Review of European methodologies for Supply, Use and Input-Output Tables compilation in ESA2010

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Eurostat, Statistical Office of the European Union, has launched in summer 2014 a questionnaire related to the Supply, Use and Input-Output Tables compilation to European countries (Member States of the European Union, Candidate countries and partners). The analysis of the European answers will be disseminated on Eurostat website along with the answers from responding countries.

The general overview underlines the harmonisation and uses of worldwide recognised common tools (classification, methodologies) at the European level.

The responses from the European countries also help to support analysis used in the UN Handbook Supply, Use and Input-Output tables with extensions and applications.

**Keywords**: national accounts, supply and use tables, compilation, European Union

# Introduction

A questionnaire on the review of Supply, Use and Intput-Output Tables compilation was launched in summer 2014 to European countries by Eurostat. The questionnaire is meant to be shared by all European countries and will provide main characteristics how Supply, Use and Input-Output tables are compiled. It covers six parts:

1. organisation,
2. data,
3. process,
4. methodology,
5. dissemination and quality,
6. applications and satellite systems.

The responses from the European countries also help to support analysis used in the UN Handbook Supply, Use and Input-Output tables with extensions and applications that is planned for dissemination in 2015 and will be disseminated on Eurostat website.

The summary of the questionnaires and possible details will be disseminated on Eurostat website. Eurostat has the responsibility to inform users and share information with them about the methodology underlying the data disseminated.

Twenty-four European countries answered the questionnaire in summer/autumn 2014 (in alphabetic order): Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Hungary, Ireland, Italy, Lithuania, Malta, Montenegro, the Netherlands, Poland, Romania, Slovenia, Sweden, Switzerland, Slovakia and United Kingdom.

# Questionnaire results

## Organisation

For all areas except the balance of payments statistics and financial accounts, all of the National Statistical Institutes (NSI) (or National Statistical Offices) have the responsibility of compiling National Accounts data.

For the annual National Accounts there is one exception (Belgium) where the National Central Bank (NCB) compiles annual and quarterly National Accounts.

In Slovakia the NCB and the NSI shares the responsibility of the quarterly National Accounts compilation. In Austria and Switzerland the quarterly National Accounts are under the responsibility of the NSI and of another institute.

Balance of Payments statistics are usually under the responsibility of the NCBs, except in Austria, Denmark, Finland, Ireland, Malta, Sweden and United Kingdom, where they are under the NSI.

Financial accounts statistics are almost equally shared between NSIs and NCBs.

The Supply, Use and Input-Output tables' compilation are in general under the NSI's responsibility except in Belgium where the Federal Planning Bureau is in charge of it. In France the Input-Output tables' compilation is shared between the NSI and another institute.

In 21 countries (out of 24) the SUT/IOT compilation is integrated in the National Accounts department.

## Data sources supporting SUIOT

The data sources for compiling SUIOTs vary from: business surveys, household surveys, administrative data sources and company accounts.

### **Business survey data**

Business surveys are of annual or quarterly or monthly frequency and could be used simultaneously for the compilation of SUIOTs. All countries except one declare to use at least one annual business survey but more than half of the countries use up to five annual business surveys to compile SUIOTs.

The annual surveys cited by countries are: production statistics survey, structural business survey, material input and commodity survey and purchases of goods and services survey, investment survey, census data on some specific industries, financial intermediation activity survey, international trade statistics, survey on R&D activities, tourism activity survey etc.

Graph 1: Histogram of countries using business surveys

The quarterly business surveys mentioned are: trade survey, balance of payments survey, financial sector survey, specific sector survey (catering, for example, in the Former Yugoslav Republic of Macedonia), services producer prices survey, and more generally, short-term statistics survey (turnover indices, industrial production indices, producer prices indices etc…), profits and stock survey etc.

On a monthly basis eleven countries indicate to use at least one monthly business survey: foreign trade statistics, balance of payments survey, turnover survey, PRODCOM survey, consumer price indices, monthly business survey, tourism survey, producer prices survey …

Business surveys are one pillar for the computation of SUIOTs and National Accounts in general. The business survey is mainly based on samples. Some countries do have census data on an annual basis, for example like Lithuanian structural business statistics or Irish industrial production census or the Swiss complete inventory of 450,000 businesses.

Many business surveys consider threshold for exhaustiveness of the survey based on turnover or number of persons employed. The sampling size varies from one country to another: some thousands to 50,000.

### **Household survey data**

The main annual household survey used in the compilation of SUIOTs is the Household Budget Survey (HBS) quoted by 15 countries as the first source (out of 16 mentioning at least one annual survey). The second annual source mentioned by four of the five countries is related to holiday/tourism survey and Balance of Payments.

From the HBS the number of households participating in the survey varies from 865 to 28,000, with a median size of 5,040 and quartiles of 3,500 and 7,000 households.

Graph 2: Histogram of countries using household surveys

### **Administrative data**

All countries except Montenegro indicated the use of administrative data in the compilation of SUIOTs. The main administrative data cited are the Value Added Tax data, annual financial accounts, income tax data, balance of payments, financial statistics of local or central government, foreign trade statistics, social data etc.

Eight countries use company accounts as data source.

### **Statistical unit**

To the question on which statistical unit is the basis of the SUTs, 12 countries answered that the statistical unit is the local Kind of Activity Unit, the KAU or a unit of homogeneous production (for Switzerland and Romania, which can be identified as well to KAU). Ten countries answered the SUTs are based on the unit enterprise. Belgium and France answered "other".

Regarding the compilation of the IOTs, 13 countries answered it was based on the local KAU, the KAU or the unit of homogenous production.

One must note that countries have plural responses to the question: four countries specified two statistical units for the compilation of SUTs, one country specified three statistical units (Malta mentions KAU, enterprise and institutional unit), while the majority (18) of countries specifies only one statistical unit. Therefore the total does not add up to 24 countries.

## Process of compilation

### **Legal framework**

Supply, Use and Input-Output Tables in European Union are compiled under national and supranational requirements.

In terms of classifications, the NACE Rev. 2 (directly linked to ISIC Rev 4.) and the CPA (linked to CPC) classifications are the most common used in the compilation of SUIOTs. A few countries use customised classifications for industries (France) and for products (Belgium, Denmark, France and Malta).

### **Classifications**

Other classifications such as COICOP, Classification Of Individual COnsumption by Purpose, COFOG (Classification Of the Functions Of Government), COPNI (Classification Of the Purposes of Non-profit Institutions serving households) are used for the compilation of SUIOTs at different level of details.

### **Size of tables**

The size of the tables varies in terms of number of products and number of industries and is usually larger than the size of 64 products and 64 industries required from the EU Regulation transmission program. In many countries the number of products is much more detailed than the number of industries for the compilation of SUTs: half of countries have more (or less) than 250 products and more than 100 industries in the case of the SUTs.

The number of products is the highest for Denmark with 2350 products, followed by Hungary with 820 products, Finland with 776 products, the Netherlands with 630 products and Austria and Poland around 550 products.

The number of industries attains at maximum 230 industries for Slovenia followed by Hungary and Finland.

On the other hand Croatia, Ireland, Sweden and Switzerland report compiling SUIOTs with details of 54 (Switzerland) or 64 products and industries.

From the SUTs to the IOTs the number of products for the compilation is reduced significantly for countries where the number of products for the SUTs compilation is over 200 (except for Italy that keeps 250 detailed products both for the SUTs and IOTs).

Graph 3: Number of products and industries in the compilation of SUT

### **Frequency**

Supply and Use Tables tend to be annual compilation while Input-Output Tables are equally compiled on an annual basis or 5-yearly basis. As the EU requirement is for 5-yearly IOTs this data situation is not surprising.

The Netherlands and France compile SUTs at a quarterly frequency. Switzerland compiles SUTs on a 3-yearly basis.

### **Timeliness and revision**

The EU Regulation sets the deadline for transmitting data to Eurostat to 36 months after the end of the reference period. In practice, the deadline for publication of the SUTs varies from five to 36 months across countries that answered (20 countries gave a response).16 out of the 21 countries publish the data as the final version. The dissemination of the SUTs earlier than two years after the end of the reference period remains minor: the five countries mentioned above, in addition, Finland (24 months) and Romania (21 months).

Three countries (Czech Republic, France and the Netherlands) indicate that the compilation of the SUTs is fully integrated in the quarterly National Accounts and sector accounts compilation.

Among the seven comments received from countries when the dissemination is close to 36 months after the end of the reference period, SUTs are not revised any longer. The link between main macro-economic statistics (such as GDP) and the SUTs can be in both directions as to which one is benchmarked to the second one. Some countries mention they put the SUTs data in line with the aggregates but others revise the main aggregates to be in line with SUTs at a quarterly or annual basis. It is interesting to read that two different approaches exist.

### **Resources**

The resources question was to quantify in person-months resources needed to compile one typical year SUT (including any subcontracting).

The answers vary from 9 person-months to 120 person-months covering a high variety of situations in terms of the work undertaken by the x person-months. For countries where the compilation of SUIOT is fully integrated into the National Accounts department and compilation of GDP quarterly data the resources may have been consolidated in the answer or not. Some countries may include as well compilation of IOTs; some may have excluded the balancing process…

Half of the countries devote less than 24 persons-months, half more than 24 person-months.

One conclusion is however remarkable: the volume of human resources identified for one typical year of SUT compilation is not correlated to the size of the country.

##  Methodology of SUTs and IOTs

The EU requirements set in the ESA 2010 transmission program are the following:

On yearly basis, countries have to transmit

* Supply table at basic prices, including transformation into purchasers' prices;
* Use table at purchasers' prices

On five-yearly basis, tables:

* Input-output table at basic prices (product by product); including two compulsory sub-tables: Input-Output table for domestic output at basic prices and Input-Output table for imports at basic prices;
* Use table at basic prices;
* Use table for domestic output at basic prices;
* Use table for imports at basic prices;
* Table of trade and transport margins;
* Table of taxes less subsidies on products.

Supply and Use tables will have to be transmitted in previous years' prices for the reference year 2015 by end of 2018.

### Price valuation and deflation

The SUTs are compiled at current prices by all countries on an annual basis. Two countries mention to compile SUTs at a quarterly frequency. Although the transmission program does not include the provision for tables at previous years' prices, 15 countries compile already tables at previous years' prices and one country (France) compile additional tables at constant prices.

When countries compile SUTs in volume terms (13 answers) the level of details is equal to the one for SUT at current prices, except for one (where the number of industries and products are lower for PYP tables than for current prices dabbles).

The prices deflators used by countries vary: PPI, CPI, UVI, SPPI, IPI, EPI, construction and agricultural PIs, implicit price deflators.

16 countries out of the 24 replies use the double deflation method to derive GVA in volume terms.

Valuation matrices (taxes less subsidies and transport and trade margins) are compiled on a more regular frequency (most of the time annually) than the EU requirement of the 5-yearly frequency. Many countries do compile as well the different layers annually: Non-deductible Value Added Tax table, Taxes on products excluding invoiced VAT table, Subsidies on products table, Transport margins tables, Retail trade margins and Wholesale trade margins.

Table 1: Frequency of valuation matrices transmitted

|  |  |  |  |
| --- | --- | --- | --- |
|  | Number of countries | Annual | 5-yearly |
| Non-deductible Value Added Tax table | 22 | 11[[2]](#footnote-2) | 3 |
| Taxes on products excluding invoiced VAT table | 19 | 8 | 5 |
| Subsidies on products table | 20 | 7 | 2 |
| Transport margins tables | 18 | 7 | 2 |
| Retail trade margins | 17 | 8 | 4 |
| Wholesale trade margins | 17 | 8 | 4 |

### Balancing process

Data confrontation is needed in the compilation of the SUTs and corresponds to a balancing process that will achieve all key identities are consistent in the SUTs framework. Countries may use exclusively an automatic or a manual procedure while others will combine both approaches.

11 countries balance mostly manually (between 85% to 100% of the whole table) while five countries balance manually 50% or less of the table. When using automatic procedure, five countries balance almost everything this way (85% to 100%), while eight countries use the automatic way for less than half of the table.

For many countries where the manual balancing is used, large balancing issues are solved manually or even nearly all cells, the automatic procedure (like RAS or Stone, Champernowne and Meade (1942) approach for example) solves then the remaining balancing issues.

The manual balancing may take a considerable time; for example in one country, the manually balancing takes around 6 weeks, using eight FTE SUT staff and around 10 seconded staff, until very near the end of the process, when a RaS algorithm is performed to remove final, minor imbalances.

The balancing process does not take as much in terms of human resources than the compilation itself.

It is to be highlighted that at least six countries rely only one or two people responsible for the compilation of the SUTs table and for the balancing.

### Other methodological issues

The SUTs bring together the components enabling the compilation of the **GDP** measure via three approaches (production, income and expenditure). When balanced, the SUTs enable a single estimate of GDP which is one of the most important aims of SUTs. Not all countries do use SUT in the three approaches. The different number of countries using SUTs to measure GDP under income approach and production approach may be related to the timing of the GDP calculation according to those different approaches.

15 countries compile **regional**/provincial accounts that are consistent with the national SUTs using the same framework. Their regional accounts are compiled at NUTS3 level for the majority.

A specific question to goods sent abroad for processing shows that 17 countries declare a net approach to this measure, while seven declare a gross approach.

In addition to 12 countries producing IOTs on a 5-yearly basis, seven compile IOTs annually and one every 3 years. The majority of countries compile a product by product table: 17 countries, six countries produce industry by industry IOTs out of which three countries produce both kind of tables product by product and industry by industry tables (Belgium, Czech Republic and Hungary).

The IOTs are often the results of a transformation model run on the SUTs. Most countries use the product technology assumption to derive IOTs where each product has its specific technology, irrespective of the industry that produces that product.

## Dissemination and quality

European countries may not disseminate the full Supply, Use and Input-Output Tables because of confidentiality issues. Nine countries apply confidentiality rules that apply to 1% to 20% of the number of cells.

In terms of quality, 13 countries assess the quality which is part of the National Code of Practice put into force in the NSO.

Except for two countries, the SUTs are made publicly available via website or paper publication

The users' needs are taken into account by NSO (13 countries answered positively to the question). User's survey is not done on a regular basis (except in Slovakia and Sweden). Supply, Use and Input-Output Tables are made available to Eurostat but as well to many other users: for example instances of policy analysis, universities, research institutes, national banks, local and international organisations, ministries (in particular ministry of finances). Ad-hoc requests may be answered as well.

Documentation is usually made available publicly regarding Supply, Use and Input-Output Tables. An annex with the list of link to useful documentation would be available with the paper on Eurostat website.

## Applications and satellite systems

13 countries compile environmental accounts (from which 9 are done under the NSI responsibility) and 16 countries produce tourism accounts.

|  |  |  |  |
| --- | --- | --- | --- |
| Are the following applications/systems compiled in your organisation (if not in your organisation, please indicate who is the producer)? | NSI | outside | Total |
| Physical Input-output tables | 5 | 1 | 6 |
| Environmental accounts | 9 | 4 | 13 |
| Education accounts | 3 | 1 | 4 |
| Health accounts | 6 | 6 | 12 |
| Tourism accounts | 9 | 7 | 16 |
| Employment statistics | 6 | 3 | 9 |
| Productivity accounts | 3 |  | 3 |
| Social accounting matrices | 2 | 1 | 3 |

# Questionnaire results conclusions

The review of the national questionnaire related to the compilation of supply, Use and Input-Output tables underlines the way for harmonisation that the European Union pushes through the adoption of common methodological, classifications standards.

However there are still room for improvements in this direction to stress even more the comparability of data across countries:

1. The definition of the statistical unit on which SUTs and IOTs are based remains diverse among countries: ten countries base the compilation of SUTs on enterprises while five countries do it for the IOTs compilation.
2. The compilation of valuation matrices is not systematic on an annual basis for all countries. However those valuation matrices are a key element for compilation SUTs.
3. The treatment of goods sent abroad for processing is not consistent across countries: 17 countries declare a net approach to this measure, while seven declare a gross approach.
4. The compilation of IOTs is subject to assumptions made on the input structure of the producing industries. The two main models are product technology assumption (model A) used by 15 countries or the fixed product sales structure assumption (model D) used by six countries. The compilation of IOT may gain for using a hybrid assumption.

Two other issues emerge from the review:

* 1. The organisation centralised against decentralised: most NSIs have a centralised organisation covering annual, quarterly National Accounts as well as Supply, Use and Input-Output tables;
	2. The size of Input-Output Tables is smaller than the Supply and Use tables when the number of products in the SUTs is larger than 140.

This review points out some advantages of the SUIOT framework in the National Accounts domain: a greater integration of SUT within National Accounts domain ensures the revision process of GDP figures to be always coherent. This approach is highly recommended in Eurostat manual (2008) and in the UN Handbook edition 2015.

1. The views expressed in this paper belong to the author and should not be attributed to the European Commission, Eurostat or its services. [↑](#footnote-ref-1)
2. Czech Republic and France indicate that the tables are updated as often as the SUT is compiled. [↑](#footnote-ref-2)