Statistics Netherlands

Division Presentation and Integration
Department of National Accounts

P.O.Box 4000
2270 JM Voorburg
The Netherlands

Ten years supply and use tables in the Netherlands

Wim van Nunspeet and Taeke Takema

Remarks:
The views expressed in this paper are those of the authors and do not necessarily reflect the policies of Statistics Netherlands.
An earlier version of this paper was presented at the NSSG/Eurostat seminar on the implementation of ESA'95 in Athens, December 1997

Project number: *PNR-*
BPA number: *-PNR*
Datum: *14 May 1998*

TEN YEARS SUPPLY AND USE TABLES IN THE NETHERLANDS

Summary: The 1987 revision of the Dutch National Accounts did not only provide the users with a new set of data including a 10 billion guilders higher GNP, but also marked a big methodological change in its compilation. As from then, supply and use tables became the core of the estimation process of national accounts data in The Netherlands and Input/output tables were now derived from them afterwards.

This paper concentrates on the ten years experience in compiling supply and use tables in The Netherlands. The paper focuses on the features that have become the main elements of the Dutch implementation. Three subjects can be distinguished here: the simultaneous compilation in current prices and constant prices; the column-row-column working procedures; and the transformation of supply and use tables into an industry by industry I/O-table.

Secondly, attention is paid to the solutions to some practical problems(and solutions): the treatment of the trade and transport margins. These examples are good illustrations of the sometimes brave assumptions that must be made to compile a full and consistent set of data with the relatively limited information that can be obtained from the reporting units in the economy.

Finally, the authors will draw some conclusions on the advantages and disadvantages of a system of supply and use tables in an economy that is becoming more and more difficult to describe. Two parallel developments seem to be universal: the structure of the economy is becoming more complex (globalisation, take-overs, outsourcing, to name only some key words) on the one hand and strong political pressure to reduce the statistical burden to a minimum on the other.

Keywords: national accounts - supply and use tables - compilation

Contents

1. Introduction

In the Netherlands, the compilation of industry by industry Input-Output tables as part of the regular national accounts data go back to the 'fifties. From 1980 onwards, I/O tables in constant prices became standard procedure. In the early 'eighties, it was decided to set up a new integration system based on supply and use tables. The superiority of the supply and use tables as an integration framework was the main reason for this move. Contrary to I/O tables, supply and use make optimal use of available sources within Statistics Netherlands. Production statistics, foreign trade statistics, data on consumption and capital formation all contain information on products. Thus, the 1986/'87 revision of the Dutch national accounts not only introduced a great number of improved estimates but it also was the starting point of a new way of national accounts integration.

Ten years after, it can be concluded that the introduction of supply and use tables has improved the quality of the estimates. A closer link with source statistics on supply and use in current prices and - maybe even more important - with price statistics sums up the main reason for this improvement.

Over the last years, the National Accounts Department of Statistics Netherlands has witnessed an increasing number of visits and written enquiries from a great number of colleagues. Their questions have been one of the major inspirations for this paper.

The second paragraph of this paper focuses on the basic features of the system. The timing and contents of the Dutch supply and use tables is the first item to be discussed. A specific feature is the simultaneous compilation in current prices and constant prices. Over the years, working procedures have changed. The current procedure can de described as the column - row - column scheme. The first phase contains the input of data by activity. The columns must be filled in current prices as well as in constant prices. The second phase is the core of the system: the balancing of the rows (i.e. by product group). The last phase is a column-wise check on the plausibility of the outcomes. If necessary, corrections are made. Finally, in this paragraph the transformation of the supply and use tables into an industry by industry I/O-table and the automation of the system is discussed.

The third paragraph focuses on some practical problems: the balancing of taxes and subsidies on products and trade and transport margins; the treatment of VAT; and the use of price indices in the system.

At the end of this paper some concluding remarks are made.

2. Basic features

2.1 Timing and contents of the Dutch national accounts

At Statistics Netherlands every year three estimates of the National accounts data are compiled[1]. The planning of these estimates for is as follows:

- T + 6 months: first estimate ("preliminary")
- T + 17 months: second estimate ("improved preliminary")
- T + 27 months: third estimate ("final")

These estimates contain a complete set of NA data:

- supply and use tables in current prices and in prices of the year before;
- I/O-tables (industry-by-industry) in current prices and in prices of the year before - in producers' prices and basic value;
- sector accounts for all main sectors including financial accounts.

Social Accounting Matrices and NAMEA's are compiled for the "final" year. Balance sheets are currently only compiled on an experimental basis; the same holds for homogeneous or product-by-product I/O-tables.

The final estimate of the supply and use table consists of around 250 industries by 800 product groups. Of course, because of confidentiality not all data can be published for a broad public. After application of the Dutch confidentiality rules a supply and use table of some 150 activities and 600 product groups is available. The corresponding activity by activity I/O-table is available at around 150 activities.

The preliminary estimates are made with 100 industries and 200 product groups. This is very close to the publication level of the supply and use table and I/O- table.

2.2 Sources and units

At Statistics Netherlands, all source statistics for the supply and use tables are "institutional statistics". This means basically, Statistics Netherlands surveys enterprises as they present themselves to e.g. the tax authorities. Main exception to this rule are the bigger enterprises that are often structured in a complex or diverse way. In these cases enterprises are asked to create special statistical units which

[1] On the basis of the Quarterly Accounts three more annual estimates are available for only a limited number of macro-economic variables (T + 0 months, T + 2 months, and T + 4 months).

often correspond to their business units. This implies that an industry classification in S&U and I/O-tables in the Netherlands should be interpreted in the institutional way: they describe establishments that are as homogeneous as possible within the limits of what is reasonably possible from a surveying point of view. As a result, in Dutch S&U tables output of most industries consists of a main product (or products) and some other products that are not always directly related to the main product.

2.3 Constant prices

Policy makers and model builders are not only interested in the level of GDP and other macro economic aggregates at current prices. Also the changes over time of these flows are of main importance. Changes over time in the values of flows of goods and services can be factored into two components reflecting changes in the prices of the goods and services concerned and the changes in their volumes.

A major advantage of compiling price and volume measures within an accounting framework, such as provided by the supply and use tables, is that a check is provided on the numerical consistency and plausibility of the set of measures as a whole. Another advantage is that price and volume measures for the important balancing items can be derived. In particular, gross value added can measured at constant prices by subtracting intermediate consumption at constant prices from output at constant prices, the so called “double deflation” method. Double deflation may be used at the level of an individual enterprise, industry or sector, or for the total economy as a whole by subtracting imports at constant prices from total final expenditure at constant prices.

More information on the simultaneous compilation of supply and use tables in current and constant prices can be found in De Boer and Van Nunspeet (1998) and De Boer et al. (1998).

2.4 Working procedures

The working procedures of the compilation of supply and use tables at Statistics Netherlands can (chronologically) be summed up as a column - row - column scheme.

A. Columns: Input from specialists

The data received from source statistics is made complete and consistent with the level of detail of the reporting year. This work is done by NA-experts (referred to as “specialists”) that are each specialised in a group of industries. They are responsible for the necessary adjustments to meet NA-definitions and to estimate the “white spots” not covered by source statistics. Furthermore, specialists are responsible for a number of additional estimates, as the source statistics do never contain all the

necessary details. An example would be the splitting up of the headings “other products” and “other costs” that you will often find in annual production statistics.

Outputs and inputs are separately deflated by using prices from a central prices database in which price data are stored on foreign trade, producers’ prices and consumer prices. In the services part where sometimes prices of inputs or other indicators are used for output prices, these prices are compiled by NA specialists.

The input from specialists (on production and uses by industry, on final use components and on foreign trade) in the main automated integration system are the columns of the supply and use tables. After the introduction of the data in the system the data are then checked again by the specialists.

B. Rows: The integration process

At the start of the integration process, the automated integration system contains a full description at product and activity level of the year under compilation in current prices and in prices of the year before (800 product groups and 250 industries in the final estimate). The data set also includes the corresponding set of data of the year before in current prices.

The integration process is based on the balancing of the rows of the supply and use tables. During the process, data can only be approached row wise; the columns are “locked”. Product groups are aggregated into about 200 “statistical groups” of related product groups. These statistical groups are attributed to an integrator; only this person is allowed to change the data of his statistical groups and the underlying product groups.

The integrator now balances manually every product group by making supply and use (or better: sales and purchases, in order to avoid valuation problems with changes of stocks) equal - both in current prices and prices of the previous year. Large discrepancies between supply and demand of a product are analysed and subject to discussions between the integrator and the most concerned specialists.

The programme allows for automatic balancing of a product group or even a statistical group, but these facilities are hardly used. No statistical discrepancy between supply and demand is left after balancing. The integrator normally does not change data on domestic output, but finds solutions by altering data on imports or intermediate and final uses (including stocks). This integration method implies that GDP according to the production method and GDP according to the expenditure method are made equal.

One of the consequences of this method is that value added by industry or total imports/exports or final uses can and will be changed from the data that were used as input from specialists. Wherever this leads to “unacceptable” changes to the data that were used as inputs, a third step is necessary.

C. Columns: Checks and "repairs"

As value added and the input structure of industries can be changed in the second step, the results are checked by the specialists to see if the results are acceptable. If not, data are changed to accommodate the wishes of the specialists. In most cases, these changes are only of minor importance.

Although the description of the integration process may lead to the assumption that it is a very lengthy and labour intensive operation, this is not the case. The balancing of the final estimate (S&U- and I/O-tables) takes about two and a half months and involves six to seven people full-time. The other two estimates are finished within four to six weeks each. The preparation of the inputs by specialists takes about the same time per estimate. Inside the National Accounts Department, around twenty people are involved.

2.5 Compiling Input/Output-tables

Balanced S&U tables give information about value added per industry, the input-output structure per industry in terms of products and, of course the major macro-economic figures like GDP, consumption etc..

S&U tables, however, do not give information on the input-output structure of the economy in terms of industry by industry. One of our main users, the forecasting agency of the Dutch government (Netherlands Bureau for Economic Policy Analysis), uses these I/O-tables of the industry-by-industry type in their forecasting models.

These industry-by-industry I/O-tables are derived from the S&U-tables in the following way. To start with, for each product group an complete I/O-table is compiled. As only limited information is available on the relation between producing units/imports and the users (intermediate or final) in many cases a proportional distribution is used. Of course when information is available this is used a starting point. In general, there is no manual balancing process; the matrix is adjusted by applying a mathematical program based on a Lagrangian adjustment method.

This procedure results into 800 I/O-tables (namely 1 for each product group). Adding them up gives the national industry-by-industry I/O-table.

2.6 On the automation of the system

In this context it is not possible to give a full description of the automation of the integration system. Only some main elements are touched upon.

The central database is an Oracle database on a Windows NT server. The database is "virtually" split up into bundles of product groups called statistical groups (= a bundle of rows of the supply and use tables). Thus only small parts of the database

can be addressed in a standard PC network environment by the integrator to whom these statistical groups have been attributed (see par. 2.4). In this way possible conflicts between integrators when changing data are evaded and the efficiency of working procedures is greatly improved.

This solution of "virtually" splitting up the database is the result of a negative experience in the 'seventies and early 'eighties. In this period, Statistics Netherlands has tried to develop an integration system that would automatically perform most of the integration work. The quality of the inputs was evaluated by putting a different weight on each item of the supply and use tables. As these weights were then considered to be indication of possible correction margins, it was thought possible to balance the whole supply and use table in one automated procedure. This work was abandoned because the results were rather unpredictable.

This negative experience has led us to the conclusion that an integration system must be as simple in its operation as possible. The current procedures which rely on the manual integration of small parts (= a limited number of rows) of the supply and use tables at a time seems to be a very workable solution. This explains why automatic balancing procedures in the compilation of supply and use tables are seldomly used.

However, the programme leaves the integrator the possibility the choose the aggregation level at which he wants to operate. He can choose between product group or statistical group at the one hand and between industry or industry group[2] at the other. For example, adjustment made on statistical group x industry group level are divided over the underlying products and industries with Lagrangian adjustment procedures.

The most complex part of the integration system is the part where industry-by-industry I/O-tables are compiled. Here again, heavy use is made of Lagrangian type of automatic adjustment procedures. But experience over the last few years has learnt us that that the current way of compiling I/O-tables can be simplified by making I/O-tables not at the level of 800 product groups but at the level of 250 statistical groups. After ESA revision the system will be changed accordingly.

[2] Industry group is an aggregation of industries.

3. Some practical aspects of balancing supply and use tables

In this paragraph three practical themes will be discussed: the balancing of trade and transport margins; the treatment of VAT; and, finally, an outline is given as regard to the availability of price indices in the Dutch situation.

3.1 The balancing of margins in supply and use tables

In an elaborated system of supply and use tables the registration as well as the balancing of taxes and subsidies on products and trade and transport margins are of great importance. First, the registration in the system will be explained. After that the balancing procedures the margins are treated.

A. Registration in the system

Valuation complicates the framework to a great extent: supply is regularly valued at basic prices and use at purchasers' prices. The bridge between the valuation of both tables is included in the supply table. The registration of margins is illustrated in Scheme 3.1. For the sake of simplicity, only three columns are distinguished: taxes and subsidies on products, transport margins and trade margins.

Scheme 3.1 Supply table

		industries	imports	taxes/subsidies on products	transport margins	trade margins	total supply
p	food						
r	.						
o	.						
d	.						
u	cars						
c	.	A	B	C	D	E	F
t	construction						
s	.						
	government						
	transp marg	.			- Σ		zero
	trade margins					- Σ	zero
total output		G	H	I	J	K	L

Explanation of symbols: see next page

Explanation of symbols:

A = output of domestic producers by industry and product group at basic prices
B = imports of goods and services by product groups at CIF-value
C = taxes and subsidies on products by product group
D = transport margins
E = trade margins
F = total supply at purchasers prices (row sums of A - E)
G = total output per industry at basic prices
H= total imports at CIF-prices
I = total taxes minus subsidies on products
J = zerol
K= zeronil
L= total supply at purchasers prices (column total)

In practice, the system has about twenty valuation layers for taxes and subsidies, while margins are split up in transport margins, wholesale trade and retail trade margins. After the ESA'95 revision, source data allow us to split up wholesale margins further into margins on export and other wholesale margins.

B. Balancing the margins

Trade and transport margins are registered twice in the supply table. First, as output of, mainly, trade and transport industries. Secondly, as a layer in the valuation bridge between supply at basic prices and use at purchaser's prices.

In the columns of trade and transport margins the total is included with a minus sign which implies that both the row totals of the product groups trade and transport margins and the column totals are equal to zero. This registration provides a check on produced and used margins. When J and K and the row totals for trade and transport margins are zero, the margins are balanced.

Before the start of the balancing process, the total of produced and used margins are equal. During the balancing adjustments are made on the margins per product group. This means that the cells of the column margins in scheme 3.1 are changed. At the end of this part of the procedure, when all product groups are balanced, the total of the margin column (= the used margins) can be calculated. The next step is to make an adjustment on the supply side in order to balance supply and demand. In practice, this often means that the output of the wholesale trade industry is adjusted.

C. Relation with the I/O-table: margin matrices

In ten years of compiling supply and use as well as I/O-tables one can distinguish two periods. From 1986 to 1992, I/O-tables were only compiled when the work on the supply and use tables was finished. In some cases, errors that resulted from the balancing of supply and use tables were discovered during the compilation of the I/O- table. Feedback to the supply and use outcomes was at that stage of the process

in many cases too difficult and time consuming. An example of such errors is re-export of a product exceeding import.

Since 1993, the balancing of supply and use tables and compiling a I/O-table has become a simultaneous process. In practice, this means that immediately after supply and use of a product group have been balanced, two operations are performed:

1. Trade and transport margins - in fact all valuation layers - are divided over the users (intermediate consumption, export, final consumption, etc.). This means that one has to estimate four margin matrices and not just four columns as suggested in Scheme 3.1. Currently, the distribution in the base year determines the distribution in the reporting year. After the ESA'95 revision margins will be distributed proportionally over the users in the reporting year.
2. For all product groups a distribution by origin and by destination has to be made. We refer to paragraph 2.5.

3.2 Treatment of VAT

In supply and use tables only non-deductible VAT is recorded: VAT on purchases by households, VAT on fixed capital formation and by VAT-exempt enterprises.

Scheme 3.2 Treatment of VAT in Use table

(mln gld)

products	VAT-exempt industries	Other industries	Final consumption	Paid minus imputed VAT	Total
non-deductible VAT	8523	0	34874	-1789	41608

Vat-exempt sales	160000	> exempt rate = 0.4
Other sales	240000	

These enterprises do not charge VAT when they sell their products. This implies that they can not settle paid VAT on their purchases of intermediate and capital goods with VAT received on their sales. This is why VAT paid by VAT-exempt

enterprises is considered as a final levy. In the use table (Scheme 3.2) this appears on the row non-deductible VAT in the column of the VAT-exempt industries. Imputed VAT differs from VAT actually paid to the government. This is due to acquittals, bad debts, fines, regulations for small entrepreneurs and VAT evasion. The difference between imputed and paid VAT is registered in a dummy column and not distributed over industries. (In scheme 3.2 the difference is -1789 mln)

Imputed VAT is calculated by taking the relevant goods and service transactions and applying the statuary percentages to them. Not necessarily all the sales of a certain industry have to be exempt from VAT. An example: within communications services postal services are VAT-exempt and telecommunications are not. Currently, estimates for these activities are made either by assuming the total output to be VAT-exempt or by imputing a mixed VAT-percentage. After the ESA'95 revision the calculation method will change: first the exempt rate is calculated for each industry; then, this rate is used to calculate VAT on the purchases of the industry as the product of exempt rate times statuary percentage per good.

3.3 The use of price indices in the system

An important purpose of the compilation of national accounts is measuring changes in economic variables. Changes in the production and use of goods and services are caused by a combination of two factors: a change in price and a change in quantity and quality (in national accounts often denoted as: volume change).

Part of the work on national accounts is the decomposition of value changes into volume changes and price changes. The most important purpose is the estimate of real growth rates (volume indices). The second goal is the estimate of price changes (deflators).

An important characteristic of this work when imbedded in a national accounts framework is that volume indices and deflators of various variables and at different levels of aggregation are interrelated in a systematic way. This is to be achieved by using supply and use tables or input-output tables as an integrating and balancing framework.

Price and volume indices of aggregates are always compiled from price and volume indices of individual goods and services. Direct observation of price and volume changes of aggregates is - by definition - impossible. Nearly all items in the national accounts are aggregates or aggregates of aggregates. Examples of the latter are total household consumption expenditure, total imports and total exports, but also total output and total intermediate consumption of industries. So the question rises how price and volume changes of individual goods can be added to price and volume changes of aggregates. Various methods are available to solve this problem. Different index formulae are available with different weighting schemes, as explained in paragraph 2.3

As regard to the availability of sources a difference must be made between goods and services. Price indices of goods are taken from Price statistics. Producer's prices, export prices, import prices and consumer prices are available. If necessary, the unit-value prices from the Foreign trade statistics can be used. The latter depends on homogeneity of the goods. In general one can conclude that reasonably well indices can be chosen for output and input of the producing industries. In those cases price and volume indices of value added can be calculated as the difference between output and input.

In the case of the services the outlook is not so bright. Only for a limited number of service industries price indices are available. For some industries the consumer price index can be used as a approximation for the output deflator. However, in many cases no high quality index is available. In those cases the last resource would be to deflate output with a wage rate. In some cases volume index of output is derived from input. Such is currently the case for banking, insurance, health service and public administration. However, recently major projects have started to improve the quality of volume measurement in the services sector. For banking an attempt has been made to estimate a direct output volume indicator.

4. Concluding remarks

For many countries the introduction of SNA'93 and ESA'95 implies the introduction of supply and use tables as an essential part of their integration system. In the Netherlands supply and use tables were introduced in the mid 'eighties. This paper gave an overview of the main features of the current implementation of supply and use tables in the Netherlands and of some of more complex statistical problems we have encountered over the last ten years.

The main conclusions that can be drawn from experiences at Statistics Netherlands are the following. First, simultaneous balancing contributes to better estimates as well in current as in constant prices. Second, after a (too) ambitious start, we have found it necessary to adapt working procedures to a more human scale. Splitting up the supply and use table into small groups of related products to be handled by one person has proved to be an effective way of organising the integration process. The automation has been constructed accordingly; thus permitting the compilation of three estimates of supply and use tables and Input/Output-tables per year in both current and constant prices.

Finally, it can be concluded that supply and use tables are an transparent framework for compiling national accounts data on the production process. It represents very clearly the available source data in an integration framework. This is even more true when the issue is price information. The product groups in supply and use tables can be chosen in such a way as to make optimal use from available price data.

As for the future plans are developed to co-ordinate with other integration systems as labour accounts and social accounting matrices (SAM). Also first steps have

been taken to build a quality control system, which makes it easier to analyse the results in time series or to compare final estimates with preliminary estimates.

References

Al, P.G., B.M. Balk, S. de Boer and G.P. den Bakker (1985), "The use of chain indices for deflating the National Accounts", Statistics Netherlands Occasional paper (NA/05).

Bakker, Gert P. den (1991), "The choice of index number formulae and weights in the National Accounts. A sensitivity analysis based on macro-economic data for the interwar period", Statistics Netherlands Occasional paper (NA/44).

Boer, S. de and G.A.A.M. Broesterhuizen (1986), "The simultaneous compilation of current price and deflated input- output tables", Statistics Netherlands Occasional paper (NA/13)

Boer, Sake de, Jan van Dalen and Piet Verbiest (1998), "Chain indices in the national accounts: the Dutch experience", Statistics Netherlands Occasional paper (NA/87).

Boer, S. de and Wim van Nunspeet (1998), "Simultaneous compilation of current and constant prices in supply and use tables", paper presented at the Twelfth International Conference on Input-Output Techniques, New York, 18-22 May 1998

Bos, Frits and Cor N. Gorter (1993), "Compiling Dutch Gross National Product (GNP); full report on the final estimates after the revision in 1992", Statistics Netherlands Occasional paper (NA/57_Ext.).

Harthoorn, R. and J. van Dalen (1987), "On the adjustment of tables with Lagrange multipliers", Statistics Netherlands Occasional paper (NA/24).