UNITED
NATIONS

E

Economic and Social
Council

Distr.
GENERAL

ECE/CES/GE.30/2008/15
28 July 2008

Original: ENGLISH

ECONOMIC COMMISSION FOR EUROPE

CONFERENCE OF EUROPEAN STATISTICIANS

Group of Experts on Gender Statistics

Fifth Session
Geneva, 6-8 October 2008
Item 5 of the provisional agenda

ECONOMIC INDICATORS FOR GENDER ANALYSIS

Social Accounting Matrix (SAM)

Note by the Statistics Portugal

Summary

In this paper an overview of the social accounting matrix and types of indicators for gender analysis of labor are presented. A Social Accounting Matrix (SAM) consists of a framework that integrates National Accounts and Social Statistics in a coherent, complete and consistent way. A labour-oriented SAM provides detailed information on the social aspect of the economy, in particular the providers of the input labour and their relations with the monetary flows and therefore it is possible to calculate simultaneously and in an integrated way different indicators for policy analysis, such as structural indicators. In this paper, a case study of Portugal is presented.

GE.08-

I. GENERAL OVERVIEW SOCIAL ACCOUNTING MATRIX (SAM) AND NATIONAL ACCOUNTS MATRIX (NAM)

1. The purpose of this document is to provide an overview of a labour-oriented Social accounting matrix (SAM) and also to show what type of labour indicators can be derived. The document will mostly focus on labour input.

2. A Social Accounting Matrix (SAM) consists of a framework that integrates National Accounts and Social Statistics in a coherent, complete and consistent way. It shows the circular flow of income within the economy: the goods and services account, the production account, the generation of income account, the primary and secondary distribution account, the use of income account, the capital account, the financial account and finally the rest of the world account.

3. SAMs can be environment-oriented, labour-oriented, investment-oriented and so forth, and are recognized as being important by the international national accounts manuals, such as UN SNA93 and EU ESA95, which have specific chapters on this subject. The compilation of a SAM Labour-oriented, one that focus on the role of the people in the economy by describing the type of labour input (on the demand side of labour) and also the type of households (on the supply side of labour). This is the type of SAM that came out from the handbook on SAMs and is complied in Portugal although other extensions can be integrated depending on the purpose of analysis. It links together macro-economic statistics with micro statistics on labour and households. Therefore a SAM includes two different statistical systems: National Accounts Matrix (NAM) and Labour Accounts.

4. The matrix format (shown in a NAM and in a SAM) is important because:
   (a) It provides a general overview of the economy in a way that all the tables are in the same format (a single entry describes simultaneously a use and a resource). There is the possibility to expand cells to distinguish sub-accounts according to the purpose of analysis and also to aggregate or subdivide groups of units in a NAM.
   (b) At a meso-level it shows interrelations among various different economic flows through detailed cross-classifications (from whom to whom- in each sub-matrix it is possible to identify the paying/receiving units).
   (c) It makes it possible for different classifications to be used from cell to cell and different aggregations for each account with the possibility of creating and introducing dummy accounts whenever data to break down a given transaction are not available. These dummy accounts show in the row the totals paid by each sector and in the column the totals received by each sector.

5. In practice, in order to compile a SAM it is necessary to have available a NAM (National Accounts Matrix) which shows the complete sequence of accounts in a matrix format: from the production accounts to the rest of the world accounts. The goods and services account is also presented.

6. SAM's can be compiled in one of two ways:

(a) On a bottom-up approach where the social accounting matrix is compiled from the root, that is, all the transactions are compiled from the micro data in order to obtain the required aggregated variables. The bottom-up approach can be set up by using National Accounts in a matrix format and labour accounts where only the monetary data related to the type of labour are integrated in the SAM. If labour accounts are not available it is necessary to compile labour data according to the requirements in the SAM. Additionally, the physical data are also available at the same level of detail; and

(b) On a top-down approach where the aggregated transactions are estimated and structures to breakdown the transactions are used. The use of the top-down approach requires National Accounts data in a matrix format. Data on labour and households are broken-down for SAM purposes creating extensions of it. Even if National Accounts are not available in a matrix format the matrices can be derived by using structures.

7. The first step for the compilation of a SAM would be a detailed National Accounting Matrix (NAM) and the second step would be the extension of the appropriate cells towards a SAM.

8. In the detailed NAM all the cells of the aggregate NAM are broken down into sub-matrices or vectors showing the "from whom-to-whom" relationship between sub-sectors. The matrix format ("from whom-to-whom") has the advantage of being very useful for checking the quality of the data in the NA. The information in these tables cannot be shown in the T-accounts where it is possible to know the total paid and received by each sector but not what each sector paid to each sector or what each received from each sector. Moreover in a NAM it is possible to introduce a specific classification or a specific level of detail in a certain account without having to introduce the same level of detail in all other accounts.

9. In order to compile a National Accounting Matrix it is necessary to have a supply-use table and institutional sector accounts. However to make it more complete in terms of having sub-matrices, it is useful to have for each account within the NAM, tables sector by sector, in addition to the supply and use table.

10. These tables "sector by sector" are compiled for each transaction and then aggregated. However, for purposes of analysis it may be necessary to have these tables only for some transactions. In this case the framework allows the insertion of a dummy account where in the table sector by sector is compiled for the required transaction(s. The other(s) would be presented as a total both in row and column. This procedure depends not only on the user needs but also on the availability of data to do so.

11. If these tables are not available when compiling the integrated economic accounts, but for all transactions the only available are totals. They can be derived through indirect estimation by using key structures.

II. LABOUR-ORIENTED SAM (EXPANSION OF A NAM)

12. Although NAM represents the entire economy, it does not show all its dimensions and a SAM provides the necessary extra-dimension to National Accounts according to the purpose of analysis. This dimension is added by means of extensions or breakdowns of the NAM sub matrices, specifying the actors or the nature of some specific monetary flow. In Statistics Portugal the experience in SAM compilation has been entirely labour oriented, given the importance of Labour as an input factor in the economy.

13. The labour-oriented SAM focuses on the generation of income account showing how income is generated, that is, the creation of primary income by an economic unit as the result of being engaged in a production activity using input factors; and allocation of primary income account that shows how income is distributed, that is, records the primary income receivable by an economic unit as a result of its involvement in the production process and ownership of assets used for purposes of production. In a labour oriented SAM, the analysis is focused on compensations and mixed income related to labour, which are the remunerations of using the input factor labour in the productive process.

14. The result of introducing the “type of labour” dimension defined by status, gender and education level in the generation of income account is the breakdown of compensations and mixed income, also by type of labour. In the NA the amount of compensations of employees, by industry, related to the implicit labour, is available. For instance, in the SAM, for a given industry, such as Education it is possible to obtain the number of posts divided into employees and self-employed, for each above position the number of posts occupied by men and women and, for each sub-position, the educational level and their associated compensations.

15. The household groups were defined according to the main source of income of the household (to be in line with the SNA93/ESA95). The outcome is the breakdown of compensations and mixed income by type of labour and by type of household in the allocation of primary income account. In the NA, the total amount of compensations and mixed income is allocated to Households. In the SAM it is also possible to obtain the amount of compensations by type of labour and, for each, which households’ group have provided the labour by receiving the compensations. For instance, it is possible to have an assessment of the compensations of the more educated labour included in household group, whose main source of income is wages and salaries or, within these categories, the proportion of the compensations generated by women.

III. PORTUGUESE SAM (NAM)

16. The SAM compiled for Portugal, on a top-down approach, follows the methodological references agreed in the LEG SAM (Leadership Group on SAM’s) where the Statistical Office has actively participated. The LEG SAM has produced a Handbook on Social Accounting Matrices which resulted from the experience of the participating countries in the group taking as a conceptual framework, the SAM proposed in the SNA93/ESA95.

17. The Classifications in the Portuguese NAM are:

(a) For **Industries**, according to NACE to have a minimum of 6 industries (A6) although it can be A17, A31 and A60 according to the availability of data.
(b) For **Products**, (CPA) to have a minimum of 6 products in detail (P6). Further detail in P17, P31 and P60 can also be compiled also depending on the available data.
(c) For **Institutional** sectors, according to ESA95, a minimum of 3 institutional sectors (corporations (S11+S12); general government (S13) and households, including NPISH (S14+S15)).
(c) For **Financial transactions**, it is proposed to be shown between an advisable minimum number of three financial instruments to the most detailed level.
(d) The categories of **primary inputs** would be: Compensations of employees by type, other taxes less subsidies on production, net operating surplus, net mixed income.

18. The classification in the several different accounts should not necessarily be the same. Because of data limitations, sectors can be combined. For instance, S11 can be combined with S12; S13 can be split.

19. In the Portuguese SAM, employment is broken-down by six types of labour and by four types of household groups. The breakdown considered in the SAM-PT for labour and households are as follows:

- **Input labour** (demand side):
  - ***By status***: (employees, self-employed), for each,
  - ***By gender*** (Male and female) and for each
  - ***By educational level*** (lower (ISCED 1-2),medium (ISCED 3-4), higher (ISCED 5-6))
- **Households** (supply side), according to the main source of income:
  - ***Wages and salaries*** (S143)
  - ***Mixed income including property income*** (S141+S142; S1441)
  - ***Income with connection with old age*** (S1442)
  - ***Other transfers income (including other households)*** (S1443 and S145)

20. It is possible to compile a SAM by using other categories for expanding the cells. For labour it can be also considered to breakdown labour by categories of professions and/or by age groups. The division of households by income class can also be considered instead of the main source of income or even combining both.

A. Demand side of the labour market: the use of different types of labour

21. The estimation of labour by types of labour on a top-down approach, as mentioned above, requires the estimation of appropriate structures and also the respective compensations. The used procedure is the same as the one adopted in the National Accounts but taking into account the characteristics that are needed for breaking down labour input and compensations of employees.

A.1 - Data Sources

22. The main data sources used were “Quadros de Pessoal”, an administrative source from the Ministry of Labour and Social Security (preliminary estimate of compensations), which records data from enterprises with at least one employed person, and the Labour Force Survey. National Accounts aggregates are worked out as absolute constrains. The estimates were made for the aggregation level of 17 industries, (A17, according to the NACE Rev.1) and six types of labour, as described above (status, gender and levels of education).

A.2 - Methodology

23. As the first step the average hourly earnings were estimated by gender, level of education and industry level according to the data of Quadros de Pessoal. The outcome is a matrix W* (6,17).

24. The matrix W* was adjusted in order to incorporate the employer’s actual and imputed social contributions. Because these data are available in the NA only for the total, for each industry it was considered that the implicit rate of actual social contributions was the same in each industry, which is a realistic assumption. The imputed social contributions were assumed as being proportional to the amount of wage and salaries and uniform in each industry. Consequently, the corrected earnings were defined according to the following:

$$w_{ij}^{g} = \frac{w_{ij}^{l} \times \left(1 + t_{.j}^{isc}\right)}{\left(1 + t_{.j}^{asc}\right)}$$

where “ i “refers to the type of labour and “ j “ refers to the branch. Each estimate was also adjusted to an annual scale (Wga) :

$$w_{ij}^{ga} = 48 \times w_{ij}^{g}$$

25. Based on the source (Quadros de Pessoal) a matrix H (hours worked in each industry, by gender and education level), with the generic element hij, was compiled and scaled to an annual basis. The average hourly earnings can be determined by considering the matrices Wga (annual earnings) and H (hours worked) as:

$$\overline{C}_{ij} = \frac{w_{ij}^{ga}}{h_{ij}}$$

26. The matrix of average hourly earnings was linked to the actual hours worked from the Labour Force Survey generating a new matrix C of compensations, by industry and type of labour. This matrix C results from the product between a matrix of hours worked by using the data of Labour Force Survey (based on an average of the actual hours worked for the four quarters, with the same breakdown, scaled to an annual basis), and the average hourly earnings:

$$c_{ij} = \overline{c_{ij}} \times h_{ij}^{w}$$

27. Each row refers to a type of labour and each column to an industry. The compensations paid by the industry are obtained by summing up each element of a given column of matrix C. The compensations of a given kind of labour are calculated by summing each element of a given row.

A.3 - Reconciliation with NA data

28. The quality of the data of the first estimates, as explained above, was crosschecked with the National Accounts aggregates. The reconciliation of the first estimates with the data from the National Accounts results from an iterative process, taking two constraints: NA figures of compensations by branch and the weights of each kind of labour in the total compensations obtained from the matrix W* of the first estimates. The final reconciled data have the following format (Table 1):

Table 1. Compensations by 6 types of labour and 17 industries(A17); matrix (6,17)

Industry	**A**	**B**	**. . .**	**P**	**Q**	**TOTAL**
Type of labour	1	2	. . .		17	TOTAL
G1 - M **G1 - F** **G2 - M** **G2 - F** **G3 - M** **G3 - F**	C_{21}	C_{22}	C_{ij}			$\mathbf{C_{2.}}$
TOTAL		$\mathbf{C_{.2}}$	$\mathbf{C_{.j}}$			

29. For the estimation of the employment linked to the compensations by industry, gender and education level, the main data sources used were also the Labour Force Survey and the Quadros de Pessoal. In order to maintain the employment figures from the NA the adjustment was also based on an iterative process.

B. Supply side of labour market: remuneration of different types of households

30. The sub-matrix corresponding to the gross generated income explains how the different institutional sectors are remunerated for their participation as input factors in the productive process. Compensations, as explained, were previously broken-down by type of labour. For the allocation of the primary income account compensations and mixed income are further broken-down by type of recipient household group according to the main source of income. In the context of a labour oriented SAM, "households" is the appropriate institutional sector to disclose since individuals are the only “labour suppliers”.

B.1 - Data sources

31. The Household Budget Survey (HBS) and the NA are the privileged data sources in this stage of compilation. The HBS supplies micro data that will provide the structure to distribute compensations by type of household, gender, level of education and by industry. The NA will provide the totals of compensations that are considered as a constraint.

B.2 – Methodology

32. The compensations by type of labour and households were also compiled on a top-down approach. On a first step, a matrix of compensations by industry type of labour (gender x education level) and type of households taken out from the HBS was compiled. This is a matrix (4,(6x17)). This matrix is conciliated with the already estimated compensations of employees by industry and type of labour (see Table 1) and a compensation matrix broken-down by type of household and type of labour (Table 2) is obtained as follows:

Table 2. Compensations by household groups and by types of labour; matrix (4,6)

Labour	G1 - M	G1 - F	G2 - M	G2 - F	G3 - M	G3 - F	TOTAL
Household							
S143		r_{22}					$R_{2.}$
S141+S142+S1441							
S1442							
S1443+S145							
TOTAL		$R_{.2}$					

33. The mixed income is also broken-down by type of labour and type of household according to the same methodological procedure used for compensations of employees.

34. In the annex, some examples of the most important final tables are included. The figures are examples in A6 level and not real figures of the Portuguese SAM due to the fact that the Statistics Portugal has not yet published any figures.

IV. MAIN USES OF A SAM

35. Considering the purpose of this document the main results that can be taken out of a SAM focus on labour. The compilation of a SAM, including physical data on employment, has advantages some of which have already been mentioned. An important one is the better knowledge of the relation between labour and national accounts which are integrated in a SAM labour-oriented. In this context, a labour-oriented SAM provides detailed information on the social aspect of the economy, in particular the providers of the labour input and their relations with the monetary flows. Therefore it provides possibly to calculate simultaneously and in an integrated way different indicators for policy analysis, such as structural indicators. In fact taking the domain of employment, several structural indicators can be obtained from the use of SAM's, such as, Labour productivity (number of persons, hours worked) in for instance, Unit labour cost growth, or Employment growth (total and by gender).

36. The SAM is also useful to measure productivity growth of labour input. The understanding of the structure of labour among industries in terms status, gender and educational level through the SAM provides a good knowledge of the composition of labour and labour cost for each industry level. For instance, it is possible to calculate for each industry the percentage of high educated women or medium education of men and for each the respective labour cost. In addition, it is possible to have the structure of employees for high educated women in all industries and their compensations.

37. The measurement of gender cost of labour differential among industries and among countries, where SAM's is compiled, is one important use of this tool. The same applies to educational level labour cost differential with combinations of gender breakdown. Also compensations of employees per capital can be obtained in a SAM.

38. For policy analysis the existence of a time series of SAM's is also important to measure impacts and possible changes in the structures of labour both in its composition and among industries.

REFERENCES

ESA95-European System of National and Regional Accounts – Eurostat

SNA93-System of National Accounts1993-United Nations

Handbook on Social Accounting Matrices- Leadership Group on SAMs

Miscellaneous documents on the Portuguese SAM- Statistics Portugal (INE, National Accounts Department)

V. ANNEX

Table 1

Cell (3,2) NET VALUE ADDED - current million euro -

Generation of income (value added categories)		Production (NACE-rev. 1 Industries) - (A6)						TOTAL
		Agriculture, foresty, fishing **(NACE A/B)**	Mining, quarrying, manufacturing, electricity, gas and water supply **(NACE C/D/E)**	Construction **(NACE F)**	Trade, repair, hotels and restaurants, transport, storage and communication **(NACE G/H/I)**	Financial intermediation, real estate, renting and business activities **(NACE J/K)**	Public administration and defence, education, health and social work, services n.e.c. **(NACE L/M/N/O/P)**	
	codes	**2a**	**2b**	**2c**	**2d**	**2e**	**2f**	**2g**
Compensation of employees	**3a**	9	349	58	60	54	232	762
Net mixed income	**3b**	14	227	35	39	99	18	432
Net operating surplus	**3c**	9	30	18	7	112	41	217
Other taxes less subsidies on production	**3d**	-2	44	5	-6	12	5	58
Total	**3e**	30	650	116	100	277	296	**1,469**

Table 2

Cell (3,2) NET VALUE ADDED - current million euro -

Generation of income (value added categories)				Production (NACE-rev. 1 Industries) -(A6)						TOTAL
				NACE A/B	NACE C/D/E	NACE F	NACE G/H/I	NACE J/K	NACE L/M/N/O/P	
			codes	2a	2b	2c	2d	2e	2f	2g
Compensation of employees	Male	Primary/lower secondary (ISCED 1-2)	3a-1	6.4	179.9	49.0	30.8	13.0	34.4	313
		Upper or post secondary (ISCED 3-4)	3a-2	0.2	29.7	3.5	5.7	10.5	10.1	60
		Tertiary (ISCED 5-6)	3a-3	0.4	34.6	3.2	5.6	14.5	70.7	129
	Female	ISCED 1-2	3a-4	1.9	82.0	1.0	11.2	6.4	40.6	143
		ISCED 3-4	3a-5	0.2	12.4	0.7	3.6	5.1	10.6	33
		ISCED 5-6	3a-6	0.0	10.6	0.7	3.2	4.6	65.6	85
Net mixed income	Male	ISCED 1-2	3b-1	8.6	128.5	31.4	21.8	21.5	5.0	217
		ISCED 3-4	3b-2	0.3	28.0	2.0	5.0	23.2	1.9	60
		ISCED 5-6	3b-3	0.0	12.0	1.5	1.5	35.0	1.9	52
	Female	ISCED 1-2	3b-4	5.1	47.9	0.1	8.2	5.7	5.8	73
		ISCED 3-4	3b-5	0.1	8.7	0.0	2.2	4.8	2.4	18
		ISCED 5-6	3b-6	0.0	2.0	0.0	0.4	8.8	1.0	12
Net operating surplus			3c	8.8	29.9	18.4	7.0	111.6	41.3	217
Other taxes less subsidies on production			3d	-2.0	44.0	5.0	-6.0	12.0	5.0	58
Total			3e	30	650	116	100	277	296	**1,469**

Table 3

Cell (4,3) NET GENERATED INCOME - current million euro -

Allocation of primary income (Institutional sectors)		Generation of income (value added categories)				TOTAL
		Compensation of employees	**Net mixed income**	Net operating surplus	Other taxes less subsidies on production	
	codes	**3a**	**3b**	**3c**	**3d**	**3e**
Non-financial corporations	**4a**			139		139
Financial corporations	**4b**			-3		-3
General government	**4c**			16	58	74
Households	**4d**	766	432	60		1,258
Non-profit institutions serving households	**4e**			5		5
Total	**4f**	766	432	217	58	1,473

Table 4

Cell (4,3) A DETAILED GENERATED INCOME MATRIX - current million euro -

Allocation of primary income (Institutional sectors)			Generation of income (value added categories)														TOTAL
			Compensation of employees						Net mixed income						Net operating surplus	Other taxes less subsidies on production	
			Male			Female			Male			Female					
			ISCED 1-2	ISCED 3-4	ISCED 5-6	ISCED 1-2	ISCED 3-4	ISCED 5-6	ISCED 1-2	ISCED 3-4	ISCED 5-6	ISCED 1-2	ISCED 3-4	ISCED 5-6			
		codes	**3a-1**	**3a-2**	**3a-3**	**3a-4**	**3a-5**	**3a-6**	**3b-1**	**3b-2**	**3b-3**	**3b-4**	**3b-5**	**3b-6**	**3c**	**3d**	**3e**
Non-financial corporations		**4a**													139		139
Financial corporations		**4b**													-3		-3
General government		**4c**													16	58	74
Households classified by main source of income	*Wages and salaries*	**4d-1**	303.6	56.3	127.2	127.3	28.8	79.7	33.9	17.5	24.4	22.3	6.8	9.6	35		872
	Mixed income (including property income)	**4d-2**	6.0	2.0	1.3	9.8	2.7	3.1	175.4	36.2	25.7	43.1	9.7	2.3	16		333
	Income in connection with old age (retirement)	**4d-3**	3.0	1.2	0.4	3.0	0.8	1.9	4.6	4.6	1.0	5.3	1.3	0.3	8		35
	Other transfers income (including other households)	**4d-4**	2.4	0.7	1.0	2.9	0.4	0.4	2.8	2.0	0.8	1.9	0.4	0.0	2		18
Non-profit institutions serving households		**4e**													5		5
Total		**4f**	315	60	130	143	33	85	217	60	52	73	18	12	217	58	1,473

Table 1.1 : Aggregate National Accounts Matrix, Europeland

ACCOUNT		1. Goods and services	2. Production	3. Generation of income	4. Allocation of primary income	5. Secondary distribution of income	6. Use of disposable income	7. Capital	8. Gross fixed capital formation	9. Financial	10. Rest of the world, current	11. Rest of the world capital	12. TOTAL
	Classifications	*product groups*	*industries*	*primary input categories*	*institutional sectors*	*institutional sectors*	*institutional sectors*	*institutional sectors*	*industries*	*financial assets*			
1. Goods and services	*product groups*	Trade and transport margins 0	Intermediate consumption 1904				Final consumption expenditure 1371	Changes in inventories 38	Gross fixed capital formation 376		Exports of goods and services 536		4 225
2. Production	*industries*	Output (basic prices) 3 595											3 595
3. Generation of income	*primary input categories*		NET VALUE ADDED (basic prices) 1469								Compensation of employees from the ROW 6		1475
4. Allocation of primary income	*institutional sectors*	Taxes less subsidies on products 133		GENERATED INCOME, NET (basic prices) 1473	Property income 341						Property income and taxes less subsidies on production from the ROW 66		2 013
5. Secondary distribution of income	*institutional sectors*				NATIONAL INCOME, NET 1633	Current transfers 1096					Current transfers from the rest of the world 10		2 739
6. Use of disposable income	*institutional sectors*					DISPOSABLE INCOME, NET 1604	Adjustment for the change in net equity of households on pension funds reserves 11				Adjustment for the change in net equity of households on pension funds reserves from ROW 0		1615
7. Capital	*insttutional sectors*						SAVING, NET 233	Capital transfers+132 68		Net incurrence of liabilities 603		Capital transfers from the ROW 1	905
8. Gross fixed capital formation	*industries*		Consumption of fixed capital 222					Net fixed capital formation 154					376
9. Financial	*financial assets*							Net acquisitions of financial assets 641				NET LENDING OF THE ROW -38	603
10. Rest of the world, current		Imports of goods and services (c.i.f.) 497		Compensation of employees to the ROW 2	Property income and taxes less subsidies on production to the ROW 39	Current transfers to the ROW 39	Adjustment for the change in net equity equity of households on pension funds reserves to the ROW 0						577
11. Rest of the world, capital								Capital transfers to the ROW 4			CURRENT EXTERNAL BALANCE -41		-37
12. TOTAL		4 225	3 595	1475	2 013	2 739	1615	905	376	603	577	-37	