28th International Input-Output Conference

Kuala Lumpur, Malaysia, August 28th – September 2nd 2022

Implementation of a new SUT balancing tool and first experiences

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Abstract

The SUT is an integrated part of the National Accounts compilation in Hungary. In Hungary the SUT has a central role in the final balancing of national accounts. The recently used SNA-NT system (adapted from Norway several years ago) has extra layers which are not part of ESA2010 and it is considered too detailed to fill in the starting tables.

In the framework of a EUROSTAT grant project – with the introduction of a new tool, the Danish balancing instrument – HCSO is intend to speed up the balancing of SUT and integrate the result into the final NA compilation by t+29. This would improve the quality of GDP/GNI data.

The aim of the action was implementing the new Danish system and speed up the balancing of SUT.

The first part of my paper gives an overview of the implementation process.

The second part of the paper focuses on the steps we have made in order to fine tuning the new system into the Hungarian circumstances.

The third part of my paper gives an overview of some problems we have faced during the implementation process and final conclusions.

Introduction

The integration of SUT into the National Account compilation process has a lot of methodological and practical advantages. Consistency and coherency for the different approaches are achieved through an integrated supply and use framework. The SUT confront supply and use estimates across products, as well as confront estimates of inputs (including also the primary inputs) and outputs within industries. In a balance table, supply for a product equals demand and the total inputs of an industry equal its total output. These identities provide an efficient framework for reconciling data on production and expenditure approach. As a result of the balancing procedure in the SUT framework, the figure of GDP is revised after 33 months of the reference period (due to the currently used methodology and revision policy) and through the GDP the SUT balancing affects the GNI figures, as well.

In Hungary the SUT has a central role in the final balancing of national accounts. The recently used SNA-NT system (adapted from Norway several years ago) has extra layers which are not part of ESA2010 and it is considered too detailed to fill in the starting tables. In the framework of this project – with the introduction of a new tool, the Danish balancing instrument – HCSO is intend to speed up the balancing of SUT and integrate the result into the final NA compilation by t+27.

Methodology

Hungary uses the Norwegian SNA-NT system in compilation of supply and use tables but the layers to fill up the SNA-NT system are not compatible with ESA2010, that means it contains valuation categories which aren't part of ESA2010 (for example: producers 'price). Therefore a new SUT compiling and balancing system was looked for. There was a decision on studying the simplified Excel-macro based Danish system for establishing and balancing the supply and use tables. This solution has the advantage that the SUT-tables are visible to the users as matrices, but in practice it may still be difficult to overview the entire system as the majority of cells are empty. To facilitate the process of manual corrections, a macro-sheet with Visual Basic programs provides the most important functions known from the Danish System. This includes procedures for extraction of product-balances and industry outputs and inputs to separate sheets, saving of corrected data into the SUT-matrices as well as a number of procedures for automatic balancing of whole matrices or selected areas within the matrices.

The cooperation has begun between the Hungarian and Danish experts. A demo-version of the SUT-framework was sent to the Hungarian team to familiar with the system.

The Hungarian staff created all tables, aggregations, code lists etc. which the Danish experts asked for making an initial version of the SUT for the year 2014. The experts were consulted on the progress of the adaptation of the system into the Hungarian circumstances.

General and specific objectives to be achieved

- create the new framework of the system (new product structure, the industry structure, the items of final use categories, the layers (purchasers' price, VAT, trade and transport margins, product subsidies, product taxes excl. VAT, basic price) and the code list and translation key)
- transform the already balanced SUT 2014 data into the new framework as initial data
- new ratios need to be calculated for trade and transport margins, VAT
- distribution rules to estimate the product taxes excl. VAT and subsidies layers
- making alteration on the excel macro to match the special Hungarian environment will be necessary
- supply and use tables for the year 2015 transformed into the new framework
- load basic data for SUT for the year 2016 in the new system
- balancing supply and use tables for 2016 in the Danish system

The structure of the system

Classification of branches and commodity groups

The dimensionality of SUT is rectangular with more products than industries. When we worked out the product list we try to keep the information derived from the branch statistics as well as possible but the list has to satisfy the requirements to be the system treatable and has to fit to the international nomenclatures. The main aspects of grouping the products were:

- the weight of a commodity group within the total supply;
- the level of availability of price, volume and price information (PRODCOM statistics, agricultural account data, statistics of service activities etc.);
- the homogeneity of destination purposes (the end-use categories);
- the homogeneity of taxes (VAT rates, excise duties and other product taxes);

- the homogeneity of price movements;

- the possibility of aggregation into 2-digit level of CPA.

In our system there are 821 products (in other word commodities). The products and their coding system are subdivided in groups supporting the balancing procedure. The codes have fixed length with 1 letter + 6 characters, where the letter is used for marking of balancing groups and the last 6 digit in generally are used for identification of type of commodity. The groups are the followings with the relevant code marking:

Table of product groups of Hungarian framework

Letter code for group	Content of the product groups	Number of rows
A	market output	481
B	product for own-account capital formation,	16
C, D	output for own final consumption, self supply in the agriculture, estimation on NOE, tourism expenditure abroad	77+6
E	product for active/inward processing	30
F	product for passive/outward processing	30
G	output of government from sales (market output and incidental sales from non-market output)	72
H	other non-market output of government (except incidental sales and output for own final GFCF)	64
I	output of NPISH from sales	23
J	other non-market output of NPISHs (except incidental sales)	22

In the basic statistics different nomenclatures are used to classify the products. It is important to make a link between these classifications to put together the supply and use from different statistics. Translation key (master file) links the commodity of SUT to the domestic product classification called ITO (fully harmonised with the CPA at four digits level and with the PRODCOM classification) and CN (for imports/exports). For services the NA categories are based on the CPA mainly at two or three digit levels, in some cases at four digit levels. The imports and exports services are classified by EBOPS so we made a key to link the NA services categories with the EBOPS codes as well.

In the SUT there is no breakdown by sector.

The tables are published at A64 and P64 level of the given classification system across both the columns and the rows as it requested by the Data Transmission Programme under ESA 2010.

Final use categories of the Hungarian framework

Code for final use category	Content of final use category
6100/6200	Exports (without re-export)/ Re-export
3110	Final consumption expenditure of households by COICOP
314x/3200	Final consumption expenditure of general government by type
313x	Final consumption expenditure of NPISH by type
51xx	Gross fixed capital formation
5200	Changes in inventories
5300	Valuables

In a normal Use table there is only one column for the household final consumption expenditure. For the sake of the expenditure side GDP estimation we extended the final consumption part of the table with the COICOP nomenclature. Final consumption expenditure of households is grouped by COICOP containing 119 headings. Final consumption expenditure of government is divided into three categories: individual consumption expenditure on commodities produced by government itself; individual consumption expenditure on commodities produced by market producers but paid by the government and supplied – without any transformation – to the households (social transfer in kind); collective consumption expenditure.

Final consumption expenditure of NPISHs is subdivided into two groups: social transfers in kind to households from own output and a small part of transfer in kind of goods and services purchased from the market.

The gross fixed capital formation is broken down by the main type of fixed assets.

The most important sources of the supply table at current prices

-   data of questionnaires of the structural business statistics survey,

-   PRODCOM survey (statistics of industrial products),

-   agricultural production data from the Economic Accounts for Agriculture (EAA) and agricultural commodity balances,

-   data of the annual survey of construction,

-   data of the following services: post and telecommunications, hotels and restaurants, computer and related services, research and development services, cultural activities, sewage and refuse disposal services, repair services,

-   output of the Government sector broken down by functional tasks in detail,

-   output of the sector of financial corporations,

-   output of the sector of NPISHs,

-   estimation of the output of the Households sector,

-   data on imports from database of foreign trade in goods (Extrastat and Intrastat – database by CN code of product and by importer classified to branches), imports of services from the statistical survey on international transportation, business and government services by EBOPS,

-   administrative data sources (tax returns, profit and loss accounts, VAT returns).

The most important sources of the use table at current prices

-   input data on the structure of intermediate consumption from statistical surveys,

-   the structure of expenditure of government institutions from budgetary reports,

-   data from branch statistics on the intermediate consumption structure of agricultural activity,

-   experts' estimation for the cost structure of financial corporations,

-   estimation for the cost structure of own-account construction of dwellings by households and of own-account housing services provided by owner-occupiers,

-   energy consumption data from the energy balance,

- household consumption in detailed groups of commodities (household final consumption expenditure, the agricultural production for own final use, social transfers in kind, the balance of tourism expenditure),

- collective consumption at a detailed level,

- investment statistics and detailed data on other items of gross fixed capital formation,

- inventory statistics broken down into own-produced and purchased goods,

- data on exports from database of foreign trade in goods (Extrastat and Intrastat - database by CN code of product and by exporter classified to branches), export of services from statistical survey on international transportation, business and government services by EBOPS,

- data on value added components from sector account (compensation of employees, other taxes on production, other subsidies on production, consumption of fixed capital and gross operating surplus for checking),

- internet sites of big enterprises, of supervisory bodies, authorities, professional associations and chambers.

Valuation concept in the system

The integrated system consist four valuation levels. In the National Accounts the output is valued at basic prices and the expenditure items are valued at purchasers' prices.

Applying the new system we can maintenance this valuation principle. There is link between the levels of valuation used in the system:

Basic price
+ Trade and transport margins
+ Taxes on products (except VAT)
- Subsidies on the product
+ Non-deductible VAT
= Purchasers' price

The most important sources of the valuation matrices

a) the turnover data on the trade activities, the turnover data broken down by the CPA classification by type of trade (CPA 45 Wholesale and retail trade of motor vehicles and motorcycles; CPA 46 Wholesale trade services expect 45; CPA 47 Retail trade services expect 45),

b) data of the survey on the transport tariffs of goods by type of them in the field of railway and other transport, in the case of transport of goods the use of data of the transport performances report in natural terms,

c) VAT and excise duty rates and items by groups of commodities, other taxes on products and customs data for the calculation of the matrices of taxes and subsidies on products.

The input data requested for establishing the SUT in current prices

List of input data to the current price calculations

Type of the input data	Content of the input data
Basic	Supply table data at basic prices
Margin	Trade and transport margin percentage matrix
Tax	Taxes on products (excl. VAT)
Subs	Subsidies
VAT	VAT percentage matrix
Purch	Use table data at purchasers' prices
Product, supplier/user, final use lists	Code lists of the framework (product list, suppliers/users list in the production account, final use categories, income components)

Establishing the SUT in current prices

STEP 1: The Supply Table at basic prices (Basic)

STEP 2: The Use Table at purchaser's prices (Purch)

STEP 3: Estimates on trade-margins/trade margin percentages by product groups should be calculated. Calculating the trade and transport margin in the use side with help of MarginPct sheet based use at purchasers' prices.

STEP 4: Calculating Matrix for product taxes (Tax)

Taxes on products should be broken down by products based on legislation. Method for distribution by uses must be chosen. The allocation of product taxes (excepted VAT) has two simplifications:

- there are only business tax on exports

- custom duties are included in imports

STEP 5: The allocation of subsidies (Subs) to the users has two simplifications:

- there are no subsidies on imports

- subsidies only belongs to market producers

STEP 6: Input data to calculating Matrix for Value Added Tax (VAT)

The distribution of VAT by products and uses should be "programmed" based on the country's VAT-legislation.

STEP 7: Calculating supply table at purchaser's prices

Balancing process

In the Supply and Use Tables supply in a balanced table must be equal to use (demand) for each commodity groups at the same valuation level. Where discrepancies appear between demands and supply each variable (both the supply and use side) can be potentially readjusted. First the integrator (balancer) analyses the differences. If large adjustments are necessary, the person responsible for preparing the input data is contacted, and possible errors and estimation problems discussed.

The balancing means mainly manual balancing with technical support. The "Danish" systems balancing is typically done simultaneously in all value levels. For each product ("row") the target for total use is supply at basic prices. For each use ("column") the target is estimated total use at purchaser's prices. When a variable is changed by the integrator all dependent variables are recalculated automatically by the software to show the all consequences of the balancing decision. It does not mean automatic balancing because as a result of the correction a new discrepancy appears in the system. The balancing procedure is repeated in an iterative manner in it each of iterations uses the result from the preceding one as a starting point. The row-wise balancing by product could result an unacceptable changes in column-wise (resulting unacceptable changes in GVA by activities). These occasional unacceptable changes in the columns are checked by the specialist of production accounts.

When adjustment have removed differences between supply and use of each product and reduced differences between actual totals for uses and the corresponding "targets" for these totals, the final balancing of the system can be performed by a number of automatic adjustments that ensures that margins on the uses side equal supply of such margins and that VAT sums up to total revenue from VAT. At the very last stage when only minor mathematical imbalances

remain the RAS algorithm are used to make the "fine-tuning" (the new system contains several RAS versions).

The balancing process means a process of searching, finding and correcting errors in initial data. During the balancing process a lot of plausibility, consistency and other cross-checking are made taking into account the characteristics of products and the level of inconsistency. Special feature of this balancing process is that some part of cross-checking is carried out at individual (reporting unit) level.

An overview of some problems we have faced during the implementation process

- First of all, we have very short time frame implementing the new balancing tool, there were no option testing the system in detail, making experimental calculations

- For optimal running of this excel based system the restrictions of layers are strict so we have needed to aggregate layers for example, trade and transport margins are in one layer instead of two layers

- Also the short time frame, we were able only to convert the data from old system to the new system but no time trying new opportunities for example, separate the wholesale trade margin from retail trade margins (there are in one layer now)

- We have lost the sectoral breakdown because the number of columns are less in the new system as in the old system. We can add columns but that means that running of the program will be slower and slower (more columns slower running). We had sectors in the old system and within the sectors were industries but it hasn't caused problem in the adaptation of the new system because we had to aggregate columns in Production table and IC table too but caused a bit difficulty estimating VAT rates. Within a certain column there are different units use inputs for taxed and exempt purposes. In that case we have to attribute the costs of the inputs to both categories of transactions. There was created a pro-rata rule for solve this question. For example, in order to identify the expenditure subject to non-deductible VAT accounted in the intermediate consumption of the questionable column, the pro-rata method is applied. It means that the inputs of this column that have right to VAT refund are taken aside by means of a pro-rata of taxable activities. This pro-rata of deductibility or non-deductibility should be updated year by year.

- What kind of alteration do we needed? For example, division of taxes on product except VAT because in Hungary we have some taxes on products which are connected to the exports but of course not all taxes on products. Local business tax (HIPA) is part of

taxes on products in national accounts in Hungary. HIPA is applied to every economic activity carried out on a permanent or temporary basis in the territory of the local government concerned. Enterprises pay this tax pro-rata application of adjusted revenue to municipality and enterprises cannot deduct export from basis of tax assessment so arises tax liability from export income too. More than 75% of this business tax are payed by large companies which have significant export. The original software does not distribute product tax on exports. The estimation of product taxes on exports are made separately outside the system

Final conclusion

As a result of the balancing procedure in the SUT framework, the figure of GDP is revised after 33 months of the reference period and through the GDP the SUT balancing effects the GNI figures, as well. In Hungary the SUT has a central role in the final balancing of national accounts. The old system (adapted from Norway several years ago) has extra layers which are not part of ESA2010 and it is considered too detailed to fill in the starting tables.

The final result of the grant project HCSO is intended to speed up the balancing of SUT and integrate the result into the final NA compilation by t+27. This would make it possible to produce the final GDP/GNI estimation earlier.

The supply and use tables for the year 2015 were transformed from the old (Norwegian) system into the new (Danish) system with help of the two experts. In next step the SUT for the year 2016 were compiled and balanced only in the new system and balanced supply and use tables were finished by t+27 months.

Implementation of the new system has finished, supply and use tables are compiled in the new system and started SUT for the year 2017 in the new framework. SUT for 2018 and 2019 was published at the same time in the end of 2021 so we are working now on SUT2020 which will be published at the end of this year and IOT too.

The recently used balancing system has been changed into a more efficient, proven, well-functioning, well-documented and faster system.