

A consolidated European Union and euro area Supply-Use System and Input-Output Tables

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Abstract

The paper will present the methods and the latest progress of the project conducted by Eurostat and the Joint Research Centre's IPTS of the European Commission. Targets are the compilation of consolidated tables for the European Union and the euro area, in particular supply tables at basic prices with a transformation to purchasers' prices; use tables at basic prices (broken down into uses of domestic production and imports) and symmetric input-output tables. The consolidated tables must be referred at least to the years 1995, 2000 and 2005; however it is envisaged to produce annual time series from 1995 to 2005 of supply and use tables at basic prices. The primary data source is the official ESA95 statistics published by Eurostat. Further, the project will draw on additional data provided by the National Statistical Institutes (NSI), e.g. valuation matrices and use tables at basic prices. A first publication on the progress of the consolidated tables is planned for end of 2009. The project will develop the methodology and prepare the tools for a regular compilation of such tables by Eurostat.

Keywords: *European consolidated accounts, supply-use system, input-output tables.*

JEL Codes: D57; O52.

¹ The views expressed in this paper belong to the authors and should not be attributed to the European Commission or its services.

1. Background

“EU-wide Extended Input-Output Analysis Tools” (EE-IOA) is a research project conducted at the Joint Research Centre's Institute for Prospective Technological Studies (JRC-IPTS), which aims at developing tools for input-output analysis to support policies in the context of Sustainable Production and Consumption at the European level. The input-output database is structured as a multi-country set of supply and use tables (SUTs) and symmetric input-output tables (IOTs) complemented with environmental extensions and a final consumption module. In October 2007, the Eurostat Directorate of National and European Accounts (C) and the JRC-IPTS (Competitiveness and Sustainability Unit) agreed to collaborate in the construction of a complete set of annual supply and use system and symmetric input-output tables (1995-2005) for the 27 EU Member States as a first step towards consolidated tables for the EU27 and the euro area. The consolidated aggregates shall be published. The project will start working for year 2000 as a base year and for which the most complete dataset is available.

2. Objectives

The objective of this joint research project is to compile a consolidated EU27 and euro area supply table at basic prices with a transformation to purchasers' prices; a consolidated EU27 (and euro area) use table at purchasers' prices (broken down into domestic and import uses); a consolidated EU27 (and euro area) use table at basic prices (broken down into domestic and import uses); and a consolidated EU27 product by product and industry by industry input-output tables. The consolidated tables must be referred at least to the years 1995, 2000 and 2005 although it is envisaged to have annual time series from 1995 to 2005 of supply and use tables at basic prices and symmetric input-output tables at basic prices for the 27 Member States. The primary data source will be the Eurostat database. As a complement Eurostat will ask National Statistical Institutes (NSI) for their support. Most NSI will have further relevant data on top of the official ESA95 statistics in stock, e.g valuation matrices and use tables at basic prices. We hope that the Institutes will allow the project to exploit this material which becomes essential to implement more refined estimation and updating procedures. Whether derived estimated annual SUT/IOT systems for individual Member States (in the instance where no national official data is available) can be published will be agreed with the NSIs.

If time allows for it both product by product and industry by industry input-output tables are envisaged in order to provide a flexible input-output data base for the user. The final database should be designed so that new upcoming information provided by Member States or Eurostat in the future could be easily incorporated and the final results updated with limited efforts.

3. Data sources and data availability and methods

The estimation of the input-output database shall be based on Eurostat data and the voluntary contributions of the NSIs of the EU Member States, concentrating on the following aspects:

- Valuation matrices for trade margins, transport margins, taxes on products, subsidies on products and non-deductible Value Added Tax (VAT)
- Extra and intra EU trade
- Estimation of non-available use tables at basic prices

As of May 2009, the project input-output database holds, for instance, the following information for the year 2000:

- Supply tables at basic prices with a transformation to purchasers' prices and use tables at purchasers' prices for all the 27 Member States except for Latvia (1998) and Cyprus.
- Use tables at basic prices with separated domestic and import uses for Belgium, Germany, Estonia, Spain, Italy, Lithuania, Hungary, Malta, Netherlands, Finland, Austria, Slovenia, Slovakia and Ireland; and for total uses: Denmark and Luxembourg.
- Input-Output tables for 2000 at basic prices with separated domestic and import uses are available for all the 27 Member States except for Portugal (1999), United Kingdom (1995), Bulgaria, Cyprus, Latvia and Malta. Only the Czech Republic and Luxembourg did not provide separate input-output tables for domestic uses and imports.
- Valuation matrices (trade and transport margins and taxes less subsidies on products) were provided so far by Belgium, Germany, Estonia, Italy, Lithuania, Netherlands, Austria, Finland and Romania; Denmark, Luxembourg, Malta and Slovakia include in addition the split between VAT and other net taxes on products (excl. VAT).
- All the tables for members of the monetary union are valued in euro with the exception of the non-members (in 2000): Malta and Slovenia.

The efforts required on any country's data depend very much on the availability of official or at least auxiliary data from the NSI in charge. As regards to the availability of supply-use and input-output tables, the following list specifies five main alternative starting points that do not intend to be extensive.

- 1) Excellent data situation
- 2) Good data situation
- 3) Satisfactory data situation
- 4) Incomplete data situation
- 5) No data available

1) "Excellent data situation" (E); all necessary information is available from the Eurostat database and/or the NSIs. In this case the project will use the actual national SUIOT data without any additional estimation. This includes (a) (domestic and import) use tables at basic prices, (b) supply table at basic prices, (c) (domestic and import) symmetric input-output tables at basic prices. Further information on geographical detail in imports and exports, reflected in the community concept, as well as on supplementary data on the geographical breakdown of re-exports would be appreciated but are not initially used for identifying specific data situations.

2) "Good data situation" (G); the supply and use tables (the latter at purchasers' prices) and (domestic and imports) symmetric product by product IO tables (SIOTs) at basic prices are available from the Eurostat database and/or NSIs. However, at annual frequency, a SIOT with a different base year from the use table at purchasers' prices will require more data estimation. Then, the project envisages operating as follows:

1. Fill in the value added components with those depicted in the use table at purchasers' prices. They are not affected by the change in valuation.
2. Fill in the final demand components with those depicted in the domestic symmetric input-output table. They are not affected by the technology assumption used in the construction of the SIOT. However, this step cannot be done this way when the SIOT is of industry by industry type (see step 4).
3. Compile the trade and transport margins matrix by row-wise distributing the corresponding column vector of the supply table. The structures are taken either from the use table at purchasers' prices or from available distribution margin matrices of other years.
4. Use the reverse model A (Eurostat Manual, pp. 352f) to obtain the total intermediate use table at basic prices from the product by product SIOT based on the product technology assumption. In the case of industry by industry tables, the reversed final demand uses must be taken into account, too.
5. Deduct the trade and transport margins matrix (step 3) and the total intermediate use table at basic prices (step 4) from the use table at purchasers' prices to obtain a matrix of taxes less subsidies on products (including non deductible VAT). Alternatively, when the structures of other years were available, they may be applied instead.
6. Compile the total use table at basic prices by putting together the value added components (step 1); the final demand values (step 2); and the intermediate uses at basic prices, this by deducting the trade and transport margins (step 3) and the matrix of taxes less subsidies on products (step 5) from the use table at purchasers' prices.
7. Distribute row-wise and proportionally to the total use table at basic prices (step 6) the import totals by product depicted in the supply table at basic prices. Another option is to use the reverse model A (Eurostat Manual, pp. 352f) to obtain the use table of imports at basic prices from the product by product SIOT based on the domestic product technology assumption. Although it has the advantage that it does not yield negatives, we did not con-

sider assuming foreign countries to have the same domestic technology of production of goods and services.

8. Compilation of the domestic use table at basic prices by deducting the import use table at basic prices (step 7) from the total use table at basic prices (step 6).

9. Bi-proportional adjustments will be made whenever necessary.

National contributions should be corrected for the community concept as regards the treatment of imports and exports of goods and services.

3) "Satisfactory data situation" (S); (available data conform transmission requirements, with the exception of ESA tables 18, 19) the supply and use tables (the latter at purchasers' prices) and the (total) symmetric IO table (SIOT) at basic prices are available from the Eurostat database and/or NSIs. The procedure is similar to the "G" situation but previously decomposing the total SIOT into domestic and imported SIOTs using as much as possible COMEXT/ITS data or by making proportional row-wise distributions. Bi-proportional adjustments will be made whenever necessary.

4) "Incomplete data situation" (I); only the supply and use tables (the latter at purchasers' prices) are available from the Eurostat database and/or NSIs. In this case, the compilation of the use table at basic prices must rely fully on the valuation matrices. Firstly, the trade and transport margins matrix is calculated from the supply table by row-wise distributing the corresponding column vector proportionally to the elements of the use table at purchasers' prices (same as for the "G" situation, step 3). Secondly, similar taxes less subsidies structures of other years or other Member States together with new information provided by NSIs would complete the scheme. For distinguishing between domestic and import uses it is envisaged to account for the COMEXT and ITS database as much as possible or by making proportional row-wise distributions. Bi-proportional adjustments will be made whenever necessary. (Depending on the amount of effort it takes, it might be an investment to investigate tables 9 from the transmission programme (detailed taxes), and to obtain supplementary information on national VAT legislation with regards to activities that are VAT exempted.) The taxes less and subsidies layers need to be set up in a detailed manner.

5) "No SUIOT data available" (N); there is nothing available. In this case, the project would appreciate the provision of useful information for the project by the NSI in charge. In as much as these estimates are relevant for aggregation; and the affected country might not significantly impact European totals; a neighbouring/similar country concept might be followed.

The project will also have to opt for an updating procedure to expand the time series of annual supply and use tables and input-output tables. To this purpose, the project will follow the so called Euro method (Eurostat, 2008), which uses official macroeconomic forecasts as exogenous input for the iterative processes. The projection method avoids the shortcomings of other

projection methods like the RAS procedure, the model of double proportional patterns, the Lagrange method, the least squares method and the minimization approach (see Eurostat, 2008 for details on the methods). The Euro method corresponds to the basic idea of the RAS approach but avoids its standard shortcomings. Initially, the Euro updating procedure, as well as virtually all the other common updating methods, was only applicable to IOTs (Beutel, 2002) but however, it has been refined under this project in order to be applied for supply and use tables.

Concerning the availability of 2005 data, it may happen not all sets of tables will be in stock but only sectoral data at the level of A31 classification will be available for the year 2005. Hence, not only data on final demand and gross value added by sectors will have to be broken down into the A59 classification by using reasonable assumptions but data from 2004 will have to be projected using these estimations.

For the cases where NSIs are not in the position to provide any of the necessary information on valuation matrices, the project will use the few country specific available data regarding wholesale and retail trade margins, transport margins, taxes on products, subsidies on products and non-deductible VAT. There are only a few countries that provide valuation matrices.

The use of an average exchange rate to convert national currency units in Euro might not be representative in the cases where the time variance of exchange rates is significant. This aspect will deserve further attention, e.g. by using purchasing power parities.

Eventually, the construction of product IO tables using the product technology assumption and the construction of industry IO tables using the fixed industry sales structure assumption may yield negatives. Conversely, the industry technology assumption and the fixed product sales structure model always provide positive outcomes. There is plenty of literature on the different methods used for removing the negatives (many of them highly dependent on manual redefinitions and specific features of each country); hence, if time allows it, the project intends to address the issue of negatives and produce both product by product and industry by industry IOTs without giving a preference to any model specification.

4. Consolidated EU27 and euro area supply-use and input-output tables

Once the project has completed the full set of annual supply and use tables at basic prices and the symmetric input-output tables for the period 1995-2005 and all the 27 Member States, the consolidation of the EU27 and euro area supply and use systems and IO tables can go ahead.

JRC-IPTS consolidated recently a EU27 symmetric IO table (Rueda-Cantuche et al. 2009) on the basis of the 27 individual national IO tables (officially available and estimated). Roughly

speaking, the IO table was constructed by means of an aggregation of the domestic and the intra-EU imports from the national IO tables. Indeed, JRC-IPTS used relatively simple default methodological assumptions to estimate use tables at basic prices and to construct the consolidated EU27 IOT for the year 2000. For further details, see Rueda-Cantuche et al (2009). Nevertheless, as remarked by van der Helm and Hoekstra (2008), there are additional key methodological aspects specific to the consolidation of the EU27 and the euro area that the project should address:

- the addition of European institutions and bodies;
- the correction of asymmetries in country data on goods and services traded within the EU27 Member States (intra-EU27 and intra EA imports and exports must be equal);
- the elimination of the cross-border transactions between European countries from the rest of the world accounts (including re-exports).

In this sense, the consolidated EU27 and euro area supply-use system and input-output tables shall be consistent with the European sector accounts which Eurostat and ECB are compiling (Eurostat and ECB, 2008).

The project will examine and consider the existing literature on the methods and results of consolidation procedures (particularly relevant is van der Helm and Hoekstra (2008), for the ECB); on the construction of an interregional EU supply-use system and IOTs (Tukker et al., 2008, for the EU funded EXIOPOL Project) and on the different ways of removing the likely upcoming negatives in the construction of IOTs (for instance, Almon (2000)). Since the project does not want to take any controversial option about the type of IOT, consolidated product by product and consolidated industry by industry IO tables are foreseen to be estimated. By using the product technology assumption and the fixed industry sales structure assumption negatives may arise and that will require further research. As regards the industry technology assumption and the fixed product sales structure assumption, the construction of the IO tables is nothing else than a linear transformation where all the resulting elements are positive.

International trade statistics should play a relevant role in the consolidation of the EU27 and the euro area tables. Notice, for instance, that the number of EU Member States varies throughout the whole period and additional information on trade statistics are absolutely needed to achieve the consolidated IO tables. The COMEXT database will be useful for this project.

Eventually, JRC-IPTS' experience in tackling with these related methodological issues will actually serve as a starting point to compile the consolidated EU27 and euro area supply-use and IO tables for 1995, 2000 and 2005.

5. Technical group and survey: latest progress

The project envisages establishing a technical group of NSI specialists and the ECB to advise and assist to the project. The annual group meeting held in Eurostat premises on June 30, 2008 with representatives of the following countries: Belgium, Germany, Spain, France, Hungary, Netherlands, Austria, Slovenia, United Kingdom and the European Central Bank. Furthermore, there is currently work ongoing on methodological issues with the CBS/ECB in order to estimate the missing use tables at basic prices and the further consolidation of the EU aggregates.

At the end of 2008, Eurostat launched a small survey to all 27 Member States NSIs specialists in order to know to what extent they could deliver to Eurostat their use tables at basic prices (with domestic and import uses separately) and/or valuation matrices. The number of replies covered almost the full set of countries with some exceptions.

The agenda and the schedule of the project, the steps to be done, the data requirements and the transparency and openness of the process were presented at the National Accounts Working Group (NAWG) Meeting in May 2008. Particularly, the presentation informed about the work done by then. A first publication on the progress of the consolidated tables is planned for the end of 2009.

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