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QNA Inventory: The Netherlands

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1. Overview of the system of quarterly accounts

1.1 Organisation and institutional arrangements

Statistics Netherlands (SN) and the Central Commission for Statistics (CCS)[1] were established under the Statistics Act of 2003.[2] The main objectives of SN are to promote official statistics that meet the demands of users for purposes of practice, policy, and science, and to promote accuracy and completeness of all statistics published. Against this background, the responsibility for collecting, processing, and disseminating (at the national and international level) all macroeconomic statistics (excluding balance of payments and monetary statistics) rests with Statistics Netherlands. This responsibility is clearly defined in the Statistics Act, sections 3 and 4, which state that:
- The task of SN is to carry out statistical research for the government for practice, policy, and -research purposes and to publish the statistics compiled on such research; and
- SN is the national authority for the production of (European) Community statistics for the Netherlands.

The Netherlands' membership in the European Union (EU) implies that European law applies to a large portion of the Dutch statistical programs. European Council Regulation 322/97 stipulates that national authorities shall be responsible for producing European Community statistics at the national level and that Community statistics shall be produced on the basis of uniform standards and, in specific duly justified cases, of harmonized standards. The production of national accounts statistics is not only subject to EU law but also to verification by the European Commission.[3] As part of the European Statistical System (ESS), SN compiles and disseminates a significant share of its data according to the legal requirements of this system.

Quarterly National Accounts (QNA) and Annual National Accounts (ANA) are products of the National Accounts Department which is a department of the Division for Economic and Business Statistics and National Accounts (EBN). Additional information about the organisation of Statistics Netherlands and more particularly on the National Accounts Department can be found in Chapter 1 of the 'Gross National Income Inventory 2010[4].
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1.2 Publication timetable, revisions policy and dissemination of QNA

[1] According to the *CBS Act, 2003 (Statistics Act)*, the CCS is an independent administrative body without corporate rights and has the following duties: (a) to foster the provision of statistical information for the government which meets the needs of practice, policy and science; (b) to foster the accuracy and completeness of the statistics to be published for the government; (c) to assess the multi-annual program and the work program of the CBS; (d) to ensure that the CBS acquires data in such a way as to minimize the ensuing administrative burden for companies and institutions; (e) to ensure that the statistical work carried out by the CBS for third parties does not lead to competition with private suppliers of similar services which would be undesirable from the perspective of the proper operation of market forces; and (f) to oversee the exercise by the Director-General of the power to make available sets of data for the purpose of statistical or scientific research.

[2] This Act replaced the *Netherlands Statistics Act, 1996* which, in turn, replaced the *Royal Act of 1899*.

[3] The European Statistical System (ESS) comprises the Statistical Office of the European Communities (EUROSTAT) and the statistical offices, ministries, agencies, and central banks that collect official statistics in the European Union Member States, as well as Iceland, Liechtenstein, and Norway. The ESS functions as a network in which EUROSTAT's role is to lead the way in the harmonization of statistics in close cooperation with the national statistical authorities. The ESS's work concentrates on EU policy areas, but with the extension of EU policies, harmonization has consequently been extended to nearly all statistical fields.

[4] Publication forthcoming

Data on GDP and its main components are disseminated 45 calendar days after the end of the reporting period (flash estimate). Revised figures are available 90 calendar days after the end of the reporting period (regular estimate). The breakdown to components includes consumption expenditure by households and by government, gross fixed capital formation, changes in inventories, exports and imports of goods and services, value added and its components by economic activity. In the flash estimates consumption expenditure by households, exports and imports, total value added and components of value added are disseminated at a higher level of aggregation or are not disaggregated at all.

1.3 QNA compilation framework

As with the compilation of ANA, supply and use tables (SUT) are the balancing framework for compiling QNA. These tables are simultaneously compiled both in current prices and in constant prices. The quarterly SUT distinguishes about 130 branches of industry and 220 categories of goods and services. After filling the SUT with initial estimates, discrepancies between supply and use of commodities appear. Subsequently these discrepancies are eliminated in a process of simultaneous balancing.

1.4 Balancing, benchmarking and other reconciliation procedures

In the balancing procedure for each commodity supply data on production and imports are confronted with data on intermediate and final use. The initial discrepancies are eliminated in the balancing process, so that in the end a consistent SUT is obtained with all the commodities (rows) in balance. This consistent SUT yields identical macro-aggregates for the three approaches to GDP, i.e. the production approach, the expenditure approach and the income approach.

There are benchmarking procedures of QNA and ANA as explained in chapter 3, that provide a complete reconciliation of QNA and ANA. Moreover the SUT-data are harmonized with the Labour Accounts and the Quarterly Sector Accounts.

1.5 Volume estimates

In compiling SUT in constant and current prices a combination of a Laspeyres volume index for extrapolation and a Paasche price index for deflation is applied. Important assumptions are fixed input/output ratio's in volume terms (the quantity indices for production are also used to compile intermediate consumption in constant prices) and the absence of price discrimination amongst the different producers and users of a commodity.

For the purpose of chain-linking and seasonal adjusted series SN applies the recommended annual overlap method. This technique is used for calculating quarter-on-quarter growth rates, which are considered the most important figures for business cycle analysis.

QNA are based on a large variety of data sources, usually compiled by different departments of SN. In general the quantity and quality of quarterly information is inferior to annual information. Source statistics, in practice usually based on sample surveys, yield many different types of information. They can refer to physical output quantities, but most common are data on sales and turnover. For some industries input data are used as indicators for output. Examples of external sources are VAT records, business accounts of large enterprises or quarterly government accounts. In some cases, notably healthcare services, volume estimates are derived applying modelling techniques. Source data are mostly available as level estimates in nominal values or as index numbers in prices, volume or values.

1.6 Seasonal and calendar adjustment

Seasonally adjusted series are available for a large number of variables including output, expenditure and income components. Adjustments are made with the Census X-13-ARIMA-SEATS method. In the pre-adjustments phase corrections are made for calendar effects (including the number of working days) and outliers. Seasonally adjusted series are revised and updated each quarter.

1.7 Additional information

The most exhaustive information on concepts, sources, classifications and methods is available from the Gross National Income Inventory, 2010. In addition, National Accounts of the Netherlands, Revision 2010 provides a detailed overview of conceptual and methodological improvements that were recently introduced and their effect on the national accounts estimates for 2010, while the annual publication National Accounts of the Netherlands contains summary metadata on concepts and scope (available in both Dutch and English). These publications and key data are all available from the CBS-websites:

National accounts 2010 benchmark revision

Nationale rekeningen 2015

National accounts of the Netherlands 2015

2. Publication timetable, revision policy and dissemination of QNA

2.1 Release policy

The timeliness of the quarterly national accounts (45 days after the end of the reference quarter for the flash estimates 90 days after the end of the quarter for the regular estimates) meets the international requirements (of T+60 days). The publication of the flash estimates coincides with the European-wide coordinated release dates of the QNA.

The revision cycle for both quarterly and annual national accounts is clearly indicated in the CBS publication calendar and follows a very regular pattern each year. The official release calendar is available from the CBS-website, about one year in advance.

The quarterly data are provisional when first released. The data become final when they are adjusted to the final annual accounts. This varies from 16,5 months after the first release for a fourth quarter to 28,5 months after the first release for a first quarter. The revision policy is explained in the annual national accounts publication and a brief explanation is provided in each press release.

A total of four versions of the annual national accounts are published for each reference year. The first annual estimate for year t is simply obtained by adding the regular estimates of the first 3 quarters and the flash estimate of the fourth quarter (published by mid-February, year t+1). The second annual estimate is obtained by addition of the four regular quarters (end of March, year t+1). The third annual estimate is also based on the quarterly estimates, but supplemented with some first annual data (July, year t+1) and with the adjusted quarters of year t-1 (the definitive year t-1) as a new basis. These estimates are referred to as the Provisional annual estimates. Fourthly, the Final annual estimates are released about one year and seven months after the reference year (July, t+2). These are based on the full set of Production Statistics.

The regular estimates of the QNA are consistent with the Quarterly Sector Accounts and the Short-term Public Finance Statistics (STPFS). The QNA and the Labour Accounts are consistent as well and released on the same day.

2.2 Contents published

Data on GDP and its main components are disseminated in millions of euros at current and constant prices (average prices of the previous year). In addition value changes, volume changes and price changes vis-à-vis the same quarter of t-1 are published. Breakdowns are available by expenditure category, economic activity and value added components.

The breakdown by major expenditure category includes consumption expenditure by households and government, gross fixed capital formation by government and corporations, changes in inventories, and exports and imports of goods and services. Furthermore, final consumption by households is broken down by type of goods and services. Final consumption by government is split into an individual and a collective part. Data on gross fixed capital formation is broken down by type of asset and economic activity, while data on imports and exports are broken down by groups of products (according to the CPA 2008). The breakdowns are disseminated both in current and in constant prices, including value, price and volume indices vis-à-vis the same quarter of t-1.

The breakdown by economic activity comprises of data on gross value added. The breakdowns are disseminated both in current and in constant prices, including value, volume and price indices. The following main activities are distinguished:

1) Agriculture, forestry and fishing
2) Mining and quarrying
3) Manufacturing
    3.1) Manufacture of food product, beverages and tobacco
    3.2) Manufacture of textile and leather products

3.3) Manufacture of paper products, publishing and printing
3.4) Manufacture of petroleum products

3.5) Manufacture of chemicals and pharmaceuticals products
3.6) Manufacture of rubber and plastic products and non-metallic mineral products
3.7) Manufacture of basic metals and fabricated metal products
3.8 Manufacture of electrical and optical equipment
3.9) Manufacture of machinery and equipment n.e.c.

3.10) Manufacture of transport equipment
3.11) Other manufacturing
4) Electricity, gas, steam and air conditioning supply
5) Water supply; sewerage, waste management and remediation activities
6) Construction
7) Trade, repair, hotels, restaurants, transport and storage
   7.1) Trade and repair
   7.2) Transport, storage and postal and courier activities
   7.3) Hotels and restaurants
8) Information and communication
9) Financial services
10) Real estate activities
11) Business activities
   11.1) Professional, scientific and technical services
   11.2) Administrative and support service activities
      11.2.1) Rental and leasing activities
      11.2.2) Employment activities
      11.2.3) Travel agencies
      11.2.4) Other business support activities
12) Public administration and defence, compulsory social security
13) Education
14) Human health and social work activities
15) Arts, entertainment and recreation and other activities

The breakdown of cost components of value added includes compensation of employees, consumption of fixed capital, taxes on production and imports, subsidies and net operating surplus. The breakdowns are disseminated both in current and in constant prices, including value and volume indices.

All quarterly tables of the ESA 2010 questionnaire are submitted at T+45 days and updated at T+90 days.

Tables according to the ESA 2010 questionnaire:
Table 0101 – Gross value added at basic prices and gross domestic product at market prices
Table 0102 – GDP identity from the expenditure side
Table 0103 – GDP identity from the income side
Table 0107 – Disposable income, saving, net lending/borrowing
Table 0109 – Real disposable income
Table 0110 – Population and employment
Table 0111 – Employment by industry
Table 0117 – Final consumption expenditure of households by durability
Table 0120 – Exports of goods (fob) and services by Member States of the EU/third countries
Table 0121 – Imports of goods (fob) and services by Member States of the EU/third countries

Seasonally adjusted data are made available at a slightly higher level of aggregation. For the seasonal adjustment procedure chain linked series are compiled using the “Annual Overlap” procedure with 2010 as the reference year. The series are the input for the seasonal adjustment procedure to get seasonally adjusted figures (see section 3.3.3 on seasonal adjustments).

2.3 Special transmissions

Special transmissions are submitted to the OECD (the ESA 2010 tables and historical series), Netherlands Bureau for Economic Policy Analyses (historical series, disaggregation of international trade in goods, and computation of seasonal adjustment) and the Central Bank (historical series and gross fixed capital formation by destination and type, computation of seasonal adjustment).

2.4 Policy for metadata

The most exhaustive information on concepts, sources, classification and methods is available from the *Gross National Income Inventory, 2010*. In addition, *National Accounts of the Netherlands, Revision 2010* provides a detailed account of conceptual and methodological improvements that were recently introduced and their effect on the national accounts estimates for 2010, while the annual publication *National Accounts of the Netherlands* contains summary metadata on concepts, scope and classifications (available in both Dutch and English).

3. Overall QNA compilation approach

3.1 Overall compilation approach

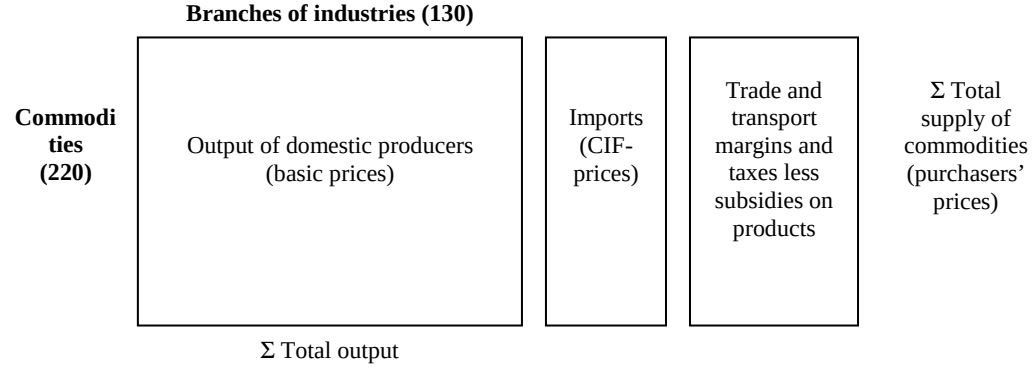
3.1.1 General architecture of the QNA system

Classifications
As with the compilation of ANA, supply and use tables (SUT) are the balancing framework in the compilation of the QNA. These tables are simultaneously compiled both in current prices and in constant prices (i.e. in average prices of the previous year). For the quarterly supply and use tables (as well as for the provisional annual accounts) about 220 categories of goods and services and 130 branches of industries are distinguished. Concerning the final annual national accounts, compilation of goods and services takes place at a more detailed level of about 600 products. The classification of commodities is generally based on the central product classification (CPA), while the columns (industries) are classified according to CBS' 2008 Standard Industry Classification (SBI'2008) which is linked to the NACE.rev.2.

Supply and use framework
Valuation differences between supply and use complicates the SU-framework somewhat as the output of industries is expressed in basic prices while the use of commodities is expressed in purchasers' prices (excluding VAT). On the product level the bridge between the different valuations of both tables is included in the supply table, by addition of trade and transport margins and taxes and subsidies on products. In practice, the SUT has about twenty valuation layers for taxes and subsidies on products, while margins are split up in transport margins, wholesale trade and retail trade margins. Wholesale margins are further divided into margins on exports and other wholesale margins. Scheme 1 below shows the elementary structure of the Dutch supply table.

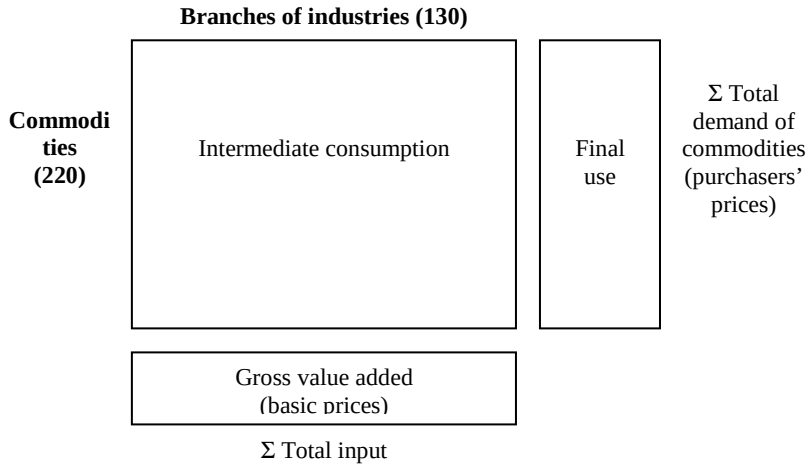
Registration of trade and transport margins
Trade and transport margins are registered twice in the supply table. First, as output of, mainly, trade and transport industries. Secondly, on the product level, as a layer in the valuation bridge between supply at basic prices and use at purchasers' prices. In the columns of trade and transport margins the total is included with a minus sign to correct for this double counting, which implies that both the row totals of the product groups trade and transport margins and the column totals are equal to zero.

Scheme 1: Supply table



The structure of the Dutch use table is given in scheme 2. The table is expressed in purchasers' prices excluding VAT. The final expenditure categories comprise of consumption of households and government, gross fixed capital formation, changes in inventories and exports of goods and services, divided into exports to EU and non-EU and re-exports to EU and non-EU.

Scheme 2: Use table



Treatment of VAT

In the Dutch system only non-deductible VAT is recorded: VAT on purchases by households, VAT on intermediate consumption and fixed capital formation and for VAT-exempted activities. VAT-exempted activities are not charged by VAT when sold. This implies that for these activities paid VAT on related purchases of intermediate and capital goods cannot be settled with VAT received on sales. For this reason VAT paid for VAT-exempted activities is considered a final levy. In the use table this appears on the row non-deductible VAT in case of VAT-exempted activities.

Theoretical VAT is calculated by applying the statuary percentages to the relevant goods and services transactions. Theoretical VAT differs from VAT actually paid to the government. This is due to bankruptcies, acquittals, bad debts, fines, regulations for small entrepreneurs and VAT evasion. The difference between theoretical and paid VAT is registered in a dummy column in the use table and not distributed over industries.

General compilation procedure

The first step is to fill the supply and use table with initial estimates for the branches of industry. Usually only output (or turnover) and price information is available on a monthly or quarterly basis. The volume change of output is used to estimate the volume change of intermediate consumption of the branches of industry (in other words: a production function with fixed coefficients of the corresponding quarter of year t-1 is assumed). Price indices are used to obtain value estimates of intermediate consumption by commodity.

The next step is to add data on household and government consumption expenditure, exports and imports of goods and services, fixed capital formation and estimates on the change in inventories and work in progress. The result is a completely filled but unbalanced SUT both in constant and current prices (thus with discrepancies between the supply and use of commodities). Total output of industries and total input of industries are automatically balanced as operating surplus is used as a residual item. In a final step the differences between supply and use of commodities are eliminated in a process of simultaneous balancing: data in current and constant prices are adjusted in the same, single process.

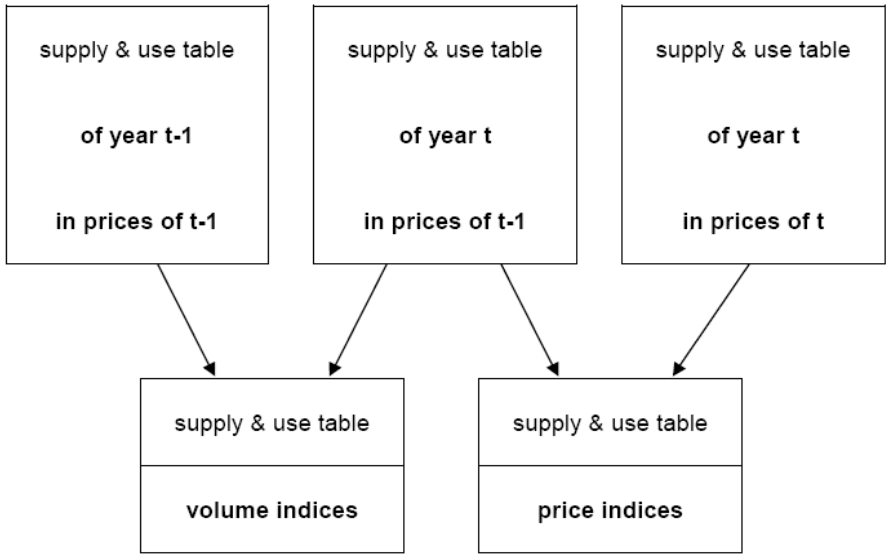
Besides the SUT, which serves as a framework for the balancing of statistical data on goods and services, three other economic frameworks are utilized. These are the Quarterly Sector Accounts, the Labour Accounts and the Government Accounts. In the Dutch system of national accounts these three frameworks are directly connected to each other and are mutually consistent.

3.2 Balancing, benchmarking and other reconciliation procedures

3.2.1 Quarterly GDP balancing procedure

The supply and use of commodities is balanced in the framework of the SUT. This applies both to the annual and the quarterly accounts. For each commodity supply data on production and imports is confronted with data on intermediate consumption and final use. The initial discrepancies are eliminated in de balancing process, so that in the end for each commodity total supply equals total use. The balancing process takes place simultaneously in both current and constant prices.

Scheme 2 Simultaneous balancing of a supply and use table



For each variable (cell) in the Dutch quarterly SUT-framework a total of 3 level estimates and 3 indices are instantly available (this is called the 6-pack). Values are expressed in current prices, constant prices (average prices of the previous year) and (average) constant prices of the previous year, with corresponding value-, volume- and price-indices.

The initial discrepancies may vary per commodity from a few million euros for agricultural produce to more than 0,5 billion euros for some fuels (about 0,3 per cent of GDP volume change). In the balancing process the discrepancies are eliminated for all commodities (rows) so that in the end a consistent SUT is obtained. The industries (columns) balance automatically as the operating surplus is used as a residual item. The consistent SUT yields identical macro-aggregates for the three approaches to GDP, i.e. the production approach, the expenditure approach and the income approach. The GDP estimates in the Netherlands are in fact the result of the combined production and expenditure approach. The income approach is not independently applied as operating surplus is used as a residual item as insufficient data are available for independently estimating this variable.

The balancing process is pursued for every single quarter leading to a consistent set of macro-economic aggregates and their components. Besides the balancing, the quarterly data have to be aligned with the annual estimates. This benchmarking process is part of the regular Dutch NA compilation cycle. The quarterly data are aligned with the newly compiled estimates for the final and provisional estimates.

Until recently, the processes of balancing and benchmarking have been pursued mainly manually. Given the level detail this was a very labour intensive way of working. In order to increase efficiency, gain more organizational control over the balancing process and make balancing adjustments more transparent, it was decided that more automated balancing was desirable. In addition, there was the aim of making better use of quarterly estimates to compile preliminary annual estimates and to

eliminate the step problem between the first quarter of one year and the fourth quarter of the previous year that commonly occurred when benchmarking quarterly data to new annual totals.

What has emerged is a new compilation process for balancing and benchmarking. From an organizational point of view, the most notable feature of the new national accounts process is a separation between, on the one hand, the identification, investigation, elimination and documentation of a relatively small number of large discrepancies by national accounts specialists (i.e. manually) and, on the other hand, the elimination of a large number of remaining small discrepancies by automated methods, i.e. by the use of balancing 'machines' (mathematical optimization models): a Balancing Machine to balance a single quarter and a Quarterly Machine to align the 12 quarters and 3 annual estimates.

Large and small discrepancies and evaluation of the results

In the new compilation process a large number of small discrepancies is eliminated in an automatic way by the Balancing Machine. However the first step in the process is to identify large discrepancies which need to be resolved manually. The identification of large discrepancies is pursued with a so-called scoreboard: an overview of all discrepancies listing the absolute and relative difference between commodity supply and demand and indications whether the Balancing Machine is able to resolve the differences (based on the relative strength of the data sources and presupposed error margins). The scoreboard also shows some consistency-indicators between production and domestically based exports and between import of goods and re-exports. Based on this scoreboard about 25 to 30 large discrepancies are identified each quarter and resolved manually.

About 10 of these large discrepancies are related to energy products. The results of important data sources for these products, specifically the Balance Sheet Petroleum Products (Balans Aardolie Producten, BAP) and the Dutch Energy Accounts (Nederlands Energie Huishouding, NEH), only become available in the course of the balancing process, and, for various other reasons as well, require manual treatment.

Other commodities which are normally selected for manual balancing are FISIM, bank fees, recycling and licences and royalties. The remaining large discrepancies are usually related to goods produced in the manufacturing; conflicting sources of the monthly production index (MPI) and the international trade statistics are the main cause of these discrepancies. The goods usually selected have a discrepancy between supply and demand of more than 100 million euro's. Goods are also selected when large differences exist between the discrepancy in current prices and constant prices (indicating inconsistencies in applied price-indices). These criteria should not be interpreted in an absolute sense, but must be considered as 'rules of thumb', based on experience with past quarters.

Macro-economic aggregates

The results are also monitored and evaluated through the report 'Macro-economic aggregates', which shows estimates of GDP applying the three approaches, the production approach, the expenditure approach and the income approach, and the main components, further specified in current and constant prices and the corresponding value-, volume- and price-indices. This report shows 'real time' outcomes and the development of the macro-economic aggregates are continuously monitored during the balancing process.

The components shown are total production, intermediate consumption, taxes and subsidies on products, wages and salaries, employers' social contributions, other taxes and subsidies on production and imports, operating surplus, household consumption, consumption of NPISHs, government consumption, gross fixed capital formation, changes in inventories, exports of goods, exports of services, imports of goods and imports of services.

The macro-economic estimates are evaluated directly after the unbalanced (but adjusted to national accounting concepts) data have been plugged in the SUT and are continuously monitored during the balancing process. They give a global overview of evolvement of inconsistencies between the

production and the expenditure approach and the development of the macro-economic aggregates. Outcomes are evaluated cross-section and on the basis of recent time-series (often the previous 4 quarters). Attention is paid to both volume and price indices. Suspicious or notorious developments are selected and if necessary further investigated in collaboration with the departments producing the source data.

The above mentioned report 'Macro-economic aggregates' gives a global overview of the economic developments and the relationships between the different components in the accounting period. It shows developments in the overall production to cost (intermediate consumption) ratio, relationships between production and domestically based exports, imports and re-exports of goods, and import of goods and domestic demand.

Table of branches of industry
This report shows volume-indices of production, intermediate consumption and value added for all the distinguished branches of industry. Where substantial changes occur further investigation and explanation is warranted. Plants may have shut down or just started operation, may have moved to or from abroad, may have changed production because of weather conditions or special festivities, government regulations or just because of positive or adverse economic conditions. Smoothing those changes is a real danger which may lead to misjudgements of economic reality. These indicators are also continuously monitored during the integration process. As only total turnover information is available for most industries the estimates for intermediate consumption and value added are initially simply estimated using these numbers. The unbalanced data for the industries start with similar volume changes in production, costs and valued added. The government and the financial institutions are an exception to this general rule, as specific information on costs and wages and salaries are available for these industries.

Process tables for the international trade in goods and services and for the industries
Process tables are available to monitor the adjustments made to the source data. The process table for the international trade in goods shows the various adjustments made to imports and exports of goods in current prices (14 main groups) from source data to unbalanced national accounts data (including adjustments for the change in ownership concept, production abroad, etc.) and to the final results (balancing adjustments). For the exports, a distinction is made between 'export from Dutch production' and 're-exports', imports which are directly or with minor modifications exported. As the source data make a clear distinction between coverage/response and imputations, the error margins per commodity are used as a reference for bounding the balancing adjustments. A similar process table is available for the international trade in services.

For the branches of industry the Monthly Production Index (MPI), which is based on the turnover of the main activity is utilized, as a process indicator. The process table for the industry compares the results of the MPI with the data for the Quarterly Accounts for 16 branches of industry. As a general rule the changes in the valued added in the quarterly Accounts should not be lower than the MPI to avoid underestimation.

During the balancing process, the data are subject to a number of plausibility checks (rules of thumb); changes in inventories cannot be only positive or only negative for longer periods of time, often a relation exists between producer prices and export prices. Import of goods should be above or equal to the re-export of goods. Extreme volume and prices changes warrant explanation.

It goes without saying that the weakest data are most likely to be adjusted in the balancing process. In many cases this means that changes in inventories are adjusted, given the lack of source data in the current procedure. In some cases imports and/or exports are judged as the weakest estimates and therefor adjusted, especially in de case of services or when substantial discrepancies occur between industry statistics and international trade data. Sometimes production (output) is adjusted, for example in the case of health services where only quarterly data on government outlays is available.

3.2.2 Benchmarking of QNA and ANA

Given the time constraints for compiling quarterly national accounts, benchmarking and balancing a large SUT with appropriate care is burdensome, particularly in a time series context. In recent years Statistics Netherlands has developed semi-automatic benchmarking and balancing methods that help the Dutch national accountants to achieve the objective of balanced and temporally consistent accounts whilst giving time to resolve manually the significant problems in the data. This last point needs to be emphasized: the mathematical methods are used only to eliminate small discrepancies in the SUTs, whereas large discrepancies are handled 'manually' by national accounts experts. The base period for SUTs and machine input and output is always the corresponding quarter of the previous year (over the year method). Seasonal adjustment – comparison to the previous quarter - is undertaken after the balancing process has concluded.

Both the benchmarking and balancing methods have been fully implemented for annual and quarterly SUTs since 2011. They also have a more general use and are applied in balancing the institutional sector accounts (both annual and quarterly) as well as various national accounts satellite accounts (e.g. regional accounts) and in national accounts subsystems (e.g. gross fixed capital formation estimates by type of asset and industry).

The "machines" are part of a redesign of the production system for the Dutch National Accounts. This redesign covered the complete production sequence of economic statistics: from data collection via surveys and administrative records (input), through statistical data validation and processing (throughput) to the compilation and dissemination of the statistical products (output), of which national accounts statistics are a prominent example.

The "core" of the Dutch benchmarking and balancing methods are the so called the Balancing Machine and the Quarterly Machine. Both "machines" are operationalisations of a general quadratic optimization problem. The mathematical aspects of these "machines" as well as their implementation, i.e. the software tools and the way these tools are used to define and solve the optimisation problems, are broadly described here. However, within the scope of this inventory, many details are ignored. A reference for further details is provided below.

The Balancing Machine can be used to balance a SUT for a single period (quarter or year). Given a certain base period, the dataset for a single period is balanced whilst minimizing the adjustment needed to the growth rates provided by NA-experts on industries and final expenditure. It is used to balance the SUT for a single period with autonomous input. The Balancing Machine is essentially a special version of the technology of the Quarterly Machine.

The Quarterly Machine balances the SUTs of twelve consecutive quarters in a single procedure. It is used to produce balanced SUTs when data are revised and when new final annual estimates become available. When a new final annual estimate has been compiled, the Quarterly Machine allows for a complete benchmarking of three years of quarterly data to these new annual totals. Not only are the twelve quarters benchmarked, but new balanced preliminary estimates for the quarter beyond the latest annual benchmark are derived.

The quarterly machine (benchmarking)

Benchmarking of the 4 quarters of t-1 takes place as soon as the final annual estimates of t-1 are finalized (end of March year t+1). The four quarters are adjusted to the annual estimates of t-1 on a proportional basis (each cell in the quarterly SUTs is proportionally scaled to its annual total). Because the quarters of t-1 are benchmarked, the quarters of t are proportionally adjusted as well.

The Quarterly Machine uses a benchmarking method which is a multivariate extension of the univariate first order Denton method. The key feature of the first order Denton method is minimizing the sum of the quadratic adjustments in (either additive or proportional) first differences of the quarterly series, also known as the "movement preservation principle". The minimization is subject to

the constraint that the adjusted quarterly series has to be consistent with the annual series. Denton's method is therefore an example of a constrained quadratic minimization problem[5].

Statistics Netherlands uses semi-automatic methods by applying a multivariate version of the Denton method in which the various quarterly series are subject to (i.e. connected through) exogenous (or "hard") linear, contemporaneous constraints. Hard constraints need to be satisfied exactly. This type of constraint is necessary for national accounts applications so that all the accounting identities in the framework are satisfied and temporal consistency is achieved.

Next to the accounting identity and temporal constraints a few extensions are used. Firstly, weights are assigned to the individual time series in order to reflect the relative accuracy of the underlying source data and any assumptions. For example, in the Dutch QNA output estimates are regarded as more accurate than estimates of intermediate consumption because the former are based on actual data whereas the latter are estimated by assuming a proportional relationship to output in volume terms. These relative degrees of accuracy of the different time series are taken into account in the benchmarking process. Secondly, "soft" linear constraints and "soft" ratio constraints are introduced. Soft constraints are those that need to be satisfied approximately by the adjusted series. An example of soft ratio constraints applies to price indices, which are formulated as the ratio of values in current prices to values in average prices of the previous year and as the ratio of values in average prices of the previous year to values in the average prices of the reference year. Preserving both types of price indices of the unadjusted series as well as possible has proved to be necessary in the benchmarking process to achieve satisfactory results. Soft ratio constraints are also used to keep the volume change of intermediate consumption in line with the volume change of output during balancing and to maintain the links in volume between the supply and demand of goods and related trade margins. The soft ratio constraints are assigned a weight label to reflect the relative accuracy of the preliminary estimates.

The upshot is that the original multivariate Denton method (including only linear exogenous constraints and no weights) has been extended at Statistics Netherlands to include weights for the individual quarterly series and weighted soft linear and weighted soft ratio constraints. An essential feature of the extended method is that the weights of the quarterly series as well as the weights of the soft constraints have been parameterized in such a way that weights labels are assigned to reflect the relative accuracy of the different series and constraints. These weight labels (in order of reliability letters A to G) subsequently appear as numerical weights in the quadratic terms of the objective function to be minimized.

In formulating the benchmarking problem, numerical values of the weights do not need to be specified because they are calculated from the assigned weight labels according to the parameterization formulae. The parameterization of weights is a key feature of the extended method because it makes it feasible to apply the method in practical situations where all that is known, at best, are the relative accuracies of the quarterly and annual estimates that are fed into the model.

The balancing machine

The Balancing Machine is an extension of the method proposed by Richard Stone (first formulated in 1942) for balancing an accounting system while taking into account the differences in accuracy of the preliminary estimates of the variables in the system. In Stone's method, the discrepancies (or residuals) are distributed among the variables in such a way that the more accurate estimates are

[5] An elaborate description of the machines can be found in: Economic Systems Research, BENCHMARKING LARGE ACCOUNTING FRAMEWORKS: A GENERALIZED MULTIVARIATE MODEL, by Reinier Bikker, Jacco Daalmans and Nino Mushkudiani. Department of Methodology, Statistics Netherlands, The Hague, The Netherlands, 31 May 2013 (http://dx.doi.org/10.1080/09535314.2013.801010). And also in: Eurostat, HANDBOOK ON QUARTERLY NATIONAL ACCOUNTS - 2013 edition, chapter 8 annex C (http://ec.europa.eu/eurostat/en/web/products-manuals-and-guidelines/-/KS-GQ-13-004).

adjusted less than the less accurate estimates, and the known (i.e. precise estimates) values are not adjusted at all.

As formulated here, Stone's method is a constrained quadratic minimization problem in which the sum of the weighted quadratic adjustments to the preliminary estimates is minimized subject to the condition that the adjusted estimates need to exactly satisfy all relations among the variables, such as the accounting identities.

As discussed above in the context of the Quarterly Machine, additional soft linear and soft ratio constraints are implemented in order to make the method suitable for application to national accounts systems. Accordingly, at Statistics Netherlands research was carried out to extend Stone's method to include these types of soft constraints.

A set of parameterization formulae was developed in order to calculate the appropriate numerical weights for the variables and soft constraints in the objective function to be minimized, such that weight labels can be assigned to the variables and constraints that reflect the relative accuracy of the preliminary estimates. As explained earlier, this parameterization is an essential aspect of the approach because it makes it feasible to apply the method in practical situations.

Several experiments were carried out with actual QNA data sets and they demonstrated that satisfactory results could be obtained. During the experiments, the balancing "set-up", i.e. all the necessary relations among the variables, were developed and tested. The weight labels of the variables were optimized using the manual balancing process. Subsequently, work was started to implement the method and it was applied for the first time to balance the QNA estimates of third quarter 2010 in December 2010.

The tools and the organization of the balancing process using the Balancing Machine are very similar to the tools and the organization of the benchmarking process using the Quarterly Machine. In particular, the clear distinction which is made in the process between large discrepancies, which need to be investigated and resolved manually by national accounts experts, and the (large number of) remaining small discrepancies which can be reconciled automatically, is identical in both approaches.

3.2.3 Other reconciliation(s) of QNA different from balancing and benchmarking

The SUT-data are subject to further plausibility checks with the Labour Accounts, especially changes in labour volume, labour income quote and labour productivity by branches of industry. Apparent inconsistencies are eliminated. They lead to adjustments in the SUT.

A similar procedure is applied for the Government data. These data are included in the SUT and apparent inconsistencies are eliminated. This mostly leads to adjustments at the commodity level, keeping the overall subtotals for the government, like total government consumption, generally unaffected.

The QNA and QSA are harmonized with respect to all taxes and subsidies on products and other taxes and subsidies on production and imports. The data are collected from the Ministry of Finance.

The QNA results are finally adopted by the QSA. The final demand categories are directly used in the QSA and a cross-classification procedure is utilized to transform the industry data into the corresponding sectors.

The end result of these procedures is a fully integrated and consistent set of accounts, i.e. QNA, QSA, Labour Accounts and Government Accounts

3.2.4. Amount of estimation in various releases

Chapter 10 describes extensively the degree to which the successive releases of QNA are covered by direct (measured) sources and by indirect sources, such as models and the like. For this purpose the

'GDP source coverage indicator' was developed. As shown in table 1 the (absolute) source coverage on the supply side (production) is 80 per cent and drops to 49 per cent for the flash estimate, while on the expenditure side the coverage results in 68 per cent and drops to 55 per cent for the flash estimate.

3.3 Volume estimates

3.3.1 General volume policy

Both the supply and the use tables are compiled in constant and current prices. Current price valuation means that the quantities of the quarter under review are expressed in the prices of the current quarter. Constant price valuation means that quantities of the quarter under review are expressed in average prices of the previous year.

In the Netherlands a combination of a Laspeyres volume index for extrapolation and a Paasche price index for deflation is applied. This combination of indices ensures consistency in both index formulas (a "full" breakdown of value changes in price changes and volume changes) and constant price level estimates (where constant price estimates of the total equals the constant price estimates of its components).

The Laspeyres volume index shows the extrapolation of a base period value with a quantity index number:

$$\sum Q_t P_0 = \sum Q_0 P_0 * \left(\sum P_0 Q_t \Big/ \sum P_0 Q_0 \right),$$

The Paasche price index shows the deflation of a current period value with a price index:

$$\sum Q_t P_0 = \sum Q_t P_t \Big/ \left(\sum Q_t P_t \Big/ \sum Q_t P_0 \right),$$

$\sum Q_t P_t$ = Current price value

$\sum Q_t P_0$ = Constant price value

$\sum Q_0 P_0$ = Base period value

First the supply part is compiled in constant prices by multiplying the data in the base period with quantity indices. The row totals (domestic production per commodity) are converted to current prices with the use of price indices. It is assumed that there is no price discrimination amongst the different producers of a commodity. Thus a single price is used for each cell in the entire row, and so the average price of the row is equal to the price used for the subtotal. By addition of all the commodities produced by an industry the column totals also become available at current prices.

Due to the assumption of fixed input/output ratio's, the quantity indices are also used to compile intermediate consumption in constant prices in the use table. The row totals of intermediate consumption are also converted from constant prices to current prices with the information on prices per commodity. Here too, there is no price discrimination between users. As in the supply table, the column subtotals (intermediate consumption) become available at current prices.

The supply columns (margins, taxes and subsidies and imports) and the final expenditure columns (consumption of households and government, exports, gross fixed capital formation) are all compiled in both constant and current prices. The compilation at constant prices is based on the volume changes of the underlying variables.

The value added components compensation of employees, value-added tax, taxes and subsidies on production are compiled in constant and current prices. Gross operating surplus in both constant and current prices is finally compiled as a residual item (where total output and total input of each column are equal).

The contributions of the macro-economic components to the growth of supply and demand of goods and services are calculated in a straightforward manner as their (absolute) volume change divided by the GDP in the base period. The growth of GDP and imports yield the supply growth of goods and services. This matches with the growth of the demand components; final consumption expenditure, gross fixed capital formation, changes in stocks and export of goods and services.

3.3.2 Chain-linking and benchmarking

There are several methods for linking quarterly figures to a chained index that is consistent with the independently estimated annual index. In the Netherlands the recommended annual overlap method is applied. As the quarterly data are consistent with the annual totals, no benchmarking is needed. This technique is used for calculating quarter-to-quarter growth rates. These growth rates are considered the most important figures for business cycle analysis.

3.3.3. Chain-linking and seasonal adjustment

Time consistency exists between quarterly calendar corrected seasonally adjusted data and annual calendar adjusted data. A direct approach is used for the aggregation of seasonally adjusted data. Concerning the raw data consistency exists between GDP and its components in both current prices and volumes (previous year's prices, unchained). But this consistency does not apply to the chain linked series and the seasonally adjusted data.

3.4. Seasonal and calendar adjustment

The results of the Dutch Quarterly National Accounts (QNA) are published both seasonally and non-seasonally adjusted. Seasonally adjusted figures are used to calculate quarter-to-quarter volume changes. Volume changes of the corresponding quarter of the previous year are calculated from non-seasonally adjusted figures.
Seasonally adjusted series are available for a large number of variables including breakdowns of expenditure, value added (in basic prices) and the income components. For a complete outline please refer to Statline:

http://statline.cbs.nl/Statweb/publication/?DM=SLEN&PA=82601ENG&D1=0-71&D2=1%2cl&D3=100-103%2cl&LA=EN&HDR=G1%2cG2&STB=T&VW=T

3.4.1. Policy for seasonal adjustment

The X13-ARIMA-SEATS method, implemented in the JDemetra+ software package, is applied for seasonal adjustment. The settings of the seasonal adjustment (pre-treatment and the filters) are analysed and updated once a year in June at the revision of provisional annual figures. The magnitude of the outliers and calendar effects are determined once a year in order to minimize revisions during that year. Also the shape of the Arima model and its coefficients are kept during constant during that year. If necessary new outliers are found in the most recent data, they are added to seasonal adjustment settings during the year.

3.4.2. Policy for calendar adjustment

As there is no information available on the actual number of days worked in a particular quarter, therefore calendar effects are based on the theoretical differences in the number of working days between corresponding quarters. Working days are Mondays to Fridays, except when they are a national holiday, i.e. January 1st, Eastern, Kings day, Liberation day, Ascension day and Christmas. February 29th is counted as a normal working day when it is not in a weekend.

The consequences of one working day more or less are somewhat complicated. One working day more often implies one non-working day less (in comparison to corresponding quarters). But in some sectors work continues on non-working days (police and public transport, for example) and in some others production is even highest on non-working days: amusement parks, for example. The total effect of one working day more or less is therefore the result of many positive and negative adjustments.

The method used at Statistics Netherlands standardises to a 'normal' number of working days per quarter. The deviations to this standard calendar are used as correction factor in a structural time series model to estimate the working day correction. The total effect averaged over a relatively long period is then around 0.3 of a percentage point per working day. This coefficient is updated once a year.

3.4.3 Revision policy for seasonally adjusted data

Every time a new quarter is added, the seasonal adjustment procedure is applied to the entire time series, potentially affecting all quarters. Normally, though, seasonal adjustments to earlier figures are small. The most recent seasonally adjusted time series can be found on the website of Statistics Netherlands.

4. GDP and components: the production approach

4.1 Gross value added, including industry breakdowns

4.1.1 Source data

The compilation of QNA and the estimation of the aggregates involve the use of a lot of statistical information usually referred to as *source statistics*. Most data sources are specific statistics compiled by several departments of SN. Some data are provided by external institutions like the Central Bank of the Netherlands (DNB) and branch organisations (agriculture). Obviously, the more complete the set of source statistics and the higher its quality, the more reliable the resulting set of QNA aggregates will be. In general the quantity and quality of quarterly information is inferior to annual information.

Characteristics of QNA source statistics often differ from those of the annual accounts since the aim of these statistics is essentially to capture and describe short-term economic movements. In general sample surveys are used for short-term surveys. Generally all firms with more than 50 employees are fully covered, but only a (stratified) sample is included of firms with less employees. In addition, surveys are not (yet) available for all types of industries, in particular for health care and other service activities. After data collection, the sample surveys require a grossing-up procedure, i.e. which means that the sample based results are adjusted to cover the whole population.

One important feature of the main data sources is the (increased) use of administrative data. This implies that VAT data are used as a major source for turnover statistics on a quarterly basis for several branches of the economy and thus as an important input for the QNA. The efficiency advantage of using VAT data includes the reduction of the administrative burden. The flash estimate of economic growth for the first quarter of 2012 was the first quarter using VAT information for some branches. Currently VAT data are the major source for the estimation of the value change of production of the following activities: transportation and storage, hotels and restaurants, information and communication and business activities.

Source statistics supply many types of information. For example, in compiling GDP according to the production approach, the amount or the quantity of output expressed in physical terms, represent the basic information. One can refer to production of crops, milk and eggs in agriculture, produced quantities of gas and petroleum in mining and the number of produced cars in manufacturing. In construction, manufacturing and business service activities, sales and turnover are the most common information. Also employment and purchases of input data are sometimes used as indicators for the output of some industries. Final consumption of households is mainly derived from retail trade statistics, and final consumption of general government is derived from administrative data on intermediate consumption and labour statistics on the wages and salaries of civil servants. For specific items, particular sources can be used. An example is the amount of productive hours per employee as an additional indicator for the output of construction.

When the aim of surveys does not directly meet QNA needs, e.g. monthly price statistics, quarterly information is derived from these sources. In addition to data collected by SN itself, raw administrative data (data that is not translated into a specific statistic) from external sources can be used for the QNA. Examples are the quarterly accounts of some large enterprises, reports by supervisory bodies on banking, private insurance and telecom and quarterly accounts of the central government and social insurance bodies. Furthermore articles in newspapers and magazines may provide information on developments or specific events like big investment projects. This information can be used to complement available data or to check their plausibility.

Source statistics are usually available as level data in nominal values (for example household surveys, balance of payments data, surveys of sales and turnovers) or as index numbers for prices, volume or values (business indices, industrial production index, consumer price index etc.).

In some cases the quarterly figures are not based on surveys but are derived using extrapolation and projection techniques (modelling). These methods are used when source statistics are not available at the desired frequency, not available at all, or do not meet the QNA requirements of timeliness. In this respect modelling techniques may yield estimates based on historical data.

Source statistics are often adjusted in order to fulfil the requirements of the national accounts. These adjustments relate to completeness, comparability in time, plausibility and definitional issues. When the source data meet the national accounts requirements they are fit to be entered into the supply use framework. This applies to all the output and cost data of industries, the final demand categories as well as the components of value added (except operating surplus which is residually derived)

1. Completeness for cut-off statistics (or the hidden economy): data should be representative for the whole economy. Since the national accounts require complete estimates for all branches of industries, data from surveys have to be grossed-up for small firms (which is usually done in proportion to the number of employees). Occasionally estimates are made for hidden transactions (like allotment gardens in agriculture).
2. Continuity of figures over time (comparability in time): data should be checked on continuity. Do year-on-year changes in the data represent *real growth rates* or are they perhaps partly caused by a change in the classifications of statistical units? For example, source statistics provide actual data. However, if an establishment is classified into another industry because of a mistake in the past, the national accounts will leave this establishment where used to be until the next revision (in contrast to the source statistics). If not, growth rates per industry would not reflect a *real* change.
3. Plausibility of figures: data are further subjected to plausibility checks. For example, to check labour productivity year-on-year changes of total output can be compared with changes in labour input; or: the output/input ratio of an industry can be verified if source data of the output as well as input are available.
4. Consistency of definitions: the source statistics should be brought in line with the concepts and definitions of the national accounts. For example, source statistics usually give sales (and purchases) while the national accounts require production (and intermediate consumption), taking into account the changes in stocks.
5. Compatibility of the nomenclatures or details: often source data are not directly compatible with the classifications (taxonomy) of the supply and use tables. The classifications and data from source statistics usually have to be mapped to the taxonomies of the supply and use table (using distribution keys). These keys are normally extracted from the supply and use table of the base period.

4.1.2 Agriculture, forestry and fishing

An important part of agricultural products is sold to the food processing industry. The estimation of agricultural output is thus closely linked to the purchases of the food processing industries. These purchases cover:

- The supply of animals to slaughterhouses;
- The supply of milk to the dairy industry;
- The supply of raw materials to flour factories, the fodder industry and breweries (grain), the starch industry and potato factories (potatoes), the sugar industry (sugar beet) and the fruit and vegetable processing industry (fruit and vegetables).

In addition, the food processing industries may sometimes sell a substantial part of their output to agricultural units, most notably is the case of the fodder industry which sell their products to farmers. In this case a commodity flow method is used to estimate agricultural inputs for these products. Also for some agricultural outputs a commodity flow method is used.

Sources

The main sources for estimating agricultural output are the surveys on agricultural quantities of SN, some secondary sources and the price statistics of the *Agricultural Economics Research Institute* (LEI). In particular, it relates to the following sources:

- The SN *Agricultural Census* plays an important part in the estimation of agricultural output. This comprehensive survey covers approximately 72,000 agricultural units, which are operating at a significant level in any agricultural activity. The survey covers cultivated areas, numbers of cattle, the workforce and main and secondary activities.
- The SN *harvest estimate of arable crops* is an important source for calculating the output for a number of arable products. The estimate is made on the base of data from a sample survey conducted by Statistics Netherlands among arable farms. The sample comprises approximately 2,500 of the approximately 20,000 units that belong to the target population as stated in the Agricultural Census. The response is grossed up to get estimates for the total target population.
- The SN *harvest estimates for vegetables and fruit* provided by Statistics Netherlands are important sources for calculating production for a number of vegetables. This includes estimates for fruit, field-scale vegetables and greenhouse vegetables. The estimate for-field-scale vegetables is based on data from a sample survey among agricultural farms. The sample comprises approximately 1,500 of the approximately 3,000 units that belong to the population as stated in the Agricultural Census. The response is grossed up to estimates for the total target population. The estimate for of fruit (apples and pears) is based on a sample of 1,000 units of the approximately 2,000 units that belong to the population. The estimates for greenhouse vegetables are largely based on the area of land as recorded in the annual agricultural census. For these vegetables no sample survey is carried out as it is possible to determine the quantities harvested of these vegetables using of data from the Quality-Control Bureau for fruit and vegetables (Kwaliteits-Controle-Bureau; KCB). These data are based on export figures. An expert working group, including representatives of Statistics Netherlands and the Ministry of Economic Affairs discusses the data and approves the harvest estimates after adjusting if judged necessary.
- The output of bulbs, flowers and plants, trees and seeds is calculated mainly using data on exports with domestic origin supplied by Royal Flora Holland. This is a conglomerate of auctions of cut flowers and plants. The organization is the world's largest of its kind and handles more than 90% of the Dutch trade in those products.
- *Additional Sample Survey on Agriculture* (pigs and cattle): There are a few moments throughout the year where additional information is gathered by Rijksdienst voor ondernemend Nederland (RVO): in August, November and December. These collected information refers to pigs (August and December) and cattle (November). This survey is used to derive seasonal structures. RVO supports enterprising Netherlands with grants, business partners, and regulatory knowledge regarding to sustainable, agricultural, innovative and international business.
- The CBS *Dairy Products Statistics* compiled on the basis of weekly reports by the CBS in conjunction with the RVO. It contains comprehensive data on milk deliveries to dairy factories, direct consumer supplies, farm butter and cheese production and poultry rearing both for sale and own consumption.
- The CBS *Slaughter Statistics* cover the authorised slaughter of domestically reared cattle (including domestic pig and poultry slaughter). These are comprehensive monthly statistics. Data on the numbers of slaughtering's are gathered from the Dutch Food and Goods Authority / Department for the Inspection of Livestock and Meat (NVWA / RVV). Data on the weight per species of animals are gathered from RVO.
- *Agricultural Daily* (Agrarisch Dagblad).
- Websites of the above-mentioned bodies, corporations, and organizations.
- Foreign trade statistics

Methods

Some of the agricultural products, e.g. cereals, potatoes, vegetables, fruits and other farming products like sugar beets, have a longer production process than the period under review (quarter).

Conceptually, the growth process should be seen as production. If the growth process lasts for example three quarters and the harvest takes place in the fourth quarter, the production should be registered as work in progress (additions to stock). In this way coherence between costs and output is maintained. However, as information on the growth process is not available, the information on estimated sales of these products (often based on harvest estimates) is used as an indicator for output.

Cereals, potatoes, oil containing seeds: in terms of output value, cereals are the least important component of agriculture. This commodity is harvested in the third quarter, but costs are incurred throughout the year. The estimated sales and the costs incurred are used as an indicator for production. Estimates are made of the harvested area and the yield per hectare (using the SN harvest data). The prices used for deflation are obtained by using the price data of the LEI. In the same way changes for potatoes and (oil containing) seeds are estimated.

Sowing seed: for this commodity a commodity flow method is used. The prices that used for deflation are obtained from price data of the LEI.

Other farming products: these products, predominantly sugar beets, are harvested in the third or fourth quarter. The sowing period is from March to April, the harvest takes place from September to December. An important purchaser of beet is the sugar industry. The costs are made throughout the year. Therefore the estimated sales and the costs incurred are used as an indicator for production.

Vegetables: Information on the production of vegetables is obtained from SN harvest estimates and information the Quality Control Board. About sixty per cent of the vegetables are exported (including re-exports) and therefore under supervision of the Quality Control Board. This board gives monthly updates on the export of fruit and vegetables.

Plants and flowers: the composition of this category varies throughout the year. To make an accurate estimation for the production of flowers a distinction is made between bulbs, cut flowers and products of tree nurseries. Bulbs are produced year-round, but approximately 50 per cent are produced in the third quarter. Cut flowers are produced mainly in the second quarter. Other flowers are predominantly supplied in the first two quarters of the year.
Information on plants and flowers is taken from the Royal Flora Holland. This organisation provides monthly data about the supply and turnover of flowers and plants. A value, volume and price index is derived from these sources. The LEI also has usable price data.

Fruit: fruit, mostly apples and pears, is grown on open land and in greenhouses and is supplied directly to consumers and to contractual buyers (such as supermarkets and the processing industries) throughout the year. The SN harvest estimates yield volume data about pears and apples. Again the price data of the LEI are used. Also information on fruits form the Quality Control Board is used.

Other crops: most other crops are imported and used as input in the food processing industry. Thus the output of these products is not part of the Dutch agricultural industry. A few examples are coffee beans, cacao beans, raw tea and raw tobacco. The sources used for these products are the foreign trade statistics.

Cattle: this group only consists of live cattle and includes productive cows for the dairy industry and cattle for the meat industry. As the prices of different categories of cattle differ greatly, a breakdown is necessary. For the calculation of livestock production a number of sources are used; i.e. the slaughter statistics, the Foreign trade statistics relating to live cattle (values and numbers) and the Agriculture Survey used to determine annual livestock variations (numbers).
The gross production of cattle = cattle for slaughtering + exports minus imports of live cattle + investment in productive livestock (dairy cows) + changes in livestock (normal cattle)
The Agriculture Census in May gives an estimate of cattle numbers. An additional sample survey is held in November. The Agriculture Survey is an integral survey used for the quarterly estimations. The quarterly structure is obtained from historical data, the additional survey and data on the other

components of production (see formula). Changes on the previous period are estimated for two types of cattle: investment (productive) cattle and normal cattle. The changes in livestock relate to the normal cattle. Other sources for the estimation of changes in cattle numbers are the Agricultural Daily and RVO and the SN slaughter data. The Netherlands also exports cattle. Data on the foreign trade are provided by the SN international trade department. The LEI data are used to obtain prices. For prices of imports and exports, the LEI data are compared with SN data, the prices provided by the foreign trade specialists. Agriculture specialists examine the prices during the process of balancing.

Pigs and poultry: the method used for pigs is the same as the one used for cattle.

Raw milk: raw milk production is estimated on the basis of the dairy product statistics, which are derived from the weekly reports by the SN in conjunction with RVO. These contain data on milk deliveries to dairy factories, direct consumer supplies, farm butter and cheese production and poultry rearing both for sale and own consumption. Coverage is comprehensive and includes price information.

Agricultural services, gardening services, forestry: hardly any information is available on agricultural services, gardening services or forestry. Hourly wage rates per industry are used as an indication for the price. The volume change of agricultural services is assumed to correspond to the volume change of overall agricultural output.

Fishing: CBS compiles monthly data on the supply of fish in Dutch ports and on prices of fish. Data on the supply of fish are provided by the Ministry of Economic Affairs. Price information of the fish product board is used.

4.1.3 Mining and quarrying

Mining and quarrying consists of coal production, crude petroleum production, natural gas production, exploration activities, metal ore production and other mining and quarrying.

Sources and methods

Coal and metal ore: these commodities are not produced in the Netherlands. They are imported mainly for intermediate use in production processes. A small part is re-exported. Data on foreign trade flows are provided by the foreign trade statistics department.

Crude petroleum production and natural gas production: a limited amount of information on the purchases of these commodities Netherlands is available from the Dutch exploration and production company (NAM). From this information a production/consumption ratio is derived. Since NAM accounts for approximately two-thirds of crude petroleum and natural gas production in the Netherlands, this ratio is considered representative for the entire category. For the QNA the ratio of previous year is utilized.
The Dutch gas supplier (Gasterra) purchases all the natural gas produced by NAM and also imports some natural gas. Gasterra, classified in ISIC 6, supplies the natural gas to regional gas distributors (mainly large, electricity producers classified in ISIC 35[6]) and to other countries. For the compilation of a natural gas account, Gasterra data are enriched with survey data on ISIC 35. The survey fully covers the largest enterprises but only a sample of the medium seize enterprises. The volume changes provided are used for the QNA. Producer prices are used as deflators.
Crude petroleum is mainly imported by oil refineries. The amount produced by NAM and other oil extracting firms is also bought by the oil refineries or sold abroad. The monthly survey among oil refineries and other oil extracting companies is used together with information from NAM to compile a crude petroleum account. The volume changes given in this account are used for the QNA. A price for deflation is obtained by using the producer price index (see section 4.1.X).
Both the natural gas account and the crude petroleum account constitute a part of the energy account.

[6] SIC 35 are industries that supply gas, electricity and water to the consumers.

Exploration activities: monthly turnover data are available. Estimation of these activities is based on deflated turnover data.

Other mining and quarrying: this industry, which includes peat and marl, is subject to the methodology described earlier. Processing starts with the production statistics of large and medium sized enterprises, supplemented by the Industry Survey data for the smaller sized enterprises. Monthly price indices and, where available, production unit values are used for deflation.

4.1.4 Manufacturing

The manufacturing industry contributed about 12 per cent to GDP in 2015. As explained in chapter 2, the assumption of a production function with fixed coefficients necessitates a classification of production processes with input structures that are fairly homogeneous. Consequently, the supply and use table distinguishes about 44 manufacturing industries and 89 manufacturing commodities.

Sources

For each industry the quarterly changes in the value of production are estimated, both at constant and current prices. In virtually all cases source data are collected by SN. The data may measure the volume changes in production both directly (e.g. number of produced cars) or indirectly (deflated turnover data). The following five types of information are distinguished:

1) Quantities produced (e.g. cars and fuel).
2) Turnover data: turnover data are given by the industrial turnover index which shows the monthly value of own products and services invoiced (excluding goods purchased for resale in the same condition as received and excluding VAT, excise-duties and other taxes). Turnover is divided into domestic sales and exports. The main source is a statistical survey.
3) Use of raw materials: for a few industries input information is used as an indicator for output (e.g. starch potatoes, raw milk, slaughter animals).
4) Information about hours worked.
5) Industrial output price indices: a statistical survey is used to obtain domestic output prices, export prices and import prices (whereby VAT and excise duties are excluded). These prices correspond to the price set at the moment of delivery. Price indices are used to deflate values of production and turnover.

Methods

The above mentioned types of information are all used for the compilation of the production index by branch of industry (volume index). The main source of this index is a statistical survey.
The production index aims to show the monthly change of gross value added at basic prices. Depending on the type of activity, enterprises report gross production, turnover, physical quantities of products, energy consumption, and use of raw materials or hours worked. As far as turnover is used for the calculation of the index, industrial output price indices are used for deflation.
The industrial production index is the main source used for the QNA. This volume index is used to calculate the constant price value in the current year. Industrial output price indices are used to calculate the current price values. However, there are a few exceptions. These are described below:

Manufacturing of food products, beverages and tobacco: a lot of activities in this group are based on deflated turnover data. For the remainder physical quantities are used to estimate a volume index. A few examples are information on the number of animals delivered to the slaughter industries (e.g. pigs and cattle), information on raw milk supplied to the dairy industry, and output of physical quantities of dairy products by the dairy industry (e.g. tons of butter, cheese and litres of consumption milk).

Manufacturing of textile and leather products: in addition to the turnover data of the industries, retail trade information on clothing is used.

Manufacturing of petroleum products: quantities from the energy accounts are used for the estimation of a volume index. The industrial output price indices are used to calculate the current price values.

Manufacturing of basic metals, metal products, machinery and equipment n.e.c.: estimation of these activities is based on deflated turnover data and on information on hours worked.

Manufacturing of transport equipment: a combination of three sources is used for these activities. Deflated turnover data, information on hours worked (e.g. production of ships and aircraft) and on quantities produced (e.g. cars and trucks).

4.1.5 Electricity, gas, steam, water, sewerage, waste management and remediation activities

Sources and methods
The sources mentioned in section 4.1.3 (mining and quarrying) are also used for these industries. In addition to information on natural gas and crude petroleum, the energy accounts also include information on the energy and water supply corporations. Constant-price analysis of output, intermediate consumption and value added is based on the monthly output price index and, where available, unit values of production. Some electricity is traded internationally. Data on these foreign trade flows are provided by the foreign trade statistics. For waste management and remediation activities additional data from the labour accounts are used.

4.1.6 Construction
In the QNA 7 branches of construction industries are distinguished: development, construction of dwellings and other buildings, construction of civil engineering works, site preparation, installation activities, completion of construction activities, other construction activities. These industries produce 13 types of commodities: new dwellings, maintenance of dwellings, new buildings, maintenance of buildings, construction of civil engineering, specialised activities new dwellings, specialized activities maintenance dwellings, specialised activities new buildings, specialised activities maintenance buildings, specialised activities other buildings, installations/isolations for dwellings, installations/isolations for buildings, installations civil engineering.

Sources
Turnover index on construction: this monthly survey provides a turnover index for each of the 7 branches of construction industries. This index is made out of a comprehensive survey among the large and middle sized companies (over 10 employees), and the use of VAT data for small companies (1-10 employees) .

Statistics Progress Buildings: this monthly statistic provides information, based on building permits, regarding the production of new buildings and dwellings. All projects with total building costs of 50 thousand euros or more with a new building permit are reported to the SN on a monthly basis. Building costs are valued exclusive of VAT. These reports contain information on the location, type of building (building or dwelling), kind of building activities, building costs, content, floor area and estimated building time. This information is used to calculate on a monthly basis the different stages of the building process to monitor the progress.

Production price indices of dwellings and buildings: in order to obtain a building permit, information must be provided to the local authorities, e.g. building costs, size and estimated building time. This information is used to construct a production price indices for newly built dwellings and buildings. Both are constructed through a hedonic method. The main explanatory variables used are volume, number of dwellings in the plan, type of principal, rental or ownership and type of soil. The index does not cover site preparation, repair and maintenance.

The Consumer Price Index (CPI) on the maintenance and repair of dwellings: this monthly index is used to deflate the maintenance of dwellings and buildings.

Input price index of civil engineering works: this index is compiled for sewerage construction, road construction with brick paving and asphalt/concrete paving, mechanical excavation for road

construction and maintenance work on roads with asphalt/concrete paving. The index is provided four times a year, the figures refer to January, April, July and October.

Productive hours in construction of dwellings and other buildings: this statistic provides monthly data on the number of productive hours per employee. The data only concern the construction of dwellings and other buildings. Data on unproductive hours and the loss of working hours due to frost and precipitation are also utilized.

Production volume of building materials (e.g. wood and concrete): The supply of building materials is mainly used for construction activities. Furthermore, the changes in construction production volume corresponds to the changes in the use of these materials.

Methods
The turnover index provides the changes in current prices for each of the 7 branches of construction industries. For the construction of dwellings and other buildings the Statistic Progress Buildings is used to split the turnover into new dwellings and new buildings.

To deflate the turnover per commodity use is made of the production price for dwellings and buildings, the input price of civil engineering works and the CPI on maintenance and repair of dwellings. For the QNA, there is no information available for the deflation of the commodity other building activities and therefore an expert guess is used. The volume change of the supply of building materials is compared with the volume change of construction output in each industry. These volume changes should be in line over a longer period, but may differ within a quarter. The number of productive hours is used to check the plausibility of the volume change of the construction of dwellings and other buildings.

4.1.7 Wholesale and retail trade; repair of motor vehicles and motorcycles

Sources and methods
The calculation of retail and wholesale margins is not based on direct surveys. Instead, the retail margins are directly linked to household consumption. Wholesale margins are linked to household consumption, gross capital formation, imports and exports and intermediate consumption. Every aggregate is linked with a certain ‘tariff’ that is taken from the most recent annual data.

The calculation of the retail margins in the QNA is given as an example. For each commodity the volume changes in retail margins are equal to those of household consumption. Valuation of retail margins in current prices is such that the consumption price excluding the retail margins equals the price of supply disposable for domestic consumption.

4.1.8 Transportation and storage

Sources and methods
Estimates are based on VAT data on turnover on a quarterly basis supplemented with survey data of large enterprises. Supplementary volume indicators are used as a check, such as transport data and traffic data for railways, air transport, sea transport, taxi, coach car and group transport companies, as well as trams, bus and related companies, numbers of phone calls, units of mail for the communication industry and number of ton-kilometres for inland shipping.

4.1.9 Accommodation and food service activities

Sources and methods
VAT data on turnover are available on a quarterly basis (value added tax) supplemented with measurement of large enterprises. Hotels and restaurants make up about three quarters of this industry. For the remaining units, mainly canteens, catering services and camping sites, also VAT data on

turnover are available. The output is deflated with CPI's. Data on labour volume and compensation of employees is used to evaluate the output volume changes.

4.1.10 Information and communication

Sources and methods
Estimates are based on VAT data on turnovers on a quarterly basis. Supplementary labour information is used as a check. Value changes are deflated by using available price indices.

4.1.11 Financial services
Financial services consist of banking and insurance services and other financial (auxiliary) services.

Sources and methods
Banking**:** For the compilation of the regular quarter, data from the Central Bank of the Netherlands (DNB) are used. The dataset consist of regulatory reporting's as well as of statistical supplements, which DNB collects from its responsibility of prudential supervisor. Whilst data dissemination is obligatory for monetary financial institutions (in short MFI's) to attain a banking licence, the gathered set entails full coverage for these types of banks.

For non-MFI banks however, e.g. like building funds, communal credit associations, holdings and exchange dealers, registration with the central bank is not required. As a result, quarterly data are hardly available for these units. To overcome this information shortage, different statistical methods are used. In most cases, annual data of the previous year are extrapolated.
After consolidating all different types of banks, the total levels of production, intermediate use and value added in current prices are determined. For each category the value index is calculated as the change in the current quarter compared to the base quarter. In order to attain a value in constant prices, a volume method is in effect for the largest groups of commodities and services, i.e. for direct services like commissions and for FISIM.

For constructing the volume index for commission fees, use is made of the MFI dataset. On the basis of this information, the total amount of commission can be decomposed down further into the different services on which commission fees apply. For each service a specific volume indicator is attributed. Subsequently, the different indicators are weighted on the base of the proportions of their adjacent services in the total amount of fees. This results in a composite volume index.

For FISIM the volume index corresponds to the deflated changes in the stocks of loans and deposits in the current quarter vis-à-vis the reference quarter.

Special purpose entities (SPEs) are obliged to register themselves to DNB and submit data on their transactions on a monthly or annual basis, depending on their size. For the QNA, SN uses international trade data on financial services, royalties and licences and 'other' services.

The output of SPEs consists of three items: banking fees, licences and royalties, and intercompany services. On the input-side banking services (both foreign and domestic) are supplemented by estimates of a whole set of smaller cost items, including FISIM. The main item on the input-side is intercompany services like legal, accountancy, management advise or (business) advertisements services.

The difference between export and import of royalties and licences is considered as domestic production (of royalties and licences) by SPEs. The assumption is made that the imports are completely re-exported. Data on the import and export of financial and other services correspond to the input and output of the SPEs. Output for domestic use are estimated additions. The value added of SPEs is equal to (or consists of) wages, salaries and social security contributions.

Constant price estimates are based on price changes in wages and salaries of the business services industries.

Insurance and pension funds: DNB provides quarterly data on pension funds and insurance corporations via a so-called Direct Reporting System (DRA). The DRA is a cut-off sample survey which is annually benchmarked on basis of the available supervisory data. The audited supervisory data on insurance corporations and pension funds are available approximately 8 months after the accounting year. At SN these DRA data are converted into national accounting concepts and definitions.

Value measurement of the output of life insurance services and pension services is calculated as operating costs plus the technical result (only for life insurance services). Theoretically this algorithm gives the same results as the ESA2010 algorithm for output measurement. For non-life insurance services the value measurement of the output is calculated conform ESA2010 as total premiums earned plus implicit premium supplements (equal to the property income earned on technical reserves) less adjusted claims incurred.

Volume measurement of the activities of insurance companies is obtained by using data on the amount of insurance policies provided by the Dutch Association of Insurers and by DNB (supervisory data on yearly basis). For pension services the volume measurement is based on the number of members, deferred members and pensioners with claims on pension funds (yearly provided by the DNB) and the number of filled vacancies available on a quarterly basis at Statistics Netherlands.

Financial auxiliaries (other financial services) consist of activities in the field of financial intermediation, consultancy etc. (not for insurance and pension funding), activities auxiliary to insurance and pension funding, insurance markets and fund management.

Quarterly output data are available for the next four groups: 1.Administration of financial markets, 2. Mortgage, credit and currency brokers, bank and savings bank agencies etc. and 3. Insurance agents. Group 2 is split up in a part mortgage and a part bank and savings bank agencies etc.

For the other parts of the financial auxiliaries it is supposed that the changes in output are the same as the development of one of the four groups. There are no data for the intermediate consumption, therefore this is supposed to have the same development as production value. Constant prices are based on changes in wages and salaries of the businesses in the field of financial auxiliaries.

4.1.12 Real estate activities

Sources and methods
Estimates are not based on direct surveys but on several volume indicators, such as the number of rental dwellings and owner-occupied dwellings (housing stock) and by using available price indices such as prices of rentals of commercial premises.

4.1.13 Professional, scientific, technical, administrative and support service activities

Sources and methods
Estimates are based on VAT data on turnovers on a quarterly basis supplemented with measurement of large enterprises. Additional labour information is used as a check. Value changes are deflated by using available price indices.

4.1.14 Public administration and defence, compulsory social security and education

Sources
The major part of the sector government is grouped into the industries of public administration and defence or subsidised education. Some government units are grouped into other industries like

forestry, railway infrastructure or financial services. These, however, concern only a small part of total government consumption.

Direct information is used for a very substantial part of the government; namely the Dutch State, the Municipalities, Joint-municipality arrangement, Provinces, Public Water boards and Social Security Funds. These sources cover compensation of employees, other taxes and subsidies on production, intermediate consumption expenditures, sales and social benefits in kind. However, the data on compensation of employees are replaced by Labour Accounts data, which covers the whole economy using data from the tax administration.

The Labour Accounts gives quarterly information on jobs, labour input and compensation of employees, decomposed into wages and salaries and social contributions. These estimates are usually already used for the quarterly flash estimates. Labour input plays an important role in the constant price calculations.

Taxes and subsidies: data on taxes and subsidies are obtained from the Ministry of Finance. The cash receipts from the various taxes are transformed to the accrual recording basis used in National Accounts by applying the time adjusted cash method. Almost all of these data are based on direct information.

Methods

The standard procedures are usually followed to estimate the various variables. Government production follows from the expenses, while government production less sales gives government consumption, which is decomposed into an individual and a collective part.

The calculation framework is given below.

Plus	Wages	(source: Labour Accounts)
Plus	Social contributions by employers	(source: Labour Accounts)
=	**Compensation of employees**	
Plus	Consumption of fixed capital	(PIM-method)
Minus	Other subsidies on production	(direct sources, see text
Plus	Other taxes on production	(direct sources, see text)
=	**Gross value added**	
Plus	Intermediate consumption	(direct sources, see text)
=	**Production (basic prices)**	
Minus	Sales	(direct sources, see text)
=	**Final production own consumption**	
Plus	Social benefits in kind	(ZIN and direct sources)
=	**Final consumption (of government)**	

For deflation a number of sources is utilized. The expenses of the government, broken down by commodity, are deflated on the basis of the CPI (Consumer Price index). The deflation of the consumption of fixed capital is pursued on the basis of the PIM-method.

A volume index of labour costs is derived by deflating the wages and salaries by the average change in the hourly wage agreed in collective negotiations between employers and labour unions. In the Dutch circumstances this index, generally speaking, is a good approximation of a pure price index. However, a part of the 'incidental' wage change must be considered a pure price component. As a result, changes in the wages and salaries caused by higher education or working experience and by changes in the composition of the labour force are included in the volume index. So all quality changes are included in the volume index. Employers' social contributions in constant prices are estimated by multiplying the value in the previous period by the volume index of wages and salaries.

The volume measure of other taxes and subsidies is calculated on the basis of the related variables. VAT, for example, is calculated on the basis of consumer expenses, investments and intermediate consumption. Finally, the volume measure of government production is calculated residually, just like the value measure.

4.1.15 Human health and social work activities

Sources and methods
This industry comprises of health, care and social work activities, Trends in this industry are mostly extrapolated using budget information, professional publications and information on hours worked and wages and salaries.

In health and social work activities, changes are based on data on public financing and on a model for volume estimates of production. Supplementary data on the number of employees and wages and salaries is also used. Since the introduction of the obligatory health care system in 2006, almost 80% of the health and social work activities are covered by final consumption of general government (social benefits in kind). Therefore the estimation in current prices is mainly determined by the outlays of general government. For the production estimates in constant prices a model for health care volume estimates described below is used. Because of this, the estimation of total supply of health care is done in strong dialogue with the estimation of general government.

The volume estimates of the supply of health care are based on a linear regression model using the least squares method. This model uses year estimates in constant prices of production and labour input and for the current year also the quarterly labour input. The model consists of a function for the labour productivity and a function which describes the development of the total labour input in time.

4.1.16 Arts, entertainment and recreation, other service activities, household services

Sources and methods
Due to a lack of short term information, volume trends in this industry can be estimated using yearly information such as annual reports, statistics, forecasts and publications from branch organizations. More specifically, the sources and methods for the individual categories of ISIC are as follows:

Creative, arts and entertainment activities: In this branch detailed consumer price indices are used. If there are no detailed consumer price indices available contractual agreed wages from labour accounts are used. Quarterly volume indicators are not available, therefor the estimate for this branch is mostly made by extrapolation the number of visitors and number of performances based on yearly information about entertainment from Statistics Netherlands, publications from branch organizations and information from the Ministry of Culture. Next to that information about the number of jobs is used from labour accounts.

Libraries, archives, museums and other cultural activities: The use of prices indices is similar to that for the creative arts and entertainment activities. Quarterly volume indicators are not available, therefor the estimate for this branch is made by extrapolation the number of registered users by libraries based on yearly information about libraries from Statistics Netherlands. Museums are extrapolated based on the yearly information about the number of visitors at museums from the Netherlands Bureau for Tourism (NBTC). Statistics Netherlands has also detailed data about museums, but this information is only available every 2 years. Next to that the annual report from ‘Natuurmonumenten’ is used for budget information about the number of hectares of nature reserve.

Gambling and betting activities: Price indices of lottery tickets and contractual agreed wages from labour accounts are used. The volume is based on extrapolating the yearly information from annual reports about the number of tickets sold and the number of visitors at casino’s.

Sports activities and amusement and recreation activities: In this branch detailed consumer price indices are used. The volume is estimated on extrapolation of the number of sportsmen based on yearly information from the main organizations for organized sports in the Netherlands (Dutch Olympic Committee and Dutch Sports Federation). Also extrapolation of the number of visitors by amusement parks from the NBTC and the number of vessels from an industry trade group for the Netherlands water sports business (HISWA) is used.. Because of the side-production in this branch also current price information from short term statistics from hospitality and advertisement services is used.

Activities of membership organizations: In this branch detailed consumer price indices are used. If there are no detailed consumer price indices available contractual agreed wages from labour accounts and contributions rates from a number of big organizations such as 'The Royal Dutch Touring Club' (ANWB) are used. The estimate of the volume is based on the number of subscripted companies in the Chamber of Commerce. Also extrapolation of the number of memberships by unions, political parties and churches are used. Beside the population growth in the Netherlands is used.

4.2 FISIM

Sources and methods
The calculation of FISIM is based on two main sources; interest rate statistics by DNB and stock estimates of Currency and deposits (AF.2) and Loans (AF.4). The interest rate statistics comprise of 'interbank' rates and various tariffs relating to lending and borrowing differentiated according to institutional (sub)-sector.

FISIM is calculated as the average of the opening and closing stocks of subcategories of Currency and deposits and Loans times the difference between the interest rates paid or received and the internal reference rate (or external reference rate for FISIM vis-à-vis the rest-of-the-world).

Volume measures of FISIM are derived by deflating the average of the opening and closing stocks of subcategories of Currency and deposits and Loans with the CPI.

Financial corporations are the only producer of FISIM. Households (in their role as consumers) pay FISIM as part of the final consumption expenditures and non-financial corporations (including household enterprises and owner-occupied dwellings) pay FISIM as part of intermediate consumption. The FISIM payments by industry are distributed according to their level of output.

4.3 Taxes less subsidies on products

Sources and methods
The most important taxes on products, apart from VAT, are levies on gasoline, diesel, tobacco and alcoholic beverages, taxes on insurance policies, taxes on purchases of existing homes and several taxes related to environmental objectives. Subsidies on products relate mostly to subsidies on public transport, research and social and cultural activities.

Nominal values of taxes and subsidies on products are obtained from the tax department of the Ministry of Finance. These cash-based data are simply converted to a valuation on transaction basis by applying a one month delay. Thus for the first quarter the tax data for February to April are taken, assuming that tax payments are made after the transactions have taken place.

Volume data on taxes and subsidies on products are computed on the basis of the volume changes of the underlying commodities. The share of taxes or subsidies in total domestic purchases in the base year is applied to the current domestic purchases. Price changes are derived residually as the difference between value changes and volume changes.

Three exceptions should be noted. The value changes of duties on tobacco, taxes on the use of electricity and gas and the vehicle registration tax are computed in the same way as the volume data. The consumption of tobacco is quite stable during the year while consumption of gas shows a clear seasonal pattern. As a consequence, the computed value data for these categories are more line with the volume data. The cash-based tax data show a different pattern due to specific payment characteristics.

5. GDP components: the expenditure approach

5.1 Household final consumption

The monthly consumption index is the main source for final consumption by households in the QNA. This index aims to give a first impression of household consumption expenditure on a macro-economic level and is an appropriate indicator for the short term business cycle. Although more details are published, the over the year value and volume changes of a number of main commodity categories are the essence of the consumption index. These categories are the consumption of food, beverages and tobacco, durable consumer goods, other goods, services and total and domestic consumption by households.

Sources and methods

Monthly turnover of the retail trade industry: household consumption is directly linked to turnover of retail trade. Consumers buy most of their goods from retail outlets and, vice versa, retail outlets supply virtually all their goods to consumers. Information on retail trade becomes available five to six weeks after the end of a reporting month at 5-digit level of the Standard Business Classification.

Consumption of petrol and energy: SN collects monthly data (physical quantities) on the consumption energy. Values are calculated with the use of price information. Turnover of petrol stations are used as an indication of consumption of petrol. A fixed ratio is applied to derived private and commercial consumption of petrol and energy.

Consumption of other services: consumption of services accounts for about half of total consumption expenditure. Some components of consumption of other services are available on a monthly or quarterly basis, but most data on services become only available during the compilation of the preliminary year, when the bulk of annual reports are published. Components not available monthly are calculated by extrapolation of quarterly data. Extrapolation yields acceptable results as the consumption of services is relatively less sensitive for business cycles.

International trade in services: information on tourist traffic is used to derive the consumption of non-residents (tourists) in the Netherlands and vice versa. The consumption of non-resident tourists in the Netherlands is subtracted from domestic consumption and added to the export of services. The consumption of Dutch tourists abroad is added to both domestic consumption and import of services.

Other internal SN sources: data on dwellings/housing (information on stocks and rents) are used as an indicator of consumption on housing (rents) and related services. Consumption of services of owner-occupied dwellings is valued by applying the rents of similar dwellings. Data on population growth has an effect on consumption and is used as a plausibility check.

External sources: detailed product specification of supermarket turnover is used to distinguish between food and non-food and to make a specification of food sales. Vehicle sales to households is taken as an indicator for the consumption of passenger cars, small trucks, company cars and motor cycles. Turnover figures of hotels and restaurants are obtained from an private research agency.

Consumer price index: the consumer price index (CPI) is used as a deflator. The CPI is compiled on a monthly basis and covers most of the commodities distinguished in the QNA. A few relevant prices are missing in the CPI such as prices for some medical services. Usually in these cases total CPI is used as a deflator for these items.

For the quarterly household consumption figures some additional information is used that is not available on monthly basis: quarterly turnover figures of hotels and restaurants, hairdressers and beauty parlours and consumption figures of medical services.

5.2 Government final consumption

The scheme for calculating government consumption of own production is given in paragraph 4.1.15. The government production for own consumption is divided into two components: the individual government consumption and the collective government consumption. The government expenses for education (except consumption of fixed capital related to research and development investments), health, welfare and cultural activities are ascribed to the individual consumption. The COFOG break down of government expenditures is used to make this splits. All other expenditures are regarded as collective consumption.

Sources

The National Health Care Institute (ZIN) gives quarterly data on the social benefits in kind. These social benefits predominantly relate to compulsory social insurance, essentially under the Medical Health Insurance Fund Act (ZVW) and the Long term Health Expenses Act (WLZ). The two Acts form the majority of the expenditures on social benefits in kind. The remaining benefits concern mostly expenses on disablement support, legal aid support, individual subsidies on rent, student transport subsidies and other social assistance. They are based upon direct information provided by the Dutch State, the Municipalities and other government bodies.

Methods

The volume measure of government production for own consumption is calculated as a residual. However, for subsidised education a specific volume method is utilised based on the number of pupils and students.

Concerning the social benefits in kind volume measures from ZIN and the health accounts are used for constant price estimates of health services. For the other social benefits each commodity, is deflated on the basis of the CPI.

5.3 NPISH final consumption

Source information on a monthly or quarterly basis is not available. The figures follow the changes in household consumption expenditure.

5.4 Gross capital formation

Gross capital formation consists of gross fixed capital formation and changes in inventories and valuables. Hardly any information is available on changes in stocks. The data are typically derived residually during the commodity balancing process. Data on valuables are not available at all on a quarterly basis.

Gross capital formation is an important final expenditure category. For the sake of the SUTs, the asset types are broken down into product groups. Gross fixed capital formation consists of producers' acquisitions less disposals of fixed assets; tangible as well as intangible fixed assets and major improvements to land (reclamation, land consolidation and land preparation for building). Fixed capital formation also includes:

- Construction work in progress, such as unfinished dwellings, non-residential buildings and civil engineering works, is recorded as fixed capital formation of the client.
- Military structures and equipment, similar to those used by civilian producers, such as airfields and hospitals.
- Improvements to existing fixed assets that go well beyond the requirements of ordinary maintenance and repairs.
- Transfer costs of fixed assets, such as conveyance fees and costs made by real estate agents, architects and notaries.
- Entertainment, literary or artistic originals.
- Weapon systems
- Research and development

Sources and methods
Gross fixed capital formation is based on the supply of the relevant commodities (indirect method) in the QNA. Information is based, for example, on construction statistics, imports and turnover data of different industries in manufacturing . In contrast, the ANA are compiled by using direct information on the expenses of industries, whereby the expenses are specified into different types of assets.

The value changes (over the year) are calculated with the aid of the turnover of the construction industry (construction turnover index), the monthly industrial production index, the value changes of the imports of capital goods, changes of the transfer taxes, changes of the turnover of architect and engineering agencies, changes in the different components of the transport industry and changes of cultivated assets.

For a large part (about 40 per cent), the estimated value index for gross fixed capital formation is based on the construction turnover index. As in the construction statistics on the supply side, the construction of new orders received is used to split total production into construction of dwellings and other buildings, based on the value of building permits. In addition to the construction statistics, information from architect and engineering agencies is used to estimate developments of different kinds of construction activities.

Gross fixed capital formation produced on own account: gross fixed capital formation produced on own account, e.g. developed and produced software for own use or production of machinery for own use, is estimated by using the changes in gross fixed capital formation of the corresponding goods.

Industrial output price indices are used to obtain volume indices. For deflators of the construction industry we refer to section 4.1.6. For the few types of commodities for which no data are available, the price and value changes of a related commodity is used or the changes are set to zero.

Disinvestments: disinvestments are assets that are sold abroad or domestically to consumers. Estimation of disinvestments is done differently for different assets. For example, disinvestments of leased cars are estimated by using investment flows from t-4 and t-3.

Gross fixed capital formation by industry of destination: the totals of the rows that result after putting in the changes are distributed to 7 industries of destination. The distribution is done according to the base quarter. Only for the construction of buildings actual information is available.

After the distribution to the different destinations, the VAT per destination is calculated. The VAT also depends on kind of product and type of asset. Publication of the quarterly gross fixed capital formation is inclusive of VAT. Furthermore non- deductible VAT on purchases of land is included in the gross fixed capital formation.

5.5 Imports and exports of goods and services

Imports and exports of goods
In the QNA the import and export of goods are specified into intra and extra EU trade. Exports are further classified into domestically manufactured products and re-exports (exports of imports).

Sources
The major source for imports and exports of goods are the International trade statistics compiled by the international trade department (TIH).

Enterprises whose intra EU imports or intra EU exports exceeds 5 million euros per year are obliged to submit data to Statistics Netherlands on a monthly basis. Over 13,000 enterprises meet this criterion.
Enterprises whose trade flow is between 1,5 and 5 million euro per year are obliged to submit their data to Statistic Netherlands on yearly base. About 14.000 enterprises meet this criterion.

Estimates of the remaining units importing and/or exporting goods are based on individual Value Added Tax declarations provided to Statistics Netherlands by tax authorities on a monthly basis.
Data on trade with non-EU countries mainly originate from the customs authorities. Some units that trade with non-EU countries have permission to supply data directly to SN, in a similar manner to the survey units trading within the EU. All data from survey units, which may arrive up to the last day of the month following the period under review, are included as response in the month concerned.

Methods
The input from TIH for QNA consists of: survey results, imputations for non-responding enterprises included in the survey and estimations for enterprises that are in the population but excluded from the survey. Following EU guidelines, TIH uses the Combined Nomenclature (GN code). For estimates and imputations TIH uses its own classification of commodities. For both classifications of TIH there is a link (a bridge) to the QNA-commodity group. The classification in the SUT is based on QNA-commodity groups derived from CPA/CPC classifications.

Estimating the level of trade of a commodity group in QNA is done according to the following method: firstly, the relative mutations per commodity group in the source statistics of the current quarter with the respect to reference period are calculated. Subsequently, using these relative mutations and the level of the corresponding quarter of the previous year in the QNA, the level of trade per commodity of the current quarter in current prices is calculated. For some commodities absolute mutations are used. This method is applied when the level of import or export of that commodity in the reference period in the source statistics deviates much from the level in the QNA The absolute mutation from the source statistics is then added to the level of the corresponding quarter of the previous year in the QNA which results in the level of trade in the current quarter in current prices. The source statistics measure cross border movements of goods as international trade, whereas for the QNA change of ownership is the criterion for international trade. The source statistics take account of some but not all corrections to for economic ownership. In the QNA the remaining corrections are made explicitly if the necessary data is both available and can be processed quickly, or, if not, implicitly by using relative mutations on NA-levels.

The data are deflated on the basis of producers' price data, which comprise of price indices of exports, imports and domestic prices. To deflate the exports of products manufactured in the Netherlands, both to EU and non-EU, the producers' price index of exports is used. For imports and re-exports to the EU and non-EU the price index of imports is used. If export and import prices are not available, the domestic price is used. In a limited number of agricultural commodities unit values are used.

As already mentioned above, the SUT contains the import and export of goods specified into intra and extra EU trade. It is also mandatory to divide EU trade in EMU-members and non-EMU members. However, as there is no balancing process at this sublevel, the ratio of EMU and non-EMU countries in the sources statistics is applied to the integrated QNA data.

Imports and exports of services
From the beginning of 2003 S|N started its quarterly survey on imports and exports of services (ITS). The ITS-statistics has been revised several times since then. The last revision took place in 2014; the current ITS-statics is fully consistent with ESA 2010. The main inputs of ITS are:

- Reports from 400 large enterprise groups;
- Reports from a sample of 5000 small and medium-sized enterprises;
- Household surveys and surveys with tourist accommodation providers;
- Data from the Dutch Ministry of Foreign Affairs and from the Dutch Ministry of Defence.
- Information on imports and exports of MFI's provided by the Dutch Central Bank (DNB)
- Information on imports and exports of services of SPE's is based on the survey conducted by DNB among SPE's.

ITS distinguishes the following service categories:

1 Manufacturing services
2 Maintenance and repair services
3 Transport services: further divided into sea transport, air transport and other transport (all further divided into passenger, freight and supporting services)
4 Travel: Business (border, seasonal, other short-term workers / other), Personal (health related / education related / travel related and recreational)
5 Construction
6 Insurance: premiums and claims
7 SG Financial services
8 Charges for the use of intellectual property n.i.e.
9 Telecommunications, computer and information services
10 Other business services: R&D /Professional and management consulting services / technical, trade related and other
11 Personal, cultural and rec.services: audiovisual and related services / other personal, cultural and recrational services
12 Government goods and services n.i.e.

Although merchanting is no longer considered a service according to ESA 2010, gross merchanting flows are surveyed by ITS for practical reasons. Because these goods do not cross the Dutch border they are not measured by the international trade in goods statistics.

Since the QNA still uses more service categories, these services are further subdivided with the help of a distribution key.

6. GDP components: the income approach

6.1 Compensation of employees, including components (wages and salaries)

Total wages and salaries by about 130 branches of industries is available on a quarterly basis from administrative records of the tax and social security authorities. These data are adjusted to ESA-definitions by adding wages and salaries in kind like the interest advantage of employees of financial corporations, free or reduced transport prices for employees of specific corporations, grants for kindergarten, free company cars, free meals, etc. Next to that 'black' wages and salaries, and grants for homework and commuting are added. The basic data also comprise of continued payment in case of sick leave. These payments are excluded from the wages and salaries and added to the employers' social contributions.

Data on employers' social contributions are derived from the administrative records of the tax and social security authorities and the pension funds.

6.2 Taxes less subsidies on production

The taxes on production comprise mainly taxes on motor vehicles, taxes on the ownership of houses and environmental levies. Subsidies on production consist mostly of wage subsidies for specific labour categories and EU-subsidies on agriculture and cattle breeding. Data are obtained from the Ministry of Finance and volume data are compiled in a similar way as the taxes and subsidies on products (see paragraph 4.2).

6.3 Gross operating surplus and mixed income

Gross operating surplus and mixed income are derived residually as the difference between the output of industries and their intermediate consumption, compensation of employees and taxes less subsidies on production.

7. Population and employment

SN produces Labour Accounts on a quarterly basis, in line and consistent with the QNA. The Labour Accounts provide statistics on the number of jobs, full-time equivalents (FTE's), contractual hours, hours paid, hours actually worked and compensation of employees, including a break down into wages and salaries and employers' social contributions. The accounts are broken down into 130 branches of industry (based on NACE), job size (full-time, part-time) and dependency (self-employed or family worker, employee). The major sources utilized are the recently integrated administrative registers of the tax and the social security authorities. The administrative registers of tax and social security covers almost all job of employees working in the Netherlands. The information about the jobs and worked hours of self-employed is obtained from the Labour Force Survey (LFS).

7.1 Population

A complete database on legal persons in the Netherlands is available, based upon administrative registers of municipalities. The temporal reference of the population is the average between two dates (based on monthly averages).

7.2 Employment: persons

The total number of jobs is monthly available from the administrative records of the tax and social security authorities. The translation to number of persons employed is pursued on the basis of the corresponding annual ratios. For the self-employed data on the number of jobs are available from the LFS.

7.3 Employment: total hours worked

The core of the Labour Accounts system contains data on contractual hours, paid hours overtime and total hours paid. To estimate hours actually worked different methods are used for employees and self-employed:

Employees**:** the so-called 'component' method is used. This means that the number of contractual hours is taken as a starting point. This number is translated into the number of hours actually worked by adding or subtracting various time components. Added time components are paid and unpaid overtime. Subtracted components are sick leave, pregnancy and maternity leave, short leave, bad weather leave and short-time. For data on the number of contractual hours (the larger part) and paid overtime of employees, the System of Labour Accounts is used as the main source. The other time components are derived from various other sources. Data on days lost because of strikes and on bad weather leave become available from specific registrations. Sickness and pregnancy leave is recorded quarterly in an establishment survey which approaches personnel departments. Data on maternity leave is used from the labour force survey and estimations for short leave are based on information from the labour cost survey. Some of these data are only available on annual basis and additional assumptions are needed to construct hours actually worked on a quarterly basis.

Self-employed: the hours actually worked per self-employed are taken directly from the Labour Force Survey. The number of self-employed (per NACE group) is taken from within the Labour Accounts system. Furthermore, information from the tax authorities is used as well to distinguish between self-employed working more or less than 24 hours a week

8. Flash estimates

8.1 Flash GDP estimate

The procedures for the flash estimates are completely similar to the regular estimates. The only difference concerns the availability of source data. In some instances only two months are available where for the regular estimates information relates to the full quarter. This applies for example to data on energy and agriculture. In most cases three months are already available but with a (somewhat) lower response and in some cases data is not available at all for the flash estimates, such as the wholesale and retail trade and the international trade in services; data are extrapolated on the basis of the growth rates of the previous quarter.

8.2 Flash employment estimate

The procedures for the flash estimates and the regular estimates are similar. As with the GDP flash estimates less data are available, often only two months or three months with less response. Moreover, the availability of data sources for the successive estimates is discussed further in chapter 10.

8.3. T+30 Flash GDP estimate

The following section gives a brief description of the sources and methods for the accelerated GDP flash estimate 't + 30', which is delivered to Eurostat from the first quarter of 2016.

Sources and methods

The quarterly t+30 flash GDP estimate is compiled using a production approach. This is first done on a monthly basis. The monthly outcomes are then aggregated into quarterly estimates. Estimates of monthly GDP volume growth are built from the supply side, using structural information from the national accounts and monthly over the year volume growth rates for separate industries. Over the year volume change of total value added is then compiled as the summation of the weighted growth rates of the separate components, using the value shares of the corresponding months of the previous year of each industry as weighting factors.

Next, total value added is converted from basic prices to market prices. Here we use the value of individual taxes and subsidies of the corresponding quarter in the previous year, multiplied by the growth rates of (mostly consumption related) activities associated with the individual taxes and subsidies.

The monthly over the year volume growth rates for separate industries are estimated using monthly statistics on the output produced (whenever available), or using a model-based approach with related indicators. Monthly statistics on the output produced are available for Mining and quarrying, Manufacturing, Production and distribution of electricity, gas and water and Construction. For the third month of each quarter, early releases, with usually lower response rates, are used.

For other sectors, such as the commercial services sector, monthly statistics on sales, output and prices are generally lacking and quarterly statistics are generally not timely enough. Here, a model-based approach is used. For commercial services[7], a Chow-Lin model for temporal disaggregation and extrapolation using indicator series that are available on a monthly basis is employed[8]. Out of a set of

[7] This sector comprises: G. Wholesale and retail trade, H. Transportation and storage, I. Accommodation and food serving, J. Information and communication, K. Financial institutions, L. Renting and buying and selling of real estate, M. Consultancy, research and other specialised business services and N. Renting and leasing of tangible goods and other business support services.

[8] Chow and Lin (1971) were the first to present a coherent and easily applicable econometric approach that handles interpolation problems for stock and flow variables. Assuming a linear relation between the series of interest (series for which observations are missing, i.e. a monthly GDP) and other data with more frequent recording (related series), a univariate regression equation is estimated.

47 candidates – indicators that are available on a monthly and timely basis, that are available over a sufficiently long period to enable us to thoroughly analyse and test their performance and that have a logical relationship with the series to be estimated – five indicators were selected: domestic household consumption (year-on-year volume growth), economic climate (a component indicator of consumer confidence, seasonally adjusted), number of bankruptcies of single-owner companies and trading partnerships (year-on-year change, two months average), the assessment order position of manufacture of intermediate goods (a component indicator of the Netherlands Business Survey) and the assessment of realized turnover for Total services (a component indicator of the Netherlands Business Survey). The Chow-Lin method is also used for Culture, recreation and other services.

For Agriculture, forestry and fishing, year-on-year volume change is estimated with the help of an ARIMA model. For Government and education and Health and social services, the last available (quarterly) observation is replicated.

The approach for estimating the t+30 flash GDP estimate takes very little production time (less than one day), which allows us to use the latest available source information till 28 days after the reference quarter. Real-time simulation over the period 2005 up till now has shown that, when the outcomes are compared to later estimates, the approach performs quite well. For more details, the reader is referred to Hoven & Schreurs, 2014[9].

Chow, Gregory C. & A. L. Lin, 1971, *Best linear unbiased interpolation, distribution and extrapolation of time series by related series*, The Review of Economics and Statistics, Vol. 53, nr. 4, Nov. 1971, pp. 372-375.

[9] Hoven, L. & G.J. Schreurs, 2014, *Towards a monthly indicator of economic growth*, paper presented at the 32nd CIRET Conference, Thu, October 9 –Sat, October 11, 2014, Hangzhou, P.R. China.

9. Main data sources used

The QNA data sources are discussed extensively in the Chapters 4 and 5. This section provides a summary of the most important sources.

9.1 Production approach

The estimation of agriculture, forestry and fishing is based on information collected by several surveys on agricultural quantities of SN (e.g. harvest estimations, slaughtering, dairy products) including the price statistics of the Agricultural Economics Research Institute. The periodicity of the source data is monthly. Fishing is derived from fish processing sales data. The source coverage is virtually complete, also for the flash estimate[10].

For mining and quarrying, gas and water supply, the Dutch Energy Balances are used for physical measures of produced and used volumes. These balances are mainly based on monthly information of the Dutch exploration and production company (NAM) and the Dutch gas supplier (Gasterra). Producer prices are used as deflators. The estimation of exploration activities is based on deflated (monthly) turnover data.

The industrial turnover index (monthly) is the main source statistic for manufacturing. This statistical survey provides turnovers divided into domestic sales and export and additional information on quantities produced, use of raw materials and hours worked (see paragraph 4.1.4). The coverage for the QNA estimates is almost 100 per cent.

The turnover index on construction is based on a monthly survey with a coverage of almost 100 per cent. The coverage for the flash estimate is approximately 90 per cent. The statistics progress buildings is used as additional information for the estimation of the production of the construction industry. This source on a monthly basis provides information, based on building permits, regarding the production of new buildings and dwellings.

VAT data on turnover on a quarterly basis (supplemented with survey data of large enterprises) is a major administrative source and is used for: transportation and storage, accommodation and foodservice activities, information and communication, professional, scientific, technical, administrative and support service activities. The coverage is generally above 90 per cent. The flash estimate has a much lower coverage, with an average of approximately 25 per cent.

Other administrative sources: e.g. data from the Central Bank of the Netherlands (DNB), quarterly business reports of the largest banks, insurance and pension funds, government budgets and accounts, budget information about health and care and data on taxes and subsidies from the Ministry of Finance.

The compilation on a quarterly basis of the Labour Accounts provides variables such as the number of jobs, full-time equivalents, wages and salaries and hours worked. The major sources utilized for the accounts are the administrative registers of the tax and the social security authorities. The accounts are a direct source for a number of industries, e.g. the government sector, health and care, arts, entertainment and recreation and household services. The coverage is almost 100 per cent. The flash estimate has a coverage of approximately 70 per cent.

9.2 Expenditure approach

The monthly consumption index provides value and volume changes of a number of main commodity categories. The index is based on a variety of sources, among which monthly retail trade statistics,

[10] For further details on the definition and method of the source coverage reference can be made to chapter 10

vehicle registrations and sales data on restaurants and bars, but estimations are made for some products, notably foodstuffs, which are purchased directly from suppliers as well as several services, of which financial services and healthcare services are the most important. The total coverage of household final consumption by measurement is 78 per cent. The flash estimate has a coverage of approximately 66 per cent.

With respect to the international trade in goods (monthly survey) about 95 per cent of total imports and exports are covered by observation (hard data). The remainder is imputed for non-response or non-coverage. The coverage of intra-EU trade is somewhat lower, while the coverage of extra-EU trade is somewhat higher. The flash estimate has a coverage of approximately 80 per cent.

The compilation of the international trade in services (quarterly survey) is mainly based on the reports of 400 large enterprises, a sample of 5000 small and medium-sized enterprises, household surveys and data from the Dutch Ministries of Foreign Affairs and Defence and the Dutch Central Bank. The coverage is approximately 93 per cent. The flash estimate is based on a model. For a detailed description of the international trade statistics see paragraph 5.5.

The major part of the estimation of the gross capital formation is not based on direct observation but on the basis of the origin of the investment goods, mostly from import, construction and manufacturing statistics. These data cover about 85 per cent of total gross capital formation.

As the supply and use tables are balanced simultaneously in current prices and volume terms, production, intermediate consumption and final expenditures have to be deflated separately by applying producers prices for output, export and import (PPI's), consumer price indices (CPI's), and price indices for services. In a number of cases where price indices are not available, volume indicators are used; examples are FISIM, health and education. The compilation of price indices is on a monthly basis. The timeliness is less than one month after the reporting month. However, the response may be lower in the flash estimate.

10. The GDP source coverage indicator

10.1 Introduction

This section covers the definitions of the two variants of the source coverage of the quarterly estimates of economic growth, the principles of the method for the calculation of the source coverage and the results of the calculations based on a updated inventory of data sources. In addition, the development of the source coverage in the course of time is analysed for both the supply side (production) and the expenditure side. The data coverage is calculated for the t+30, t+45 and t+90 quarterly estimates of GDP growth. Finally, an overview is provided of measures taken to improve the quality of the QNA and hence the source coverage.

10.2 Methodology of the source coverage indicator

A systematic investigation of the data sources of the QNA was the starting point of the calculation of the 'absolute source coverage'. This is the percentage share of GDP covered by direct source information (i.e. the actual data measured). Source statistics are here also described as directly measured information on certain variables such as production, consumption, gross capital formation etc. The calculations were made for the supply side (production) and the demand side (expenditures). Initially for reporting year 2010 and then for this inventory for reporting year 2015 based on an updated inventory of data sources[11].

The definition of the **source coverage** is as follows: The percentage share of GDP covered by **direct** (measured) sources. This is determined by the timeliness (month or quarter) and the response of the source statistic. Two variants of the source coverage are calculated: the absolute and the relative source coverage. The **absolute source coverage** indicates the degree of the actual coverage of GDP by the sources and the **relative source coverage** quantifies the extent to which the coverage changes (decreases) as the timeliness of the estimate accelerates.

The method has the following principles:

- There is no qualitative distinction between sources based on comprehensive measurement and (in case of 100 per cent response), based on a sample.

- There are no qualitative statements about indirect sources, such as models and the like (including imputation and grossing-up methods).

- All indirect estimation methods have an equal rating, namely zero per cent.

- The source coverage of total GDP is calculated as a weighted average of the underlying components, which means for the production at the level of groups of economic activities (share of value added) and for the expenditures at the level of the expenditure categories). The weights are the shares of value added in GDP (in current prices).

- The t+90 GDP growth estimate applies as a benchmark for the relative source coverage, which gets a 100 per cent score, regardless of the quality of the source information at the commencement time of the production process of this estimate (= t+75).

[11] The calculation of the data coverage ratio is based on the sources of GDP at current prices. It is therefore exclusive of data on prices.

For clarification an example (absolute source coverage) of the use of both an indirect and a direct method for the QNA flash and regular estimate. Suppose the estimate for the 'flash' is based on measured information for the first two months and that the third month is estimated with a model and that the regular estimate has three months of measured information. Furthermore the response of the source statistic has a score of 70 per cent for the 'flash quarter' and 80 per cent for the 'regular quarter'. Then the coverage rates are as follows:

	T+45 'flash' estimate	T+90 'regular' estimate
Source	Indirect (model)	Direct (by measurement)
Source coverage	46.7% *	80%

* *Two months available means a coverage of 67%. The indirect method relates generally to 1/3 of the source data and gets a coverage of 0%. 0.67*70% therefore provides a cover of 46.7%.*

The table shows the absolute and relative source coverage's for the production side and the expenditure side. The following commencement times of the production process for the quarterly estimates are distinguished:

T+21: This variant describes the accelerated flash estimate; the figures become available at t+30.

T+28: This variant describes the flash estimate; the figures become available at t+45.

T+75: This variant describes the regular estimate; the figures become available at t+90.

10.3 The results of the calculations

The table below shows that the relative source coverage on the supply side (production) at the current flash estimate drops to 67 per cent (with respect to the regular estimate on t+75, which has a coverage of 100 per cent). An acceleration to t+21 results in a substantially lower coverage of 40 per cent. This is due to a limited availability in source data on commercial and non- commercial services. The source coverage is (slightly) higher on the expenditure side, but the reduction in coverage from the current flash estimate (83 per cent) to t+21 (60 per cent) is less compared to the production side. This can be explained by the relative high coverage of the international trade in goods and the consumption of households and the relatively stable or even equal source coverage of all expenditure categories (except final government consumption) for t+28 and t+21.

Note that the effect of an acceleration from t+28 to t+21 on the relative source coverage of the expenditure categories imports and exports of services and gross capital formation is negligible, but that the actual (absolute) source coverage is low or even zero.

The source coverage of 2015 has improved in comparison with the source coverage of 2010 (supply and expenditure side). The main explanations are the improvement of the response and timeliness to a number of existing source statistics (for example, turnovers of the industrial activities, construction and the international trade in goods statistics), the introduction of new or different source data (for example the use of VAT data for transport, post, information and communication, other business activities and other service activities, the use of external volume indicators for real estate activities and the use of labour accounts for activities of employment agencies), and finally that sometimes slightly different choices are made than in 2010 in delimiting direct and indirect sources. For example, the recently introduced model for the estimation of the care sector is considered now as a direct source, in so far as it relates to the input of labour data. The consideration here is that the labour accounts data is an important indicator for the development of the value added. In addition, the consumption of fixed capital in both the government and the care sector are considered as a direct source, which also has a positive effect on the source coverage at t+21. The source coverage of the government also benefits somewhat from the higher response of the international trade in goods.

Note that for some activities the use of VAT data has led to a lower (absolute) source coverage. The explanation is that VAT data have replaced turnover source statistics, which scored higher in terms of response. This phenomenon is even more visible in the course of the relative source coverage on the

sections other business activities and care and other service activities. That explains why the 2015 rate t+21 (relative data coverage, total production) scores worse than the 2010 rate.

Table 1: Absolute source coverage rates (macroeconomic level) at t+21, t+28 and t+75, as measured in 2015 and 2010

		t+21	t+28	t+75
Production approach	**2015**	**27**	**49**	**80**
	2010	**22**	**37**	**68**
Agriculture, forestry, fishing	2015	72	73	89
	2010	52	56	69
Mining and quarrying	2015	80	93	93
	2010	60	61	90
Manufacturing	2015	85	90	91
	2010	67	76	86
Electricity, gas and water supply	2015	60	72	99
	2010	68	69	100
Construction	2015	90	90	99
	2010	63	65	97
Trade and repair	2015	5	8	9
	2010	2	5	10
Hotels and restaurants	2015	15	35	90
	2010	15	30	90
Transport, post, information and communication	2015	0	27	94
	2010	0	38	94
Financial activities	2015	35	50	100
	2010	33	49	100
Real estate activities	2015	22	67	100
	2010	12	12	60
Activities of employment agencies	2015	33	44	97
	2010	17	17	93
Other business activities	2015	0	26	93
	2010	0	0	81
General government	2015	26	73	97
	2010	4	70	93
Care and other service activities	2015	5	46	61
	2010	2	7	8
Expenditure approach	**2015**	**36**	**55**	**68**
	2010	**24**	**38**	**53**
Final consumption households	2015	51	66	78
	2010	40	49	66
Final consumption government	2015	20	63	83
	2010	0	35	50
Gross capital formation	2015	9	10	11
	2010	10	11	17
Exports – imports of goods	2015	68	80	95
	2010	62	77	92
Exports – imports of services	2015	0	0	93
	2010	0	0	90
Changes in inventories	2015	0	0	0
	2010	0	0	0

Table 2: Relative source coverage rates (macroeconomic level) at t+21, t+28 and t+75, as measured in 2015 and 2010

		t+21	t+28	t+75
Production approach	**2015**	**40**	**67**	**100**
	2010	**49**	**66**	**100**
Agriculture, forestry, fishing	2015	81	82	100
	2010	83	88	100
Mining and quarrying	2015	86	100	100
	2010	67	67	100
Manufacturing	2015	94	99	100
	2010	78	88	100
Electricity, gas and water supply	2015	60	73	100
	2010	68	69	100
Construction	2015	91	91	100
	2010	65	67	100
Trade and repair	2015	96	99	100
	2010	90	94	100
Hotels and restaurants	2015	17	39	100
	2010	17	34	100
Transport, post, information and communication	2015	0	29	100
	2010	0	40	100
Financial activities	2015	35	50	100
	2010	33	49	100
Real estate activities	2015	22	67	100
	2010	43	43	100
Activities of employment agencies	2015	34	45	100
	2010	18	18	100
Other business activities	2015	0	29	100
	2010	4	4	100
General government	2015	27	75	100
	2010	4	75	100
Care and other service activities	2015	9	76	100
	2010	93	99	100
Expenditure approach	**2015**	**60**	**83**	**100**
	2010	**53**	**82**	**100**
Final consumption households	2015	65	85	100
	2010	71	80	100
Final consumption government	2015	24	76	100
	2010	0	85	100
Gross capital formation	2015	91	91	100
	2010	82	91	100
Exports – imports of goods	2015	72	84	100
	2010	67	84	100
Exports – imports of services	2015	0	0	100
	2010	0	0	100
Changes in inventories	2015	100	100	100
	2010	100	100	100

10.4 Measures to improve estimates and data sources

Estimates
In recent years several measures have taken to improve the quality of the estimates. Some examples.

- An important innovation is the implementation of an automatic balancing process ('the balancing machine'). For a detailed explanation of this phenomenon we refer to 3.2.3.
- QNA continuously monitors the adjustments in the subsequent economic growth estimates, which results in a variety of studies to improve the estimates and the data sources.
- Recently the lead time of the flash estimate has been shortened by two days (by means of a lean-6-sigma approach). Since 2015 Q3 the production process starts two days later, allowing the use of source material with a higher response. This applies in particular for the quarterly source data in commercial services, making the adjustments in turnover between the flash and regular estimate for this sector smaller.
- Recently seasonally adjusted quarter-on-quarter developments are earlier available in the production process of QNA. Previously this information was only available during the final consultation to validate the results of the estimation. This additional information has provided an important contribution to an adequate analysis of the economic picture that emerges from the figures.

Data sources
A systematic investigation of the various data sources for the growth estimates of the branches and expenditure categories in the economy was carried out in recent years, to raise the source coverage measured in 2010. This revealed that there were still many opportunities to improve the use of data sources. In general, it involves improvements in the response and timeliness for several source statistics and the introduction of new sources. The main examples are:

- Turnover of manufacturing and construction: improvements in the response and timeliness.
- International trade in goods: improvements in the response.
- International trade in services: improvements in the response and timeliness.
- Hotels and restaurants, transport, storage and post, information and communication, business activities: introduction of new source statistics on a quarterly basis, the 'VAT based turnover estimates'.
- Banking: improved dataset on financial services from the Central Bank of the Netherlands (DNB)