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ROMANIAN EXPERIENCE IN INPUT-OUTPUT TABLE COMPILATION

Invited paper submitted by National Institute of Statistics of Romania*

I. INTRODUCTION

1. In Romania, the process of compiling macroeconomic time series based on ESA79 started in 1989. The National Institute of Statistics (NIS) has already compiled national accounts according to ESA95 for the years 1998 and 1999 – final version, 2000 – semi-final version and 2001 – provisional data. The year 1998 was chosen to be a benchmark year, so the accounts for 1998 were compiled according to both methodologies. It is important to stress that the former methodology (based on ESA 79) applied for the compilation of national accounts already included some improvements of ESA95, such as:

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- The valuation of production and gross value added at basic price;
- Expenditure with mineral exploration were included in the gross fix capital formation;
- The compilation of the supply and use tables and the symmetric Input-Output Table (IOT) in current and constant prices;
- National accounts in constant prices were estimated in the prices of the previous year.

2. The most important changes brought to the Romanian national accounts in the process of implementing ESA 95 were:

- The reclassification of the institutional units into sectors;
- The new sequence of accounts for institutional sectors;
- The valuation of certain taxes and contributions on accrual basis;
- The estimation of the final consumption according the new concepts: expenditure for final consumption and actual final consumption;
- The treatment of food and equipment for military staff;
- The treatment of purchased soft-ware in the gross fixed capital formation;
- The treatment of transport margins.

II. INPUT-OUTPUT TABLE

3. At the beginning of 1990, Romania had a minimal experience in the compilation of Input-Output Table and in its uses for economic analysis, economic forecast or scientific research. The only Input Output Tables compiled in the country were for 1970 (when a special calculation was done) and for 1980 and 1982 (the tables were compiled on the basis of data sources existent in the statistical information system and using an experimental macroeconomic computation).

4. Since 1989 the Input-Output Table is compiled on an annual basis of current prices and at prices of the previous year. The table covers 105 industries by 105 products. Since the secondary output of enterprises is allocated to the relevant branch, the input-output table has the same number of industries and products and can be considered as a symmetric product x product table.

5. Some characteristics of the Romanian Input-Output Table are:

- It is integrated in the national accounts, being coherent with the Table of Integrated Economic Accounts. This treatment has been chosen because the flows reflected in the two synthesis tables describe the same processes from different points of view: of institutional sectors and of industries;

- It contains four sub-tables:

  - The supply table which contains resources by products: production and imports, as well as the adjustments elements which allow the passage from the basic price in which production is valued and the CIF price in which imports of goods are valued, to the purchasers' prices in which the uses are valued. These elements are: taxes on products including VAT, customs duties, subsidies on products and imports, transport and trade margins;

  - The intermediate consumption table which is a matrix of 105 industries by 105 products;

  - The final uses table which contains the following aggregates, detailed by 105 products: final consumption of households, final consumption of general government and the non-profit institutions serving households, gross fixed capital formation, changes in inventories and exports;

  - The primary input table which contains the elements of value added, such as compensation of employees, other taxes on production, other subsidies on production and gross operating surplus;

- Consumption of fixed capital is not clearly highlighted, the aggregates being expressed in gross value; consumption of fixed capital has been estimated on an experimental basis but not integrated in the accounts for the moment;
- The Input-Output Table is compiled at current prices and the prices of the previous year;
- The Input-Output Table includes 105 commodities based on the "Classification of national economic activities", compatible to the international classifications (ISIC and NACE Rev.3).
- A classification compatible with NACE Rev.3;
- The final version of Input-Output Table is available two years after the end of the period, at the same time with the Table of Integrated Economic Accounts; a semi-final version is ready one year after the end of the period.

III. DATA SOURCES FOR IOT

6. The most important data sources used for the IOT are the following:

- Statistical data sources: the annual enterprise survey (also called structural enterprise survey), the integrated households' survey; the household labour force survey, the balance of agricultural products;

- Accounting and financial data sources: the annual accounting statements of financial, insurance and non-financial units;
- Administrative data sources: the outcome of the consolidated general government budget, the income declarations for self employed and family associations, balance of payments.

The enterprise annual survey (EAS)

7. The Enterprise Annual Survey, also called the Structural Survey of Enterprises, is the main source of annual structural data for enterprises in Romania. It was introduced as a pilot project in 1993 and has been conducted annually ever since.

8. The objectives of the survey are to:

- Provide detailed information on the total activities of enterprises, by homogeneous branches of the economy irrespective of type of ownership;
- Facilitate the compilation of national accounts, being a major data source for estimating of production, intermediate consumption and gross value added by industries;
- Provide the information required for updating the statistical register (REGIS) which is used as a list frame for surveys conducted by the NCS;
- Facilitate studies using the survey results.

9. The questionnaires of the structural enterprise survey were designed in accordance with the accounts used for business accounting. Three main sets of questionnaires are used depending on the type of unit: non-financial enterprises covered by census; non-financial enterprises covered by a sample, and budgetary units and financial institutions covered by a sample.

10. For the non-financial enterprises covered by census, the units are selected according to the number of employees and turnover. Like the turnover thresholds, the employment thresholds are differentiated by kind of activity. Thresholds are revised each year.

11. The following information is included in the questionnaire:

- Identification data (address, type of ownership, legal form, main activity);
- Activity results (information on social capital, credits, revenues, expenses, inventories);
- Data on the number of employees on December 31 and the average number of employees for the year;
- Data on turnover and expenditure by product (67 products) and activity (4 digit level);
- Capital formation and stocks of fixed assets;

- Opening and closing inventory levels by type of inventories;
- Expenditure for the purpose of environmental protection.

12. This survey is the most important data source for the compilation of IOT; data on turnover and expenditure are used to estimate output and intermediate consumption by industries; data on investments are the main information for estimating gross fixed capital formation.

The integrated households' survey (IHS)

13. This is a regular monthly survey conducted to obtain information for describing the living conditions of the population and to observe their evolution, which is of special interest during the transition to a market economy. A pilot survey was conducted in 1994 and the survey has been held on a regular basis since 1995. The survey aims to cover a number of different subject areas.

14. Beginning with 2001 a new harmonised households budget survey has been implemented. The survey was designed to comply with the methodological concepts and survey organisation of the Eurostat manual "Household Budget Survey in the EU. Methodology and recommendations for harmonisation".

15. Data from IHS are used in the process of estimating households final consumption.

Household labour force survey (HLFS)

16. The Household Labour Force Survey is the main data source for information on active employment and unemployment. Designed to cover all the population categories, it gives multiple possibilities to organise various structures and make comparisons, by social-demographic characteristics, as well as international comparisons. The HLFS was introduced partly to provide data in between the population censuses. A pilot survey was conducted in 1993. During 1994 and 1995, the HLFS was conducted annually in March. Since 1996, it has been carried out quarterly.

17. The survey is also used to estimate the black labour as a component of the non-observed economy which is integrated in national accounts.

Balance of agricultural products

18. The agricultural balances are compiled by the Department of agriculture on the basis of the reports of the agricultural enterprises for data in physical units and surveys of the production of the farmers. Statistical reports on the entries of products in the agricultural resources fund (which keep the evidence stocks of agricultural products), data from enterprises collecting seeds are also used. These are combined with special calculations of intermediate consumption of seeds and animal foodstuff. The balances are made by products in quantities and, combined with agricultural price estimates, also in values.

19. The agricultural balance is the main data source for estimating output, intermediate consumption and gross value added of agriculture as well as for the calculation of the households consumption of own-account production.

Accounting data sources of legal units

20. In 1991, a new law of business accounting was introduced. The new accounting scheme became operational on January 1st 1994. According to this law, the following units are required to keep a full set of accounts: government owned units with independence of decision making (quasi-corporate enterprises such as those engaged in energy, railways, metro, etc.); enterprises; banks; insurance companies; trade unions, political parties, religious organisations and various other NPISHs. The law also applies to those units which are not independent legal entities and which have their headquarters in another country, or with headquarters in Romania but belonging to natural or legal persons from abroad. The new accounting scheme also included the introduction of the national activity classification (CAEN) into the enterprises' bookkeeping.

21. In general the accounting statements cover the profit and loss account, the balance sheet assets and liabilities by type, and certain annexes covering inventories, provision for losses, assets and liabilities and distribution of profit.

Consolidated general government budget

22. The consolidated general government budget comprises separate information for:

- The central government budget, the social security budget, local government budgets, and the extra-budgetary funds established for special purposes their resources being earmarked taxes and fees;
- The outcome of the budgets of autonomous public institutions. These are public institutions totally or partially financed by extra-budgetary funds and subordinated to ministries and other central bodies. These cover activities of national interest, such as the Botanical Gardens, national libraries, music institutions, research units, canteens for pupils and students, etc;

- The outcome of the budgets of public institutions wholly or partially financed from extra-budgetary funds and subordinated to regional bodies, including that of the city of Bucharest. These cover activities of local interest such as craft centres and local museums, art schools, sporting clubs and associations, markets, fairs, etc.

Income declarations of self-employed and family associations

23. The income declarations submitted to the Ministry of Finance by the self-employed and family associations are completed in March and concern the income expected to be obtained over the current year and not the income earned over the previous year, though this might be the base for the current year estimate. These declarations are used to compile data for the household sector. They cover gross income, taxable income and tax on income by activities and by regions. The Ministry of Finance aggregates the data, first at regional and then at national level.

24. It should be noted that up to 1999 no income tax declarations were submitted by individual wage and salary earners as income tax payments were deducted directly by employers.

Balance of payments

25. The Balance of Payments (BoP) of the National Bank is compiled according to the recommendations of the International Monetary Fund's Balance of Payments Manual, 5th edition. Exports and imports of goods are based on customs declaration statistics compiled by the General Direction of Customs from Ministry of Finance. Trade in services is based on reports made by banks to the National Bank.

IV. CURRENT PRICE VALUATION

26. Different categories of prices are being used for the current price valuation of the aggregates of the input-output table, as follows:

- Production is valued at basic prices;
- Intermediate consumption is valued at purchasers' prices, excluding deductible VAT;
- Gross value added is valued at basic prices;
- Final consumption of households is valued at purchasers' prices for goods and services which are purchased and at cost for goods and services which are produced and consumed by households;
- Final consumption of general government and non-profit institutions is valued at the costs incurred in the industries producing non-market services;

- Gross fixed capital formation is valued at purchasers' prices, excluding deductible VAT, for capital goods purchased and at basic prices for own-account fixed capital formation;
- Imports of goods are valued CIF;
- Imports of services and exports of goods and services are valued FOB;
- Changes in inventories are valued at basic prices with zero profit for stocks of finished goods and work-in-progress (producer stocks) and at purchasers' prices, excluding deductible VAT, for raw materials and fuels (user stocks) and goods for re-sale (trade stocks).

V. CONSTANT PRICE VALUATION

27. The price indices used for the estimation of output of market goods and services in constant prices are: producer price indices, aggregated by activity at the level of 105 industries; consumer prices indices, aggregated by groups of goods and services at the level of 105 products; price indices on the farmers' market; price indices for agricultural production; construction prices. In parallel, estimates of production in constant prices are made using volume indices, when they are available. Estimates made using these two approaches are the reconciled.

28. For constant price estimates of output of non-market goods and services, intermediate consumption and value added are separately valued at constant prices and the output is derived as a sum of these.

29. The constant price estimation of taxes and subsidies on products and customs duties is undertaken for each type of tax/subsidy. Base year tax rates are applied to the flows in base year prices. These are calculated for 105 products. The tax base used for the estimates includes: retail sales data and data concerning services rendered to the population (this information is used for estimation of VAT and subsidies on products); data concerning output and imports-used for estimation of other taxes on products; import data-used for estimating customs duties and subsidies on imports; data concerning agricultural production-used for estimation of the subsidies granted to agricultural producers.

30. Two methods are used in the initial stage in order to estimate intermediate consumption in constant prices: price deflation and volume indices.

31. In order to derive a price index, which can be used to deflate intermediate consumption within an input-output framework, synthetic indices are created by weighting together, using base year weights, the implicit price indices for output, imports, taxes on products excluding VAT, custom duties, transport and trade margins for intermediate consumption, separately for each product. These indices are used to value the table of intermediate consumption in constant

prices. This method is generally used for agriculture, financial, banking and insurance services and general government.

32. The second method used to estimate the table of intermediate consumption in constant prices starts with the intermediate consumption table of the previous year in current prices and applies output volume indices by industries. This approach is based on the assumption of constant technological coefficients, that is a change in the quantity of output between periods requires a similar change in the quantity of goods and services consumed for its production. This method is generally used for all industries, except those mentioned above for which the technological coefficients might significantly change from one year to another.

33. In practice, both methods are used with a comparative analysis of the results being undertaken. This allows a better cross-checking of the data contained in the intermediate consumption table.

34. For the valuation of household actual final consumption in constant prices different price indices are used for various components of final consumption. The components of household final consumption expenditure are thus deflated separately at the level of 105 products. The main items are described below:

- Purchases of market goods and services are valued at constant prices using the consumer price indices by products;
- For electricity, gas and water, volume indices based on the quantities consumed are available;
- For transport, the index of the number of passenger-kilometres is used as a volume index;
- For the valuation of purchases of goods on the farmers' markets at constant prices, the price indices, by products, on the farmers' markets are used;
- For household production, volume indices of household agricultural production are used. This is equivalent since the current price data is derived as volume times the price on farmers' markets;
- The prices indices used to estimate own consumption in constant prices are those of agricultural production;
- The market output of government and NPISHs are deflated by consumer price indices by products;
- The government and NPISHs expenditure on individual goods and services in constant prices is estimated as a sum of the cost for producing these services, as it was described above for the non-market output of this sector.

35. The actual final consumption of general government in constant prices is calculated as the difference between the production of those industries producing these services in constant prices and the value of government expenditure on individual goods and services in constant prices.

36. In order to derive a price index which can be used to deflate gross fixed capital formation within an input-output framework, synthetic indices are created by weighting together price indices for output, imports, taxes on products excluding VAT and custom duties, separately for each product.

37. The volume index of investments is used for checking the constant price estimates of gross fixed capital formation.

38. The estimates of changes in inventories in constant prices are made by deflating the values of the changes in inventories adjusted for holding gains and losses in current prices with the same type of synthetic indices which are calculated and used to deflate intermediate consumption and to estimate holding gains and losses. Rather than deflating inventory levels, it is the change in inventories which is deflated.

39. In order to calculate the value of exports and imports of goods in constant prices, the values in current prices are deflated by unit value indices (UVIs). The Department of Trade started to calculate UVIs based on customs statistics from 1997. Prior to this, UVIs were estimated in the national accounts department.

40. The export and import unit value indices in lei are calculated by correcting the indices of the unit values of exports and imports of goods in US dollars by the index of the trade-weighted average exchange rate on goods calculated on the import and export of goods. The price indices are calculated at CIF values for imports and FOB values for exports of goods. Unit value indices in US dollars are calculated for approximately 300 products. The indices (aggregated to the level of 78 groups of goods) are Paasche type indices. The weights used are the quantities of goods exported or imported during the current period.

41. Since appropriate price indices for deflation of exports and imports of services are not available, the average exchange rate index for total services is used to deflate exports and imports for each type of service. This ignores the effect of inflation in partner countries, but as long as inflation in Romania is significantly higher, the error introduced is not extreme.

VI. COMPILATION PROCEDURE

42. Building up an IOT is a very complex work that makes use of an important quantity of information from different data sources. In order to produce the aggregates of the IOT, data are processed to meet the ESA 95 definitions and rules. During this process an important target is to increase the accuracy, consistency and reliability of the estimates. This is the reason that in order to produce one estimate more than one data source must be used, whenever possible. So, an

important amount of work is dedicated to the reconciliation of data sources and to the cross-checking of the aggregates produced within the national accounts.

43. The most important data source for the IOT is the Annual Enterprise Survey. This provides the information needed to estimate the elements of the production and generation of income account by homogenous industries at four digit level of CAEN, the change in inventories, and the investments by products. For non-financial corporations, credit and insurance institutions as well as non-profit institutions this information is checked and reconciled with the accounting statements of these units.

44. The reconciliation is performed gradually during the process of analysing simultaneously the current and constant price estimates of output, intermediate consumption and gross value added. Plausibility checks on the value of production and intermediate consumption take place at the commodity level (105 industries) by comparing the volume changes of production and intermediate consumption (as a use of this production) with each other and with other uses. Adjustments are made and new plausibility checks are carried out. This process is repeated until the data are considered to be reliable.

45. Another important use of this survey is that additional information on different indicators is obtained in order to meet the needs of the national accounts definitions and IOT compilation. Some good examples are:

- The breakdown of output, intermediate consumption and compensation of employees at the enterprise level by homogenous activities which is used to make the distinction between primary and secondary activities and to build up the supply table and the symmetric table product x product;
- A decomposition of certain expenditure elements of the accounting statement (those items which are mixing elements of intermediate consumption with elements of compensation of employees);
- The breakdown of the opening and closing stocks by type of stocks and by products;
- The breakdown of market output of government and non-profit institutions;
- The breakdown of investments by products;
- The value of transport activity by products transported in order to estimate the transport margins;
- The value of retail and wholesale trade and of the expenditure on goods for resale by products in order to estimate the trade margins.

46. Comparing the estimates with data from the Integrated Households Survey (HIS) makes a first check of the estimates of households final consumption (HFC). Before comparing the data resulting from the two sources, at a commodity level, the necessary adjustments for coverage and definitions to the basic data are made. This is followed by a validation performed within the

input-output table during the process of balancing the supply and use of each product. This is done simultaneously in current and constant prices and gives the final figure for households final consumption.

47. Before 1997, the HIS was not grossed up to arrive at total expenditure by product for the total population. So, the survey could only provide a breakdown of HFC expenditure. For the 1997 accounts the first grossed up figures from the HIS were calculated. Some large discrepancies were identified by comparing these data with those from the Annual Enterprise Survey (AES). Together with our colleagues from the IHS we have analysed these results and identified the major problems, so that, we hope to be able soon to use this survey as an alternative independent estimate of the level of HFC.

48. The main sources for estimation of gross fixed capital formation by institutional sectors are the accounting statements of financial and non-financial units, information concerning the outcome of the consolidated general government budget, and accounting statements of NPISHs. For the estimates of GFCF by product, the main data source is the AES. For certain estimates other statistical data sources are also used: HIS, statistical reports on dwelling construction, the balance of agricultural products.

49. GFCF by product and for the economy as a whole refers to acquisition of new assets only. GFCF by institutional sectors covers acquisitions minus sales of existing assets. These two different totals, in the Input-Output Table and in the table of Integrated Economic Accounts are reconciled.

50. In order to check the data, a sector by product matrix is constructed by matching data from accounting statements and the AES. This shows, for example, where there may be discrepancies between bookkeeping definitions and national accounting concepts. Based on this information, certain adjustments are then made, mainly to the corporation data from the accounting statements and to the household sector.

51. A second cross-check of the estimates of GFCF is performed in the input-output table framework, during the process of balancing the resources and uses by products, simultaneously in current and constant prices.

VII. BALANCING PROCEDURES

52. The first stage in compiling the input-output table is the estimation of each indicator of the supply and the use table in current and constant prices for the whole economy and by products. The second stage is obtaining the balance between resources and uses of each product. This is undertaken simultaneously in current and constant prices. The reconciliation of GDP estimates provided by the three approaches (production, expenditure and income) is ensured within the IOT table. Adjusting elements on either the supply or use side eliminates differences by commodity group. When a figure in current prices is adjusted, the figures in constant prices, the volume index and the deflator are examined. The same procedure is followed when a deflated value is adjusted. The advantage of this procedure is that it offers the possibility of checking the plausibility of proposed corrections.

53. An important starting point for the analysis of the discrepancies are the prices used for evaluation and deflators used for each element of the resources and uses. These deflators are independently obtained during the previous stages of the constant price estimation of the indicators. During the balancing they are compared and their consistency with each other is checked, which provides an indication of where the corrections should be carried out. In this phase, the elimination of differences takes place on the grounds of past experience and expert judgment and the experts' decisions may lead to the correction of one or more aggregates.

54. The balancing process is carried out manually in several steps, each adjustment being followed by an examination of the consequences of each correction on the volume indices of the aggregates.

55. At the end of this procedure, a system of tables containing consistent and detailed information on the level of volume and price changes of goods and services transactions is available. The simultaneous balancing in current and constant prices will lead to a different allocation of the discrepancies than would be obtained if a separate balancing process was used.

56. In principle, this process of examining all the estimates for current prices, volumes and deflators at a detailed level should give valuable insights into the relative strengths (and weaknesses) of different data sources and may indicate priority areas for attention in the future.

VIII. FUTURE IMPROVEMENTS

57. The most important issues for improvement of the IOT in the future are:

- A fully compliance with ESA 95 definitions and aggregates coverage;
- The presentation of the supply table in a matrix form;
- The estimation of a separate import matrix.
