Social Accounting Matrix Multipliers for Greece

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The aim of this paper is to calculate Social Accounting Matrix (SAM) multipliers for Greece for the year 2010. The SAM provides the socalled "direct effect", "indirect effect" and "closed loop" multipliers. The SAM sectors are divided into three categories, namely the industries of production, the remuneration of factors of production and the various kinds of income. The "direct effect" multiplier has a significant effect on the first and third categories. The "indirect effect" multiplier has a significant effect on the second and third categories while the "closed loop" multiplier has significant effects on the first second and third categories. Finally, the global multiplier has a greater effect than those of the "closed loop", "indirect effect" and "direct effect" multipliers combined.

INTRODUCTION

The aim of this paper is the calculation of Social Accounting Matrix (SAM) multipliers for Greece for the year 2010, in the hope that these might be useful tools in the contemplation of a more targeted and therefore more effective employment policy and, at the same time, be used as a benchmark for the repetition of the experiment with more recent input data and other necessary data for the construction of SAM matrices.

As is well known, by combining the SAM with input-output analysis it is possible to develop an extended input-output model, which can then be used to analyse economic and social policy (see, e.g. Miller and Blair, 2009). The main characteristic of a SAM is its incorporation of transactions and transfers related to distribution of income in the economy. The SAM provides the multipliers relating to the "direct effect" (just like the Leontief output multiplier) and "indirect

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effect" (recording the impact of an exogenous input on each major sector), as well as "cross" or "closed loop" multipliers, which capture the final "feedback" effect of the subsequent rounds of impact on each sector (Miller and Blair, 2009, pp. 514-524). As such, SAM multipliers can be used as tools in the formulation of an economic policy programme.

The calculation of SAM multipliers is also important because they can be used, as follows. The solution of the Leontief system depends essentially on the relationships that productive sectors develop among themselves. However, an increase in final demand, which creates a multiplicative increase in the gross output of sectors, inevitably leads to an increase in income and or in employment of the factors of production. These incomes, grouped according to institutional sectors (Households, Financial Corporations, Non-Financial Corporations, Government), in turn create demand for domestic output or for imports. In this way, a second or third cycle of results is created which the Leontief solution cannot estimate, because the Leontief table does not describe the interdependence between production, demand for factors of production and income, which can be addressed with the SAM (Pyatt and Round, 1979; Panethymitakis, 1991).

Multipliers also have a further use. The product of the multipliers gives the global multiplier. Because the multiplicative relationship is difficult to interpret, it can be transformed into an additive relationship in which each result category is separate. Between any two accounts (one as start pole and the other as end pole) the value of the global multiplier can be estimated. Depending on the type of connection emanating from the manner of description of the economic relations in a SAM table, the global multiplier may be broken down into "direct effect", "indirect effect" and "closed loop" multipliers. However, what we don't know are the nodes through which the final result was shaped. It is a fact that in many cases the direct connection between two sectors explains a small part of the overall result. And this is where path analysis comes in, for it identifies the networks of nodes through which the final result is shaped at the end pole (Defournal and Thorbecke 1984; Panethymitakis, 1991).

The remainder of the paper is structured as follows. The second section focuses on the principal method used to construct the SAM. The third section presents the decomposition of the SAM multipliers for Greece. The fourth section presents and evaluates the results of the analysis. The final section concludes the paper.

CONSTRUCTION OF THE SAM

The SAM resulting in this paper has been constructed in such a way that the rows and columns of the matrix constitute a set of macroeconomic accounting balance equations (Miller and Blair, 2009, p. 501).

Moreover, this SAM also includes savings, investment, imports, exports and the role of government. At the same time, it presents the linkage with the industries of the economy by creating an input-output system.

This expansion of account information can be seen in the following list of "Annual Accounts" that have been added to the SAM:

1. Production (industries); 2. Income generation (original categories of inputs); 3. Distribution of initial income (institutional agents); 4. Secondary income distribution; 5. Use of disposable income (institutional agents); 6. Capital (institutional agents); 7. Gross fixed capital (industries); 8. Financial (financial data); 9. Rest of world (current, capital).

The Annual Accounts together with the Symmetric Input-Output Table for the Greek economy, for the year 2010, are the main sources used for the construction of the Social Accounting Matrix for that year (Economides and Economidis, 2017; Economidis and Economides, 2017).

We consider the productive sectors, factors of production and the various kinds of income as endogenous, in contrast with the other categories such as investment and foreign trade, which we consider as exogenous with respect to the production system.

Finally, the SAM for the year 2010 covers 64 industries. The institutional agents included are Households, Non-Financial Corporations, Financial Corporations and General Government.

DECOMPOSITION OF SAM MULTIPLIERS

Miller and Blair (2009, p. 515) define the matrix of SAM coefficients as

$$\mathbf{S} = \begin{bmatrix} \mathbf{A} & \mathbf{O} & \mathbf{C} \\ \mathbf{V} & \mathbf{O} & \mathbf{O} \\ \mathbf{O} & \mathbf{Y} & \mathbf{H} \end{bmatrix}$$
(1)

and **S** as the sum of two matrices, **Q** and **R**, i.e.

$$\mathbf{S} = \mathbf{Q} + \mathbf{R} \tag{2}$$

where

$$Q = \begin{bmatrix} A & O & O \\ O & O & O \\ O & O & H \end{bmatrix}$$
(3)

$$\mathbf{R} = \begin{bmatrix} \mathbf{O} & \mathbf{O} & \mathbf{C} \\ \mathbf{V} & \mathbf{O} & \mathbf{O} \\ \mathbf{O} & \mathbf{Y} & \mathbf{O} \end{bmatrix}$$
(4)

In the case of the Greek economy, **A** corresponds to the technical coefficient table, i.e. those coefficients deriving from the data of the first quartile of the Social Accounting Matrix when divided by the total output of each industry (64 x 64), **C** stands for the coefficients of endogenous final consumption expenditure of households and of non-profit institutions serving households and government (64 x 4), **V** stands for the coefficients per unit of endogenous wages, profits and taxes in value-added categories (3 x 64), **Y** stands for the endogenous coefficients of wages, profits and taxes in primary input categories (12 x 3), and **H** stands for endogenous coefficients of each institutional agent in the various kinds of income (12 x 12).

The relevant basic model is as follows

$$\overline{\mathbf{x}} = \mathbf{S}\,\overline{\mathbf{x}} + \mathbf{f} \tag{5}$$

$$\overline{\mathbf{x}} = \begin{bmatrix} \mathbf{x} \\ \mathbf{v} \\ \mathbf{y} \end{bmatrix}$$
(6)

where **x** is the vector, each element of which is the total output of the corresponding sector (1×64) , **v** is the vector of value added of the corresponding sector (1×3) , and **y** is the vector of the different kinds of total income of each agent (1×12) .

Furthermore,

$$\overline{\mathbf{f}} = \begin{bmatrix} \mathbf{f} \\ \mathbf{w} \\ \mathbf{h} \end{bmatrix}$$
(7)

where **f** is the vector of exogenously specified demand (64 x 1), i.e. "Gross Fixed Capital Formation" and "Exports", **w** is the vector of exogenously specified value-added inputs (3 x 1), and **h** is the vector of that part of income which we take as exogenously given (12x1).

Now we can rewrite the basic model as follows:

$$\overline{\mathbf{x}} = (\mathbf{Q} + \mathbf{R})\overline{\mathbf{x}} + \mathbf{f}$$

or

$$\overline{\mathbf{x}} = (\mathbf{I} - \mathbf{Q})^{-1} \, \mathbf{R} \, \overline{\mathbf{x}} + (\mathbf{I} - \mathbf{Q})^{-1} \, \overline{\mathbf{f}}$$
(8)

or, setting
$$\mathbf{T} = (\mathbf{I} - \mathbf{Q})^{-1} \mathbf{R}$$
,

$$\overline{\mathbf{x}} = \mathbf{T}\overline{\mathbf{x}} + (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}}$$
(9)

We multiply equation (9) by T:

$$\mathbf{T}\overline{\mathbf{x}} = \mathbf{T}^2 \,\overline{\mathbf{x}} + \mathbf{T}(\mathbf{I} - \mathbf{Q})^{-1} \,\overline{\mathbf{f}}$$
(10)

We substitute equation (10) into (9):

$$\overline{\mathbf{x}} = \mathbf{T}^2 \overline{\mathbf{x}} + \mathbf{T} (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}} + (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}}$$
(11)

We multiply equation (11) by T:

$$\mathbf{T}\overline{\mathbf{x}} = \mathbf{T}^3 + \mathbf{T}^2 \ (\mathbf{I} - \mathbf{Q})^{-1} \ \overline{\mathbf{f}} + \mathbf{T} (\mathbf{I} - \mathbf{Q})^{-1} \ \overline{\mathbf{f}}$$
(12)

We substitute equation (12) into (9):

$$\begin{split} \overline{\mathbf{x}} &= \mathbf{T}^{3} \overline{\mathbf{x}} + \mathbf{T}^{2} \left(\mathbf{I} - \mathbf{Q} \right)^{-1} \overline{\mathbf{f}} + \mathbf{T} (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}} + (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}} \\ \overline{\mathbf{x}} - \mathbf{T}^{3} \overline{\mathbf{x}} &= \mathbf{T}^{2} (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}} + \mathbf{T} (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}} + (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}} \\ \overline{\mathbf{x}} (\mathbf{I} - \mathbf{T}^{3}) &= \mathbf{T}^{2} (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}} + \mathbf{T} (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}} + (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}} \\ \overline{\mathbf{x}} &= (\mathbf{I} - \mathbf{T}^{3})^{-1} (\mathbf{I} + \mathbf{T} + \mathbf{T}^{2}) (\mathbf{I} - \mathbf{Q})^{-1} \overline{\mathbf{f}} \end{split}$$

or

 $\overline{\mathbf{x}} = \mathbf{M}_3 \, \mathbf{M}_2 \, \mathbf{M}_1 \, \overline{\mathbf{f}}$

or, finally,

 $\overline{\mathbf{x}} = \mathbf{M} \overline{\mathbf{f}}$

where $M_1 = (I - Q)^{-1}$, $M_2 = (I + T + T^2)$, $M_3 = (I - T^3)^{-1}$ and $M = M_3 M_2$ M_1 .

The multipliers are calculated as follows:

$$\mathbf{M}_{1} = \begin{bmatrix} (\mathbf{I} - \mathbf{A})^{-1} & \mathbf{O} & \mathbf{O} \\ \mathbf{O} & \mathbf{I} & \mathbf{O} \\ \mathbf{O} & \mathbf{O} & (\mathbf{I} - \mathbf{H})^{-1} \end{bmatrix}$$

Matrix \mathbf{M}_{1} defines the "direct effect" just like the Leontief output multiplier.

$$\mathbf{M}_{2} = \begin{bmatrix} \mathbf{I} & (\mathbf{I} - \mathbf{A})^{-1} \mathbf{C} (\mathbf{I} - \mathbf{H})^{-1} \mathbf{Y} & (\mathbf{I} - \mathbf{A})^{-1} \mathbf{C} \\ \mathbf{V} & \mathbf{I} & \mathbf{V} (\mathbf{I} - \mathbf{A})^{-1} \mathbf{C} \\ (\mathbf{I} - \mathbf{H})^{-1} \mathbf{Y} \mathbf{V} & (\mathbf{I} - \mathbf{H})^{-1} \mathbf{Y} & \mathbf{I} \end{bmatrix}$$

Matrix \mathbf{M}_2 is known as the matrix of "indirect multipliers". It describes how the impact of an exogenous input of each type gets transmitted to each major sector: "When a sector is affected by an external shock, these multipliers show those effects that are transmitted to other blocks and end there, not fed back to the sector where they originated. These are one-way, outward effects. Any impact on the originating block is excluded, shown by the fact that the diagonal blocks of the \mathbf{M}_2 matrix are identity matrices". (Research Bulletin, 1993)

$$\mathbf{M}_{3}\begin{bmatrix} [\mathbf{I} - (\mathbf{I} - \mathbf{A})^{-1}\mathbf{C}(\mathbf{I} - \mathbf{H})^{-1}\mathbf{Y}\mathbf{V}]^{-1} & 0 & 0\\ 0 & [\mathbf{I} - \mathbf{V}(\mathbf{I} - \mathbf{A})^{-1}\mathbf{C}(\mathbf{I} - \mathbf{H}) - \mathbf{Y}]^{-1} & 0\\ 0 & 0 & [\mathbf{I} - (\mathbf{I} - \mathbf{H})^{-1}\mathbf{Y}\mathbf{V}(\mathbf{I} - \mathbf{A})^{-1}\mathbf{C}]^{-1} \end{bmatrix}$$

Matrix \mathbf{M}_3 is often referred to as the matrix of "cross" or "closed loop" multipliers because they calculate the final "feedback" from the subsequent rounds of impact on each sector.

RESULTS

The Appendix contains the schematic presentation of a Social Accounting Matrix for 2010 at basic prices and in EUR millions (Eurostat, 1996), which shows the data used for the calculation of the

In the SAM multipliers for there are negative elements which derive from the initial data and may be interpreted as the inability of certain industries to reproduce themselves.

Of the 90 columns and rows of the Social Accounting Matrix, we considered the first 81 to be endogenous and the rest exogenous.

The amount of 9,611 million euros has been added to the exports of the SAM, which according to the Hellenic Statistical Authority correspond to expenditures of non-residents in Greece, and which we have distributed proportionately among the export sectors.

The calculations give direct effect \mathbf{M}_1 , indirect effect \mathbf{M}_2 and feedback effect \mathbf{M}_3 , the impact of which is much lower than the \mathbf{M} calculation. In Table 1 we present only the sums of the multiplier columns, which are aggregate measures of the multiplier effects. In this Table, three categories stand out:

- a) From 1 to 64, the industries of production.
- b) From 67 to 69, the remuneration of the factors of production and taxes.
- c) From 70 to 81, the Allocation of primary income, Secondary distribution of income, Use of disposable income.

The multiplier tables are 79x79. Of the 81 sectors, we do not take into account sector 65 (Total) and sector 66 (Total intermediate consumption).

From the multiplier matrices it can be seen that:

 \mathbf{M}_{1} has significant effects on the first category, no effect on the second and the greatest effects on the third category.

M, has significant effects on the second and third categories.

M₂ has significant effects on the first, second and third categories.

M has the greatest effect in all three categories and particularly the third category.

The sectors that have a greater effect on income in the institutional sectors, with a one unit increase in demand in one productive sector, are those which create the greatest interactions in the economy. According to the data in Table 1, with regard to the M_2 , M_3 and M multipliers, these sectors are 28, 36, 41, 43, 44, 45, 51, 54, 55, 56, 57, 58, 60, 62 and 63. In contrast, the picture is quite different in the case of the M_1 multiplier, where the sectors with the greatest changes are 7, 27, 35, 38, 46, 47, 48, 52, 59 and 60. Therefore, according to the global multiplier M, the sectors that have a greater effect on the economy are those that are important in M_2 and M_3 .

The global multiplier **M** reveals that for the Greek economy as a whole, the "weakest" sectors appear to be those of industry, since these show the smallest changes from a policy to boost demand, while those of services are the "strongest".

If we now add each separate multiplier vertically in Table 1, we see that the sum of multiplier \mathbf{M} (the global multiplier) is five times greater than the vertical sum of multipliers \mathbf{M}_2 and \mathbf{M}_3 and ten times higher than the vertical sum of multiplier \mathbf{M}_1 .

		Table 1 Direct effect, indirect effect, feedback effect, and global SAM mul-	ltiplier			
No	Code	Sectors	$M_{_{1}}$	$M_{_2}$	$M_{_3}$	Μ
	CPA_A01	Products of agriculture, hunting and related services	1.65	2.45	2.33	10.94
ы	CPA_A02	Products of forestry, logging and related services	1.53	2.23	2.23	9.76
Ю	CPA_A03	Fish and other fishing products; aquaculture products; support services to fishing	1.46	3.23	3.08	12.92
4	CPA_B	Mining and quarrying	1.11	1.22	1.23	2.68
ß	CPA_C10- C12	Food products, beverages and tobacco products	1.71	2.36	2.3	11.63
9	CPA_C13-	Textiles, wearing apparel and leather products	1.3	1.57	1.58	5.41
	C15					
~	CPA_C16	Wood and of products of wood and cork, except furniture; articles of straw	2.04	2.03	2.02	12.49
		and plaiting materials				
8	CPA_C17	Paper and paper products	1.53	1.54	1.56	6.88
6	CPA_C18	Printing and recording services	1.81	2.88	2.86	14.05
10	CPA_C19	Coke and refined petroleum products	1.76	1.48	1.45	6.01
11	CPA_C20	Chemicals and chemical products	1.33	1.33	1.33	4.45
12	CPA_C21	Basic pharmaceutical products and pharmaceutical preparations	1.18	1.83	1.8	5.69
13	CPA_C22	Rubber and plastics products	1.71	1.29	1.32	6.64
14	CPA_C23	Other non-metallic mineral products	1.58	2.72	2.69	11.97
15	CPA_C24	Basic metals	1.92	1.65	1.65	9.32
16	CPA_C25	Fabricated metal products, except machinery and equipment	1.79	1.95	1.94	9.81
17	CPA_C26	Computer, electronic and optical products	1.03	1.11	1.11	1.68
18	CPA_C27	Electrical equipment	1.42	1.79	1.77	6.86
19	CPA_C28	Machinery and equipment n.e.c.	1.28	1.71	1.71	5.72
20	CPA_C29	Motor vehicles, trailers and semi-trailers	1.12	1.29	1.29	3.02
21	CPA_C30	Other transport equipment	1.03	1.14	1.15	1.80
22	CPA_C31_	Furniture; other manufactured goods	1.49	1.62	1.63	6.92
	C32					
33	CPA_C33	Repair and installation services of machinery and equipment	1.70	3.09	3.11	14.25
					cont	d. table 1

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No	Code	Sectors	M_1	M_2	$M_{_3}$	M
24	CPA_D35	Electricity, gas, steam and air-conditioning	1.54	2.88	2.79	11.80
25	CPA_E36	Natural water; water treatment and supply services	1.78	1.97	2.13	11.28
26	CPA_E37-	Sewerage; waste collection, treatment and disposal activities; materials recovery;	1.54	3.04	3.01	12.83
	E39	remediation activities and other waste management services				
27	CPA_F	Constructions and construction works	2.12	2.29	2.26	14.37
28	CPA_G45	Wholesale and retail trade and repair services of motor vehicles and motorcycles	1.48	4.03	3.88	16.94
29	CPA_G46	Wholesale trade services, except of motor vehicles and motorcycles	1.80	3.04	3.03	15.91
30	CPA_G47	Retail trade services, except of motor vehicles and motorcycles	1.64	3.29	3.3	15.92
31	CPA_H49	Land transport services and transport services via pipelines	1.82	2.19	2.23	11.1
32	CPA_H50	Water transport services	1.73	2.48	2.38	10.69
33	CPA_H51	Air transport services	1.93	1.93	1,93	10.37
34	CPA_H52	Warehousing and support services for transportation	1.26	1.56	1.55	5.01
35	CPA_H53	Postal and courier services	2.11	2.61	2.68	16.14
36	CPA_I	Accommodation and food services	1.55	3,81	3.62	16.07
37	CPA_J58	Publishing services	1.5	3.38	3.28	14.6
38	$CPA_J59_$	Motion picture, video and television programme production services, sound	2.07	1.60	1.67	11.51
	J60	recording and music publishing; programming and broadcasting services				
39	CPA_J61	Telecommunications services	1.5	3.25	3.12	13.99
40	CPA_J62_ 163	Computer programming, consultancy and related services; information services	1.45	3.18	3.12	13.5
41	CPA_K64	Financial services, except insurance and pension funding	1.38	3.83	3.83	16.17
42	CPA_K65	Insurance, reinsurance and pension funding services, except compulsory	1.5	2.42	2.39	11.56
		social security				
43	CPA_K66	Services auxiliary to financial services and insurance services	1.33	4.63	4.43	18.58
44	CPA_L68B	Real estate services (excluding imputed rent)	1.1	3.64	3.42	11.87
45	CPA_M69_	Legal and accounting services; services of head offices; management	1.55	3.68	3.52	16.17
	M70	consulting services				
46	CPA_M71	Architectural and engineering services; technical testing and analysis services	1.99	2.65	2.56	15.86
					cont	d. table 1

TCrA_M72Scientific research and development services2.051.081.299.6849CTA_M72Other professional, scientific and technical services2.451.411.411.39949CTA_M72Other professional, scientific and technical services2.451.431.411.4140CTA_M73Binployment services1.662.172.121.10551CTA_M78Employment services1.662.172.121.10552CTA_M78Employment services2.072.322.2915.4553CTA_M89Public administration and defence services, compulsory social security services1.423.443.4654CTA_M89Fublic administration and defence services, compulsory social security services1.423.463.533.8955CTA_M89Fublic administration and defence services, compulsory social security services1.423.463.753.6655CTA_M89Fublic administration and defence services, compulsory social security services1.423.743.8615.9556CTA_M89Fublic administration and defence services, ilbrary, archive, museum and other1.274.434.1617.0856CTA_Q89Fublic administrationCTA_M893.753.623.753.753.753.7616.6756CTA_Q87Scial work servicesIntral services, graphing and betting services1.274.434.1617.0858CTA_Q89 <th>No</th> <th>Code</th> <th>Sectors</th> <th>$M_{_{1}}$</th> <th>M_2</th> <th>$M_{_3}$</th> <th>М</th>	No	Code	Sectors	$M_{_{1}}$	M_2	$M_{_3}$	М
46CTA M73Advertising and market research services47CPA M74.Other professional, scientific and technical services, veterinary services14814114350CTA M74.Other professional, scientific and technical services, veterinary services1283.082.9814.951CTA M78Employment services1085.475.20191755652CTA M80Security and investigation services, services and related services1.072.123.17155653CTA M80Security and investigation services, compulsory social security services1.423.17155653CTA O88Public administration and defence services; compulsory social security services1.423.173.5554CTA O88Human health services1.423.743.8615.9555CTA O86Human health services1.423.743.8615.9556CTA O86Human health services1.433.1617.0857CTA O86Human health services1.433.1617.0858CTA O86Human health services1.433.16 <td< td=""><td>47</td><td>CPA_M72</td><td>Scientific research and development services</td><td>2.05</td><td>1.08</td><td>1.29</td><td>9.68</td></td<>	47	CPA_M72	Scientific research and development services	2.05	1.08	1.29	9.68
40 CPA_M74. Other professional, scientific and technical services, veterinary services 183 3.08 2.98 149 80 C7A_NY7 Rental and leasing services 166 2.17 2.12 11.05 81 C7A_NY7 Employment services 1.08 5.47 5.26 1917 82 CPA_N77 Tarval agreey, tour operation and other reservation services and related services 1.08 5.47 5.24 5.55 1917 83 CPA_N80 Femily and investigation services, services is proport and other business support services 1.43 3.04 3.96 15.85 84 CPA_N80 Human health services 1.43 4.04 3.95 15.85 85 CPA_086 Human health services 1.43 4.04 3.95 15.85 86 CPA_086 Human health services 1.43 4.04 3.95 15.86 87 CPA_086 Human health services 1.43 4.04 3.95 15.85 86 CPA_087 Social work services 1.43 4.04 3.95 16.67 87 CPA_087	48	CPA_M73	Advertising and market research services	2.48	1.41	1.41	13.99
50 CPA.NY7 Rental and leasing services 166 2.17 2.12 11.05 52 CPA.NY3 Employment services 108 5.47 5.26 19.17 52 CPA.NY3 Travel agency, tour operation and other reservation services 108 5.47 5.26 19.17 53 CPA.N80 Security and investigation services; services to buildings and landscape; 1.72 3.12 3.17 15.56 54 FA.N80 Fundation services 1.43 4.04 3.86 15.59 55 CPA.085 Human health services 1.43 4.04 3.95 15.66 55 CPA.085 Human health services 1.43 4.04 3.95 15.85 56 CPA.085 Bunding and defence services; tibrary, archive, museum and other 1.27 4.43 4.16 17.08 57 CPA.085 Social work services Sombing add moscless and betting services 2.04 2.41 2.47 15.48 57 Social work services CPA.081 CPA.081 2.43 4.16 17.08 50 Sorial work services	49	CPA_M74_ M75	Other professional, scientific and technical services; veterinary services	1.83	3.08	2.98	14.9
51 CPA, M78 Employment services 108 547 5.26 19,17 52 CPA, M78 Enrediagravy, tour operator and other reservation services and related services 1.08 5.47 5.26 19,17 53 CPA, M78 Security and investigation services services to buildings and landscape; 1.72 3.12 3.17 1556 53 CPA, M88 Public administrative, office support and other business support services 1.42 3.74 3.86 1535 55 CPA, O88 Human health services 1.42 3.74 3.86 1585 55 CPA, O87 Book work services 1.42 3.75 16.67 56 CPA, O87 Social work services 1.42 3.75 16.67 56 CPA, O87 Social work services 1.62 3.62 3.75 16.67 58 CPA, O87 Social work services 1.67 3.43 4.16 17.08 58 CPA, B80 Creative, aris and entertainment services; library, archive, museum and other 1.27 4.43 4.16 17.08 59 CPA, B80 Creative, aris and	50	CPA_N77	Rental and leasing services	1.66	2.17	2.12	11.05
22CPA N79Travel agency, tour operator and other reservation services and related services 2.07 2.32 2.29 1545 33CPA N89Security and investigation services; services to buildings and landscipe; 1.72 3.17 356 554 531 1595 54CPA 084Public administration and defence services; compulsory social security services 1.42 3.74 3.86 1595 55CPA 084Fulunan health services 1.42 3.74 3.86 1595 55CPA 085Education services 1.42 3.74 3.86 1582 56CPA 087Social work services 1.42 3.75 1.667 58CPA 087Social work services 1.62 3.62 3.75 1.667 58CPA 089Creative, arts and entertainment services 1.62 3.62 3.75 1.67 58CPA 080Creative, arts and entertainment services 1.127 4.43 4.16 17.26 59CPA 083Sporting services and answement and recreation services 1.125 4.75 4.76 4.76 4.75 50CPA 984Services furnished by membership organisations 1.25 4.75 4.46 17.25 60CPA 984Services furnished by membership organisations 1.25 4.75 4.76 4.46 17.25 61CPA 984Services of computers and personal arrives 1.25 4.75 4.76 4.96 17.45 62CPA	51	CPA_N78	Employment services	1.08	5.47	5.26	19.17
53CPA_N80Security and investigation services, services to buildings and landscape;1.723.123.17155654CPA_088Public administrative, office support and other business support services1.434.043.951.89555CPA_086Human health services1.434.043.951.83256CPA_086Human health services1.434.043.951.83257CPA_086Human health services1.434.043.951.88256CPA_086Human health services1.6673.623.751.66757CPA_087Social work services1.623.623.751.66758CPA_087Social work services2.111.751.891.26058CPA_083Sporting services and annewment and recreation services2.111.751.891.26058CPA_595Repair services intamished by membership organisations2.042.412.471.5460CPA_595Repair services intamished by membership organisations1.254.754.4617.2561CPA_595Repair services of computers and personal and household goods1.254.754.4617.2561CPA_595Repair services of computers and personal services1.33.433.05162CPA_596Other personal services1.254.754.4617.2563CPA_10Services furnished by membership organisations1.254.75 <t< td=""><td>52</td><td>CPA_N79</td><td>Travel agency, tour operator and other reservation services and related services</td><td>2.07</td><td>2.32</td><td>2.29</td><td>15.45</td></t<>	52	CPA_N79	Travel agency, tour operator and other reservation services and related services	2.07	2.32	2.29	15.45
N82 55Other administrative, office support and other business support services142374386159555CPA_O86Human health services1.095245.31189856CPA_O86Human health services1.095245.31189856CPA_O86Human health services1.673.623.7516.6757CPA_O87Social work services1.623.623.7516.6758CPA_O87Social work services1.623.623.7516.6758CPA_R03Sporting services and antertainment services1.1623.623.7516.6758CPA_S04Creative, arts and entertainment services2.111.751.8912.6060CPA_S04Services furnished by membership organisations2.011.751.8912.6061CPA_S04Services furnished by membership organisations2.042.412.4715.4862CPA_S04Services furnished by membership organisations1.254.354.3617.2563CPA_S05Reparanal services15.795.8320.5164CPA_UServices of households are mployers; undifferentiated goods and services15.795.8320.5165CPA_UServices of households for own use15.795.8320.5166CPA_UServices provided by extraterritorial organisations and bodies15.795.8320.5167<	53	CPA_N80-	Security and investigation services; services to buildings and landscape;	1.72	3.12	3.17	15.56
5. CTA_D85Fund and unsummed and uservices1.02 5.74 5.30 12.95 5. CTA_086Human health services1.09 5.24 3.95 15.82 5. CTA_086Human health services1.67 3.62 3.75 16.67 5.8Creative, arts and entertainment services1.67 4.43 4.16 17.08 5.8CTA_087Social work services1.67 4.43 4.16 17.08 5.8CTA_087Social work services1.67 4.43 4.16 17.08 5.8CTA_R93Sporting services and antusement and recreation services 2.11 1.77 4.43 4.16 17.08 60CTA_S94Services furnished by membership organisations 2.04 2.41 2.47 2.47 5.48 61CTA_S95Repair services of computers and personal and household goods 1.27 4.36 4.75 4.46 17.25 62CTA_S95Repair services 1.35 5.82 2.051 1.35 4.39 1.260 67CTA_S95Repair services 1.25 6.74 2.41 2.47 2.44 2.47 5.48 61CTA_S95Repair services 1.35 6.75 1.35 5.79 5.82 2.051 62CTA_S95Repair services 1.25 6.77 5.79 5.82 2.051 63CTA_S15Repair services 1.25 6.77 7.75 4.36 1.74 64CTA_S15	ŭ	N82 00 A 004	office administrative, office support and other business support services	¢	17 0	20 6	15.05
50 CPA_Q86 Humana health services 143 9.44 3.95 1582 57 CPA_Q86 Social work services 1667 3.62 3.75 1667 58 CPA_Q86 Social work services 11.27 4.43 4.16 1708 58 CPA_Q86 Creative, arts and entertainment services; library, archive, museum and other 1.27 4.43 4.16 1708 59 CPA_S93 Sporting services and anusement and recreation services 2.11 1.75 1.89 12.60 60 CPA_S93 Sporting services and anusement and recreation services 2.11 1.75 1.89 12.60 61 CPA_S93 Sporting services and musement and recreation services 2.11 1.75 1.89 12.60 62 CPA_S95 Repair services of computers and personal and household goods 1.25 4.75 4.46 17.25 63 CPA_U Services provided by extraterritorial organisations and bodies 1 5.79 5.83 20.51 64 CPA_U Services provided by extraterritorial organisations and bodies 1 5.79 5.83 20.51	5 6		I UDIL AUIIIIBLIATIOL AIU UEIEIRE SELVICES, COILIPUISUI Y SUCIAI SECULITY SELVICES	1.00	1.0 1.01	о.0 7 21	1909
50 CTA_Q87 Social work services 1.52 3.62 3.75 16.67 58 CPA_R087 Social work services 1.62 3.62 3.75 16.67 58 CPA_R096 Creative, arts and entertainment services, library, archive, museum and other 1.27 4.43 4.16 17.08 58 CPA_R095 Creative, arts and entertainment services, library, archive, museum and other 1.27 4.43 4.16 17.08 60 CPA_S05 Repair services and anusement and recreation services 2.11 1.75 1.89 12.60 61 CPA_S05 Repair services of computers and personal and household goods 1.25 4.75 4.46 17.45 62 CPA_S06 Create soft onuscholds are enclosed on the services 1.3 5.43 20.51 63 CPA_S06 Create browneed by households for own use 1.3 5.74 3.24 3.21 10.18 64 CPA_U Services provided by extraterritorial organisations and bodies 1 3.435 20.51 10.18 65 CPA_U Services provided by extraterritorial organisations and bodies 1 1	с С		Luman hadth consists	1 12	4 0 V	2 0F	15.00
57 CPA_Q87_ 088 Social work services 1.62 3.62 3.73 16.67 58 CPA_R90- 088 Creative, arts and entertainment services; library, archive, museum and other 1.27 4.43 4.16 17.08 59 CPA_R93 Sporting services ind amusement and recreation services 2.11 1.75 1.89 12.60 60 CPA_S94 Services furnished by membership organisations 2.01 2.41 2.47 15.48 61 CPA_S95 Repair services of computers and presonal and household goods 1.25 4.75 4.46 17.25 62 CPA_S96 Other personal services 1.1.25 4.36 17.45 63 CPA_T Services provided by extraterritorial organisations 1.25 4.75 4.46 17.25 64 CPA_U Services provided by extraterritorial organisations and services 1 5.79 5.83 20.51 65 CPA_U Services provided by extraterritorial organisations and services 1 5.74 3.31 10.18 65 CPA_U Services provided by extraterritorial organisations and bodies 1 5.79 5.83 <td>81</td> <td></td> <td></td> <td>01.1</td> <td>4.04</td> <td></td> <td>70.01</td>	81			0 1 .1	4.04		70.01
58Construction1.274.434.1617.08780cultural services; gambling and betting services2111.751.8912.60782cultural services; gambling and betting services2.111.751.8912.6060CPA_S93Sporting services and amusement and recreation services2.111.751.8912.6061CPA_S95Repair services and amusement and recreation services2.042.412.4715.4861CPA_S95Repair services of computers and personal and household goods1.254.754.4617.2562CPA_S96Other personal services1.34.354.3917.4563CPA_UServices of households as employers; undifferentiated goods and services15.795.8320.5164CPA_UServices provided by extraterritorial organisations and bodies13.443.2110.1864CPA_UServices provided by extraterritorial organisations and bodies13.443.2110.1865CPA_UServices provided by extraterritorial organisations and bodies16.443.1119.9166TOT_CATotalTotal67PrimaryCompensation of employees16.443.1119.9168TOT_CAServices16.443.1119.9169PrimaryCompensation of employees16.443.1119.91<	57	CPA_Q87_ 088	Social work services	1.62	3.62	3.75	16.67
58 CPA_R90- Creative, arts and entertainment services; library, archive, museum and other 127 4.43 4.16 17.08 892 cultural services; gambling and betting services 2.11 1.75 1.89 12.60 60 CPA_S94 Services furnished by membership organisations 2.04 2.41 2.47 15.48 61 CPA_S95 Repair services of computers and personal and household goods 1.25 4.75 4.46 17.25 62 CPA_S95 Repair services of computers and personal and household goods 1.25 4.75 4.46 17.25 63 CPA_S17 Services funnished by membership organisations 1.3 4.35 4.39 17.45 64 CPA_S16 Services of households for own use 1.3 4.35 4.39 17.45 65 CPA_U Services provided by extraterritorial organisations and bodies 1 5.79 5.83 20.51 64 CPA_U Services provided by extraterritorial organisations and bodies 1 5.79 5.83 20.51 65 CPA_U Services provided by extraterritorial organisations and bodies 1 6.74<		X 00					
59CPA_R03Sporting services and anusement and recreation services2.111.751.8912.6060CPA_S04Services furnished by membership organisations2.042.412.4715.4861CPA_S05Repair services of computers and personal and household goods1.254.754.4617.2562CPA_S05Repair services of computers and personal and household goods1.34.354.3917.4562CPA_S05Repair services1.34.354.3917.4563CPA_TServices of households as employers; undifferentiated goods and services15.795.8320.5164CPA_UServices provided by extraterritorial organisations and bodies13.443.2110.1865CPA_Total13.443.2110.1865CPA_Total13.443.2110.1866TOT_CATotal16.443.1119.9167PrimaryCompensation of employees16.443.1119.9167PrimaryCompensation of employees16.443.1119.9168TOT_CATotal intermediate consumption/Final use at purchasers' prices16.443.1119.9167PrimaryCompensation of employees16.443.1119.9168FinutServices16.443.1119.9168FinutServices16.443.11	58	CPA_R90-	Creative, arts and entertainment services; library, archive, museum and other	1.27	4.43	4.16	17.08
59CrA_r893Sporting services and amusement and recreation services2.111.731.891.20060CPA_594Services furnished by membership organisations2.042.412.4715.4861CPA_595Repair services of computers and personal and household goods1.254.4617.2562CPA_596Other personal services1.34.354.4617.2563CPA_TServices of households for own use1.35.795.8320.5164CPA_UServices provided by extraterritorial organisations and bodies13.443.2110.1864CPA_UServices provided by extraterritorial organisations and bodies13.443.2110.1865CPA_UServices provided by extraterritorial organisations and bodies16.443.1119.9165CPA_UTotalTotal66TOT_CATotal intermediate consumption/Final use at purchasers' prices16.443.1119.9167PrimaryCompensation of employees16.443.1119.9168FrimaryCompensation of employees16.443.1119.9167PrimaryCompensation of employees16.443.1119.9168PrimaryCompensation of employees16.443.1119.9169PrimaryCompensation of employees10 <td>Ċ</td> <td>26V</td> <td></td> <td>č</td> <td>L C T</td> <td>00</td> <td></td>	Ċ	26V		č	L C T	00	
60 CPA_S94 Services furnished by membership organisations 2.04 2.41 2.47 15.48 61 CPA_S95 Repair services of computers and personal and household goods 1.25 4.75 4.46 17.25 62 CPA_S96 Other personal services 1.3 4.35 4.39 17.45 62 CPA_S96 Other personal services 1 5.79 5.83 20.51 63 CPA_I Services of households for own use 1 5.79 5.83 20.51 64 CPA_I Services provided by extraterritorial organisations and bodies 1 3.44 3.21 10.18 65 CPA_I Total 1 17.45 <td< td=""><td>66</td><td>CPA_K93</td><td>Sporting services and amusement and recreation services</td><td>2.11</td><td>67.1</td><td>1.89</td><td>12.60</td></td<>	66	CPA_K93	Sporting services and amusement and recreation services	2.11	67.1	1.89	12.60
61 CPA_S95 Repair services of computers and personal and household goods 1.25 4.75 4.46 17.25 62 CPA_S96 Other personal services 1.3 4.35 4.39 17.45 63 CPA_T Services of households as employers; undifferentiated goods and services 1 5.79 5.83 20.51 64 CPA_U Services provided by extraterritorial organisations and bodies 1 3.44 3.21 10.18 64 CPA_U Services provided by extraterritorial organisations and bodies 1 3.44 3.21 10.18 65 CPA_U Total 1 3.44 3.21 10.18 65 CPA_U Total 1 3.44 3.21 10.18 67 Primary Total	60	CPA_S94	Services furnished by membership organisations	2.04	2.41	2.47	15.48
 CPA_S96 Other personal services CPA_S17 Services of households as employers; undifferentiated goods and services Services of households for own use CPA_U Services provided by extraterritorial organisations and bodies Total Total TOTAL Total Total Total Compensation of employees Categories Categories Contract Contr	61	CPA_S95	Repair services of computers and personal and household goods	1.25	4.75	4.46	17.25
63 CPA_T Services of households as employers; undifferentiated goods and services 1 5.79 5.83 20.51 64 CPA_U Services provided by extraterritorial organisations and bodies 1 3.44 3.21 10.18 65 CPA_ Total 66 TOT_CA Total intermediate consumption/Final use at purchasers' prices	62	CPA_S96	Other personal services	1.3	4.35	4.39	17.45
64 CPA_U 3.44 3.21 10.18 65 CPA_ Total 65 CPA_ Total 65 CPA_ Total 66 TOT_LL Total intermediate consumption/Final use at purchasers' prices 1 6.44 3.11 19.91 67 Primary Compensation of employees <	63	CPA_T	Services of households as employers; undifferentiated goods and services	1	5.79	5.83	20.51
64 CPA_U Services provided by extraterritorial organisations and bodies 1 3.44 3.21 10.18 65 CPA_ Total 7OTAL Total 66 TOT_CA Total intermediate consumption/Final use at purchasers' prices			produced by households for own use				
65 CPA Total	64	CPA_U	Services provided by extraterritorial organisations and bodies	1	3.44	3.21	10.18
66 TOT_CA Total intermediate consumption/Final use at purchasers' prices	65	CPA_ TOTAL	Total				
67 Primary Compensation of employees 1 1 6.44 3.11 19.91 input Categories contd. table 1	99	TOT CA	Total intermediate consumption/Final use at purchasers' prices	l	l		
input Categories Contd. table 1	67	Primary	Compensation of employees	1	6.44	3.11	19.91
Categories contd. table 1		input					
contd. table 1		Categories					
						cont	d. table 1

Nο	Code	Sectors	M_1	M_2	$M_{_3}$	W
68		Other net taxes on production	, 1	6.31	ε	19.12
69		Operating surplus, net		6.34	2.88	18.37
70	Allocation of primary	Households	3.79			19.01
	income					
7		Non-financial Institutions	4.12	1	1	14.93
2		Financial Institutions	3,52	1	1	9.17
23		General Government	3.88	-1	-	18.12
74	Secondary	Households	2.79			18.24
	of income					
75		Non-financial Institutions	3.2	-1	1	14.25
76		Financial Institutions	2.45		1	6.06
4		General Government	3.3		1	24.79
78	Use of	Households	1.35	3.08	7.73	15.38
	Disposable Income					
79		Non-financial Institutions	1	1	1	1
80		Financial Institutions	1	1	1	1
81		General Government	1	6.59	24.13	43.44
82	Capital Account	Households				
83		Non-financial Institutions				
84		Financial Institutions				
85		General Government				
86		Total Economy				
87	Rest of	Current (Number)				
	the World					
88		Capital				
89		Corrections				
90	SUPBP	Total				

CONCLUDING REMARKS

The above results relate primarily to the effect of multipliers on the SAM for the Greek economy for the year 2010 and these multipliers can be used as a basis for formulating an economic policy that takes into account the way in which production, income and employment are affected at a sectoral level. The results also point to a space for possible intervention at the level of wages, distribution of income and allocation among the different categories of institutional sectors in efforts to create strong demand for domestic production and factors of production.

More specifically, the M_1 "direct effect" multiplier can be seen to have an impact on the first and third categories, which is to be expected when one considers that it relates to the effect on the sectors of production and the effect on the different kinds of income. The M_2 "indirect effect" multiplier, which shows the indirect effects on other sectors of a direct effect on a sector, has a significant effect on the second and third categories. It can be seen that the indirect effects on the second category are quite strong.

 M_3 , the "closed loop" multiplier, captures the final feedback effect of the subsequent rounds of impact on each sector. M_3 has significant effects on the first category, on the second category and on the third category. The greatest effects are on the third category. The sectors that have a greater effect on income in the institutional sectors, are those which create the greatest interactions in the economy. According to the global multiplier **M** the sectors that have a greater effect on the economy are those that are important in M_2 and M_3 . Finally, **M**, the global multiplier, has a much greater effect than the other multipliers on all categories and especially the third, which means that on the basis of the specific production, there is a significant increase in employment and income. The global multiplier reveals that, for the Greek economy as a whole, the "weakest" sectors appear to be those of industry, while those of services are the "strongest".

The above conclusions are of importance for economic policy because, apart from the sectoral linkages provided by the Input-Output Table, the SAM shows us the effect of increasing the production of the sectors on employment and income. It can be seen that the effects of the global multiplier are much higher than those arising from the sum of the multipliers. Therefore, the prerequisites exist for a path analysis, which may be used to improve the linkage between sectors (nodes). The multipliers can also be used to address other economic policy problems, such as how the reduction of external borrowing affects the country's output.

Acknowledgments

The authors also wish to thank two anonymous referees for their valuable comments. In the course of compiling the SAM, a number of issues were discussed with officers of the Hellenic Statistical Authority and in particular with Nikolaos Stromplos, whom we would like to thank.

Notes

- 1. The SAM data used for the calculation of the multipliers for this paper are presented at the end of the Appendix.
- 2. The results for the multipliers were also confirmed by the Additive Multiplier method of Stone (1985).

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APPENDIX: SCHEMATIC PRESENTATION OF A SOCIAL ACCOUNTING MATRIX, BASIC PRICES

ACCOUNT			0.Goods and	0.Goods and TOTAL ECONOMY			
			services	I. Production	II.1.1	II.1	II.2 Secondary
			(products)	(industries)	Generation	Allocation of	distribution of
					of income	primary	income
					(primary	income	(institutional
					input	(institutional	sectors)
					categories)	sectors)	
			I=1	II=2	III=3a	IV=3b	V=4
0.0	loods and services		Trade and	Intermediate			
	(products)	I=1	transport	consumption			
			margins	156,163			
T	1.Production	11=2	Output				
U	(industries)		351,385				
1	TT 4 4	777					
- A T		=		NET VALUE			
L	Generation of	3a		ADDEL			
F	income (primary			(DASIC			
Ċ	input categories)			150 575			
ŏ	II 1 Allocation of	IV-	Taxos loss	10,010	CENERA	Proportz	
N	nrimary income	3b	subsidie		TED	income	
0	(institutional	50	on products		INCOME	41 335	
Μ	sectors)		26 930		NET (BASIC	11,000	
Υ	occoro,		20,000		PRICES)		
					159,322		
	II.2 Secondary	V=4				NATIONAL	Current
	distribution of					INCOME,	transfers
	income					NET	108,496
	(institutional					180,270	
	sectors)						
Т	II.4 Use of	VI=					DISPOSABLE
0	disposable	5					INCOME, NET
T	income						178,719
A	(institutional						
L	Sectors)	N ZIT					
Б	Capital	VII					
C	(institutional	=0/					
õ	Sectors)	7a					
Ň							
0	Gross fixed	VIIJ		Consumption			
M	capital	=7b		of fixed capital			
Υ	formation			35,647			
	(industries)						
	III.2 Financial	IX=					
	(financial assets)	8					
			- · ·				
P	Current	X=1	Imports of		Compensati	Property	Current
R		4/1	goods and		onot	income and	transfers
0		5	services		Employees	taxes less	to the rest of the
٧V			70,02C		to the	subsidies on	world
					rest of the	to the rest of	5,015
					453	the world	
		1			100	11.794	
	Capital	XI=					
		16/					
		17					
	TOTAL		448,335	351,385	159,775	233,399	290,830
					-		

SOCIAL ACCOUNTING MATRIX MULTIPLIERS FOR GREECE / 73

	TOTAL ECONOMY		REST OF TH	E WORLD	TOTAL	
II.4 Use of	Capital	Gross fixed	III.2 Financial	Current	Capital	
disposable	(institutional	capital	(financial assets)			
income	Sectors)	formation				
(institutional		(industries)				
VI-5	VII-6/7a	VIII-7b	IX-8	X-14/15	XI-16/17	
I Final	Changes in	Gross fixed	LA-0	Exports of	AI-10/ I/	448 335
consumption	inventories	capital		goods and		110,000
203.803	-230	formation		services		
· · · ·		39,185		49,414		
II						351,385
ш				Compensation		150 775
				of employees		107,110
				from the rest of		
				the world		
				200		
IV				Property		233,399
				income and		
				taxes less		
				subsidies on		
				production from		
				the rest of the		
				world		
				5,812		
V				Current		290.830
				transfers		230,000
				from the rest of		
				the world		
				2,064		
VI Adjustment				Adjustment for		178,719
for the change				the change		
in the net equity				in the net equity		
of households on				of households		
pension funds				on pension		
U				runds from the		
VILSAVING.	Capital transfers		Net incurrence	, , , , , , , , , , , , , , , , , , ,	Capital	7.323
NET	3,797		of liabilities		transfers	- ,
-25,084			24,473		from the rest	
					of the world	
					4,137	
VIII	Net fixed capital					39,185
	formation					
TV	3,538 Not consistions				NET	24.472
IX	Net acquisitions				LENDING	24,473
	ormancial				OF THE	
	0				RESTOF	
	Ň				THE	
					WORLD	
					24,473	
X Adjustment						85,882
for the change						
in the net equity						
of households on						
pension funds to						
the rest of the						
world						
VI	Capital transform			CUPPENIT		28.610
A1	to the rest of the			EXTERNAL		20,010
	world 218			BALANCE		
				28,392		
TOTAL	7,323	39,185	24,473	85,882	28,610	
178,719		, 		1 '		

Source: Eurostat (1996, Table 8.20, p. 204)
 Matrix A derives from the data of cell I vertically and horizontally.
 Matrix C derives from the data of VI = 5 Final consumption.
 Matrix V derives from the horizontal data of II.1.1 Generation of Income (primary input categories) or III = 3a.
 Matrix H derives from the horizontal data of IV = 3b, V = 4 and VI = 5.
 Vector f derives from the data of VII = 6/7a, VIII = 7b, IX = 8, X = 14/15, XI = 16/17.