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Tore Halvorsen and Kerstin Solholm

Process tables in the Norwegian national accounts

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Preface

This report describes the results from a project aiming at high quality system of process tables within the Norwegian system of national accounts. These tables show the source basis and all the adjustments done to the source data in estimating gross national income (GNI) within the compilation system of the national accounts. Statistics Norway is through the EEA agreement obliged to report to Eurostat process tables as part of the GNI Inventory.

Contributors to the project and authors of this report have been Tore Halvorsen and Kerstin Solholm, both at the Division of national accounts at Statistics Norway.

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Statistics Norway, 12 January 2015.

Hans Henrik Scheel

Abstract

Process tables is a tool for presenting and explaining in a tabular form what sources are used and what happens to the source figures in the process of compiling national accounts. In Norway the first attempt to produce some sort of process table was carried out in the early 2000s. The use of the table was first and foremost to inform the various statistical divisions within Statistics Norway of what happens to "their figures" in the national accounts.

During the same period Eurostat developed at set of process tables to accompany the detailed documentation of the national accounts in terms of an Inventory for each member country. The Eurostat guidelines on process tables were given in the document Eurostat/C1/GNIC/054 and presented in 2005. Norway compiled for the first time a process table of the Eurostat type as part of the 2007 Inventory. The tables were modified following the Eurostat visits to Statistics Norway in 2009 and 2010.

These first attempts in compiling process tables were largely done manually as a sub-routine subsequent to the compilation of the final national accounts. Clear lessons from these experiences were that to achieve tables of good quality and in an efficient way the tables must be compiled as an integrated part of the national accounts compilation process itself and as much as possible in an automated way. The crucial questions to be answered in designing a system for the compilation of process tables in practice are what technical platform to use and at what level of details and at what frequency should the tables be compiled? Also, what structure or type of characteristics should be used in the tables – identical to those of the Euorstat tables or are there special needs of Statistics Norway to be taken into account?

This report addresses these questions and presents the new system for process tables in the Norwegian national accounts. This system is built to serve both the needs of Eurostat and some additional needs of Statistic Norway. The tables will be compiled on an annual basis as part of the routines of compiling the final national accounts. However, as the report reveals, although the structure and design of all the tables have been finalized, some follow-up work will have to be done to finalize the routines for filling in all the process tables. This concerns in particular the household final consumption and exports and imports of the table for the expenditure measure, and the tables for the income measure and the table for transition from GDP to GNI.

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1. Introduction

1.1. The EUROSTAT GNI reporting

According to the EEA[1] agreement with the EU, Norway has to fulfil the same obligation to compile and report national accounts data as the EU member states. An important part of the obligation is the annual reporting of aggregated national accounts data on Gross National Income (GNI) and its components. The data are used for the estimation of the countries' contributions to the EU budgets (the 4th resource). This reporting is administrated by the Eurostat Gross National Income Committee (GNIC). A whole system of administrative and legal routines has been established to accommodate and supervise the reporting of those important data. The GNI tables reported annually are accompanied by a quality report, describing various qualitative aspects concerning the figures.

The essential set of information used for assessing the quality of each country's GNI data is however to be found in the GNI Inventories. These detailed documents (300 – 500 pages) describe in large detail the sources and methods of estimations behind the GNI data in each country for one selected reference year. In addition a process table is set up to accompany the Inventory. This table presents an overview of the source data for the GNI components and all the adjustments made by the national accountants to the source data before they become final national accounts figures. The process table also gives information on in which paragraph in the Inventory each type of adjustments are explained and commented upon.

Statistics Norway submitted process tables to Eurostat for the first time together with the 2007 version of the GNI Inventory. The reference year of the process table was 2005, which also was the reference year in the Inventory. As this was the first Norwegian process table of the Eurostat type ever, the routines for compiling the tables definitely had its flaws and weaknesses and the results were far from perfect.

The first lesson learnt was that it is very difficult to compile a process table of good quality ex post, i.e. after the compilation of the national accounts itself has been carried out. The process table must be compiled based on routines fully integrated with the national accounts compilation process itself. This is the only way of ensuring good quality of the data in the table and the same time do the compilation in a most resource efficient way.

The second important lesson concerns frequency. The Inventory itself will be produced about every five years or so, following major revisions of the national accounts. Our experiences tell us that to be able to report good quality process tables to Eurostat every five years, the process tables must be compiled annually.

The third important lesson has been that the process table must be compiled at a detailed national accounts level and then aggregated into tables for transmission to Eurostat.

1.2. Objectives

This project aims at a robust system for the compilation of annual detailed process tables taking into account the experiences referred to in chapter 1.1. Annual detailed process tables will serve two purposes.

First, it will serve as a guarantee of good quality aggregated process tables to be submitted to Eurostat together with the periodic GNI Inventory. Maintaining an annual routine for the compilation of process tables will be the best way of reaching this goal.

[1] EEA = European Economic Area

Secondly, it will serve internal control and documentation purposes within Statistics Norway. Detailed process tables will be an important documentation of the Norwegian final annual national accounts estimations. As such the tables will serve as a very useful fundament for discussions between the national accounts compilers and the statistical divisions within Statistics Norway that supply the national accounts with source or input data. The explanations of the adjustments made to the input data are important in discussing further improvements of both the statistics supplying the input data and the methods for using the input data in the national accounts.

The project has three phases. First, some technical questions are studied and discussed. One main question is what technical platform to be used in designing the detailed process tables? Excel or SAS are the obvious alternatives for Statistics Norway. Another question concerns the structure of the tables: should the Eurostat process tables be copied or should the detailed tables be supplemented by additional information for own use purposes? Or the level of detail: should the tables show the most detailed industry level in the Norwegian national accounts (155 industries) or some aggregated level (e.g. 2-digit NACE)?

Next, the integration of standardised work routines for compiling the process tables with the annual national accounts work process is elaborated upon. To what extent is it possible and desirable to have the various steps in compiling the process tables designed as automatic operations?

The third phase is documenting the new Norwegian system for annual detailed process tables, including a detailed report on the project to be submitted to Eurostat according to contract.

The project has been organised within the Division for National Accounts in Statistics Norway, and was managed by a senior statistician/adviser, supported by one statistical adviser. The project was integrated with the annual work plans of the Division and approved and supervised by the management of Statistics Norway. The future current compilation of the detailed annual process tables will financed by the annual budget of Statistics Norway.

2. The Norwegian National Accounts framework

2.1. General description

As a prelude to the description of a Norwegian process table it is useful to describe the main relevant characteristics of the Norwegian national accounts, upon which the process tables must be based.

Generally speaking, the national accounts of Norway contain a number of important characteristics, among which the following ones in the respect of GNI process tables can be considered of particular importance:

- Annually updated supply and use tables and commodity flows
- Detailed breakdown
- Full integration of Balance of Payments

Norway is one of few countries that very early (since 1952) has input-output tables (read: supply and use tables) integrated in the annual national accounts. The background for this was both analytical and statistical, and eventually also methodological as the input-output structure became one of the main features of the national accounts as recommended in global System of National Accounts (SNA) and the European System of Accounts (ESA).

Supply and use tables and commodity flows are systematically exploited in the compilation of the national accounts figures. That is, total supply and total use of individual types of goods and services have to be balanced with each other, and next providing the basic information and serving the statistical basis for the derivation of input-output tables for purposes of economic analysis and projections. It goes without saying that detailed breakdown characterises the Norwegian national accounts along with supply and use and input-output tables.

In Norway, the data situation has been characterised by more abundant statistics on domestic production, exports and imports than statistics on incomes and expenditures, thus leading to the appraisal that the production approach is the main approach used to estimate gross domestic product (GDP) per se. At the industry level, however, value added may not always in the first place be estimated from using the production approach, inter alia because reliable data for intermediate consumption may not exist, and must be replaced by either the expenditure approach or the income approach. After the more elaborated use of accounting statistics in the Norwegian national accounts, this situation seems to occur however continuously less frequently.

The production approach is used to compute value added for all industries technically speaking. This is done within the framework of detailed SUT on annual basis and by making use of the commodity-flow method.

The expenditure approach is used for computing government final consumption expenditure based on government accounts and for exports (and imports) based on external trade statistics and other supplementary sources. The expenditure approach is also used as a main method in computing household final consumption expenditure and gross fixed capital formation, but combined with the detailed commodity-flow method.

The income approach is used in general to obtain estimates on components of GDP, inter alia compensation of employees, but not for operating surplus. Operating surplus rather is a balancing item arrived at residually. Recently, however, independent estimation of gross operating surplus from accounting statistics has modified this position somewhat (serving as a control for the estimates by industry). The income approach is used to compute value added of the non-market (government and NPISH) industries.

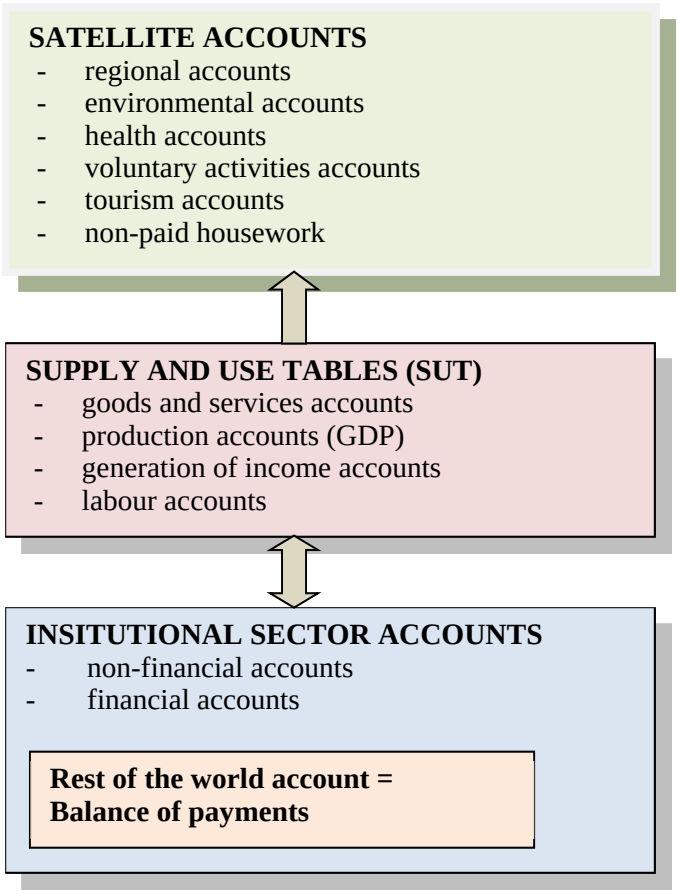
2.2. Technical attributes of the Norwegian national accounts

The Norwegian national accounts system consists of a set of modules which are designed within a joint technical environment. This accommodates an efficient and transparent production process in compiling the national accounts. The main modules are supply and use tables, institutional sector accounts including balance of payments, and satellite accounts, see figure 1.

All of the modules, except for the satellite accounts, are produced on both an annual and a quarterly basis. The IT tools SAS and Excel are the most important technical platforms used for processing data for the compilation of the annual national accounts[2]. Joint technical platforms are a condition for efficient data transmissions between the various modules. For example are data for the various government sectors first processed in the institutional sectors accounts module and subsequently transferred into the SUT module for the compilation and estimation of the production account of the government sector, and the results are finally transferred back into the institutional sectors accounts module.

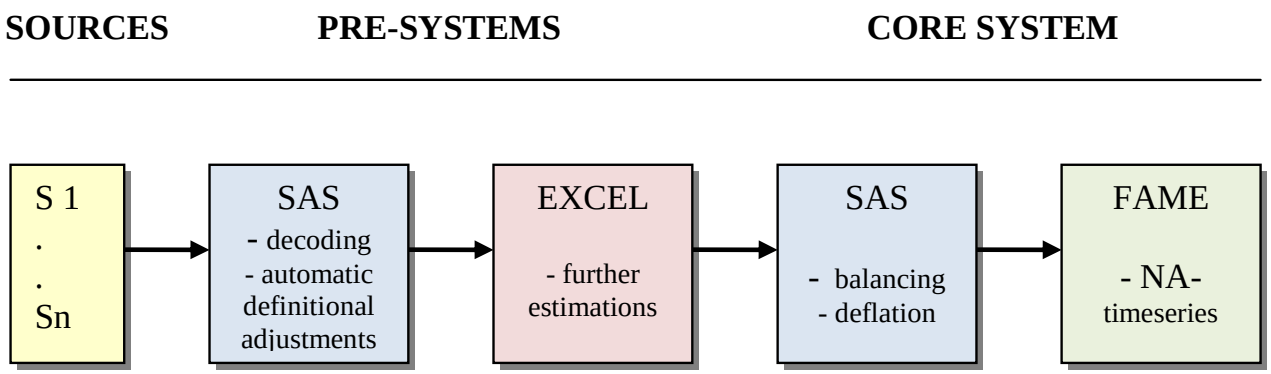
[2] For the quarterly SUT two other programmes are used: TROLL and FAME.

Figure 1. Norwegian national accounts. Main modules



SAS programming is used in particular for balancing SUT at both current and constant prices as well as estimating the various national account aggregates and balancing items. Excel is on the other hand mostly used for processing and adjusting source data for the various sectors and industries prior to the compilation and balancing of the national accounts are carried out.

Figure 2. The Norwegian national accounts compilation process.



One of the most important source for the Norwegian annual national accounts is the structural business statistics (SBS), covering a larger part of the industries of the economy. Data from this source are transferred into a SAS application that processes the data according to a set of standard rules. For example are the turn-over figures from the business accounting based SBS converted into output figures in accordance with national accounts definitions. The results of this processing are subsequently transferred into an excel application for each industry, where various manual procedures make the final transformation of the source data into national

accounts concepts and definitions. The processed data are subsequently transferred into the core or main system for balancing and compilation of the national accounts. Finally, data are stored as time series in FAME application for publishing and reporting purposes.

2.3. Brief outline of the production approach to GDP estimation[3]

Classifications

Main classification schemes used in the Norwegian national accounts for the estimation of GDP according to the production approach are the activity classification based on NACE Rev.2 and the product classification based on CPA. Number of activities specified are 131 (altogether 155 when adding market and non-market etc.), and number of products are about 925 national accounts products, of which 450 are goods, 350 are services, while the remaining products primarily are there for technical or other reasons (partly goods and partly services).

The breakdown by categories of production - or types of producers, i.e. market, own final use and other non-market - is handled through the coding system (prefixes). It means introducing separate categories for market production, production for own final use and three categories for other non-market production, i.e. in central government, local government and NPIs serving households.

Main sources of data

In general and typically, a mixture of administrative records and statistical surveys is used as sources for the production approach in the Norwegian national accounts. The most important source is the SBS, which combines administrative information from Tax authorities and information from sample surveys conducted by Statistics Norway. The surveys are designed based on Statistics Norway's Business Register - the Central Register of Establishments and Enterprises - an important instrument of the Norwegian statistical system. It comprises in principle all production units. But also other sources are employed, e.g. oil statistics, government accounts, agriculture account compiled by the Budgeting Committee for Agriculture.

2.4. Brief outline of the income approach to GDP estimation

Classifications

Main classification schemes used in the Norwegian national accounts for the estimation of GDP according to the income approach are again by kind of activities (NACE), as well as by categories or components. In practice, they are cross - classified, i.e. each of the components is broken down by kind of activity or industry.

Main sources of data

In general and typically, a mixture of administrative records and statistical surveys is used as sources for the income approach to the Norwegian national accounts. Like for the production approach the SBS is major source for wages and salaries, together with government accounts and for total considerations within the Labour Accounts - Employment statistics, Wage statistics and Register of Wages and Salaries (RWS). Government account are the source for other taxes and subsidies

[3] For more detailed information on the production approach but also the other approaches, see Statistics Norway (2012).

on production, while consumption of fixed capital is estimated using a standard PIM model. Mixed income of self employed is estimated from accounting statistics while operating surplus is a residual.

2.5. Brief outline of the expenditure approach to GDP estimation

Classifications

The main classification schemes used in the Norwegian national accounts for the estimation of GDP according to the expenditure approach are the purpose-like classifications of COFOG and COICOP used for final consumption expenditure of general government and households, respectively. Furthermore, they include the classifications of fixed assets and activities used for GFCF, and breakdowns on categories of inventories, and on exports and imports. COICOP for household consumption expenditure is relatively detailed and structured at three different levels of aggregation. The classification by type of fixed assets is also relatively detailed. GFCF is also broken down by kind of activities, in fact to have full accordance with the activity classification in production. On the other hand, there are few categories of inventories specified; for changes in inventories the main breakdown in Norwegian national accounts is by products. Also for exports of goods and services and import of goods and services the main breakdown is by products. At an aggregated product level, exports and imports are also broken down by partner country.

Main sources of data

In general and typically, a mixture of administrative records and statistical surveys is used as sources for the expenditure approach to Norwegian national accounts. Three classes of sources are utilised in the estimation of household final consumption expenditure; these are household consumer surveys (or household budget surveys HBS), retail trade statistics and the third group consisting of output figures, selected indicators and the commodity flow method. The final figures are the results of an interplay between these three source elements.

Central government accounts and local government accounts are the sources used for the calculation of central and local government final consumption expenditure.

For gross fixed capital formation, the estimation is first directed at the use of industry-related sources, such as the SBS-based statistics, and the expenditure approach, while the commodity flow approach takes a substantive role in the next phases. The main approach to estimating changes in inventories is through balancing of supply and use for each national accounts product by using the commodity flow method. Exports of goods and imports of goods are based on external trade statistics, containing detailed specifications and distributed on detailed national accounts products. Exports of services and imports of services are estimated with basis in the sample survey on international trade in services, ocean transport statistics, oil statistics and travel surveys.

2.6. The transmission from GDP to GNI

Transmission from GDP to GNI involves just a handful of items. These are shown in the table 1.

Investment income includes interest, dividends, remittance of branch profits and reinvested earnings. Interest is the largest item contributing to investment income and investment expenditure (see table above). The main sources used are sample surveys by direct reporting from non-financial enterprises, and census like reporting from financial enterprises and government.

Table 1. Transition from GDP to GNI – main components

	NOK billion in 2009	Percentages of GDP
GDP	2 356.6	100.0
Compensation of employees from abroad	4.0	0.2
Compensation of employees to abroad	26.1	1.1
Interest income from abroad	102.0	4.3
Interest expenditure to abroad	71.6	3.0
Dividends from abroad	74.2	3.1
Dividends to abroad	78.8	3.3
Reinvested earnings from abroad	-7.9	-0.3
Reinvested earnings to abroad	-17.8	-0.8
GNI	2 370.1	100.6

Reinvested earnings are the difference between the total operating surplus in direct investment enterprises (income for the investor) and distributed dividends. Reinvested earnings are estimated based on information collected as part of the surveys on direct investment.

3. The EUROSTAT process tables guidelines

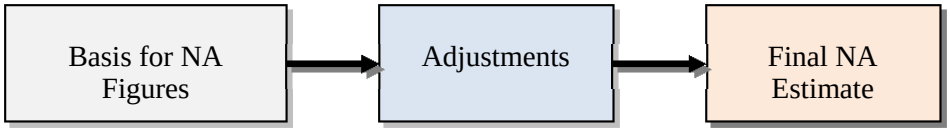
3.1. Structure of the national accounts compilation process

The description of the Eurostat process tables can be found in the document Eurostat(2005). Here the basic ideas behind the process tables as well as the more precise instructions on how the process tables have to be compiled are outlined.

The main idea is that the compilation of national accounts is carried out as a rather permanent process that is annually repeated. The structure of this process is then the basis for the process tables itself.

The main steps of the process is the collection of input data that constitute the basis for the national accounts figures, the adjustments made to the input data and finally the presentation of the final national accounts results. This is shown in figure 3.

Figure 3. Structure of the National Accounts (NA) compilation process



3.2. Structure of the Eurostat process tables

The structure of the Process Table follows the order of the national accounts compilation process itself. The Process Table shows the various adjustments that are added to input data to produce final balanced figures and shows their relative importance. The table consists of two layers: Layer 1 consists of numbers; Layer 2 provides cross-references to the corresponding sections in the GNI Inventory, where the estimations leading to the resulting numbers are explained.

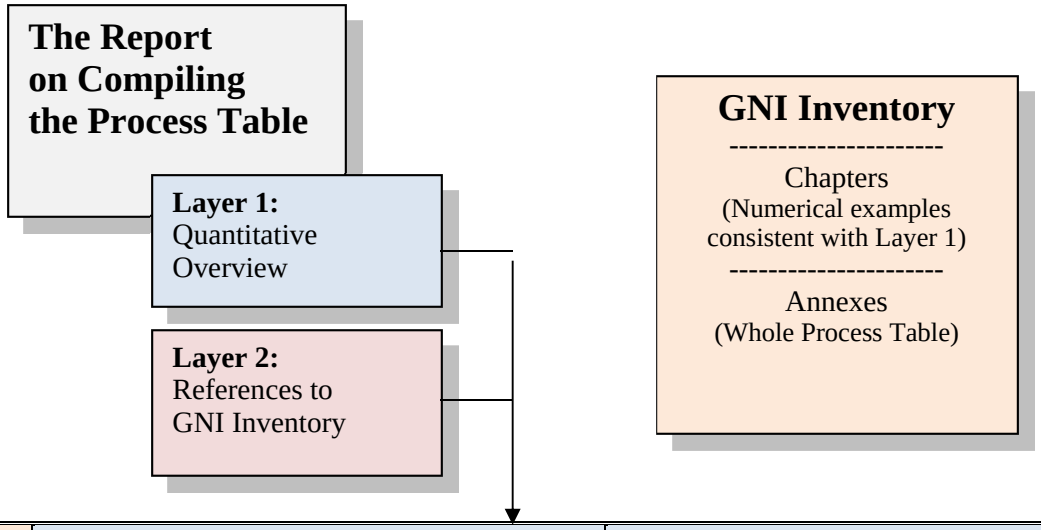
Each of the two layers contains identical lines for estimation of GDP from the Production, the Expenditure, and the Income measures, and the transition to GNI. The columns are split into two groups: the first distinguishes the type of source data; the second separates different kinds of adjustments made.

The table must be accompanied by a report on the compiling of the Process Table that explains the data included in the table, and the classification of the various sources and adjustments.

The Process Table is an integral part of the GNI Inventory, and is attached to the Inventory as an annex. The corresponding section of the Inventory contains

numerical examples that are consistent with, but possibly more detailed than, the figures in Layer 1.

Figure 4. Overview of the Eurostat Process Table



GDP& GNI components	Basis for NA Figures					Adjustments					Final Estim.
	Surv +Cn	Adm. Rec.	Comb. Data	Extrap+ Models	Othr	Data Val.	Con cept	Cut-off	Exhau stiven	Balanci ng	
Production											
Expenditure											
Income											
GNI											

3.3. Types of data sources and adjustments (the columns of the Process Table)[4]

3.3.1 Data sources – basis for NA figures

The Process Table consists of the following data sources (basis for national accounts figures), which form the first block of columns:

- Surveys and Censuses
- Administrative Records
- Combined Data
- Extrapolations and Models
  - Benchmark Extrapolations
  - Commodity Flow Model and Ratios
  - CFC (PIM) and Imputed Dwelling Services
  - Other Extrapolations and Models
- Other Source Data

3.3.2 Adjustments to the basis NA data

The Process Table consists of the following adjustments, which form the second block of columns:

- Data Validation Adjustments
- Conceptual Adjustments
- Cut-off Adjustments
- Exhaustiveness Adjustments
- Balancing Adjustments

[4] See Eurostat (2005) for more detailed information.

3.4. Classification of components of GDP and GNI (Rows of the Process Table)[5]

The general structure of the rows is straightforward. It follows the structure of the GNI/GNP questionnaire showing the three approaches to the calculation of GDP and then the transition to GNI.

The Production measure section is based on the NACE A17 breakdown of economic activities. Within each category a distinction is made between output, intermediate consumption and gross value added.

The Expenditure measure section contains lines for the standard components. Household final consumption expenditure is broken down at the COICOP 1-digit level and the Pi6 detail is shown for gross fixed capital formation.

The Income measure section distinguishes compensation of employees by sectors, gross operating surplus and mixed income, and taxes and subsidies on production and imports.

The transition from GDP to GNI section contains lines for the standard components, namely compensation of employees received and paid, property income received and paid, and taxes on production and imports and subsidies.

3.5. Report on compiling Process Table

A report must accompany the Process Table and its aim is to explain the data included in the Process Table, the sources used and adjustments made to national accounts final estimates. The report should also inform how the compilation of the Process Table was organised among statisticians. The report follows a fixed structure decided by Eurostat and comprises the following chapters:

- Introduction
- Analysis of the process table
- Problems encountered
- Specific questions related to the national accounts compilation, and
- Conclusions

4. The Norwegian process tables – early experiences

4.1. The first Norwegian process table

National accounts is an important tool for integrating and co-ordinating economic statistics and considerable emphasis has been attributed in Statistics Norway to this aspect of national accounts. Furthermore, Statistics Norway has emphasised the importance of bringing together its role as producer and main user of national accounts. All within Statistics Norway, activities such as economic modelling work (national accounts as basic structure), analysis of business cycles (based on quarterly accounts data) and describing external economy (balance of payments fully integrated in national accounts) are important tasks.

This implies a relative short distance between the user needs of researchers on macroeconomics via the national accounts and down to the basic statistics. Having such a feedback system functioning properly, clear and robust routines for dialogue between the national accountants and the statisticians responsible for basic economic statistics must be established. For such a dialogue to be constructive information must be given both ways. The national accountants need information

[5] See Eurostat (2005) for more detailed information.

on the compilation of the basic statistics to be able to make for example definitional adjustments or simply to make the correct assessments and decisions in the balancing process. On the other hand the producers of the basic statistics need knowledge of the use of their data in the national accounts and what adjustments are made to them in the national accounts compilation process.

Business statistics in the form of structural statistics for enterprises (SBS) were developed and established in Statistics Norway in second half of the 1990s. These statistics replaced former production statistics (establishment-based) or various indicators and provided new levels of output, intermediate consumption and gross fixed capital formation in an increasing number of industries. In industries like construction, wholesale and retail trade, business services, and hotels and restaurants, changes from previous statistics were so large that it became impossible to implement this new information on current basis in national accounts. Thus, it was necessary to have a main revision of national accounts, bringing the new levels into the backward time-series, the results of which were published in the summer of 2002. The cooperation and contact with other units within Statistics Norway was tight during this the main revision project with many meetings held, and a steering group was established for this purpose. In this process the idea of having "processing tables" comparing the final national accounts data with the input data from the structural business statistics was launched. At the time some experimental tables were made, but not systematically used.

The first serious attempt at establishing processing tables was carried out with 2004 as a reference year. These tables gave a picture of the levels and the differences in levels comparing the structural business statistics with the national accounts for the following core variables for each industry:

- output
- intermediate consumption and
- fixed capital formation.

In the presentation a separation was made between the national accounts figures reached after various definitional adjustments to the source data and the national accounts figures reached after final balancing of supply and use within the national accounts itself.

The information was presented for each industry in tables with the following structure:

Table 2. The structure of the 2004 Norwegian process table.

Industry	NOK million				
	(1) SBS	*(2) NA after definitional adjustments*	*(3) Final NA after balancing*	*(3) – (1) Total adjustments*	*(3) – (2) Balancing adjustments*
1……n Output					
Intermediate consumption					
Of which FISIM					
Gross capital formation					

In addition for each industry, a short written comment on the adjustments was given.

The tables, which were compiled at a quite detailed industry level and then aggregated, were used in the communication and discussions with the organisational units within Statistics Norway responsible for the source statistics in explaining the adjustments made during the process of estimating the final national accounts data, based on in particular structural business statistics, but also other sources.

4.2. The first Norwegian process table of the Eurostat type

The first experiments in producing a process table of the Eurostat type was done in connection with the compilation of an updated version of the GNI Inventory for Norway. The reference year for the version of the Inventory was 2005, and hence the process table also had to be based on 2005 data. The first version of the Process table 2005 was compiled in 2008, more than one year after the compilation of the final national accounts figures for 2005. To compile the process table so long after the final national accounts figures proved a difficult task. The process table was set up in a rather mechanical way as it was not possible to recollect all the various adjustments made to the source figures. When analysed more in detail, especially in connection with the Eurostat GNI visits in 2009 and 2010, several mistakes and errors were detected in the initial version of this process table and several new versions of the 2005 Process table were made.

This first Eurostat process table with Norwegian data was to a large extent filled in by extracting data manually from the national accounts databases and input files, and was thus quite a time consuming exercise. In addition, the manual procedures of course was potential the source to errors and mistakes.

So, the most important lessons learnt in this initial exercise in compiling process tables of the Eurostat type was that

a. to be able to achieve good quality on the process tables, they must be compiled as an integrated routine of the NA compilation process itself, and
b. as far as possible, be designed as, at least partly, an automatic system.

5. The new Norwegian process tables

5.1. Level of details

The early experiences at Statistics Norway in compiling a process table of own design combined with the recommendations from Eurostat on the process tables constitute the starting point when discussing the design of a new Norwegian system of process tables.

One lesson learnt from earlier exercises was that, as far as possible, automatic compilation routines must be used. One question to be answered in this respect is whether the Eurostat process table should be compiled directly by extracting data from the detailed Norwegian national accounts data bases; or as an alternative, that the Eurostat process table is compiled by aggregating data from a more detailed national process table established at a meso level.

Here, our earlier experience was quite clear: the Norwegian system of process tables must be designed as a set of tables at quite detailed level, from which data are aggregated into the Eurostat process table as a second step.

The two main reasons for making this decision are: First, data and information needed to compile the aggregated Eurostat table can only be found at a detailed national accounts level, implying that the national accounts staff members responsible for the various fields of the national accounts have to be involved in compiling the process tables. For those persons to be able to give a quality assurance on the data they are responsible for and document the various steps in the compilation of the process table, the tables must be kept at a detailed level. Secondly, and this may be even more important, for Statistics Norway to benefit from the system of process tables, both in the dialogue between the national accounts department and the statistical departments, and for internal use ex post as a documentation of the national accounts compilation, process tables compiled on a detailed level are needed.

The starting point in deciding the exact level of detail to be used is at one hand the requirements of the Eurostat process table. Here the following levels of detail are required:

- For industries, the Eurostat process tables are to provide data at the aggregated section NACE A17 (21 sections indicated by letters A – U).
- For final uses the figures are also broken down by aggregated categories (e.g COICOP 1-digit level).

At the other end of the scale we have the detailed Norwegian national accounts databases, i.e. the detailed Supply and Use tables. In principle it would be possible to compile the process table at the detailed level of supply category × product, and product × use category, but this seems neither practical nor necessary[6]. More achievable is a process table compiled at detailed industry level, both regarding production and fixed capital formation, i.e. disregarding the product dimension. This will be most useful in documenting all adjustments made to the initial source data for these categories. The same goes for final consumption expenditures where figures for the detailed consumption categories will be most useful.

A somewhat more difficult question is the level of details to be chosen for exports and imports. The only alternatives seem to be the detailed product level or alternatively the top aggregates for total exports and total imports respectively. Here some more studies and experiments are needed before a final solution is found.

5.2. Frequency

Another question is at what frequency the process tables are to be compiled. The minimum frequency is to have process tables compiled every time the GNI Inventory is updated, which normally will be following every main revision of the national accounts, say about every 5 years. Two aspects speak against this. First, the idea of making the operations of compiling the process tables largely automated makes it both possible and sensible to use the system annually. Otherwise, to maintain the knowledge and competence needed to update and run an automated system every five years might be more complicated and costly in the long run than running the system each year. Secondly, if the process tables are to be a part of the documentation of the national accounts and support the dialogue with the compilers of the source statistics, they also have to be compiled annually.

So, our conclusion is that the Norwegian process tables are to be compiled annually, as an integrated part of the procedures in compiling final annual accounts. It can also be mentioned that even Eurostat recommends that the process tables are compiled annually, even if not reported to Eurostat each and every year.

5.3. Technical platform

As seen in chapter 3 the process tables to be reported to Eurostat are designed as Excel tables. The new Norwegian system for process tables therefor must be able to feed these tables with the requested figures. The process tables will have to be compiled using figures from both the input data sets used in the annual national accounts compilation and the final national accounts estimates, as well as figures for the various adjustments made during the process. As seen in chapter 2.2, the Norwegian annual national accounts are compiled on a technical platform consisting of both SAS and Excel applications. The question then is: Which technical platform should be chosen for the system of process tables?

The main arguments for choosing a SAS platform are:

[6] If however the Process tables were to document the compilation of national accounts at constant prices, it would be important to describe the product dimension as these values would constitute the weights used in aggregating detailed constant price flows into macro economic totals (e.g. GDP).

- The balancing of the SUT and the estimations of the final national accounts aggregates and balancing items are carried out in SAS
- The uploading of data from the primary sources are mainly done using SAS routines
- The first steps in the transformation of the input data into national accounts concepts are in many cases carried out using SAS routines
- SAS is a strategic IT tool chosen by Statistics Norway
- SAS thus means standardisation of routines and consequently a more safe system as less manual operations means less chance of human errors.

Excel on the other hand has the following advantages:

- At least some detailed estimations and adjustments made in the pre-systems prior to the results are loaded into the main balancing system, are designed using Excel
- Excel are a more flexible platform compared to SAS, an advantage of particular importance in the establishment phase of a new system, as it makes experimenting with different estimation procedures more easy
- Excel are in general more accessible to the operators, i.e. the national accounts compilers, compared to SAS programming

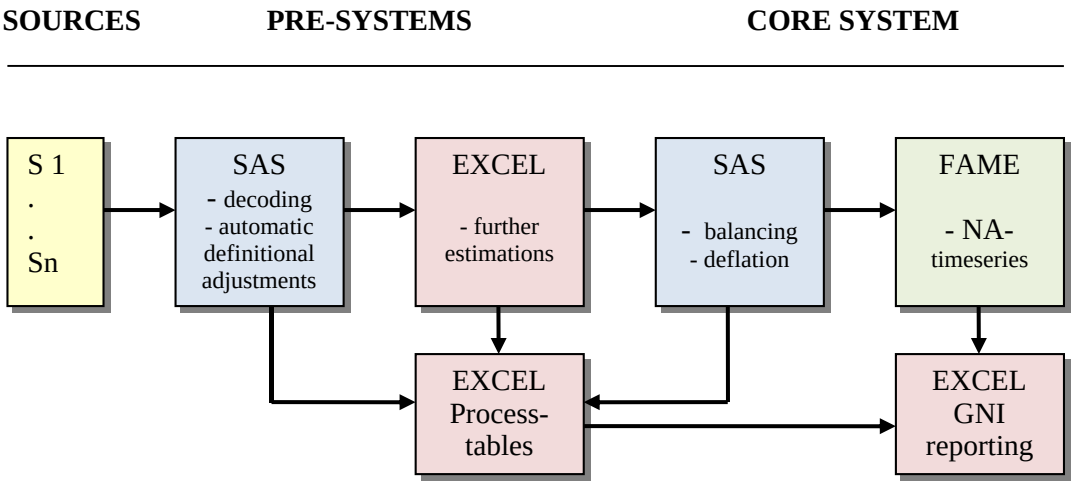
Operations based on Excel applications implies a more manually operated system, accommodating for the operators having a more intimate feel of and closeness to the data they work on.

The fact that the tables to be reported to Eurostat are Excel tables is not a decisive point, as it is uncomplicated to load figures from SAS to Excel. So, one can argue for both SAS and Excel being used as technical platform for the new process tables. Or even using both types of IT-programmes?

In much the same manner as for the national accounts compilation system itself, the compilation of the process tables consists of some routines which are standard for all sources and categories, while other routines varies between sources and categories and should preferably be kept rather flexible.

The conclusion then is that part of the routines of compiling the process tables can be standardised and therefore make use of SAS, while other routines need more flexibility and will be handled using Excel. SAS is used specifically in transferring of source figures and the final national accounts figures into the process tables and in estimating definitional adjustments. The process tables itself are however constructed using Excel, see figure 5.

Figure 5. The Norwegian national accounts compilation process including process tables.



5.4. The structure of the tables

Finally, we have to decide what structure or headings are to be used for the tables. Again the Eurostat tables, as showed in chapter 3.2, are the staring point. One question to be answered then is whether the structure of the detailed Norwegian process table should reflect exactly the same structure as the Eurostat process table, or whether another structure should be chosen. Whatever solution is chosen the main condition is that it must be possible to aggregate data from the detailed Norwegian table to the Eurostat table.

As seen from figure 4 in chapter 3.2 the Eurostat table has 5 columns representing the various types of sources used in the national accounts compilation:

- Surveys and Censuses
- Administrative Records
- Combined Data
- Extrapolations and Models (with 4 sub-categories)[7]
- Other Source Data

We found it appropriate and necessary to keep the same main structure. However, for the description of source data, for each source category we want to separate between the figures as received from the responsible department within Statistics Norway and the corresponding figures as published on Statistic Norway's web site by the same departments. Normally, the two sets of figures should be identical, but differences in the figures occur and they should be identified and explained.

Also seen from figure 4 in chapter 3.2 the Eurostat table contains 5 columns representing different types of adjustments. Also here the Norwegian table will show more details. In the adjustment category Explicit exhaustiveness, three different sub-categories are introduced:

- compensation of employees in kind,
- tips, and
- non-registered activity.

Thirdly, in the Eurostat category Balancing, a sub-category labelled Other errors, is introduced. This category is used when adjustments are made to correct mistakes made earlier in the compilation process and it is not convenient to restart the process of compilation. Finally, for intermediate consumption a separate adjustment sub-category for FISIM is introduced.

In addition, in each detailed process table separate columns for the following information is included:

- Date (for filling in)
- Initials (of responsible person)
- Comments

5.5. Preparation for completing the new system of Process Tables

One important lesson learnt from the earlier experiences in compiling an own designed process table and the first attempts to compile the Eurostat process tables is that process tables must be produced as an integrated part of our annual routines for compiling the final national accounts. This implies involving all staff members taking part of the finale accounts compilation.

[7] As from 2012 the 4th sub-category under Extrapolations and Models – Other extrapolations and models – will be reserved estimated figures for R&D.

About half of the staff (12-15 persons) at the national accounts division has responsibilities related to the final national accounts and thus the process tables. They were introduced to the layout of the Eurostat process tables and has been involved in the discussions on how to organize our work on the process tables and how to extract and categorise the needed information from our detailed system to be able to fill in the Eurostat tables in the most useful and efficient way.

It was decided to design for our own purposes and uses a set of detailed process tables, which also will serve as a fundament for filling in the Eurostat tables, which are kept at a rather aggregated level. For example the description of production is in the Eurostat tables according to the 2-digit NACE level, while the Norwegian annual accounts as seen in chapter 3, comprise 155 activities or industries at its most detailed level. These disaggregated process tables will serve as a detailed quantitative documentation of each annual volume of the final Norwegian national accounts. The tables will include data on adjustments made on a detailed industry level for production, intermediate consumption (and thus value added) and gross fixed capital formation. For household consumption expenditures the adjustments will be shown on a detailed consumption category level, accounting for more than one hundred elements.

The Norwegian final national accounts estimates are released 23 months after the end of the accounting year, i.e. in November year t+2. The compilation work starts normally 7 months earlier, in April year t+2. The work on the process tables will be done in three steps or phases during the same period. First, some automated SAS-routines has been designed to calculate definitional adjustments to SBA-based source data, e.g. output calculated as turn over less changes in stocks of finished goods. The original source data and the results of the adjustments are filled automatically into the process table. The second phase is after other estimations are done on the source data, mostly using Excel, and the results set up as input to the balancing system. Here each person responsible fills into the process table the requested information. Thirdly, after balancing and the figures are finalised, the final estimates and the adjustments due to balancing are filled into the process tables. The two latter steps are manual procedures.

5.6. Process tables for 2011 according to the three approaches to GDP

5.6.1 Production measure

Table 3 presents the final design of the Norwegian process table according to the production approach by detailed industry, with the same structure also used for the process table for fixed capital formation by detailed industries. The structure is identical for output and intermediate consumption, with the exception that FISIM has a separate column in the table for intermediate consumption, see table 4.

Almost 80 per cent of the basis of the national accounts figures is so-called combined data. In effect this is structural business statistics covering most industries and which is compiled using information from tax declarations (administrative data) and supplementary surveys. Almost 20 per cent of the basis is administrative data, leaving only a minor part based on other surveys, censuses or extrapolation and models. It should be stressed however that also combined data includes a large share of administrative data, implying that administrative data in reality constitute a much larger share than 20 per cent.

Table 3. The Norwegian process table production approach (output)

	BASIS FOR NA FIGURES											
	a	b	c	d	e	f	g	h	i	j	k	l
							EXTRAPOLATION AND MODELS					
	1 = Surveys & Censuses		2 = Administrative Records		3 = Combined Data		4 = Benchmark extrapolation	5 = CFM and ratios	6 = CFC (PIM) & Imputed Dw.	7 = Other E & M	8 = Other	Total 1-8
Industries 1...155	Published	Received	Published	Received	Published	Received						

	ADJUSTMENTS										FINAL			
	m	n	o	p	q	r	s	t	u	v	w	x	y	z
				EXPLICIT EXHAUSTIVENESS										
	Data validation	Conceptual	Explicit Cut-off	Income in kind	Tips	Unregistred activity	Total adjustments	Total 1-8 + Total adjustments	Other errors	Balancing	Final estimate	Date	Initials	Comments
Industries 1...155														

Table 4. The Norwegian process table production approach (intermediate consumption inclusive FISIM)

	ADJUSTMENTS										FINAL			
	m	n	o	p	q	r	s	t	u	v	w	x	y	z
				EXPLICIT EXHAUSTIVENESS										
	Data validation	Conceptual	Explicit Cut-off	Income in kind	Tips	Unregistred activity	Total adjustments	Total 1-8 + Total adjustments	Other errors	FISIM	Balancing	Final estimate	Date	Initials	Comments
Industries 1...155															

5.6.2 Expenditure measure

As mentioned in chapter 7.6.1 the structure or headings used for the process table for fixed capital formation is identical to the structure used for output or production tables. The table shows fixed capital formation broken down by detailed industries × detailed type of capital. For estimation of gross fixed capital formation the main source are combined data, i.e. the structural business statistics combined with other administrative data, e.g. information from vehicle registers. The figures are adjusted due to data validation, conceptual reasons, or exhaustiveness and balancing. Also for final consumption expenditures a separate detailed process table is made. The level of detailed is all detailed consumption groups in the Norwegian final national accounts, i.e. more than 100 consumption groups for households and altogether more than 230 consumption groups when government and NPISHs also are taken into account, see table 5.

Table 5. The Norwegian process table expenditure approach.

	Basis for NA figures		Adjustments										
		a	b	c	d	e	f	g	h=g-a				
Con-sumption groups 1...234	Type of source	Total	Data validation	Conceptual	Explicit Cut-off	Explicit exhaustive-ness	Balancing	Final estimate	Total adjust-ments	Date	Initials	Comments	

The structure of the process table for final consumption expenditures is much like those for production and capital formation. One difference is however that instead of having each type of sources presented in separate columns in the headings, one single column is used for this purpose using a classification for type of sources with the following elements:
1 = surveys and censuses
2 = administrative data
3 = combined data
4 = extrapolation
5 = models
6 = other

For total final consumption expenditures of households the actual levels are in general established through benchmarking in main revisions using various types of sources and methods, a.o. the survey of consumer expenditure, turn-over data from the trade industry and commodity-flow method. Estimations for subsequent years are however to a large degree done using extrapolation methods using many types of indicators. For final consumption expenditures in general government the source base for the national accounts figures are annual census type information from government accounts.

Exports and imports of goods are mainly based on administrative records and left unadjusted, but supplemented with estimations on trade in goods related to in particular ocean shipping and petroleum activities. For exports and imports of services however various sources are used, of which a sample survey of trade in services of non-financial enterprises, supplementary information on ocean shipping collected as part of the structural business statistics and sample surveys on travel expenditures are among the most important. Here some adjustments are made due to both data validation and balancing.

Changes in inventories are in the Norwegian national accounts estimated through balancing of the commodity flows.

5.6.3 Income measure

Gross operating surplus for all industries are estimated as a residual in the Norwegian national accounts. The final estimates are therefore reached through balancing.

For the time being a separate process table for the items according to the income approach has not been established. Probably the most relevant item for such a table is compensation of employees. The basis for the figures for compensation of

employees is administrative information from official registers. The source data are adjusted to fit into the national accounts concepts, but also due to exhaustiveness and through balancing. Taxes on production and imports and subsidies are taken from administrative records and adjusted for time lag to adhere to the national accounts timing concept.

5.7. Transition from GDP to GNI

GNI is estimated taking into account the flows of compensation of employees and property income from residents to non-residents and vice a versa. For compensation of employees across the borders figures are estimated as a procedure of the compilation of the integrated employment tables of the national accounts, and the sources are register based employment statistics and estimated data for non-resident sailors on ships operated by Norwegian companies, combined with statistics on wage rates.

For property income the main sources are census like data from larger parts of the financial enterprise sector and sample survey from the non-financial enterprise sector.

A process table has not yet been set up for the transition from GDP to GNI.

5.8. The compilation of the Eurostat process tables

The new Norwegian process tables have been designed with the view to the compilation of process tables of the Eurostat type to be reported to Eurostat to support the assessment of the reported GNI figures. Several measures have been taken to achieve this. Although the Norwegian tables are more detailed than required by Eurostat in terms of classifications used for industries and use categories etc., the structure or headings of the Norwegian tables designed to accommodate direct aggregation to the Eurostat tables.

The IT-platform chosen for the Norwegian process tables is Excel, the same format used by Eurostat. This has the advantage that the aggregation from the detailed tables to the Eurostat tables can be is done without transferring data between different platforms (see also figure 5, chapter 5.3). The data are automatically transformed into a copy the Eurostat table using Excel algorithms and subsequently copied into the original Eurostat table before reporting.

6. Final assessment and future work

During the last ten years Statistics Norway has made several attempts at compiling national accounts process tables. The new Norwegian system of process tables documented in this report draws upon those early experiences in addition to complying with the Eurostat guidelines in this field.

The new tables have been compiled for the years 2009, 2010 and 2011 based on the final national accounts figures for those years. Some flaws are still present in these tables however. In particular this concern the filling in for households' final consumption expenditures and exports and imports in the table describing the expenditure measure and the tables for the income measure and the table for the transition from GDP to GNI.

These shortcomings will have to be dealt with in the compilation of the 2012 process tables which will accompany the Norwegian 2015 GNI Inventory.

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Statistics Norway

Postal address:
PO Box 8131 Dept
NO-0033 Oslo

Office address:
Akersveien 26, Oslo
Oterveien 23, Kongsvinger

E-mail: ssb@ssb.no
Internet: www.ssb.no
Telephone: + 47 62 88 50 00

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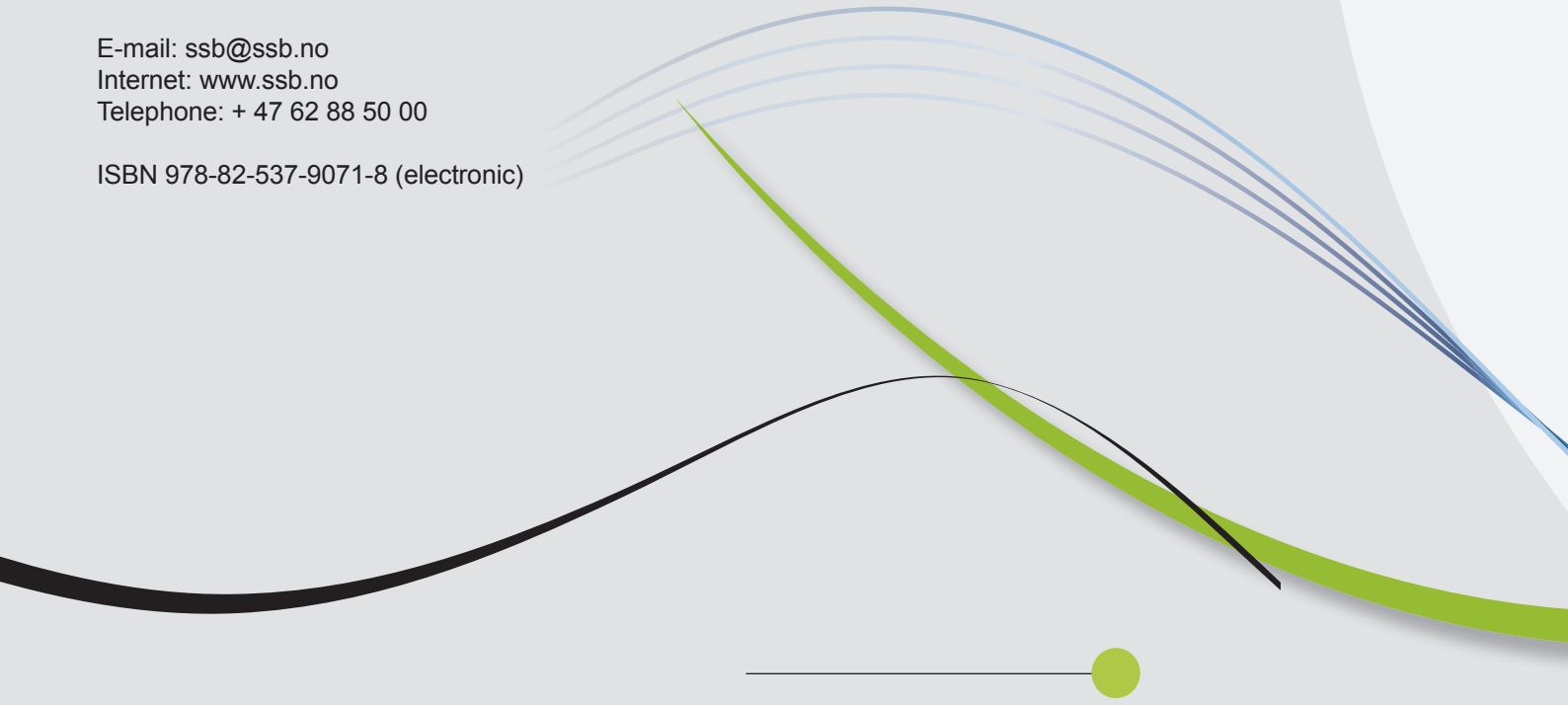

Statistisk sentralbyrå
Statistics Norway

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