

# COMPILATION OF SUT IN ESCWA Member States

August 2018

Balancing and  
Valuation Matrix

# Balancing: Introduction (1/2)

- When the compiled data is posted in the supply and use tables, normally the two tables would show different values for supply and uses for each product, as they are based on a large number of data sources of varying quality and coverage
- Many cells in the supply and uses sides are estimated to fill gaps, since data sources are incomplete
  - Some countries do not capture data on production and intermediate consumption by products in the establishment/enterprise surveys
  - Administrative data, such as financial accounts of companies do not provide information on secondary products and intermediate consumption in sufficient details
- The two tables would automatically balance for each product only when the tables are based on accurate and ideal data sources. However, this is not the case, even in advanced statistical systems.
- Therefore, the task for SUTs compilers is to bring the two sides into balance, by establishing the identity, supplies = uses for each product
- There are two ways of doing this: (a) manual balancing and (b) automatic balancing



# Balancing: Introduction (2/2)

- Manual balancing: SUTs compiler inspects the supply and uses of each product and adjusts one or more entries so that the two sides are equal
  - This involves systematic confrontation of all collected data, using justifiable assumptions, discussing with subject specialists, estimating missing values using commodity flow approach, etc. This is often an iterative and lengthy process, but is the preferred approach
- Automatic balancing: Mathematical procedures are available to automatically produce balanced SUTs, when the marginal totals for the total economy are same in the two tables.
  - However, when the discrepancies are large at product level, the resultant balanced SUTs may be very misleading.
- Therefore, manual balancing should be carried on until the remaining differences have been reduced to a minimum.
  - A good rule of thumb is that the row and column totals should sum to within  $\pm 5\%$  of the known correct marginal figures before resorting to automatic balancing.
- [Balancing](#)

# Manual balancing (1/6)

- Initially, both supply and use tables are compiled using all available source data, assumptions, coefficients, etc. according to SNA concepts
- Both tables now provide product-wise information on supplies and uses (along with all their components or layers, namely, the domestic supply by industries, imports, valuation vectors, and intermediate and final uses) at purchasers' prices
- The preferred approach is to balance products in the two tables at purchasers' prices, rather than at basic prices, as it is easier to bring supply table to purchasers' prices than use table to basic prices
- Balancing should be carried out simultaneously within the entire SUT system, so as to ensure that for each product:  
Supplies at purchasers' prices = uses at purchasers' prices

# Manual balancing (2/6)

- Balancing to be carried out in the use table, assuming supply table gives target values or control figures. For this purpose on the use side,
  - Establish target values for products at purchasers' prices in the use table (row totals) as equivalent to those in the supply table
  - Establish target values for totals of each final use vector (column totals) from surveys, administrative data, commodity flow methods, etc.
  - The target values for output for each industry at basic prices (column totals) are same as those in the supply table

# Manual balancing (3/6)

- Use side at purchasers' prices: targets for column totals
  - Intermediate consumption by industry
  - Household and government consumption expenditure by purpose
  - Gross fixed capital formation by category
  - Changes in inventories
  - Exports FOB by product
- Use side at purchasers' prices: targets for row totals
  - The targets here are implicitly given by the row-totals of the supply table at purchasers' prices
- Establish predetermined values for certain components, such as exports and government consumption on the use side, which are considered firm

# Manual balancing (4/6)

- The target values can be expected to be of different quality depending on the available statistical sources.
- At any stage of the compilation, the balancing procedure may reveal the need for revisions of some target values.
- As a result one may decide to adjust some of the target values that were originally used in the balancing process
- Sometimes, even predetermined values also may need to be revised, if not at the total level, but at individual product level.
  - Products may be misclassified in the source data

# Manual balancing (5/6)

- Once the target values are determined, a “bridge column” on the right side of use table and “bridge row” at the bottom of use table may be included in the use table, which show the difference between total values in the use table (both column totals and row totals) and their corresponding target values.
- The target values can be made dynamic by keeping links with supply table, so that they change when values in supply table undergo change
- The values in the bridge column and row need to be systematically transferred to different cells of the use table, so that eventually the bridge column and row will show zero values, indicating that the two tables are balanced



# Manual balancing (6/6)

- Every difference shown in the 'bridge columns/rows' requires applying credibility checks, such as input-output coefficients or consumption ratios, discussions with subject specialists, etc. which further necessitates going back to the source data and analysing the problem in detail.
- If something appears to be implausible, one has to look for an acceptable explanation by analysing the underlying sources and discussing the data with experts in the concerned area.
- It is very time consuming to investigate all basic data. Large inconsistencies require more attention than smaller ones.
- A number of products may need to be redistributed between uses to bring the distance between totals and targets within an acceptable range for each category of use
- differences between totals and targets are removed except where such differences are considered acceptable for automatic balancing (less than 5%)

# Example: firm figures

- The compiler **decides** on firm figures:
  - Imports and exports
  - Taxes and subsidies
  - Government consumption expenditure



# Example: data source assessment

- The compiler analyses data sources to identify weaknesses :
  - For *households expenditures*, the coverage of the survey can be criticized: “**Decision to reduce it by 4%**”
  - For *domestic production*, the survey was made three years ago and the coverage can be criticized (because of the type of enterprises producing this type of products): “ **Domestic production becomes a balancing item**”



# Example: Analysis

- VAT are paid by HH: *Estimation of HH expenditures is possible*
  - **HH expenditure = (Tax amount / % VAT) + Tax amount**
- Government does not usually purchase this type of products:
  - Enterprises must have purchased these products as intermediate consumption



# Driving factors

- Identification of consistent figures to define pivots
- Identification of the weaknesses of the data sources: adjustments needed
- Experts opinion and good knowledge of the economy are important
- Type of products under analysis will help also



# Automatic balancing

- **Rapidly evolving field becoming a lot more sophisticated**
  - Constrained Optimization Techniques beyond RAS
  - Ability to ‘weight’ data sources by reliability:
    - 10 = perfect data not to be adjusted
  - Ability to put in numerous constraints beyond Supply=Use:
    - Taxes on products stay within given range
    - No negative numbers where there shouldn’t be any
    - Etc
  - Balancing happens in ‘real time’

# SUTs at basic prices: Valuation matrices



# Introduction (1/2)

- Each cell in quadrant I and quadrant II of the use table at purchasers' prices comprises
  - values at basic prices
  - trade margins
  - Freight transport costs and
  - taxes less subsidies on products
- For the use table at basic prices, each of these components needs to be segregated from the cell values at purchasers' prices. This process is achieved by compiling following valuation matrices and then subtracting them from the use table at purchasers' prices
  - trade margins
  - Freight transport costs and
  - taxes less subsidies on products

# Introduction (2/2)

- The values so removed from each cell will be summed up and allocated to the respective product rows, in each column of use table.
  - The trade and transport rows already existing in the use table will now include the trade and transport margin values (at purchasers' prices, these rows had zero values)
  - A separate row is introduced for taxes less subsidies on products at the end of the product rows.
  - This ensures the intermediate consumption of industries and final uses are still valued at purchasers' prices, though individual cells are now at basic prices
- Valuation matrices can be compiled either from the supply side or from the use side. Here, we will consider the preparation of these matrices from the use side.



# Valuation matrix: Trade margins

- It is extremely difficult to obtain information directly on trade margin component included in each cell in use table.
- Therefore, trade margin matrix has to be compiled using plausible assumptions, such as using relevant margin ratios of the products purchased by different users.
- It is preferable that SUTs have separate products for wholesale trade and retail trade, so that it is easier to allocate the trade margins between different users, as
  - Producers buy products mostly from wholesalers for their intermediate consumption, capital formation, inventories, and exports
  - Consumers buy mostly from retailers for the household consumption expenditure
  - Trade margin ratios differ for wholesalers and retailers
- In all these steps, the details of products available from the supply-side should be utilised as much as possible
- The resulting use-side trade margin matrices should also be checked on overall plausibility, with regard to the
  - relationship between allocated wholesale and retail trade margins
  - relations between use data at purchasers' prices and the allocated trade margins.
  - It is possible that based on such checks, the supply-side margin data may also have to be changed.

# Valuation matrix: Transport costs

- As in the case of trade margin matrix, compilation of transport margin matrix is also complex.
- Users may incur transport costs only on part of their purchases and again only for certain inputs, as sometimes producers bear the transport costs. Transport costs differ based on distance. Different modes of transport are involved in transportation.
- It is difficult to collect direct information on transport costs paid by producers on the products purchased by them. Therefore, plausible assumptions starting from the supply of transport margins, have to be used
- It is also necessary to distinguish between different kinds of transport margins, such as road, rail, water, air and support services, and also sometimes between foreign carriers and domestic carriers, while compiling transport margin matrix
- One source of information for the matrix could be the transport costs paid for by the seller, if such data can be collected from the suppliers
- Because of the weak database one may concentrate on the products with large transport margins involved and allocate the remaining products according to some plausible assumptions



# Valuation matrices: Taxes and subsidies on products

- The vectors of taxes and subsidies on products are shown in the supply table.
- These need to be allocated to different users on the use side for valuation matrices
- This step needs to be based on tax legislation of the country.
  - A particular product may be taxed at normal rates for some users, may be differently taxed for different types of users, and may not be taxed at all for some users. For example, electricity supplied to farmers may not be taxed, export oriented units may be charged at lower tax rates and consumers may be fully taxed.
  - Purchasers' prices values in the use table include non-deductible VAT but not the deductible VAT
  - VAT is normally recorded as being paid on final uses, mainly on household consumption. A part of VAT, however, is paid by enterprises exempted from VAT or not allowed to deduct VAT paid on their purchases
  - Some exports (for example, purchases of non-residents) may include non-deductible VAT, while purchases of residents abroad, recorded under household consumption, do not include domestic VAT.
- It is preferable to compile the matrices separately for different types of taxes and



# A simpler method to compile valuation matrices

- For trade and transport margins as for taxes less subsidies on products, it is assumed that the output structure of the use table at purchasers' prices can be used to estimate the valuation matrices.
- This assumption means that for a particular product, all industries and final users incur same ratio of trade and transport margins and same rates of taxes and receive same rate of subsidies.
  - Though this assumption is quite sweeping, adjustments can be made in some cells, if information as discussed in the previous slides is available. For example, certain taxes like VAT can be largely allocated to HFCE.
- With this assumption, separate matrices for trade and transport margins are compiled for the trade and transport services, as also for taxes less subsidies on products.
- It should be noted that the columns totals for the trade and transport margin matrices always sum up to zero, as there is no trade and freight transport activity at purchasers' prices.



# Use table at BP

- Transformation from purchasers' prices to basic prices involves deducting trade and transport margins as well as product taxes less subsidies.
  - The preferable sequence of these steps is: non-deductible VAT, other taxes and subsidies on products, trade margins and transport margins
  - The use table at basic prices is prepared as: use table at purchasers' prices - use table of taxes on products + use table of subsidies - use table of TTMs
- For the balanced SUTs at basic prices the following identities hold:
  - Output of domestic industries (supply table) = Output of industries (use table)
  - Supply of products (supply table) = Use of products (use table)
  - GDP = Gross Value added + Taxes less subsidies on products
  - GDP = Final Consumption + Gross capital formation + Exports – Imports
- [Example](#)

# Discussion Points – Balancing & Valuation

- What are the key challenges in balancing? Do countries in the region use automatic balancing? Is this supported by specific software?
- What are the key challenges with valuation matrix?

