ¶ 20.13). Thereafter, the remaining

process of disaggregation (from other sources) will be made easier, without any loss occurring in the consistency of the system as a whole, since the transactions or cells of the matrices will be transformed into submatrices, with the sum of all their cells being equal to the former cell. Several methods can be used for making the necessary adjustments to these submatrices in the macro context, with the cross-entropy method, extensively used and developed by Sherman Robinson, probably being the most suitable.

Given the possibility of constructing consistent SAMs from the SNA, we are now certainly experiencing the beginning of a new analytical phase in the development of this work instrument – perhaps the third such phase, since Richard Stone, who initiated the first one, identified the beginning of the second phase with the work of Pyatt and Roe in 1977, as he mentions in his foreword to their book "Social Accounting for Development Planning with special reference to Sri Lanka" (Pyatt and Roe, 1977).

5. The SAM and the Input-Output table

SAMs are commonly considered as being a form of extended Input-Output tables, which is not true.

Table 5 identifies blocks of submatrices or sets of submatrices that have the same characteristics as the SAM represented in Table 2, with those that are either totally or partially "covered" by the Input-Output (IO) table being shown with a thicker border.

The specification of these blocks involves the identification of the transactions of the National Accounts, which are the sources of information used to construct the SAMs. These can be clearly seen in Table 3 and are also shown in greater detail in other papers written by the author (Santos, 2005, 2006 and 2006a).

As can be seen from an analysis of Table 5, a significant part of the blocks have no thicker border, meaning that a significant part of the SAM is not covered by the IO table. This is caused by the fact that the IO table doesn't work with institutions whereas the SAM does.

On the other hand, the IO table and the SAM can both work with activities, although, in the case of intermediate consumption, the IO table can distinguish between what is domestically produced and what is imported whereas the SAM cannot. The essence of the IO table lies in its ability to record the transactions between activities, with the structure of production being conditioned by these linkages, whereas the essence of a SAM is its ability to record the transactions (and transfers) between institutions, with the distribution of income being conditioned by these (Pyatt, 1999). Even if institutions were introduced into the IO table, the bottom right-hand corner of the SAM would still not be completed – "The social accounting

system offers a more extensive capture of flows and transactions, endogenizing even more of the entries in the primary inputs and final demand components of the input-output table and, most importantly, affording the opportunity to account for both earned and unearned income (income from rents, dividends etc.)"[1]

Therefore, the SAM cannot be seen as an extension of the IO table, although a SAM could be used to consistently study the interdependence of income distribution and production structure (Pyatt, 1999).

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[1] G. Hewings: *New Developments in Input-Output Modelling: a short course*, session 4, Summer School – 5th edition, Department of Economics – School of Economics and Management (ISEG – Instituto Superior de Economia e Gestão), Lisbon, July 2003.

Table 5. The SAM by blocks

Incomes (receipts) \ Outlays (expenditures)		Production			Institutions			Rest of the World
		Products	Activities	Factors	Current A.	Capital A.	Financial A.	
Production	Products	Trade and transport margins	Domestic trade	0	Domestic trade	Domestic trade	0	External trade
	Activities	Production	0	0	0	0	0	0
	Factors	0	Compensation of the factors of production	0	0	0	0	Compensation of the factors of production
Institutions	Current A.	Net indirect taxes	Net indirect taxes	Compensation of the factors of production	Current transfers	0	0	Current transfers
	Capital A.	0	0	0	(-) Net lending/ borrowing	Capital transfers	(-) Net lending/ borrowing	Capital transfers
	Financial A.	0	0	0	0	0	Financial transactions	Financial transactions
Rest of the World		External trade / Net indirect taxes	Net indirect taxes	Compensation of the factors of production	Current transfers	Capital transfers	Financial transactions	

Source: Table 2

Legend:

☐ Submatrices "covered" by the IO table

4. Concluding Remarks

The flexibility and consistency inherent in the SAM and the possibility of its construction from the systems of national accounts, most notably the ESA 95, may be considered to represent major contributions towards an improved form of economic modelling.

Since SAMs can be constructed from the national accounts, time series can also be compiled of national accounting transactions and, using the available computer technology, these can be exposed to the full range of possibilities of econometric modelling, helping in the definition and breakdown of the SAM cell contents. Most notably, it is even possible to consider qualitative variables, separate quantities and prices (using current and constant or previous year price value series) or calculate elasticities. It will then be possible to speak, for instance, about dynamic econometric SAM-based Computable General Equilibrium (CGE) models that, either operating in isolation or joined together in sets, will provide better policy definition and analysis, based on the use of better data. In such a case, it will also be possible to speak in terms of the past, present and future and/or in terms of ex-ante and ex-post analysis.

On the other hand, if we consider modelling techniques as a support of (socio-)economic theory, better and more stable empirical evidence can help us to (re-)evaluate this theory or even to (re-)orient the way in which reality has traditionally been defined and conceptualized. At the same time, policy design can be based on a more positive and less normative analysis.

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Current accounts
Uses

Accounts	Total	Services	S.2 World	S.1 Economy	S.15 NPISHs	S.14 Households	S.13 Government	S.12 Corporations	S.11 Corporations	Code	Transactions and other
I. Production / external account of goods and services	47 874	47 874								P.7	Imports of goods and services
	38 790		38 790							P.6	Exports of goods and services
	253 683	253 683								P.1	Output of goods and services
	133 219			133 219	3 369	18 875	5 251	4 029	101 695	P.2	Intermediate consumption
	18 118	18 118		18 118						D.21-D.31	Net taxes on products
	138 582			**138 582**	**2 311**	**25 939**	**21 686**	**7 621**	**62 908**	B.1g/B.1*g	**Gross added value/gross domestic product**
	22 654			22 654	563	6 118	2 315	570	13 088	K.1	Consumption of fixed capital
	115 930			**115 930**	**1 748**	**19 821**	**19 371**	**7 051**	**49 820**	B.1n/B.1*n	**Value added, net/Net domestic product**
	9 084		**9 084**							B.11	**External balance of goods and services**
II.1.1. Generation of income account	69 665		214	69 451	1 951	4 164	19 568	3 099	40 669	D.1	Compensation of employees
	17 638			17 638	- 28	- 206	- 125	- 11	- 110	D.2-D.3	Net taxes on production and imports
	18 118			18 118						D.21-D.31	Net taxes on products
	- 480			- 480	- 28	- 206	- 125	- 11	- 110	D.29-D.39	Net taxes on production
	29 513			**29 513**	**388**		**2 243**	**4 533**	**22 348**	B.2g	**Gross operating surplus**
	21 981			**21 981**		**21 981**				B.3g	**Gross mixed income**
	12 976			**12 976**	**- 175**		**- 72**	**3 963**	**9 260**	B.2n	**Net operating surplus**
	15 863			**15 863**		**15 863**				B.3n	**Net mixed income**
II.1.2. Allocation of primary income account	33 805		6 519	27 286	7	1 226	4 023	12 540	9 490	D.4	Property income
	136 630			**136 630**	**741**	**98 735**	**17 343**	**3 577**	**16 234**	B.5g	**Gross national income/ Gross balance of primary**
	113 976			**113 976**	**178**	**92 617**	**15 028**	**3 007**	**3 146**	B.5n	**Net national income/ Net**
II.2. Secondary distribution income account	12 730		1 243	11 487	2	7 365		464	3 656	D.5	Current taxes on income, wealth, etc
	20 701		64	20 637		20 637				D.61	Social contributions
	22 712		26	22 686	18	49	19 110	1 848	1 661	D.62	Social benefits other than social
	20 262		4 221	16 041	65	2 777	8 787	1 974	2 438	D.7	Other current transfers
	139 037			**139 037**	**2 791**	**95 498**	**26 187**	**3 268**	**11 293**	B.6g	**Gross disposable income**
	116 383			**116 383**	**2 228**	**89 380**	**23 872**	**2 698**	**- 1 795**	B.6n	**Net disposable income**
II.3. Redistribution of income in kind account	19 782			19 782	2 747		17 035			D.63	Social transfers in kind
	139 035			**139 035**	**43**	**115 280**	**9 150**	**3 267**	**11 295**	B.7g	**Gross adjusted disposable**
	116 381			**116 381**	**- 520**	**109 162**	**6 835**	**2 697**	**- 1 793**	B.7n	**Net adjusted disposable**
II.4. Use of income account	**139 037**			**139 037**	**2 791**	**95 498**	**26 187**	**3 268**	**11 293**	B.6g	**Gross disposable income**
	116 383			**116 383**	**2 228**	**89 380**	**23 872**	**2 698**	**- 1 795**	B.6n	**Net disposable income**
	115 951			115 951		104 857	11 094			P.4	Actual Final Consumption
	115 950			115 950	2 747	85 074	28 129			P.3	Final consumption expenditure
	273			273				273		D.8	Adjustment for the change in the net
	23 087			**23 087**	**44**	**10 697**	**- 1 942**	**2 995**	**11 293**	B.8g	**Gross saving**
	433			**433**	**- 519**	**4 579**	**- 4 257**	**2 425**	**- 1 795**	B.8n	**Net saving**
	8 628		**8 628**							B.12	**Current external balance**

Accumulation accounts
Changes in Assets

Accounts	Total	Services	S.2 World	S.1 Economy	S.15 NPISHs	S.14 Households	S.13 Government	S.12 Corporations	S.11 Corporations	Code	Transactions and other
III.1.1. Change in net worth due to saving and capital transfers account										B.8g	**Gross saving**
										B.8n	**Net saving**
										B.12	**Current external balance**
										D.9	Capital transfers, receivable
										D.9	Capital transfers, payable (-)
	9 061		**5 365**	**3 696**	**- 267**	**5 359**	**- 2 152**	**1 306**	**- 550**	B.10.1	**Changes in net worth due to saving and capital transfers**
III.1.2 Acquisitions of non-financial assets account	31 733			31 733	806	7 671	4 303	1 103	17 850	P.51	Gross fixed capital formation
	- 22 654			- 22 654	- 563	- 6 118	- 2 315	- 570	- 13 088	K.1	Consumption of fixed capital (-)
	- 141			- 141		- 35			- 106	P.52	Changes in inventories
	122			122	14	100	6	1	1	P.53	Acquisitions less disposals of valuables
			13	- 13		- 1 454	- 69	156	1 354	K.2	Acquisitions less disposals of non-produced non-financial assets
			5 352	**- 5 352**	**- 524**	**5 195**	**- 4 077**	**616**	**- 6 562**	B.9	**Net lending (+) /borrowing (-)**

Accounts	Total	S.2	S.1	S.15 + S.14	S.13	S.12	S.11	Code	Transactions and other
III.2 Financial account	85 798	35 280	50 518	13 039	- 185	29 521	8 143		Net acquisition of financial assets\
									Net incurrence of liabilities
		769	- 769			- 769		F.1	Monetary gold and SDRs
	15 686	5 450	10 236	210	- 1 290	7 941	3 376	F.2	Currency and deposits
	17 851	5 161	12 690	3 369	199	7 904	1 218	F.3	Securities other than shares
	22 366	8 236	14 130	- 2	423	13 691	17	F.4	Loans
	25 938	15 407	10 531	5 669	386	1 473	3 002	F.5	Shares and other equity
	3 420	8	3 412	3 101	1	168	143	F.6	Insurance technical reserves
	536	249	287	692	95	- 887	386	F.7	Other accounts receivable/payable
								B.9 F	**Net lending (+) /borrowing (-)**
									Statistical discrepancy

Source: Instituto Nacional de Estatística; Banco de Portugal

Appendix: Integrated Economic Accounts (in millions of euros) for Portugal in 2003 – Resources

Code	Transactions and other flows stocks and balancing items	S.11 Non-Financial Corporations	S.12 Financial Corporations	S.13 General Government	S.14 Households	S.15 NPISHs	S.1 Total of the Economy	S.2 Rest of the World Account	Goods and Services Account (Uses)	Total	Accounts
P.7	Imports of goods and services							47 874		47 874	I. Production / external account of goods and services
P.6	Exports of goods and services								38 790	38 790	
P.1	Output of goods and services	164 603	11 650	26 937	44 814	5 680	253 684			253 684	
P.2	Intermediate consumption								133 218	133 218	
D.21-D.31	Net taxes on products						18 117			18 117	
B.1g/B.1*g	Gross added value/gross domestic product	62 908	7 621	21 686	25 939	2 311	138 582			138 582	II.1.1. Generation of income account
K.1	Consumption of fixed capital										
B.1n/B.1*n	Value added, net/Net domestic product	49 820	7 051	19 371	19 821	1 748	115 930			115 930	
B.11	External balance of goods and services							9 084		9 084	
D.1	Compensation of employees				69 435		69 435	229		69 664	II.1.2. Allocation of primary income account
D.2-D.3	Net taxes on production and imports			17 960			17 960	- 322		17 638	
D.21-D.31	Net taxes on products			18 198			18 198	- 80		18 118	
D.29-D.39	Net taxes on production			- 238			- 238	- 242		- 480	
B.2g	Gross operating surplus	22 348	4 533	2 243		388	29 512			29 512	
B.3g	Gross mixed income				21 981		21 981			21 981	
B.2n	Net operating surplus	9 260	3 963	- 72		- 175	12 976			12 976	
B.3n	Net mixed income				15 863		15 863			15 863	
D.4	Property income	3 376	11 584	1 163	8 545	360	25 028	8 778		33 806	
B.5g	Gross national income/ Gross balance of primary incomes	16 234	3 577	17 343	98 735	741	136 630			136 630	II.2. Secondary distribution income account
B.5n	Net national income/ Net balance of primary incomes	3 146	3 007	15 028	92 617	178	113 976			113 976	
D.5	Current taxes on income, wealth, etc			11 954			11 954	776		12 730	
D.61	Social contributions	1 661	1 995	16 922	49	18	20 645	56		20 701	
D.62	Social benefits other than social transfers in kind				22 629		22 629	84		22 713	
D.7	Other current transfers	1 153	1 982	7 865	4 913	2 117	18 030	2 232		20 262	
B.6g	Gross disposable income	11 293	3 268	26 187	95 498	2 791	139 037			139 037	II.3. Redistribution of income in kind account
B.6n	Net disposable income	- 1 795	2 698	23 872	89 380	2 228	116 383			116 383	
D.63	Social transfers in kind						19 782			19 782	
B.7g	Gross adjusted disposable income	11 293	3 268	9 152	115 280	44	139 037			139 037	II.4. Use of income account
B.7n	Net adjusted disposable income	- 1 795	2 698	6 837	109 162	- 519	116 383			116 383	
B.6g	Gross disposable income	11 293	3 268	26 187	95 498	2 791	139 037			139 037	
B.6n	Net disposable income	- 1 795	2 698	23 872	89 380	2 228	116 383			116 383	
P.4	Actual Final Consumption								115 951	115 951	
P.3	Final consumption expenditure								115 951	115 951	
D.8	Adjustment for the change in the net equity of households in pension funds reserves				273		273			273	
B.8g	Gross saving										
B.8n	Net saving										
B.12	Current external balance										

Code	Transactions and other flows stocks and balancing items	S.11 Non-Financial Corporations	S.12 Financial Corporations	S.13 General Government	S.14 Households	S.15 NPISHs	S.1 Total of the Economy	S.2 Rest of the World Account		Total	Accounts
B.8g	Gross saving	11 293	2 995	- 1 942	10 697	44	23 087			23 087	III.1.1. Change in net worth due to saving and capital transfers account
B.8n	Net saving	- 1 795	2 425	- 4 257	4 579	- 519	433			433	
B.12	Current external balance							8 628		8 628	
D.9	Capital transfers, receivable	2 926	664	5 101	1 040	277	10 008	169		10 177	
D.9	Capital transfers, payable (-)	- 1 681	- 1 783	- 2 996	- 260	- 25	- 6 745	- 3 433		- 10 178	
B.10.1	Changes in net worth due to saving and capital transfers	- 550	1 306	- 2 152	5 359	- 267	3 696	5 365		9 061	III.1.2 Acquisitions of non-financial assets account
P.51	Gross fixed capital formation								31 734	31 734	
K.1	Consumption of fixed capital (-)										
P.52	Changes in inventories								- 141	- 141	
P.53	Acquisitions less disposals of valuables								122	122	
K.2	Acquisitions less disposals of non-produced non-financial assets										
B.9	Net lending (+) /borrowing (-)										

Code		S.11	S.12	S.13	S.14 + S.15		S.1	S.2			
	Net acquisition of financial assets\										III.2 Financial account
	Net incurrence of liabilities	14 240	29 373	3 879	8 408		55 899	29 900		85 799	
F.1	Monetary gold and SDRs										
F.2	Currency and deposits		6 471	697			7 168	8 518		15 686	
F.3	Securities other than shares	- 774	1 894	3 069	- 1		4 188	13 663		17 851	
F.4	Loans	7 633	6 357	143	8 963		23 096	- 729		22 367	
F.5	Shares and other equity	8 114	10 895				19 010	6 929		25 939	
F.6	Insurance technical reserves	1 373	1 880				3 253	168		3 421	
F.7	Other accounts receivable/payable	- 2 106	1 876	- 31	- 554		- 815	1 351		536	
B.9 F	Net lending (+) /borrowing (-)	- 6 097	148	- 4 064	4 631		- 5 381	5 380			
	Statistical discrepancy	- 465	468	- 13	40		29	- 28			