BULLETIN OF POLITICAL ECONOMY
11: 1-2 (2017): 59-73

Social Accounting Matrix Multipliers for Greece

CHARALAMPOS ECONOMIDIS* AND PAULIN MEMA**

The aim of this paper is to calculate Social Accounting Matrix (SAM) multipliers for Greece for the year 2010. The SAM provides the so-called "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

* Department of Public Administration, Panteion University, Athens, Greece; *E-mail: checonom@panteion.gr*
** Department of Public Administration, Panteion University, Athens, Greece; *E-mail: p.mema@hotmail.com*

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

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

and $\mathbf{S}$ as the sum of two matrices, $\mathbf{Q}$ and $\mathbf{R}$, i.e.

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

where

$$\mathbf{Q} = \begin{bmatrix} \mathbf{A} & \mathbf{O} & \mathbf{O} \\ \mathbf{O} & \mathbf{O} & \mathbf{O} \\ \mathbf{O} & \mathbf{O} & \mathbf{H} \end{bmatrix} \tag{3}$$

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

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

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

$$\bar{\mathbf{x}} = \begin{bmatrix} \mathbf{x} \\ \mathbf{v} \\ \mathbf{y} \end{bmatrix} \tag{6}$$

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

Furthermore,

$$\bar{\mathbf{f}} = \begin{bmatrix} \mathbf{f} \\ \mathbf{w} \\ \mathbf{h} \end{bmatrix} \tag{7}$$

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:

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

or

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

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

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

We multiply equation (9) by **T**:

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

We substitute equation (10) into (9):

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

We multiply equation (11) by **T**:

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

We substitute equation (12) into (9):

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

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

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

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

or

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

or, finally,

$$\bar{\mathbf{x}} = \mathbf{M}\,\bar{\mathbf{f}}$$

where $\mathbf{M}_1 = (\mathbf{I} - \mathbf{Q})^{-1}$, $\mathbf{M}_2 = (\mathbf{I} + \mathbf{T} + \mathbf{T}^2)$, $\mathbf{M}_3 = (\mathbf{I} - \mathbf{T}^3)^{-1}$ and $\mathbf{M} = \mathbf{M}_3\,\mathbf{M}_2\,\mathbf{M}_1$.

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 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 **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.

$\mathbf{M}_2$ has significant effects on the second and third categories.

$\mathbf{M}_3$ has significant effects on the first, second and third categories.

M has the greatest effect ïn 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 $\mathbf{M}_2$, $\mathbf{M}_3$ 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 $\mathbf{M}_1$ 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 $\mathbf{M}_2$ and $\mathbf{M}_3$.

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 **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 multiplier

No	*Code*	*Sectors*	M_1	M_2	M_3	M
1	CPA_A01	Products of agriculture, hunting and related services	1.65	2.45	2.33	10.94
2	CPA_A02	Products of forestry, logging and related services	1.53	2.23	2.23	9.76
3	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
5	CPA_C10-C12	Food products, beverages and tobacco products	1.71	2.36	2.3	11.63
6	CPA_C13-C15	Textiles, wearing apparel and leather products	1.3	1.57	1.58	5.41
7	CPA_C16	Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials	2.04	2.03	2.02	12.49
8	CPA_C17	Paper and paper products	1.53	1.54	1.56	6.88
9	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_C32	Furniture; other manufactured goods	1.49	1.62	1.63	6.92
23	CPA_C33	Repair and installation services of machinery and equipment	1.70	3.09	3.11	14.25

contd. table 1

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-E39	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services	1.54	3.04	3.01	12.83
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_J60	Motion picture, video and television programme production services, sound recording and music publishing; programming and broadcasting services	2.07	1.60	1.67	11.51
39	CPA_J61	Telecommunications services	1.5	3.25	3.12	13.99
40	CPA_J62_J63	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 social security	1.5	2.42	2.39	11.56
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_M70	Legal and accounting services; services of head offices; management consulting services	1.55	3.68	3.52	16.17
46	CPA_M71	Architectural and engineering services; technical testing and analysis services	1.99	2.65	2.56	15.86

contd. table 1

No	Code	Sectors	M_1	M_2	M_3	M
47	CPA_M72	Scientific research and development services	2.05	1.08	1.29	9.68
48	CPA_M73	Advertising and market research services	2.48	1.41	1.41	13.99
49	CPA_M74_M75	Other professional, scientific and technical services; veterinary services	1.83	3.08	2.98	14.9
50	CPA_N77	Rental and leasing services	1.66	2.17	2.12	11.05
51	CPA_N78	Employment services	1.08	5.47	5.26	19.17
52	CPA_N79	Travel agency, tour operator and other reservation services and related services	2.07	2.32	2.29	15.45
53	CPA_N80-N82	Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services	1.72	3.12	3.17	15.56
54	CPA_O84	Public administration and defence services; compulsory social security services	1.42	3.74	3.86	15.95
55	CPA_P85	Education services	1.09	5.24	5.31	18.98
56	CPA_Q86	Human health services	1.43	4.04	3.95	15.82
57	CPA_Q87_Q88	Social work services	1.62	3.62	3.75	16.67
58	CPA_R90-R92	Creative, arts and entertainment services; library, archive, museum and other cultural services; gambling and betting services	1.27	4.43	4.16	17.08
59	CPA_R93	Sporting services and amusement and recreation 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_S96	Other personal services	1.3	4.35	4.39	17.45
63	CPA_T	Services of households as employers; undifferentiated goods and services produced by households for own use	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	Total	—-	——	——	—-
66	TOT_CA	Total intermediate consumption/Final use at purchasers' prices	—-	—-	——	—-
67	Primary input Categories	Compensation of employees	1	6.44	3.11	19.91

contd. table 1

No	Code	Sectors	M_1	M_2	M_3	M
68		Other net taxes on production	1	6.31	3	19.12
69		Operating surplus, net	1	6.34	2.88	18.37
70	Allocation of primary income	Households	3.79	1	1	19.01
71		Non-financial Institutions	4.12	1	1	14.93
72		Financial Institutions	3,52	1	1	9.17
73		General Government	3.88	1	1	18.12
74	Secondary Distribution of income	Households	2.79	1	1	18.24
75		Non-financial Institutions	3.2	1	1	14.25
76		Financial Institutions	2.45	1	1	6.06
77		General Government	3.3	1	1	24.79
78	Use of Disposable Income	Households	1.35	3.08	7.73	15.38
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 the World	Current (Number)				
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 $\mathbf{M}_1$ "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 $\mathbf{M}_2$ "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.

$\mathbf{M}_3$, the "closed loop" multiplier, captures the final feedback effect of the subsequent rounds of impact on each sector. $\mathbf{M}_3$ 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 $\mathbf{M}_2$ and $\mathbf{M}_3$. 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).

References

Economidis, Ch. and Economides, A. (2017). 'Using the Social Accounting Matrix to understand the Greek economic crisis', *East-West Journal of Economics & Business* (forthcoming).

Economides, A. and Economidis, Ch. (2017). 'The Social Accounting Matrix as an economic policy tool for addressing the economic crisis' (in Greek), 2nd International Scientific Conference, Reconstruction in Greece: Economic Crisis and Growth Perspectives, 5-6 May 2017, Serres, Greece.

Eurostat (1996). *European System of Accounts 1995*, Office for Official Publications of the European Communities. Luxembourg.

Defournal, J. and Thorbecke, E. (1984). "Structural path analysis and multiplier decomposition with in a Social Accounting Matrix framework", *The Economic Journal*, 94 (373), pp. 111-136.

Miller, R. and Blair, P. (2009). *Input-Output Analysis Foundations and Extensions*, Second Edition, Cambridge University Press, Cambridge.

Panethymitakis, A. (1991). *Greek Industry. Sectoral multipliers of social accounting and path analysis for 1975* (in Greek), Athens, Gutenberg.

Pyatt, G. and Round, J. (1979). "Accounting and Fixed Price Multipliers in a Social Accounting Matrix Framework", *The Economic Journal*, 89 (356), pp. 850-873.

Research Bulletin XB 1027 (1993). *SAM Multipliers: Their Decomposition, Interpretation and Relationship to Input-Output Multipliers*, Washington State University, College of Agriculture and Home Economics Research Center.

Stone, R. (1985). 'The Disaggregation of the Household sector in the National Account', in Pyatt, G. and Round, J. (eds), *Social Accounting Matrices. Basis for Planning*, Washington, DC: World Bank.

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

ACCOUNT			0.Goods and services (products)	TOTAL ECONOMY			
				I. Production (industries)	II.1.1 Generation of income (primary input categories)	II.1 Allocation of primary income (institutional sectors)	II.2 Secondary distribution of income (institutional sectors)
			I=1	II=2	III=3a	IV=3b	V=4
0.Goods and services (products)		I=1	Trade and transport margins	Intermediate consumption 156,163			
TOTAL ECONOMY	1.Production (industries)	II=2	Output 351,385				
	II.1.1 Generation of income (primary input categories)	III=3a		NET VALUE ADDED (BASIC PRICES) 159,575			
	II.1 Allocation of primary income (institutional sectors)	IV=3b	Taxes less subsidies on products 26,930		GENERATED INCOME, NET (BASIC PRICES) 159,322	Property income 41,335	
	II.2 Secondary distribution of income (institutional sectors)	V=4				NATIONAL INCOME, NET 180,270	Current transfers 108,496
TOTAL ECONOMY	II.4 Use of disposable income (institutional Sectors)	VI=5					DISPOSABLE INCOME, NET 178,719
	Capital (institutional Sectors)	VII=6/7a					
	Gross fixed capital formation (industries)	VIII=7b		Consumption of fixed capital 35,647			
	III.2 Financial (financial assets)	IX=8					
ROW	Current	X=14/15	Imports of goods and services 70,020		Compensation of Employees to the rest of the world 453	Property income and taxes less subsidies on production to the rest of the world 11,794	Current transfers to the rest of the world 3,615
	Capital	XI=16/17					
	TOTAL		448,335	351,385	159,775	233,399	290,830

TOTAL ECONOMY				REST OF THE WORLD		TOTAL
II.4 Use of disposable income (institutional Sectors)	Capital (institutional Sectors)	Gross fixed capital formation (industries)	III.2 Financial (financial assets)	Current	Capital	
VI=5	VII=6/7a	VIII=7b	IX=8	X=14/15	XI=16/17	
I Final consumption 203,803	Changes in inventories -230	Gross fixed capital formation 39,185		Exports of goods and services 49,414		448,335
II						351,385
III				Compensation of employees from the rest of the world 200		159,775
IV				Property income and taxes less subsidies on production from the rest of the world 5,812		233,399
V				Current transfers from the rest of the world 2,064		290,830
VI Adjustment for the change in the net equity of households on pension funds 0				Adjustment for the change in the net equity of households on pension funds from the rest of the world 0		178,719
VII SAVING, NET -25,084	Capital transfers 3,797		Net incurrence of liabilities 24,473		Capital transfers from the rest of the world 4,137	7,323
VIII	Net fixed capital formation 3,538					39,185
IX	Net acquisitions of financial assets 0				NET LENDING OF THE REST OF THE WORLD 24,473	24,473
X Adjustment for the change in the net equity of households on pension funds to the rest of the world 0						85,882
XI	Capital transfers to the rest of the world 218			CURRENT EXTERNAL BALANCE 28,392		28,610
TOTAL 178,719	7,323	39,185	24,473	85,882	28,610	

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.