Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

10-Sep-2013

English - Or. English

Directorate for Financial and Enterprise Affairs
Statistics Directorate

COM/STD/DAF(2013)9
Unclassified

Working Party on Financial Statistics

NEW DESIGN OF THE DUTCH SECTOR ACCOUNTS COMPILATION PROCESS REPORT

To be held on 30 September - 1 October 2013
OECD Conference Centre
Beginning at 10:00 a.m. on the first day

This document has been prepared by Bram de Boo (Statistics Netherlands) and will be presented under item 21 of the draft agenda

JT03344144

English - Or. English

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REPORT

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1. Introduction

In 2006, Statistics Netherlands' National Accounts department was confronted with a budget cut of 25 to 30 percent, to be realised in a period of six years. The management concluded that this could only be realised by redesigning the complete production process of the National Accounts. Although ideas for a redesign had already been present for some time, it had proved difficult to realise them during regular operations, as implementation would require a major investment. The imposed budget cut offered a good opportunity to invest in a new design.

This paper presents the new design of the Dutch sector accounts compilation process. It starts with the ideas underlying the new design and the improvement to be achieved. Subsequently, it explains how these ideas were developed in the context of the sector accounts by describing the main elements of the new design. The paper concludes with the first experiences and future developments.

2. Redesign of the National Accounts

Because of budgets cuts affecting Statistics Netherlands, the management of the National Accounts department was asked to develop plans to reduce the capacity earmarked for the production of the National Accounts by 25 to 30 percent across a period of six years. This was a substantially larger reduction than those affecting the department in the past; the management concluded that the days of regular trimming were past, and it was time for a radical change. As a result, ideas about new ways of processing the National Accounts that had already been present for some time were combined to develop a new design for the National Accounts. In addition to making the process more efficient, the aim was to improve the flexibility of the compilation process and make it more transparent.

2.1 Design principles

One important precondition for the redesign of the National Accounts was the new business architecture, which had been developed by Statistics Netherlands as part of the HEcS innovation programme. This programme comprised the redesign of the chain of economic statistics within Statistics Netherlands; it encompassed the redesign of the general business register, the data collection strategy for short-term statistics and the structural business statistics, based on sales taxes and the employment and wages registration and the National Accounts. The programme also provided for the introduction of a new unit to process consistently all information from about 300 large or complex enterprises.

The HEcS programme shifted the focus from individual statistics and their processes to chains of statistics. Therefore the redesign of the National Accounts had to be attuned to the redesign of the processes for data collection and processing, and vice versa. In this way data collection could be optimally adapted to the data needs for the National Accounts and thus prevent duplication of work like checking, correction and completing the data.

[1] The auteur thanks H.J. Nijmeijer for reading the concept and the useful suggestions.

To facilitate the combination of individual statistics, the new architecture introduced a number of breaks in the production chains. These breaks are Inputbase, Microdata, Statbase and Outputbase. These respective bases contain the raw source data, data during processing, confidential data sources for the publications, and the data available for users. Between the breaks, one or more statistical operations take place for which - depending on the type of operations – sub-breaks can be introduced. This architecture improves transparency and facilitates the exchange of intermediate products between different statistics. It also enables the use of a common-database structure for the statistics of Statistics Netherlands, which reduces costs.

As more and more public activities are taking place digitally, and businesses and organisations are becoming increasingly reluctant to supply information for statistical purposes, the compilation processes need to be more flexible. Statistics Netherlands is increasingly required to source its data from registrations. As these registrations are dynamic both in content and quality, our statistical processes have to be flexible enough to cope with these sources. The same can be said for the national and international users: their desire for more details and quicker delivery require more flexibility in the production processes. The experience is that the old compilation process of the National Accounts had its limitations in this respect.

A third aspect of the statistical process that was changing was the growing demand for transparency and reproducibility, in terms of both the product: *what do these figures mean?* and the process: *how are published figures compiled?* This demand is expressed nationally, but international organisations in particular are urging national statistical institutes to provide all kinds of meta information. With the old fragmented processes, fulfilling these wishes was very time consuming.

2.2 Working out the principles

The need to make the Dutch National Accounts more efficient, flexible and transparent, and get it in line with the new business architecture resulted in the formulation of a number of principles for the new design. In this way the management of the National Accounts department structured the redesign of the various parts of the National Accounts, such as the supply-and-use tables and the sector accounts.

2.1.1. One annual revision

Statistics Netherlands publishes four annual National Accounts estimates. The first is published after 90 days, as the sum of the four quarters. The final estimate is published after 30 months, following two revisions at 6 and 18 months after the end of the year. Most of the annual estimates are based on incomplete sources, as these sources have their own timetables depending on their own purposes. As a result, sources for the different branches and sectors of the National Accounts are available at different moments and most of them undergo several revisions. For the compilation of the National Accounts, which has its own timetable, this means that capacity is needed to estimate missing figures or to revise earlier estimates several times. To reduce the capacity spent on the compilation process, it was decided to restrict the number of annual revisions to one, i.e. the final one. The consequence is that the quarterly estimates are kept unchanged until the final annual estimate becomes available, unless counterpart branch or sector information becomes available, in which case this information is used to adapt parts or proportionate parts of a branch or sector.

2.1.2. Automatic reconciliation

The decision to restrict the number of annual revisions and revise the branches and sectors without new information only partially or proportionally was facilitated by the recent development of automatic procedures for efficient reconciliation of the various branches and sectors of the National Accounts. This

resulted in software applications, based on a model of the national accounts with constraints and optimisation procedures. The outcome are consistent solutions for the supply-and-use and the whom-to-whom tables. The applications can be used for one individual period, but also to find a simultaneous solution for several sequential annual and quarterly estimates.

The reconciliation applications were introduced by Statistics Netherlands some years ago to align the quarterly accounts to the annual accounts. To find a solution they apply procedures based on the multivariate Denton method to align the variables over time, so preventing jumps between last and first quarters of the years concerned by a non-equal spreading of the annual adaptations over the four quarters; and to align the variables within one period to enforce consistency of the system. The multivariate Denton method was extended by Statistics Netherlands with the introduction, next to the unconditional constrains, of reliability weights, running from A to G, to cope with differences in the quality of the source data. As a consequence of the introduction of the latter 'soft' constraints, some variables will be adjusted more than others.

The solution found by the reconciliation applications is perfectly consistent, but not necessarily plausible. So the outcome must be judged by an expert in terms of plausibility. This plausibility can be reached by using the space that is created by the chosen combination of reliability weights.

The reconciliation application was originally developed for the alignment of the quarterly figures to the annual figures for a number of consecutive years. With small adaptations it could also be used to align the figures of one period and to estimate time series between to reference periods. So within Statistics Netherlands there now applications to align quarterly figures to annual figures, *the rebasing machine*, applications the find a consistent solution for one period, *the balancing machine*, and applications to estimate time series, *the time-series machine*.

Automation of the reconciliation improved the transparency of the process and the reproducibility of the results, as the rules, constrains and weights used for every reconciliation are fixed in the specific version of the software of the applications.

2.1.3. Top-down approach

The introduction of automatic reconciliation offered the possibility to centralise the reconciliation process. In the former process, individual specialists conducted the reconciliation on their own and by hand. This required relatively much capacity and completion time, also because time was spent on solving discrepancies too small to matter in the end or that were brushed aside later on. To improve this part of the process it was decided to introduce a top-down approach in which decisions about the reconciliation are taken by the project manager of the reconciliation, while the specialists are asked to concentrating on the problems that really need to be solved.

To facilitate this centralized process, several tools were developed to analyse the quality of the results. Like a dashboard, these tools show different aspects of the results. Originally the intention was to make these analyses objective, by introducing a predefined set of norms and standards. However, this was difficult because setting these standards and norms resulted either in a massive number of irrelevant discrepancies, or only in discrepancies already known from experience. Therefore the indication of discrepancies to be analysed is based on the developing experience of the experts involved.

3. The new design of the sector accounts

The redesign of the National Accounts started with the redesign of the production process of the supply-and-use tables, as the implementation of the design principles formulated by the management for this part of the National Accounts was quite straightforward. For the sector accounts, there was a general

idea about the implementation of the principles, but the practical implementation still had to be developed. Moreover, staff capacity - especially in terms of qualified specialists - to implement the redesign for the supply and use tables and the sector accounts at the same time, was lacking.

The implementation of the general National Accounts redesign principles for the processes of the sector accounts was an intensive process, because the sector accountants involved felt that the automatic reconciliation process was not suited for the sector accounts. In these accounts the consistency of the interrelations between the sectors should be treated differently from those in the supply-and-use tables. For the supply-and-use tables there is relatively limited information about the mutual supply and use of the different branches, while there is detailed information about total production and intermediate consumption. So an automatic way of finding consistent supply and use table can be justified.

Especially for the financial account of the sector accounts, on the other hand, much more information is available about the interior of the whom-to-whom tables. Besides the users are also very interested in these mutual relations. So an automatic reconciliation of the interrelations in the whom-to-whom tables could reduce the quality of the sector accounts considerably.

Another argument to treat the sector accounts differently was that in the Dutch National Accounts the supply-and-use tables concentrate on volume changes in the economy, while the sector accounts focus more on the size of the transactions and the balance sheets positions.

The scepticism of the sector accountants was solved by introducing an extra stage in the reconciliation process of the sector accounts, in which the well-known and attention-receiving structural reconciliations are settled first. Subsequently, important discrepancies that appear are analysed and solved by hand. The remaining - less important – discrepancies can be solved automatically, resulting in a consistent set of accounts.

However, the sector accounts had to make one concession to the technical aspects of the applications in terms of the active estimation of the other changes in volume. Within the financial accounts, these other changes in volume are part of the relation between the opening balance sheet, transactions, and the closing balance sheet. In the former process, other changes in volume was calculated as the discrepancy between the opening and closing balance sheet and the financial transactions. This was no longer possible with the way the reconciliation applications of the new design find an optimal solution. Specialists are now asked to estimate other changes in volume actively, and the application establishes the closing balance sheet, which required an extra constrain because negative balance items are not allowed.

3.1 Systematic reconciliation machine

The reconciliation process of the current and financial accounts of the Dutch sector accounts starts with the import of the accounts for the individual sectors into the reconciliation database. Due to the independent compilation of these accounts, mutual relations, whether they be transactions in the current account or transactions and positions in the financial account, may differ. In the Dutch situation these discrepancies may be or systematic or incidental. Systematic discrepancies occur as a result of differences in the quality of sources or lack of sources. Incidental discrepancies may have several causes, e.g. errors, changes in sources, etc. and should be analysed and solved in every compilation.

The solution for systematic discrepancies is straightforward: a decision has previously been made on how to cope with these discrepancies. In the past this was executed manually by the analysts for each estimation. Although part of a fixed methodology, in reality these systematic reconciliations were regularly performed individually because the analysts combined these adaptions with actual knowledge about source quality and the correction of incidental discrepancies. On the one hand this was advantageous for the

quality of the sector accounts, but on the other hand it did not help in terms of transparency and reproducibility. Besides, it was a time-consuming way of working.

In the new design of the sector accounts, the systematic discrepancies are solved automatically. A software application, the systematic reconciliation machine, was developed to do this. To instruct this application analysts were asked to substantiate their standard corrections of the systematic discrepancies anew. Following a check by the reconciliation management, these rules were fed into the systematic reconciliation machine. The corrections by the application are structured by type: for example, the overwriting of a transaction in the account of one sector by the information of a transaction of its counterpart sector; or the breakdown of one transaction in a sector across several counterpart sectors. There are about 20 types of correction for almost 3000 systematic corrections.

This automatic correction improves transparency, consistency and efficiency. It also speeds up the reconciliation: this stage of the reconciliation process now takes only a few hours.

Figure 1. Systematic reconciliation

		Non Financial Enterprices		Financial Institutions		General Government		Households	
		Assets	*Liabilities*	*Assets*	*Liabilities*	*Assets*	*Liabilities*	*Assets*	*Liabilities*
Before									
	Taxes					50			
	Long term loans		30	100					20
After									
	Taxes		50			50			
	Long term loans		60	100					40

An automatic reconciliation of the systematic discrepancies does run the risk of becoming an 'auto-pilot' process, in terms of losing the relation with the arguments for the correction in time. To reduce this risk, specialists are asked to check and confirm the rules for the automatic reconciliation every year, at the beginning of a new production cycle. After this confirmation, the rules are fixed for the duration of the whole production cycle that lasts one calendar year.

In principle there can be different standard rules for the reconciliation of the quarterly and annual estimations as a consequence of different relative quality of the sources for the quarterly and annual estimations. Until now this has not been necessary.

One of the consequences of the introduction of the systematic reconciliation machine is the requirement that - after the import of the individual sector accounts - the database must be complete. This is not actually a new requirement, but in the former way of working it was not a necessary one. So specialists used this space to create some extra time to do their compilation by importing no or provisional figures into the database and supplement or correct these figures during the reconciliation stage. The systematic reconciliation machine, however, is based on the assumption that the database is complete. An incomplete database would lead to technical failure of the application, and would hamper the subsequent central analysis of the discrepancies. This places extra pressure on the specialists to finalise their accounts in time, but results in a better structured and more transparent process.

3.2 Solving discrepancies

The discrepancies between mutual transactions and positions between the sectors of the sector accounts that remain after systematic reconciliation are either systematic discrepancies that are too large to

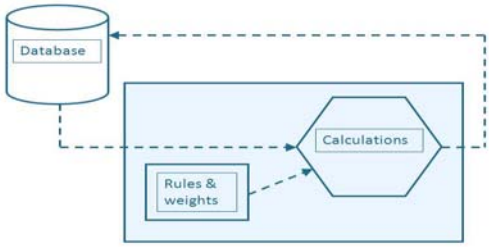
be solved standardly, incidental discrepancies, or small discrepancies. The last category is accepted in this stage of the reconciliation process because they can be solved automatically later on. The large systematic and incidental discrepancies are mostly discrepancies between the transaction or position as reported by one sector in its account, and the sum of the transactions or positions reported by the counterpart sectors. This can be both due to discrepancy between the sources used or the lack of information for one of more counterpart sector figures.

Immediately after the standard corrections have been implemented, the figures are analysed by the reconciliation management, to detect discrepancies that need extra clarification.

For discrepancies marked out as relevant for the final outcome by the reconciliation management, specialists are asked for extra information to confirm the figures or to come up with a proposal to eliminate the discrepancy. During the reconciliation of the quarterly accounts, the specialist has one or two days for the extra analysis. For the annual estimation there is more time to find a solution.

The suggested solution may be a correction of a figure, for example in the case of erroneous or misinterpreted sources, or an adjustment of the figures because of the relative quality of the source. These proposals take into account not only the transaction concerned, but also the consequences for the rest of the accounts, such as the discrepancy between the balancing items of the current and financial account.

Figure 2. Recursive automatic reconciliation process



The adjustments are implemented by the specialists in close consultation with the reconciliation management, in order to monitor the adjustment process and the consequences for the figures for the other sectors and transactions.

After the solutions for relavant discrepancies have been fed to the database, the reconciliation application is asked to find a consistent solution for the system by solving the remaining discrepancies. The solution found by the application is a perfectly consistent, but not necessarily a plausible set of transactions and accounts. So the specialists, especially those who suggested solutions for the large discrepancies, are asked to check the figures again. This mostly results in additional suggestions which are again fed to the system, be it an adaption of the figures in the database or in the rules or weights of the application. In this way, in several optimisation rounds an acceptable result is reached.

The result at this stage of the reconciliation process is consistent and plausible for the transactions and positions (whom-to-whom matrices), but not necessary for the balancing items of the current and the financial account. These discrepancies, the so called statistical discrepancies, are another indication of the quality of the solution found. Therefore, the specialists are subsequently asked for an assessment of these

discrepancies and suggestions to diminish them. The reconciliation application is rerun with the suggested adjustments. This process ends when the remaining discrepancies are plausible, e.g. in line with the sources used, or small enough to be accepted. For the 'financial institutions' and 'government' sectors this means that in the last run these discrepancies are forced to zero, while for the other sectors the sources are so diverse that some discrepancies between the current and financial accounts must be accepted.

3.3 One annual estimation

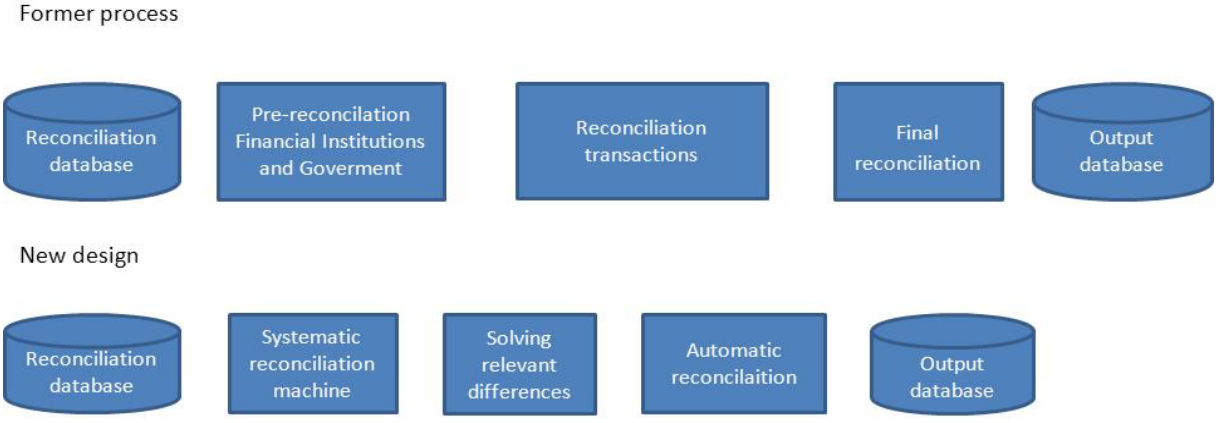
For the sector accounts, Statistics Netherlands publishes four estimations every calendar year. This publication cycle starts three months after the end of the year concerned with the publication of the first annual figures: the sum of the four quarters. Three months later the first revision of this annual figure is published, together with the second and the third revisions respectively of the two preceding years. The third revision is considered as the final estimate. Originally all figures were compiled anew for each revision.

The principles for the new design of the National Accounts reduce the number of annual compilations to just one. This principle could however not be implemented fully in the new design for the sector accounts, mainly because the Dutch sector accounts are used to fulfil the requirements of the Excessive Deficit Procedure of the European Commission (EDP). Another argument to adhere less strictly to this principle was that the accounts for the financial institutions and the rest-of-the-world account must correspond as much as possible to the figures published by the Dutch Central Bank, which is the main source for these sectors. The EDP requires that the most recent figures be used to establish government deficit and debt, figures with great political weight. Therefore, the first annual figures for the government, published three months after the end of the year as the sum of the four quarter estimates, are revised twice.

3.4 Project management

The main organisational difference resulting from the new design is the centralisation of the project management of the reconciliation process. In the former process, reconciliation started with a pre-reconciliation of transactions and positions between the sub-sectors within the 'financial institutions' and 'general government' sectors. Transactions with other sectors and the rest of the world were subsequently aligned by the transaction specialists. Although the project manager was involved, his role was mainly to co-ordinate the process. Only at the end - when the remaining discrepancies had to be solved – did the project manager take the lead. This was time-consuming and inefficient, as the co-ordination of the individual solutions was difficult and much time was spend on minor problems.

Figure 3. Former and new design of the compilation process



In the new design, decisions about discrepancies to be solved are made by the reconciliation management, enabling specialists to focus their attention on relevant discrepancies without reducing the quality of the sector accounts, and reducing the required capacity.

The automation of the reconciliation process is also more demanding for the reconciliation project management. On the one hand, the management has to check and implement the rules and constraints for the systematic and the automatic reconciliation applications, and on the other hand these software applications can only be run and maintained centrally.

The centralisation of the reconciliation process provides in assistance for the project manager from a number of senior experts: an expert for systematic discrepancies, two experts for the content of the reconciliations for the various sectors and one for the maintenance of the applications. This group will probably be reduced to the project manager and two assistants as soon as the software is adapted to the new design and more experience has been gained. In the meantime, extra attention and expertise is required to complete the various parts of the process in time.

4. Experiences and future developments

Before switching over the compilation of the sector accounts to the redesign, test compilations were held with both quarterly and annual estimates. Although these tests proved that the new design was feasible, implementation required more effort than expected. The main reason for this was that the quality of the raw data was too heterogeneous for the applications to handle, resulting in manual adjustments and extra rules for the applications. This mischance may have been the result of the testing being done on datasets that had already been upgraded to some extent. However, after having solved the problems encountered during the first compilations according to the new design, the conclusion after more than one year of production is that the new procedure with the systematic reconciliation machine, concentrating on relevant discrepancies only and reconciling small discrepancies automatically is not only feasible but is also an improvement in terms of process efficiency, transparency and reproducibility.

Although the implementation of the new design implied a considerable change of activities for the staff involved, they managed without too much extra effort, principally because the sector accountants took an active part in the development and testing of the new design. Their knowledge thus contributed to the specification of the sector accounts according to the principles for the new National Accounts design which also matched their ideas and needs, creating a solid basis for the new way of working.

The exact efficiency gain resulting from the redesign of the sector accounts is difficult to establish. On the one hand the redesign of the sector accounts was part of a wider innovation programme within Statistics Netherlands, for which general tools and applications were developed. The National Accounts department was able to use these for the redesign of the sector accounts without any extra cost. On the other hand, during the implementation of the new design also other aspects of the compilation process have changed and improved. However, a rough estimate of the input for the redesign of sector accounts alone is 10-12 full time equivalent (FTE) in the course of the three years of the development and implementation. In this period, the capacity needed for the compilation of the sector accounts was reduced by 4.5 FTE per year.

For the quarterly estimations, the systematic reconciliation machine in particular proved to be a powerful instrument, enabling this element of the reconciliation process to be performed in a few hours. This left more room for analysis and sped up the compilation by a number of days. The automatic reconciliation of small discrepancies was also a strong tool, as it made extra rounds possible while adhering to the timetable, giving better results and correcting last-minute minor errors, which contributed to the flexibility of the compilation process.

Although the number of estimations was reduced to one or two, in the end it turned out that not that much time was saved. The reason for this was that even though specialists do not need to make more than one compilation, their sector was subject to adjustment as a result of new estimations for one of the other sectors. Therefore, the specialists have to recheck and re-authorise their adjusted sector accounts for every estimation. In addition to this, the amount of time saved by omitting a revision of a sector account if no new information is available is relatively small.

The reduction in the number of annual estimations turned out not only to be less efficient than foreseen; the consequences for the quality of the sector accounts also had a greater effect than expected. Using only the final version of the sources means that preliminary results are ignored, even if the quarterly figures are clearly much too low or too high. This may especially be the case if little or no information is available to make the quarterly estimates on which the first annual figures are based. In the near future, therefore, the one-estimation list will be revised.

For the compilation of the annual figures for the sector accounts, it was initially decided to compile the annual figures and align the quarterly data at the same time. According to the revision strategy of Statistics Netherlands, this meant that shortly before the publication of the most recent annual figures, the Denton method could adjust twelve quarters of the three annual periods under revision. However, this turned out involve too much work. Therefore, first the Denton mechanism, which is less important for the figures of the financial accounts, was reduced and subsequently the alignment of the quarterly data was separated from the estimation of the annual figures, and effectuated afterwards.

The redesign of the sector accounts did not matched the requirements of the new business architecture of Statistics Netherlands completely. Especially the break that indicates that the data set is complete is now part of the compilation process of the National Accounts. To set this break between the sources and the national accounts itself, as is intended by the architecture, has not been an option because sources are not ready yet to compile complete branches and sectors that are directly usable in the reconciliation. This may change in the near future when discussions with the compliers of the source information appear successful.

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