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NEW I-O TABLE AND SAMs FOR POLAND

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Introduction

The national economy is a complicated and complex economic system. Different fields of activity carried by economic units are interlinked to a great extent and it is difficult to understand certain phenomena without attempts to describe them by means of statistical, mathematical or econometric tools taking into consideration, of course, the theory of economy. These tools cannot be used effectively without a good system of statistical accounting, which appears to be a synthetic quantitative reflection of economic processes occurring in the national economy.

Economic links between different countries, necessity of assessing their economic situation and comparative needs made it necessary to design standardized systems of collecting, classifying and presenting statistical data at the level of entire national economy. The Material Product of System – MPS for short – was commonly used in the former socialist countries, while the remaining countries used mainly the system of social accounting otherwise known as the System of National Accounts – SNA. Differences between both systems were quite significant. They were reflected primarily in a different approach to defining production activity yielding value added as well as in terminology, definitions of economic categories and their classifications (see, for instance, Tomaszewicz (1994)).

MPS included the concept of material activity as the activity, which produces value added. The so-called non-material services belonged to the sphere of distribution and not production, and the vast majority of them were provided by the government free (education, health services or even services of the financial sector). The necessity of adopting SNA can be explained by a simple fact that MPS is useless in the present situation of a market economy, in which most services belong to the market services, that is, services, whose price covers costs and yields profit. The system has been introduced to the Polish statistical practice changing in this way the methods of material balances followed in Poland for over thirty years.

The Social Accounting Matrix (SAM) for 1995 presented in this paper is a synthetic approach to links between accounts. A part of this matrix is the input-output table for 1995. SAM is a statistical model of the national economy, which reflects the main quantitative relations (transactions) occurring in the field of production, consumption and accumulation between economic units (institutions) and production sectors, and it describes flows of incomes between them (see, for instance, a special edition of Economic System Research vol. 3, 1993). The double entry principle is fulfilled automatically in this matrix – each element of the matrix is simultaneously an income on a given account (line) and an expenditure on another one (column). The accounts are usually divided into: production accounts, consumption accounts (current accounts) and accumulation accounts (capital accounts). The last mentioned accounts include all transactions changing the level of assets (of physical and financial) of institutional sectors. For comparison of the Social Accounting Matrix and the input-output table a very simplified scheme of the SAM is presented, with no peculiar analytical goal hiding behind this scheme. It is rather an illustration of possibilities of describing the System of National Accounts in the matrix form for the Polish economy. It can be seen from the scheme that apart from production accounts showing creation (columns) and allocation of products (lines) between intermediate and final uses (input-output table) there are additional accounts describing generation and distribution of incomes in the national economy.

Scheme 1. Simplified scheme of SAM

	Production accounts (according to NACE)		Accounts of institutional sectors		Total
	Product accounts	Value added accounts	Current accounts (consumption)	Capital accounts (accumulation)	
Product accounts					
Value added accounts					
Current accounts (consumption)					
Capital accounts (accumulation)					
Total					

The SAM opens huge possibilities before the national economy analysts. Application of the multiplier analysis allows to get an answer to the question how a given economic category for instance, growth of final demand for products of a given economic sector or transfers of capital will respond to an impulse sent to the economy in the form of, for instance, increase of direct taxes by unity and, thus, revenues on the government's institutional account. This simple example shows that SAM is a valuable analytical tool, and availability of matrices for successive years creates an opportunity of monitoring the country's economic condition and dynamics of economic growth.

The input-output table for 1995 (according to SNA) allowed to build aggregated national accounts in the form of the social accounting matrix for that year in a way making allowances for generation of incomes (value added) also in production sectors (according to NACE). Integration of national accounts of institutional sectors in the form of SAM has been possible since 1992. Statistical data to be found in national accounts provide information about generation of incomes and value added (GDP) in institutional sectors without their division into activity sectors.[1] It was only the input-output table which allowed to include activity sectors, i.e. present income generation processes in these sectors.

Unfortunately, no data are available about the cross classification, i.e. about incomes in activity sectors with an additional division into institutional sectors.

Expenditures and incomes on particular production and current accounts are shown below by way of illustration. Entries are organized in such way as it is done in publications of the Polish Central Statistical Office, that is, one of expenditure items is treated as a balancing item being simultaneously a revenue (income) on the subsequent account. Entries on accounts showing generation of revenues and primary and secondary distribution, as well as allocation of disposable incomes are presented schematically below.

1. Production accounts (according to NACE)

1. Product accounts

Incomes from sales: *Expenditures:*

Total value	Material costs
	Balancing value: value added - Costs resulting from involvement of primary production factors (GDP)

2. Income generation account – value added account

Incomes: *Expenditures:*

Value added (total production – material costs)	Costs connected with employment
	Taxes from producers minus subsidies for producers

[1] It can be found primarily in publications of the Central Statistical Office in the series "*National accounts according to institutional sectors*," as well as in statistical yearbooks.

	Balancing value: gross operating surplus
	Taxes from products minus subsidies for products

2. Current accounts

3. Primary distribution of income account (according to NACE and institutional sectors)

Incomes: *Expenditures*

Gross operating surplus	Ownership incomes
Costs connected with employment	Balancing value: gross primary incomes
Taxes from producers minus subsidies for Producers	
Taxes from products minus subsidies for products	
Ownership incomes	

4[0] Secondary distribution of income account (according to institutional sectors)

Incomes: *Expenditures:*

Gross primary incomes	Income and property tax
Income and property tax	Social insurance benefits and other social transfers
Social insurance benefits and other social transfers	Various current transfers
Various current transfers	Remaining current transfers
Remaining current transfers	Balancing value: gross disposable incomes

2. SAM' 95

Before passing to the presentation of SAM'95 I would like to characterize briefly Polish accomplishments concerning construction of such matrices for our economy and statistics of national accounts in general.

The first works in this field are connected with the person of Professor L. Zienkowski from the Department of Statistical-Economic Studies, Central Statistical Office in Poland, who pioneered and continued consistently the introduction of the system of national accounts to the Polish statistical accounting.

The first Polish social accounting matrices built according to the SNA standards were published, for instance, in a book edited by S.I. Cohen (1993). The work contains a comparative analysis based on national accounts and SAM. Cohen submits to analysis the economies of countries undergoing economic transformation (Hungary, Poland), which are compared with the economies of Western European countries such as the Netherlands, Spain, Germany and Italy. Co-authors of chapters dealing with Poland are: L. Zienkowski, Z. Żółkiewski and A. B. Czyżewski.

The book edited by Cohen provides social accounting matrices for Poland for the years 1987 and 1990. The matrices for those years were presented in an aggregated and desegregated form. Only aggregated variants are presented below.

The matrices presented below do not contain information about shares of transactions in incomes (expenditures) on particular accounts, but they show the structure of transactions, with the sum total of all elements of the matrix of accounts being treated as equal to 100. This sum does not have a direct economic significance, but it allows to compare in an accessible manner money flows on different accounts and make comparisons over years and according to countries (matrices for all analyzed countries of Western and Central-Eastern Europe are presented in a standardized system in Cohen's book). It should be remembered in these comparisons that these money flows are present in current prices.

For comparative purposes with an aggregated version of SAM'95 built by me I made an additional aggregation of SAM'87 and SAM'90 bringing down all matrices to possible comparable shares.

Table 1. Structure of SAM for Poland for 1987 (sum of all matrix elements equals 100)

		1	2	3	4	5	6	7	8	9	**Total**
1	Consumer goods & services				9,4						**9,4**
2	Labor								9,0		**9,0**
3	Capital								8,0		**8,0**
4	Households		7,2	0,9			1,7			0,4	**10,2**
5	Firms			6,0			0,3				**6,4**
6	Government		1,7	1,0	0,2	2,8			0,1	0,1	**5,9**
7	Accumulation				0,7	3,6	-0,2		1,2	-0,0	**5,3**
8	Activities	9,0					3,2	4,8	20,8	3,8	**41,5**
9	Rest of the World	0,4					0,9	0,5	2,5	0,1	**4,4**
	Total	**9,4**	**9,0**	**8,0**	**10,2**	**6,4**	**5,9**	**5,3**	**41,5**	**4,4**	**100**

Source: On the basis of Cohen (1993) p.29 – some items were additionally aggregated for the purposes of this paper

Table 2. Structure of SAM matrix for Poland for 1990

		1	2	3	4	5	6	7	8	9	**Total**
1	Consumer goods & services				8,6						**8,6**
2	Labor								7,2		**7,2**
3	Capital								10,6		**10,6**
4	Households		5,5	3,2			2,0			0,5	**11,2**
5	Firms			6,5							**6,5**
6	Government		1,7	0,9	0,1	3,6	0,3		0,3	0,1	**6,9**
7	Accumulation				2,4	3,0	0,4		1,1	-0,8	**6,0**
8	Activities	7,9					3,0	5,3	17.0	5,0	**38,2**
9	Rest of the World	0,7					1,2	0,7	2,1		**4,8**
	Total	**8,6**	**7,2**	**10,6**	**11,2**	**6,6**	**6,8**	**6,0**	**38,2**	**4,8**	**100**

Source: on the basis of Cohen (1993), p.29 – some items were additionally aggregated for the purposes of this paper.

Table 3. Structure of SAM for Poland for 1995

		1	2	3	4	5	6	7	8	9	10	11	12	**Total**
Labor	1											7,0		**7,0**
Taxes from producers	2											0,2		**0,2**
Capital	3											7,5		**7,5**
Taxes from products	4											2,2		**2,2**
Ownership incomes title	5						0,1	2,2	1,1					**3,4**
Households	6	5,0		4,0		1,6		0,1	3,3	0,1			0,8	**14,9**
Firms	7			3,2		1,5	0,1		0,1					**4,9**
Government	8	2,0	0,2	0,2	2,2	0,1	1,8	0,7						**7,2**
Non-commercial institutions	9			0,1			0,1	0,1						**0,3**
Accumulation	10						1,6	1,6	0,1		0,1		1,5	**4,9**
Activities	11						10,3		2,6	0,2	3,3	19,9	4,3	**40,7**
Rest of the World	12					0,2	0,9	0,2			1,5	3,9		**6,7**
Total		**7,0**	**0,2**	**7,5**	**2,2**	**3,4**	**14,9**	**4,9**	**7,2**	**0,3**	**4,9**	**40,7**	**6,7**	**100,0**

Source: own estimates made in co-operation with B. Fraszczyk (M.A. dissertation).

Table 4. Share of main transactions in all transactions

	Gross output	Intermediate deliveries	Incomes from labor	Incomes from capital	Disposable incomes	Household consumptio n	Total investment
	1	2	3	4	5	6	7
1987	41,5	20,8	9,0	8,0	10,2	9,4	5,3
1990	38,2	17,0	7,2	10,6	11,2	8,6	6,0
1995	40,7	19,9	7,0	7,5	14,9	10,3	4,9
Average for Poland	40,1	19,2	7,8	8,7	12,1	9,4	5,4
Average for selected EU countries	31,0	15,0	9,9	5,7	17,1	11,6	3,9

Source: Own estimates based on SAM'95 for Poland, SAM 1987 and 1990 for Poland and EU countries published in Cohen S.I. (1993).

A number of clear differences was pointed out both in Cohen's book (1993) and in other publications containing macroeconomic comparisons of western economies with Central and Eastern European economies. SAM'95 covers, to some extent, the results of five years of the Polish economic transformation and it seems to be a valuable analytical tool from this point of view. Among differences the authors would most frequently mention low effectiveness of the economy (big share of raw materials and materials, low value added), a bigger share of consumption in household expenditures than in western countries, a low share of transactions connected with the sector of households, which was translated directly into lower transactions reflecting disposable incomes of this sector than in western countries.

A comparison of SAM for particular countries creates further analytical possibilities. These possibilities can be seen from Table 4 already presented in a synthetic form.

The shares reflecting transactions in the field of household consumption in all transactions in the national economy are characterized in the years 1987, 1990 and 1995 by respective figures 9.4; 8.6; 10.3. These figures in the analyzed Western European countries in the 1980s had an average value at the level of 11.6 (average for Poland 9.4). Personal income expenditures in Poland represent a considerable part of disposable incomes. The share of transactions covered by disposable incomes amounted, however, in western countries in the 1980s on average to 17.1 as compared with only 12.1 for Poland in the analyzed period. It could be seen that the share of transactions in this field rose in 1995. Although the share of consumption in disposable incomes is really quite big, the shares of transactions concerning personal income expenditures are still smaller than in western countries in the 1980s.

The role of transactions between households and the government institutions tended to grow visibly along with the transformation of our economy into a market economy. The shares of transfers from households to government institutions in the analyzed years were: 0.2; 0.1; 1.8 respectively, while transfers from the budget to households were: 1.7; 2.0; 3.3, which makes the latter closer to those observed in western countries in the 1980s (4-5). The shares of transactions connected with indirect deliveries continue to be much bigger than in western countries. The average for Poland reaches 19.2 as compared with the average of 15.0 for western countries in the 1980s.

3. Multiplier analysis

To remind of some problems of the multiplier analysis we will start with input-output multipliers in the input-output model. In this model final demand is exogenous and gross output of particular activity sectors is endogenous, i.e.

$$(I-A)^{-1}Y = X$$

where Y – final demand vector and X – gross output vector (by activity sectors).

The sum elements of the matrix $(I-A)^{-1} = [\alpha_{ij}]$ is the production multiplier

$$M_j = i^T \alpha_j$$

where α_j - are elements of column j of the matrix $(I-A)^{-1}$, and i^T is a summing up vector (row of unities).

Multiplier M_j indicates how much gross output in the whole economic system will increase if final demand for products of sector j increases by unity (e.g. by 1 PLN)

Let us divide the accounts shown in SAM into endogenous and exogenous ones. Let endogenous accounts be production accounts (generation of incomes) and institutional current and capital accounts apart from the government and rest of the world sectors. The last two sectors will belong to exogenous accounts.[2]

Scheme 2. SAM in division into endogenous and exogenous accounts*

		Expenditures		
		Endogenous accounts	Exogenous accounts	Total
Incomes	Exogenous accounts	$Z = A_z\hat{\bar{x}}$	$\bar{Y}$	$\bar{x}_1$ $\bar{x}_2$ $\vdots$ $\bar{x}_n$
	Exogenous accounts	$R = A_r\hat{\bar{x}}$	W	r_1 r_2 $\vdots$ r_s
Total		$\bar{x}_1\ \bar{x}_2 \dots \bar{x}_n$	$r_1\ r_2 \dots r_s$	

**Source: According to notation used in Pyatt and Round (1985).*

[2] Not distinguishing particular analytical goals in this paper, I accepted usually used divisions – see, for instance (Pyatt, Round (1985)), (Cohen (1993)).

Square Z matrix shows transactions between endogenous accounts. It is a product of matrix A_z - shares of particular expenditures on endogenous accounts in total expenditures (incomes) by these expenditures (incomes) presented in the form of the diagonal matrix:

$$Z = A_z \bar{x}$$

and, thus

$$A_z = Z\hat{\bar{x}}^{-1}.$$

Matrix R, which is not generally a square matrix, is a product of matrix A_r of shares of remaining expenditures (transfers to the government sector and abroad) in expenditures on endogenous accounts by the vector of total expenditures:

$$R = A_r \hat{\bar{x}}$$

and, thus

$$A_r = R\hat{\bar{x}}^{-1}.$$

Unit changes in elements of matrix $\bar{Y}$ (which formally are incomes on endogenous accounts from transfers coming from exogenous accounts) are treated as impulses producing corresponding changes on endogenous accounts. Square matrix W shows transfers between exogenous accounts.

Introducing a notation

$\bar{y} = \bar{Y}i$ – vector of exogenous values (where i is a summing up vector with dimensions $r \times 1$ composed of unities) we obtain the relation:

(1) $\bar{x} = A_z\bar{x} + \bar{y}$.

After transformations we get:

(2) $\bar{x} = (I - A_z)^{-1}\bar{y}$

on condition that $(I - A_z)^{-1}$ exists.

Denoting matrix $(I - A_z)^{-1}$ with a symbol of M_a multiplier we obtain:

(3) $\bar{x} = M_a\bar{y}$.

The element m_{ij} of M_a informs how endogenous variable $\bar{x}_i$ will change (incomes on account i) under an influence of a change in exogenous variable $\bar{y}_j$ by unity (increase of incomes on account j).

In the case of SAM'95 version shown in Table 5, A_z matrix was divided into submatrices within appropriate groups of accounts to allow an appropriate interpretation of this matrix elements[3]. Matrix A_z is presented in the scheme below:

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[3] A consequence of accepting a definite division is the structure and values of A_z matrix elements.

Scheme 3. Matrix A_z divided into submatrices according to appropriate groups (subsystems) of accounts

	0	0	A_{13}
A_z =	A_{21}	A_{22}	0
	0	A_{32}	A_{33}

- A_{13} – matrix of shares of particular items of the income generation account in total supply of products by NACE activity sectors;
- A_{21} – matrix of shares of primary income elements of endogenous institutional sectors in total primary incomes of these sectors;
- A_{22} – matrix of shares of ownership incomes and redistribution transfers (current and capital transfers of incomes) in disposable incomes of endogenous institutional sectors;
- A_{32} – matrix of shares of particular items of final demand in disposable incomes of endogenous institutional sectors;
- A_{33} – matrix of shares of intermediate demand in total supply of products – matrix of input-output coefficients - by NACE activity sectors.

Following the transformations given in Pyatt and Round (1985) we will exclude from matrix A_z block matrix A_z^0.

Scheme 4. Structure of matrix A_z^0

	0	0	0
$\mathbf{A}_z^0$ =	0	A_{22}	0
	0	0	A_{33}

Equation (1) is then equivalent to equation:

(4) $\bar{x} = (A_z - A_z^0)\bar{x}_z + A_z^0\bar{x}_z + \bar{y}$

Transforming (4) gives:

(5) $\bar{x} = (I - A_z^0)^{-1}(A_z - A_z^0)\bar{x} + (I - A_z^0)^{-1}\bar{y}$

let $A^* = (I - A_z^0)^{-1}(A_z - A_z^0)$

(6) $\bar{x} = A^*\bar{x} + (I - A_z^0)^{-1}\bar{y}$

Multiplying both sides by A^* it can be noticed that:

(7) $A^*\bar{x} = A^{*2}\,\bar{x} + A^*(I - A_z^0)^{-1}\bar{y}$

It results from (6) that $A^*\bar{x} = \bar{x} - (I - A_z^0)^{-1}\bar{y}$. Substituting it to equation (7) gives:

(8) $\bar{x} = A^{*2}\,\bar{x} + (I + A^*)(I - A_z^0)^{-1}\bar{y}$

Multiplying (7) by A^* and substituting for $A^{*2}\,\bar{x}$ an expression from (8) yields:

(9) $\bar{x} = (I - A^{*3})^{-1}(I + A^* + A^{*2})(I - A_z^0)^{-1}\,\bar{y}$

assuming that matrix $(I - A^{*3})^{-1}$ exists.

Comparing equation (3) with equation (9) it can be seen that algebraic transformations presented above have led to decomposition of M_a into three independent matrices. It shows that equation (9) can be written using symbols of multipliers, i.e.:

(10) $\bar{x} = M_{a3}M_{a2}M_{a1}x$, assuming that:

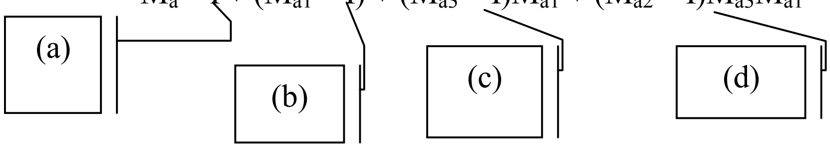
- $M_{a1} = (I - A_z^0)^{-1}$
- $M_{a2} = (I + A^* + A^{*2})$
- $M_{a3} = (I - A^{*3})^{-1}$

Further algebraic transformations aimed at calculating matrices of multipliers M_{a1}, M_{a2} i M_{a3} are also shown in Stone (1985).

Decomposed multiplier M_a can be presented in an additive form, which will make it more useful and will allow to determine the role of particular decomposed parts in the whole. Stone (1985) showed that multiplier M_a can be expressed as[4]:

(11)

$$M_a = I + (M_{a1} - I) + (M_{a3} - I)M_{a1} + (M_{a2} - I)M_{a3}M_{a1}$$



Particular elements of the sum are explained in the following way:

(a) initial impulse (injection);
(b) intragroup multipliers;
(c) intergroup multipliers;
(d) extragroup multipliers.

Thus, the above denotation shows how the matrix of multipliers can be decomposed into particular elements (multipliers), with each of them referring to definite interrelationships (links) in the entire system. In our case we are dealing with three endogenous subsystems: primary incomes according to types and institutional sectors, primary and secondary division of incomes according to institutional sectors, and manufacturing of products (generation of incomes) according to NACE. A unit impulse on the exogenous account, for instance, growth of government transfers to households by 1000 PLN, can:

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[4] It follows from (11) that $M_a = M_2 M_3 M_1 = M_3 M_2 M_1$, which is in conformity with the relationship obtained by Stone (1985, p. 162), namely $\bar{x} = (I + A^* + A^*)(I - A^{*3})^{-1}(I - A_z^0)^{-1}\,\bar{y}$.

Table 5. SAM'95

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	RAZEM
labor costs	1														2 581 463	71 621	8 044 601	33 526 204	3 953 879	8 848 239	10 507 554	1 026 118	6 481 247	3 747 463	9 383 327	13 879 352	9 082 855	8 417 277	8 699 759					*128 250 959*
producers taxes	2														321 542	8 198	52 565	1 174 359	343 736	344 033	699 887	36 468	-403 973	897 949	572 939	0	16 749	11 333	341 226					*4 417 011*
operating surplus	3														17 237 598	20 723	859 456	22 641 516	4 192 279	10 525 141	49 946 756	1 440 320	9 980 021	-2 025 010	11 707 313	762 456	660 050	1 170 051	4 717 148					*133 835 818*
taxes on products	4														5 815 979	102 295	1 935 883	81 760 383	471 944	1 994 043	-53 285 840	295 271	462 662	6 275	933 565	0	-3 419	-4 032	-670 475					*39 814 534*
ownership incomes	5						206 400	2 141 900	12 127 700	27 291 500																					19 233 900	1 295 900		*62 297 300*
non-profit institutiones	6			1 646 800		511 600		1 412 000		1 103 400																						116 000		*4 789 800*
households	7	91 673 759		72 436 936		29 006 900	1 103 400		2 631 000																						57 462 100	14 203 300		*268 517 395*
financial corp	8			-2 086 600		22 898 800		2 490 100	36 200	568 200																					2 921 800			*26 828 500*
non-financial corp	9			59 128 282		3 890 900		21 600	489 900																									*63 530 682*
non-profit institutions	10						673 200																											*673 200*
households	11							28 857 600																										*28 857 600*
financial corp	12								7 151 100																									*7 151 100*
non-financial corp	13									21 425 478																				1 175 300			18 425 500	*41 026 278*
A	14						0	16 487 846	0	0		322 325	-687	956 162	13 044 721	2 980	16 996	20 234 740	2 229	21 384	2 887 318	56 498	3 087	18	29 596	298 310	42 118	433 519	24 460	-3 487	0	1 789 690		*56 649 823*
B	15						0	90 170	0	0		20	0	60	10 469	156 134	9	215 475	15	476	500	4 623	659	1 109	2 854	3 851	988	6 398	397	0	0	30 876		*525 083*
C	16						0	1 733 550	0	0		15 476	0	46 233	836 972	711	2 595 366	8 045 183	6 217 053	996 195	792 283	44 677	597 548	589	515 747	105 661	47 300	171 559	137 865	0	0	3 668 454		*26 568 422*
D	17						0	94 103 259	0	0		3 128 779	990 017	19 098 738	10 175 995	105 732	3 863 604	114 831 612	4 847 469	16 292 993	15 856 528	736 034	7 962 301	416 128	5 799 227	2 383 979	993 310	2 367 466	1 096 640	5 028 088	1 885 500	53 078 752		*365 042 151*
E	18						0	7 014 789	0	0		186	0	554	847 187	2 983	988 871	5 723 445	2 809 959	403 668	1 635 299	240 859	1 032 312	116 445	3 054 210	613 002	326 782	349 864	424 708	0	0	248 690		*25 833 813*
F	19						0	3 249 149	0	0		2 840 592	1 032 913	18 660 328	274 429	926	382 659	1 647 073	440 542	6 347 547	494 956	70 465	373 120	4 721	1 188 457	1 356 671	415 476	252 178	525 942	5 245 948	0	6 785 000		*51 589 093*
G	20						0	24 088 896	0	0		35 555	0	106 217	482 158	7 271	259 317	4 076 252	470 216	1 468 099	3 421 625	260 103	1 205 409	519 910	1 642 763	1 119 603	313 927	212 936	338 375	0	0	409 770		*40 438 402*
H	21						0	2 140 771	0	0		-18	0	-54	51 433	296	8 728	468 991	16 053	144 722	194 393	281 633	798 426	79 192	78 271	95 503	77 155	73 258	36 255	0	0	686 349		*5 231 357*
I	22						0	9 365 907	0	0		574	0	1 714	610 796	19 735	494 457	6 975 907	1 059 130	1 695 618	3 211 007	333 418	7 783 468	351 798	1 186 663	646 416	332 339	283 006	334 776	0	200 000	7 298 188		*42 184 917*
J	23						0	2 254 124	0	0		0	0	0	87 440	75	6 326	1 562 838	114 324	115 009	266 975	10 501	145 836	1 091 228	71 348	80 799	52 714	83 751	18 491	0	0	2 141 000		*8 102 779*
K	24						0	11 345 354	0	0		319 975	115 156	2 090 195	604 208	4 054	561 089	8 453 651	786 031	2 264 617	3 265 946	161 927	1 438 323	457 493	9 293 494	830 127	840 984	613 232	353 809	584 851	1 050 000	1 787 941		*47 222 457*
L	25						0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22 636 497	0		*22 636 497*
M	26						397 515	2 001 627	0	0		1 946	0	5 813	7 270	57	6 304	91 632	16 159	12 511	25 189	2 567	25 029	31 483	28 231	19 339	72 898	3 464	11 824	0	10 588 976	31 500		*13 381 334*
N	27						195 958	1 082 696	0	0		163	0	488	60 269	26	11 104	119 289	4 422	12 851	74 161	12 629	11 579	28 455	19 741	202 178	1 791	332 522	7 904	0	12 786 807	21 867		*14 986 900*
O	28						2 205 927	9 817 757	0	0		20 027	0	59 830	107 634	4 000	94 689	652 936	67 511	101 947	191 446	217 246	334 560	11 745	210 951	239 250	68 994	196 855	586 548	0	1 653 900	193 592		*17 037 345*
goverment cap. acc	29																														3 426 000		8 604 700	*12 030 700*
goverment current	30	36 577 200	4 417 000	2 730 400	39 814 534	2 709 100		32 766 400	4 392 600	9 720 000																						718 200		*133 845 434*
rest of the world current	31					3 280 000	7 400	16 051 900		3 422 104					3 492 260	17 266	6 386 398	52 840 665	20 862	0	252 419	0	3 953 303	2 365 788	1 503 760	0	38 323	12 263	51 693				828 700	*94 525 104*
rest of the world cap. acc.	32										673 200	22 172 000	5 013 700																					*27 858 900*
Total		*128 250 959*	*4 417 000*	*133 855 818*	*39 814 534*	*62 297 300*	*4 789 800*	*268 517 395*	*26 828 500*	*63 530 682*	*673 200*	*28 857 600*	*7 151 100*	*41 026 278*	*56 649 823*	*525 083*	*26 568 422*	*365 042 151*	*25 833 813*	*51 589 093*	*40 438 402*	*5 231 357*	*42 184 917*	*8 102 779*	*47 222 457*	*22 636 497*	*13 381 334*	*14 986 900*	*17 037 345*	12 030 700	133 845 480	94 505 069	27 858 900	

*) minus subsidies

Source: own calculations

Table 5. Matrix of multipliers

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	1,27530	0,00000	0,33883	0,00000	0,27773	0,63166	0,38515	0,20517	0,28485	0,00000	0,10403	0,13646	0,45291	0,34725	0,44007	0,56957	0,32952	0,59205	0,56010	1,15099	0,61889	0,54218	0,78350	0,61947	1,00400	1,03819	0,92652	0,88351
2	0,01239	1,00000	0,01493	0,00000	0,01235	0,02335	0,01733	0,00904	0,01224	0,00000	0,00442	0,00572	0,01911	0,01970	0,03199	0,01232	0,01367	0,02966	0,02304	0,05633	0,02466	0,00425	0,13862	0,03127	0,01725	0,01732	0,01675	0,03627
3	0,40243	0,00000	1,47386	0,00000	0,39596	0,58162	0,56300	0,28701	0,37694	0,00000	0,13441	0,17084	0,57576	0,77287	0,39274	0,35416	0,37691	0,64619	0,72911	2,52245	0,87147	0,77642	0,11945	0,83313	0,60470	0,55950	0,56721	0,79302
4	0,04853	0,00000	0,08673	1,00000	0,05985	0,03962	0,06789	0,05656	0,11406	0,00000	0,05957	0,07762	0,25843	0,25275	0,38429	0,16029	0,36009	0,15293	0,18182	-1,10364	0,11703	0,10864	-0,04227	0,09487	0,04335	0,05821	0,09975	0,02712
5	0,11135	0,00000	0,35908	0,00000	1,35345	0,20500	0,15577	0,65103	0,63932	0,00000	0,03357	0,04271	0,14388	0,19020	0,09962	0,09177	0,09456	0,16242	0,18205	0,62097	0,21702	0,19325	0,03760	0,20779	0,15705	0,14654	0,14714	0,20109
6	0,01534	0,00000	0,03928	0,00000	0,02643	1,01936	0,02147	0,01602	0,03480	0,00000	0,00387	0,00493	0,01660	0,02126	0,01183	0,01135	0,01099	0,01895	0,02096	0,06946	0,02486	0,02211	0,00614	0,02388	0,01949	0,01846	0,01823	0,02387
7	1,18940	0,00000	1,22844	0,00000	1,09856	1,10428	1,66396	0,73089	0,73753	0,00000	0,16484	0,21256	0,71133	0,76661	0,57989	0,64763	0,48951	0,85880	0,89108	2,51476	1,02855	0,90972	0,64542	1,00338	1,12853	1,12304	1,04756	1,16723
8	0,04741	0,00000	0,12662	0,00000	0,50459	0,07906	0,06632	1,24499	0,24712	0,00000	0,01234	0,01573	0,05294	0,06824	0,03754	0,03572	0,03502	0,06033	0,06690	0,22290	0,07941	0,07065	0,01847	0,07622	0,06134	0,05794	0,05737	0,07574
9	0,18568	0,00000	0,67589	0,00000	0,26874	0,27126	0,25977	0,19024	1,21101	0,00000	0,06171	0,07844	0,26434	0,35459	0,18044	0,16288	0,17308	0,29676	0,33474	1,15730	0,40004	0,35640	0,05550	0,38247	0,27814	0,25745	0,26088	0,36434
10	0,00216	0,00000	0,00552	0,00000	0,00371	0,14327	0,00302	0,00225	0,00489	1,00000	0,00054	0,00069	0,00233	0,00299	0,00166	0,00159	0,00155	0,00266	0,00295	0,00976	0,00349	0,00311	0,00086	0,00336	0,00274	0,00260	0,00256	0,00336
11	0,12782	0,00000	0,13202	0,00000	0,11806	0,11868	0,17883	0,07855	0,07926	0,00000	1,01771	0,02284	0,07645	0,08239	0,06232	0,06960	0,05261	0,09229	0,09576	0,27026	0,11054	0,09777	0,06936	0,10783	0,12128	0,12069	0,11258	0,12544
12	0,01264	0,00000	0,03375	0,00000	0,13450	0,02107	0,01768	0,33185	0,06587	0,00000	0,00329	1,00419	0,01411	0,01819	0,01001	0,00952	0,00933	0,01608	0,01783	0,05941	0,02117	0,01883	0,00492	0,02032	0,01635	0,01544	0,01529	0,02019
13	0,06262	0,00000	0,22794	0,00000	0,09063	0,09148	0,08761	0,06416	0,40841	0,00000	0,02081	0,02645	1,08915	0,11958	0,06085	0,05493	0,05837	0,10008	0,11289	0,39029	0,13491	0,12019	0,01872	0,12899	0,09380	0,08682	0,08798	0,12287
14	0,18124	0,00000	0,20593	0,00000	0,17407	0,18481	0,25356	0,12196	0,15472	0,00000	0,05946	0,05785	0,22428	1,45643	0,14177	0,12634	0,19311	0,17563	0,19479	0,57541	0,21424	0,18423	0,12107	0,19378	0,22115	0,19701	0,22847	0,20237
15	0,00146	0,00000	0,00167	0,00000	0,00141	0,00154	0,00204	0,00101	0,00127	0,00000	0,00043	0,00055	0,00186	0,00172	1,42437	0,00109	0,00198	0,00153	0,00174	0,00412	0,00301	0,00164	0,00122	0,00173	0,00195	0,00171	0,00225	0,00169
16	0,06522	0,00000	0,07697	0,00000	0,06419	0,07864	0,09125	0,04677	0,06192	0,00000	0,02262	0,02856	0,09656	0,08990	0,05898	1,17103	0,08132	0,37465	0,10692	0,22811	0,10668	0,10276	0,05564	0,11591	0,09541	0,08800	0,09622	0,09471
17	0,94569	0,00000	1,15619	0,00000	0,94748	1,02709	1,32302	0,71005	0,99307	0,00000	0,38542	0,49864	1,66602	1,10100	0,99560	0,84592	1,98212	1,21721	1,41564	3,09201	1,27087	1,24406	0,70899	1,23347	1,22959	1,12970	1,19901	1,16964
18	0,08038	0,00000	0,09054	0,00000	0,07739	0,09990	0,11245	0,05459	0,06636	0,00000	0,02123	0,02737	0,09160	0,09185	0,06784	0,10402	0,07322	1,21582	0,09951	0,26922	0,15043	0,11977	0,08195	0,17824	0,12727	0,12089	0,11649	0,12131
19	0,08355	0,00000	0,17714	0,00000	0,11560	0,12039	0,11688	0,11979	0,25871	0,00000	0,13364	0,19202	0,61049	0,11074	0,06729	0,08093	0,06547	0,12530	1,24926	0,35025	0,14384	0,12502	0,04574	0,15628	0,17443	0,13652	0,11862	0,15699
20	0,14721	0,00000	0,15966	0,00000	0,13908	0,15652	0,20595	0,09561	0,10816	0,00000	0,03128	0,03916	0,13297	0,12059	0,10734	0,10267	0,08842	0,14916	0,16553	1,44277	0,20410	0,16836	0,17215	0,18762	0,20897	0,17747	0,15931	0,17770
21	0,01535	0,00000	0,01675	0,00000	0,01456	0,01714	0,02148	0,01006	0,01149	0,00000	0,00331	0,00432	0,01437	0,01317	0,01131	0,01049	0,01008	0,01522	0,01823	0,04433	1,07417	0,03846	0,02297	0,01798	0,02174	0,02265	0,02088	0,01918
22	0,10690	0,00000	0,12114	0,00000	0,10323	0,12492	0,14955	0,07328	0,09013	0,00000	0,02932	0,03830	0,12737	0,10846	0,13983	0,10099	0,09303	0,16661	0,15844	0,38708	0,20678	1,33871	0,14059	0,15825	0,16283	0,15076	0,13921	0,14724
23	0,01917	0,00000	0,02117	0,00000	0,01827	0,02039	0,02681	0,01275	0,01496	0,00000	0,00455	0,00589	0,01968	0,01802	0,01328	0,01329	0,01682	0,02361	0,02220	0,05698	0,02328	0,02349	1,16855	0,02225	0,02557	0,02498	0,02637	0,02231
24	0,13155	0,00000	0,15946	0,00000	0,13143	0,15733	0,18404	0,09804	0,13461	0,00000	0,05004	0,06748	0,22102	0,13315	0,10743	0,12165	0,11442	0,18007	0,20210	0,46842	0,19691	0,18927	0,17378	1,39509	0,20241	0,22454	0,19325	0,17962
25	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	1,00000	0,00000	0,00000	0,00000
26	0,01092	0,00000	0,01338	0,00000	0,01116	0,09449	0,01528	0,00735	0,00919	0,00000	0,00188	0,00234	0,00796	0,00845	0,00615	0,00669	0,00548	0,00969	0,00968	0,02765	0,01138	0,01033	0,01053	0,01124	0,01196	1,01639	0,01055	0,01240
27	0,00662	0,00000	0,00797	0,00000	0,00669	0,04861	0,00927	0,00445	0,00550	0,00000	0,00121	0,00153	0,00516	0,00652	0,00388	0,00447	0,00376	0,00589	0,00621	0,01858	0,00936	0,00637	0,00805	0,00703	0,01607	0,00688	1,02912	0,00763
28	0,05834	0,00000	0,07259	0,00000	0,06016	0,53578	0,08162	0,03968	0,05082	0,00000	0,01090	0,01312	0,04543	0,04796	0,04440	0,03912	0,03087	0,05307	0,05422	0,15313	0,10501	0,06341	0,03524	0,06320	0,07154	0,06465	0,06999	1,09903

Source: own calculations.

1) release direct and indirect reactions (feedbacks) within an account of a given subsystem similar to those which find reflection in the matrix of full outlays in the input-output analysis,
2) release reactions with the remaining subsystems through shifting an impulse onto the remaining subsystems and returning to the account of initial subsystem;
3) release a reaction passing through all subsystems, which produces a change on an account of another subsystem.

Table 5 contains SAM'95 and Table 6 presents corresponding multipliers. Due to limited frames of this paper we do not include elements (b), (c) and (d) – see: (11). For illustration purposes we are giving these elements in the case of household accounts.

Let us take into account several elements of the multipliers matrix column corresponding to household accounts.

Element: m_{77} = 1,66396 =

1 + 0,01007 + 0,65388 + 0

(a) (b) (c) (d)

which means that the primary impulse in the form of government transfers to households by 1000 PLN gives the income (as the result of direct and indirect reactions within the subsystem of income distribution) of 1010.7 PLN and of 653.88 PLN as a result of indirect reactions with other subsystems (e.g. additional income earned by households due to the loop: the higher the income, the higher the demand for products, the higher the primary incomes, the higher incomes as a result of distribution processes.

Element: m_{97} = 0,25977 =

0 + 0,00134 + 0,25843 + 0

(a) (b) (c) (d)

This multiplier concerns the account of firms classified in the same subsystem, i.e. subsystem the redistribution of incomes. It means that primary impulse in the form of growth by 1000 PLN of government transfers to households raises firms' income by 259.77 PLN as the result of intra- and inter groups effects.

Element: $m_{15,7}$ =0,00204 =

0 + 0 + 0 + 0,00204

(a) (b) (c) (d)

means that primary impulse by 1000 PLN to the household sector raises household spending on construction services by only 2 PLN. Element $m_{15.7}$ belongs to an external subsystem (the account of construction products).

Summing up, the well known restrictions of SAM and the multiplier analysis should be pointed out:

1. Relations between particular categories have a linear character.
2. They are static, that is, there are no lags showing multiplier reactions.
3. Division into exogenous and endogenous parts will be always controversial.
4. No distinction is made between quantitative and ad valorem variables – these are multipliers assuming constant prices (with a bigger income either more money can be spent on purchasing a definite product if its price is the same or the same quantity (or less) can be purchased when prices rise.

These restrictions cause that more developed models are built on the basis of SAM, which are of a wide spectrum starting with simple attempts at modeling transactions of generation and distribution of incomes and ending with sophisticated general equilibrium models.

The structure and way of construction of SAM'95 presented here fits, first of all, the needs of multisectoral model of the Polish economy – IMPEC, which is regularly used as a tool of simulation and forecasting analyses. The identities used in IMPEC characterizing the main income flows by institutions in the transformed Polish economy are almost entirely based on SAM'95.

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