# CHAPTER 13. APPLICATIONS OF EXTENDED SUPPLY AND USE TABLES: CONSTRUCTING GLOBAL SUPPLY AND USE AND INPUT-OUTPUT TABLES

*Annotated table of contents – prepared by OECD*

## 13.1 Introduction

1.      Global value chains (GVCs) have become a dominant feature of today's global economy, challenging conventional wisdom regarding trade and trade policy, as well as the analyses of production *within* economies, which is increasingly dependent upon relationships with producers and consumers abroad. In today's economy, intermediate products produced in country A are increasingly sent to country B before being further processed and sent on to other downstream countries, including potentially country A itself, before finally arriving at country Z. This means that national (extended) SUTs, are, on their own, no longer able to provide fully comprehensive insights on all global inter-dependencies between final consumers and producers, or indeed the nature of global production.

2.      In order to better understand these relationships a global input-output table is required[1]; such as that developed by the OECD for the OECD-WTO Trade in Value-Added database. But constructing global input-output tables is far from a simple exercise, requiring the harmonisation of many national datasets with common classification systems and common conceptual accounting standards, as well as, and perhaps most importantly, the reconciliation of bilateral international trade statistics. This chapter provides an overview of how global input-output tables can be constructed as well as the conceptual and practical data challenges that need to be overcome in their construction. It also describes the approach being developed by the OECD and international partners to generate such tables collaboratively, ensuring that regional initiatives like FIGARO (EU), NAFTA-TiVA, APEC-TiVA and others are fully consistent with the global table while leveraging the efforts of all partners involved.

## 13.2 Conceptual framework for global supply and use and input-output tables

3.      Conceptually an theoretically, creating a global SUT and a global input-output table (whether on an industry by industry or product by product basis) is not overly onerous once all the required data are available, including, primarily, national supply and use tables (with a split between imports and domestically produced goods and services) consistent with corresponding symmetric bilateral trade flows. This section describes the conceptual framework for constructing global SUT and IO tables and clearly identifies the ideal data that are needed.

## 13.3 Empirical challenges

4.      In reality, the construction of a global SUT and IO is mired in empirical challenges, including the need to make up for the sometimes limited availability of, and level of detail in, national SUTs and IOs; estimating missing import flow matrices; overcoming national data inconsistencies between national

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[1] See http://oe.cd/icio for the OECD's global IO tables covering the years 1995, 2000, 2005, 2008-2011. Other examples include WIOD, EORA, GTAP and Exiopol.

accounts and trade statistics, particularly those caused by goods for processing and merchanting in the 2008 SNA; reconciling international trade asymmetries (goods and services); and harmonizing different classifications for products (HS, EBOPS, CPA) and for industries (ISIC vs national systems) differences, This section describes these challenges in detail as well as the different ways in which these can be dealt with.

## 13.4 A coordinated, step-wise approach to developing global supply-use and global input-output tables

5.　　While TiVA has quickly become accepted as the international standard for developing global input output tables, efforts to improve quality and to expand the database to more countries and regions are ongoing. A central feature of the mechanism to achieve this is through the development of regional initiatives, such as the FIGARO project being developed within the EU, APEC-TiVA for APEC economies and NAFTA TiVA for North America. Since these initiatives are designed with a view to being integrated within the OECD-WTO TiVA database, a coordinated approach that builds around a common framework characterised by replicability and transparency is necessary.

6.　　This section describes the main steps involved in this coordinated approach, presenting a method that ensures full additivity and consistency between the regional tables and the global table, consisting of seven steps.

### 13.4.1 Step 1. Coherent, balanced bilateral trade statistics (merchandise trade and trade in services)

7.　　The OECD, WTO and other international organisations, together with countries, have given high priority to the development of coherent bilateral trade statistics, which are not only essential for high quality global supply-use tables but also important in and of themselves to provide insights in international trade and to motivate improvements in the underlying national data. This section will summarize the main features of the development of these datasets in HS (goods) and EBOPS (services) and their conversion to CPA[2], with special attention to some of the more complicated issues – mainly related to manufacturing services, travel, and cif-fob margins/ transport - that need to be tackled to make these datasets consistent with national accounts.

### 13.4.2 Step 2. Aligning balanced trade with national accounts and SUTs: exports

8.　　The jointly developed, coherent view of international merchandise trade and trade in services statistics is subsequently aligned with published national estimates of exports and imports of goods and services, and with the export by product (CPA) figures given in national supply-use tables, using a conversion matrix that ensures that the CPA classification in the balanced trade export data reflects those reported in SUTs. As this section explains, this process will identify both an unallocated component (positive or negative) for any given product, and requires special treatment for conceptual differences related to manufacturing services and to merchanting, a separate treatment of residents expenditure abroad and non-resident expenditures in the compiling economy (i.e. travel services),for re-exports, and for unobserved transactions.

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[2] As described in more detail in Fortanier, F, Liberatore, A., Maurer, A. and Thomson, L. (2016) 'Towards a global matrix of trade in services statistics', paper presented at the WPTGS meeting, 21-23 March 2016, STD/CSSP/WPTGS(2016)16; in Fortanier, F. and Sarrazin, K. (2016) 'Balanced International Merchandise Trade Data, version 1' paper presented at the WPTGS meeting, 21-23 March 2016, STD/CSSP/WPTGS(2016)18; and in Miao, G. and Fortanier, F. (2016) 'Estimating transport and insurance costs of international trade', OECD Statistics Working Paper, forthcoming.

### 13.4.3 Step 3: Aligning balanced trade with national accounts and SUTs: imports

9.　　The import figures in national supply-use tables are then aligned with the balanced international trade import figures, again using a conversion matrix (constrained to the national accounts and with no changes in imports consumed by industries) that arise from the balanced and NA/SUT coherent view of trade developed in Sections 13.4.1 and 13.4.2. This approach is chosen to preserve industry-export relationships. Adjustments are made for similar conceptual challenges as identified for exports.

### 13.4.4 Step 4: Constructing a global supply table (basic prices) and use table (purchasers prices)

10.　　The balanced and NA/SUT aligned view of international trade, as well as the national SUTs with import flow matrices aligned with balanced trade developed in the previous steps, can subsequently be integrated to populate a global Supply and a global Use table.

### 13.4.5 Step 5: Converting the global use table to basic prices

11.　　The above steps result in a global SUT at purchasers prices for most excluding intermediate imports (residents expenditures abroad are also recorded at purchasers prices). Creating IO tables first requires conversions to basic prices, which can be achieved using the standard conversion techniques for national IO tables that will only be referred to briefly in this section.

### 13.4.6 Step 6: Converting the global SUT to the global IO table

12.　　Once the global SUT is available in basic prices, it can be converted to a global IO on an industry-by-industry basis using the fixed product sales structure assumption (whereby each product has its own specific sales structure irrespective of the industry where it is produces) or a product-by-product basis.

### 13.4.7 Final balancing

13.　　The final global SUT and IO tables constructed by this method will contain a column of discrepancies, as a result of the decision to fully constrain the system to the officially published GDP of each country, and the fact that the sum of global exports included in these GDP numbers is larger than the sum of global imports (i.e., there are 'exports to the moon'). Depending on (regional) needs and preferences, this discrepancy column can either remain as such, and even be used as in indicator to identify areas where further work to reconcile national and bilateral statistics is necessary, or can be eliminated by a final, simple balancing procedure (e.g. RAS).

## 13.5 Extended Global Supply and Use Tables

14.　　In the same vain as national tables can be extended (see chapter 3) to include additional (sub-industry) breakdowns and dimensions such as employment and emissions, global supply and use tables can accommodate this information – and in fact the OECD-WTO TiVA database in its latest release has already included heterogeneity breakdowns for China (processing exporters, 'regular' exporters and domestic enterprises) and for Mexico (global manufacturers and other enterprises). This section highlights the compilation challenges involved – above and beyond those that are encountered when extending national SUTs – and highlights the additional data needs to account for e.g. heterogeneous firms (notably bilateral trade statistics by industry/product, firm type and partner).

## ANNEX: Flow diagram and empirical example on the construction of the global SUT and IO table