

Introducing Methods of Integrating SUT into National Accounts in Finland

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ABSTRACT The balanced supply and use tables (SUT), and the input-output tables based on them, form an integral part of the Finnish National Accounts. The compilation process of SUT is based on preliminary national accounts data. The calculation of annual accounts is organised into more than 30 activities by statistical topic, e.g. by industry and sector. Information on these statistical topics is first calculated at the total level in accordance with national accounts concepts and classifications. In the compilation of supply and use tables, national accounts supply data at basic prices and use data at purchasers' prices are allocated to products at the level of 950 product groups and certain classifications required by ESA 95 are added. Price formation items are used in the process of transforming use data into basic prices in order to balance basic price supply and use data at the detailed product level. In the balancing phase, supply data are usually considered to be more reliable at the product level, and are therefore less likely to be changed. The final result is a balanced product balance, which at the same time constitutes the national balance of demand and supply and the final annual national accounts data for a certain year. There is no remaining discrepancy between supply and use of products, i.e. the discrepancy between supply and use of the preliminary national accounts data is eliminated. Balanced current price SUT have been compiled for the years 1995 - 2004 and volume calculations have been compiled in the framework of SUT for the years 2001 - 2005 in the Finnish National Accounts. Input-output tables published for the earlier years were compiled after the compilation of the annual national accounts data. Statistical discrepancy was presented both in the final national accounts data and the input-output-tables.

KEY WORDS: Supply and use tables, national accounts, product balance

1. Background

The annual supply and use tables (SUT), and the input-output tables (IOT) based on them, conform to ESA 95 and nowadays form an integral part of the Finnish National Accounts as final annual national accounts at current prices and annual national accounts at constant prices are compiled in the framework of SUT (Eurostat, 1996). The compilation process of the current price SUT and IOT is based on the preliminary national accounts data, which are balanced within the framework of supply and use tables. Balanced current price SUT have been compiled for the years 1995 - 2004. Volume calculations have been compiled in the framework of SUT for the years 2001 - 2005.

Input-output tables have been compiled previously for years 1956, 1959, 1970, 1980, 1982, 1985, 1989, 1992, 1993 and 1995. These tables were compiled after the compilation of the final annual national accounts data. Statistical discrepancy was presented both in the final national accounts data and the input-output tables.

2. Time schedule of annual national accounts

The first preliminary data for year t is completed at the end of February in year $t+1$. This first version is less comprehensive than the national accounts proper. The contents of the first version correspond to the quarterly national accounts at current and constant prices, but will also contain the first version of sector accounts for all sectors.

The second version is completed in July of year $t+1$. The national accounts for year t are compiled in their entirety, as accounts for production and generation of income, gross capital formation accounts and changes in inventories for 97 industries are compiled for the first time. The third version is completed in January of year $t+2$ as the previous year, $t-1$, becomes final and more current price information becomes available. The fourth version, if necessary, is completed in July of year $t+2$. This version differs from the third version only in possible corrections made to the third version. Preliminary volume calculations of the second, third and fourth versions are compiled in the framework of SUT. All preliminary versions are unbalanced both at current and constant prices.

The fourth version at current prices is a basis for the fifth and final balanced version that is completed in December of year $t+2$. The final version is compiled both at current and constant prices within the framework of SUT.

3. The compilation of the SUT

3.1. Classifications of SUT

Supply and use tables are compiled for 950 national accounts product groups (KTTL) and 179 industries, which are reduced to 59 industries and 59 products in the final official version of SUT and IOT. In the compilation process of SUT, products are classified according to aggregated 6-digit CPA (Classification of product by activity) containing approximately 780 product groups for goods and approximately 170 product groups for services. Industries are classified according to the SIC95 standard classification of industry, based on NACE Rev. 1. containing 179 industries. Industry classification is the same as in the national accounts database (SKT95) with the exception that industries of sections C, D and E are classified at the 3-digit level instead of the 2-digit level. Other classifications (institutional sector, type of producer, type of output) conform to SKT95 database classifications. Supply and use classes are classified into 20 classes (Table 1).

3.2. Preliminary national accounts data

The compilation process of SUT is based on the preliminary national accounts current price data on production accounts, goods and services accounts and generation of income accounts of the national accounts database (SKT95). The database includes the following accounts:

- production and generation of income accounts,
- gross capital formation accounts,
- changes in inventories,
- final consumption expenditure of households,
- final consumption expenditures of government and

- national balance of demand and supply (including imports, exports and taxes and subsidies on products and final consumption expenditures of NPISH).

The supply and use tables thus rely heavily on the work that is necessary for the calculation of annual accounts. The work is organised into more than 30 activities by statistical topic, *e.g.* by industry and institutional sector. Information on these statistical topics is calculated on a total level in accordance with national accounts concepts and classifications. Part of the information is gathered from sources that describe a specific statistical topic (*e.g.* Structural Business Statistics for the manufacturing and construction industries, Central Government Accounting Records, insurance company statistics, Household Budget Survey). Other information comes from sources covering several topic areas (*e.g.* the Business Register, Structural Business Statistics for service industries, the Labour Force Survey).

3.3. Allocation of preliminary national accounts data to products

In the compilation of SUT, supply and use data of national accounts database (SKT95) are allocated to products, and certain classifications that are required by ESA 95 are added. This is made either by combining information obtained during the previous phase with separate product-related material gathered from the same economic units, or by using the same source material as in the previous phase, but on a product group level. Sources that provide product data include *e.g.* Statistics Finland's Prodcop statistics, which contains statistics on production, raw material and fuel of industries C, mining and quarrying, D, manufacture and E, electricity, gas and water supply. Foreign goods trade is calculated on the basis of National Board of Customs foreign trade in goods data and balance-of-payments data for trade in service in the preliminary phase. In this case, data need only to be translated to the national accounts product classification, and their linkage to other supply and use items need to be analysed on a more detailed level. The same procedure is applied to *e.g.* the Central Government Accounting Records material, the financial statistics of municipalities and joint municipal authorities, as well as to Structural Business Statistics, the Business Register, basic agricultural and forestry statistics, and the Household Budget Survey.

The choice of procedure to be used in the production of data by product depends largely on the scope of the statistical topic and the nature of the source material. In some cases

(*e.g.* activities of a relatively limited scope), the work is carried out directly by the sector researchers in charge. In other cases (*e.g.* more extensive activities), the work is conducted by the group in charge of the compilation of supply and use tables (*i.e.* SUT team), in consultation with the sector researcher in charge of the statistical topic in question. Combination of information from different statistical topic areas yields a supply table at basic prices and a use table at purchaser's prices.

3.4. Price formation items

Taxes and subsidies on products, trade and transport margins are used in the process of transforming supply data into purchaser's prices and use data into basic prices. The relative shares that are needed to calculate the transformation items are produced by the SUT team, in co-operation with sector researchers. The tables that are produced contain information on the relative share of specific margins, expressed as a percentage of the purchaser's price or producer's price of a product used for a specific use, or as a percentage of the basic price of a product pertaining to a specific supply.

The proportional share of the margin by a trade industry is calculated at the greatest possible level of detail (NACE 5-digit) from Structural Business Statistics. Each good is given a characteristic trade industry, through which it is most likely to pass. A good will then automatically get the same proportional share as its "pass-through" industry. The share is proportional to the producer's price.

Separately invoiced input transport costs are calculated from Structural Business Statistics and Prodcom statistics for intermediate and final uses that do not include trade margins. Breakdown by transport services is found by combining the above-mentioned information with transport statistics. The final outcome of this procedure is a good x transport service matrix, in which each element has a proportional share that shows how much the transport margins are for different means of transport, proportional to the purchaser's price of a good.

The value added tax base is updated annually for possible changes in the proportional shares of the purchaser's price of a product *i.e.* for changes in legislation. Import duties' proportional shares of the c.i.f. prices of goods are calculated from National Board of Customs' data. Proportional shares of other taxes on products are calculated using central government's revenue data and by using both supply and use information of the

products the taxes concern. Proportional shares of subsidies on products are calculated using central government's payments data, agricultural statistics and both supply and use information of the products the subsidies concern.

3.5. *Balancing of SUT*

The next stage, the balancing adjustment phase, is based on two identities that must hold for supply and use tables:

1. The identity by industry:

Output by industry = Input by industry

i.e., for each industry: Output = Intermediate consumption + Value added.

2. The identity by product:

Total supply by product (at basic prices) = Total use by product (at basic prices);

i.e., for each product: Output + Imports = Intermediate consumption

+ Final consumption expenditure + Gross capital formation + Exports.

In the first manual balancing phase, balancing adjustments are made in either supply at basic prices or use at purchaser's prices, depending on which information is considered most reliable. Supply data are usually considered to be more reliable at the detailed product level, and are therefore less likely to be changed. Adjustments generally involve transferring supply (or use) to a substitute as close as possible, with opposite-sign discrepancy between supply and use. At this stage, no adjustments are made to industry totals on supply, intermediate consumption, imports or totals of final use.

After the manual adjustment is completed, the process moves on to the automatic adjustment of price formation. At this stage, price formation is very close to its correct level. The final adjustments ensure that use by product sums up in such a way that taxes and subsidies on products equal taxes paid and subsidies received, and that trade and transport margins equal the margin-producing services supplied by the trade, transport and other industries.

When these phases of the process have been completed, the product balance reveals which products are responsible for the statistical discrepancy in the preliminary national accounts. If the discrepancy at the level of the total economy is positive, *i.e.* supply is greater than use, the next step is to select the products whose remaining discrepancy has the same direction and the greatest absolute value. If the discrepancy is negative, the same procedure is applied using the opposite criteria. After that, the products in the product set are analysed once more. Statistical discrepancy is eliminated from products with source estimates based on the weakest source material. These changes thus apply to the levels of preliminary industry and final use totals, and the effect of these changes determines the final level of value added.

After the statistical discrepancy is eliminated, no discrepancies remain between supply and use at the level of the total economy. Discrepancies may, however, remain at the level of specific products. Another important consideration is that discrepancies may occur between different types of output. Some products do not necessarily show a perfect match between the use of domestic market output (or use of imports) on the one hand, and the domestic supply (or imports) on the other hand, even though the product is in balance at the total level (total domestic market output and total imports). Any remaining discrepancies are eliminated in the final automatic balancing adjustment, where matrix elements are multiplied by coefficients calculated by an RAS algorithm. The balanced matrix elements then add up to pre-set row and column totals.

The final result is a balanced product balance, which at the same time constitutes the national balance of demand and supply. There is no remaining discrepancy between supply and use of product groups or between types of output. Balanced current price SUT data are aggregated into transactions in products in national accounts database (SKT95).

3.6. Compilation of the constant price SUT data

Constant price SUT data are compiled at previous year's prices at the detailed product level based on the guidelines of Eurostat's Handbook on Price and Volume Measures in National Accounts (Eurostat 2001). Constant price calculations start from the supply side at basic prices. Constant price domestic output and imports are calculated by deflating the current price SUT data with product-specific price indices, by

extrapolating the previous year's current price SUT data with product-specific volume indicators or by using industry-specific input cost method. The extrapolation method is applied to the output of non-market individual services. The input cost method is applied to the output of non-market collective services.

Current price use data at basic prices are deflated with the implicit price indices of supply. This automatically leads to balanced constant price SUT data at basic prices, when current price SUT data are balanced. Thus total supply equals total use by every product group x type of output-combination also at constant prices.

Price and volume indices are compiled for each product group x type of output combination. Index data consist of the following indices:

- Producer price indices (for goods) of domestic output for domestic use at basic prices
- Import price indices (for goods) at c.i.f. prices
- Export price indices (for goods) at f.o.b. prices
- Producer price indices for services at basic prices
- Consumer price indices at purchaser's prices
- Volume indicators for output of non-market individual services.

The constant price use data at purchaser's price are calculated in two alternative ways: Intermediate consumption, final consumption expenditure excluding final consumption expenditure of households and gross capital formation are calculated by adding constant price net taxes on products and trade and transport margins to the constant price use data at basic prices. The constant price taxes and subsidies on products are calculated by applying the tax and subsidy rate prevailing in the previous year to the volume of products in the current year. Trade and transport margins are deflated with the corresponding price indices of the margin-producing services.

Final consumption expenditure of households and exports at purchaser's prices are deflated by consumer price indices and export price indices. Constant price taxes and

subsidies on products and trade and transport margins are adjusted to the constant price use data at basic and purchaser's prices.

The previous years' price balanced SUT data are aggregated into transactions in products in national accounts database (SKT95). Changes of values, prices and volumes of transactions in products are checked with the sector researchers in charge. To obtain the final current and constant price SUT data, possible corrections must be made both to price and volume indices and/or current price data to obtain plausible changes of values, prices and volume. This way the final current and constant price national accounts and SUT data are compiled simultaneously. Finally chained volume measures are compiled in the prices of the reference year for the transactions in products of national accounts database (SKT95) with the help of Laspeyres volume indices.

3.7. Compilation of preliminary national accounts at constant prices

Preliminary annual accounts (completed in July of year t+1, January of year t+2 and July of year t+2) at constant prices are compiled in the framework of SUT. In the preliminary volume calculations, the current price transactions in products of the national accounts database are deflated with price indices calculated by weighting the SUT price indices with the current price product structure of each transaction in products. Current price product structures of transactions in products are calculated by updating product structures of the latest current price SUT data with the new current price product data of import, export and domestic output by industry. Preliminary current and constant price calculations are unbalanced.

4. Compilation of input-output tables

The balanced supply and use tables are used as a basis for the compilation of the symmetric input-output tables in industry x industry format. Transformation is done using the so-called market share assumption, which states that each product has its own specific sales structure, irrespective of the industry where it was produced. The market share assumption cannot always be trusted: in some industries it is advisable to use establishment level data. In other respects, the compilation of input-output tables is a straightforward matrix operation.

5. Data system

All SUT base data are converted into SAS tables, as some of them are in Excel-format. There are altogether 35 SAS programs that are ran in a certain order to produce the SUT and IOT described before. Some of the manual balancing, however, is done by using Excel. 33 of the 35 programs are for current price tables and only two for constant price tables. Actual published supply and use and input-output tables are tabulated from these tables with another SAS program.

References

Eurostat (1996), European System of Accounts 1995 - ESA 1995

Eurostat (2001), Handbook on Price and Volume Measures in National Accounts.

Table 1. Supply and use classes

Code	Heading
1010	Domestic output
1021	Imports, EU
1022	Imports, non-EU
1100	Cif/fob adjustment
2010	Intermediate consumption
2111	Final consumption expenditure of households
2112	Final consumption expenditure of NPISHs
2121	Final consumption expenditure of central government
2122	Final consumption expenditure of local government
2123	Final consumption expenditure of social security funds
2210	Gross fixed capital formation
2301	Finished goods, changes in inventories
2302	Work in progress, changes in inventories
2303	Goods for resale, changes in inventories
2304	Fuels, changes in inventories
2305	Other materials and supplies, changes in inventories
2311	Changes in inventories of retail trade
2312	Changes in inventories of wholesale trade
2411	Exports, EU
2412	Exports, non-EU