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HANDBOOK ON SOCIAL ACCOUNTING MATRICES AND LABOUR ACCOUNTS

Leadership group SAM

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This handbook was prepared by the Leadership group (LEG) on Social Accounting Matrices under the co-ordination of Statistics Netherlands. The list of the members of the LEG is included at the beginning of the handbook.

The views expressed in this document are the author's and do not necessarily reflect the opinion of the European Commission.

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http://forum.europa.eu.int/Members/irc/dsis/employ/home

Foreword

The increasing integration of economic and social policies in Europe, and across the world, requires increased integration of economic and social statistics. This Handbook has been written to help the Statistics Offices of EU member states (and, indeed, any other country) to meet this requirement.

This Handbook is one of the responses to the 1999 ECOFIN Council document on the statistical requirements for the implementation of Stage 3 of Economic and Monetary Union (EMU). This saw effective surveillance and co-operation of economic policies as of major importance. It requires a comprehensive information system providing policy makers with the necessary data on which to base their decisions. ECOFIN commended the national accounts because they are based on harmonised concepts, and they provide both mutually consistent aggregate indicators and a detailed statistical information system. It emphasised the need to develop more comprehensive and comparable indicators and accounts for labour, and to ensure their consistency with national accounts. This is what Social Accounting Matrices (SAMs) and Labour Accounts (LAS) do.

It is generally acknowledged that human capital is in Europe the most critical factor for the generation of social welfare. Yet, traditional National Accounts do not distinguish between low-skilled and high-skilled labour, or any other type of labour. This serious shortcoming is remedied in Social Accounting Matrices, which also have various other features that augment to their usefulness. SAMs use the very powerful (matrix) framework of national accounts, by integrating into a single (matrix) format supply and use tables or an input-output table and institutional sector accounts. In general, social statistics lack a framework that ensures consistency across a range of statistics from different sources. SAMs provide this, ensuring consistency not just between social statistics in the matrix, but also between these social statistics and national accounts. The focus on households and employment categories means a greater emphasis on the role of people in the economy.

The Handbook is written entirely in conformance with the world (SNA) and European (ESA) systems of accounts. It concentrates on labour statistics and their links with national accounts. This can be seen as one of the most important sets of relationships that concern policy makers today. Studying a labour-oriented SAM enables policy makers better to understand relationships between output, labour (and therefore productivity), households, income, expenditure at very detailed levels.

The EU Statistical Programme Committee approved the project LEG SAM in May 1999. The work was done in a Leadership Group (LEG). This was co-ordinated and chaired by Statistics Netherlands, and supported by the statistical offices of Belgium, Finland, Greece, Italy, the Netherlands, Norway, Portugal, and United Kingdom.

This handbook is the result of a lot of hard work of all the members of the Leadership Group, for whom it was not easy, in times of budgetary retrenchment, to focus on the development of a new statistic that is, at the moment, not legally required in Europe. This academic, yet practical achievement demonstrates that NSI's become more and more knowledge institutes that are willing to invest in a statistical framework for the future. The LEG members have prepared this new framework for European policy purposes without substantial financial backing.
We hope that this Handbook will pave the way for the implementation of Social Accounting Matrices (and Labour Accounts) in all European countries and, in

addition, that it will also provide guidance for non-European countries that want to compile a SAM.

R.B.J.C. van Noort

Director-General
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List of abbreviations and acronyms

CGE	Computable General Equilibrium
c.i.f	cost, insurance, freight
COICOP	Classification of Individual Consumption by Purpose for Households
CPA	Classification of Products by Activity
ECHP	European Community Household Panel
ECU	European Currency Unit
ESA	European System of Accounts
ESES	European Structure of Earnings Survey
EU	European Union
EUROSTAT	Statistical Office of the European Union
FISIM	Financial Intermediation Services Indirectly Measured
f.o.b.	free on board
FSDS	Framework for Social and Demographic Statistics
FTE	Full-Time Equivalent(s)
FTEU	Full-Time Equivalent Unit(s)
GDP	Gross Domestic Product
GNI	Gross National Income
HBS	Household Budget Survey
HICP	Harmonised Index of Consumer Prices
HOV	Heckscher-Ohlin-Vanek
ICLS	International Conference of Labour Statisticians
ILO	International Labour Organization
IPF	Iterative Proportional Fitting
ISCED	International Standard Classification of Education
KAU	Kind-of-Activity Unit
LA	Labour Accounts
LAS	Labour Accounting System

LEG	Leadership Group
LFS	Labour Force Survey
NA	National Accounts
NACE rev. 1	General Industrial Classification of Economic Activities within the European Communities (revision 1)
NAM	National Accounts Matrix
NNGI	Net National Generated Income
NNI	Net National Income
NPISH	Non-Profit Institutions Serving Households
NSI	National Statistical Institute
OECD	Organisation for Economic Cooperation and Development
R.o.W.	Rest of (the) World
SAM	Social Accounting Matrix
SBS	Structural Business Statistics
SDR	Special Drawing Right
SEA	Social-Economic Accounts
SESAME	System of Economic and Social Accounting Matrices and Extensions
SNA	System of National Accounts
STS	Short Term Statistics
UN	United Nations
VA	Value Added
VAT	Value Added Tax

1 Introduction

1.1 Background

A Social Accounting Matrix (SAM) elaborates the interrelationship between economic and social statistics by linking together the (mainly) macro-statistics of national accounts with the (mainly) micro- statistics of the labour market and of households. Both ESA95 (8.134) and SNA93 (20.4) in their definitions of SAMs, emphasise the linkages between supply and use tables and sector accounts, and their focus on the role of people in the economy. As examples, the two international guidelines refer to “extra breakdowns of households and disaggregated representations of labour markets”. With these links and extra breakdowns, it is possible for the analyst to investigate economic and social policy issues within an integrated framework.

The aim of this handbook is to provide member states of the European Union and, indeed, other countries, with sufficient information to enable them to understand what SAMs are, how they can be compiled, and how they can be used. The handbook takes ESA95 as its starting point, and is entirely consistent with it and with SNA93. Significant parts of chapters 2 and 3 are extracts from ESA95 and SNA93.

Although this handbook is a general guidance on SAMs, it concentrates on a labour-oriented SAM, i.e. its main purpose is to describe a SAM that provides detailed information on the met demand for and used supply of labour in monetary terms.

1.2 Structure of this chapter

This chapter gives a brief overview of the different statistical systems (accounts, national accounts, and labour accounting systems) that need to be brought together in order to construct a SAM. The structure of the chapter is as follows:

– the chapter begins (above) with a definition of SAMs, briefly describes their use, and the purpose of this handbook;
– a road map describes the content of each chapter of the handbook, and provides the reader with alternative routes through the handbook according to their interests and expertise;
– general principles of accounting – illustrates the advantages arising from constructing economic accounting systems by outlining some important principles and characteristics; overview of national accounts – provides a very brief introduction to the system of national accounts;
– overview of labour accounts – provides a brief introduction to labour accounts, and the Labour accounting System of the International Labour Organisation (ILO), which provide a framework for integrated labour market statistics;
– and classifications – describes the units and the classification of units that are used within the individual accounts to show who paid what to whom.

1.3 Road map

Chapter 2 presents both a general introduction to the matrix presentation of national accounts (a national accounts matrix – a NAM), and a more detailed elaboration of the NAM. The level of detail of this NAM gives the basic framework for SAMs. It discusses the circular flow of income, various accounts within the system and ways to compile a selection of specific accounts.

Chapter 3 shows in detail the expansions of a NAM into sub-matrices focusing on the role of people in the economy - the transition to the labour-oriented SAM. At the core of this system are descriptions in monetary terms of both the demand and the supply of labour. The description of the demand side focuses on demographic, social and economic characteristics of employed persons; and, for the supply side, on relevant breakdowns of both employees and households. The way to produce the different sub-matrices is explained and demonstrated with the help of detailed examples. The chapter concludes with the expansion of primary and secondary distribution of income and the description of consumption expenditure and savings of households.

Chapter 4 describes various aspects of labour accounting systems (LAS). A brief look at the availability and quality of labour statistics in Europe underlines the need for consistency between them. The relationship between labour accounts and national accounts and SAMs is explained. The chapter shows the conceptual framework for a LAS as it was developed by the International Labour Organisation (ILO) in the 1980s. The monetary parts of labour accounts (LA) overlap with the labour oriented SAM (described in chapter 3). The non-monetary parts, and the way they can be constructed, are explained in this chapter.

Chapter 5 deals with compilation procedures and techniques. It describes the steps that need to be taken to compile a SAM, from design to final balancing. The top-down, bottom-up, and combined approaches for compiling the sub-matrices are described, emphasising the strengths and weaknesses of each. There is a more detailed description of the construction of a labour-oriented SAM using a bottom-up approach. Several techniques used for the matching, calibrating, and integration of micro data are described. The chapter ends with an outline of the balancing tools that are available for producing the final product of fully balanced SAM sub-matrices.

Chapter 6 looks at the possible use of SAMs and labour accounts, which mainly centres around the linkages between the two often distinct worlds of statistics: economic and social statistics. The advantages of more integration of basic data with SAMs and Labour accounts are given. Separate attention is drawn to the SAM as a tool for policy analysis. Combining the pilot SAM figures for the Netherlands with similar figures for previous years enables an analysis over time. Using the pilot SAM figures for all countries participating in the Leadership group of SAMs gives a country comparison. The modelling approach, substantially used in SAM analysis is separately described. [Revise when chapter has been edited]

Who should read what?

Readers with different needs may wish to use alternative routes through the handbook according to their interests and expertise. Chapters 1 and 6 may be of interest to any researcher, analyst, or student in the area of socio-economic statistics.

The user of SAMs should concentrate on Chapter 6 – applications, frequency, timeliness, quality, and coverage.

The national accounts expert (e.g. compiler) should work through four chapters. Chapter 2 is a guide on accounting and national accounts matrices (NAMs); Chapter 3 on the extension of NAMs to SAMs; Chapter 5 on methods of compiling SAMs (and labour accounts); and, Chapter 6 on how these various accounts can be combined and used.

Labour statistics expert (e.g. compiler) may be interested in employment and/or wage and labour cost/price statistics. These experts may prefer to look at the last four chapters. Chapter 3 will help on what SAMs can say about labour; Chapter 4 on what labour accounts can add to traditional labour market statistics; Chapter 5 on how to compile SAMs and labour accounts; and, Chapter 6 on how these various accounts can be combined and used.

1.4 General principles of accounting

Social Accounting Matrices (SAMs) are an extension of the core national accounts as presented in the European System of Accounts (ESA95) and the System of National Accounts (SNA93). They also make extensive use of labour market statistics that can be presented as labour accounts. It is therefore useful to understand the general principles of accounting that underlie all of these systems.

An account is a means of recording, for a given aspect of economic life, the uses and resources or the changes in assets and liabilities during the accounting period, or the stock of assets and liabilities held at a certain time. Each account is balanced by introducing a balancing item defined residually. The accounting rules and procedures used in national accounting are based on those well established in business accounting (see SNA93, 1.58ff, and ESA95, 1.48ff).

The traditional double-entry book-keeping principle, whereby a transaction gives rise to a pair of matching debit and credit entries within the accounts of each of the two parties to the transaction, is a basic tool of economic accounting. For example, recording the sale of output requires not only an entry in the production account for the seller but also an entry of equal value (the counterpart) in the seller's financial account to record the cash, or short term financial credit, received in exchange for the output sold. As two entries are also needed for the buyer, the transaction gives rise to four entries in total.

Later on, in chapters 2 and 3 in particular, we see that when the accounts are put in a matrix format, two entries suffice to record these transactions.

Accounting systems provide logical structures that allow consistency checks within and between accounts. For example, the total of transactions recorded as resources (or changes in liabilities) and the total of transactions recorded as uses (or changes in assets) must be equal. Similarly, the strong link between the flow accounts and the stocks (balance sheets) ensures that changes in stocks are fully explained by recorded flows (SNA93, 3.4). In practice, national accountants use a wide range of different data sources that do not necessarily match. The accounting framework provides the logic whereby reconciliation of these various data sources can take place.

1.5 Characteristics of accounting systems

There are a number of requirements of economic accounting systems. ESA95, 1.05 cites eight characteristics, of 'good' national accounts, which establish a "good balance between data needs, and data possibilities". The seven characteristics that are considered to be important in developing NAMs and SAMs and labour accounts are briefly discussed below.

a) Full coverage

Accounting systems should be exhaustive (within the defined scope). The ESA95 and SNA93 cover all economic activities within the production boundary as defined in these national accounting systems (for further details see ESA95 3.07ff and SNA93 6.14ff). Similarly, labour accounting systems should cover persons and all the jobs that they hold. Where two systems are combined, as they are in SAMs, the (exhaustive) coverages should be the same. Similarly, variables that are closely related must be measured coherently, so that the important differences between them are retained and measurable. For example, Chapter 4 makes clear the importance of coherent measurement of employment on both national and domestic bases.

b) Harmonised concepts

As with coverage, to achieve coherence in SAMs, the concepts and classifications used in the national accounts and labour accounts have to be harmonised and mutually consistent. Labour accounting (and SAMs) concepts and breakdowns are linked to ILO

and SNA recommendations. ILO concepts describe employment (paid and self-employment) and unemployment. The SNA defines employment (consistently with ILO) and compensation of employees. This harmonisation is crucial when combining statistics from different sources and from different accounting systems (as is done for SAMs), and when comparing results from different countries.

c) Consistency

Accounting systems provide sets of estimates that satisfy strict identity relations. This consistency is (usually) a consequence of the account compilers making informed adjustments to the source data. Compilers are better placed to do this than users as they have more knowledge of strengths and weaknesses of the various sources, and have had more access to individual records. It is more efficient for the accounts to be made coherent once (by the compiler) rather than by a variety of different users, who will use different assumptions, and therefore produce different results. The information on how these coherence adjustments have been made should be clear and open to public scrutiny and challenge (see also g. on transparency, below).

d) Good quality data

Comprehensive accounting systems build on statistics from a variety of sources including administrative sources, enterprise surveys, and household surveys. This helps to produce good quality information in both the accounts and in the source data themselves. Firstly, each source has strong and weak points that are known to the compiler, and the system can use the sources in a way that makes use of the strong aspects of each source, thus improving the quality of the accounts. Secondly, where different sources provide alternative measures of the same concept, the compiler may be able to trace and quantify imprecisions and errors in the different data sets by comparing them. Feeding this information back to the source statistician should lead to better source data.

e) Flexibility

Accounting systems are flexible because their scope can be extended to include other concepts or more detailed information (providing these do not conflict with the logic of the system). A SAM is an example of this flexibility. It enriches the national accounts by elaborating the linkages between supply and use tables and the sector accounts, using detailed breakdowns particularly of the household sector. It incorporates additional information on the level and composition of employment. Satellite accounts, such as environmental accounts, or a combination of a SAM and environmental accounts, also enhance the scope of the national accounts framework.

f) Timeliness

Integrated statistics may, at first glance, seem less timely than the results of source statistics. Integration takes time. Experience with national accounts has shown that the availability of an accounting system in fact facilitates the estimation of reliable and timely short-term business cycle indicators (Algera and Janssen, 1991). Because comprehensive source statistics are typically not available fast enough for the estimation of all the desired indicators, ‘plugging in’ scattered, timely statistics into the accounting system, makes it possible to update the rest of that system with the help of the required consistencies and estimates for previous periods. This approach can provide the best possible early estimates of aggregate indicators. At the very least, the use of accounting systems ensures the release of provisional estimates that are mutually consistent.

g) Transparency

During the process of integration many decisions have to be taken to adjust results from the various data sources used. Some adjustments are well based; others less so. Documenting and publishing the different steps taken in the process allows the adjustments to be challenged and improved where necessary. Although this activity requires considerable resources, it stimulates quality improvement by forcing producers of integrated statistics to justify their decisions explicitly, and to document their judgements. The source statisticians are then able to comment on the adjustments made to their statistics.

1.6 Overview of national accounts

This section is a very brief guide to the coverage and structure of national accounts. More detailed explanations of the system are in SNA93, Chapter 2, and ESA95, Chapter 1.

National accounts apply the general accounting principles outlined above. They account for the uses and resources and changes in assets and liabilities of the total economy, including transactions with the rest of the world.

The uses made of the national accounts are many. Accounts are analysed over successive periods to monitor the development of an economy. Using a clearly structured and internationally agreed accounting framework allows economies of different countries to be compared.

In describing the accounts, a split is usually made between two sets of tables: a) the sector accounts; and b) the supply and use framework, including industry accounts.[1)]

1.6.1 The sector accounts

The economic actors of a country or a region are sub-divided into institutional units. The resulting sub-divisions are institutional sectors. Accounts are prepared for each of these sectors, and are aggregated for the whole economy. An institutional unit is an elementary economic decision making centre characterised by uniformity of behaviour and decision making autonomy. These institutional units are grouped into five mutually exclusive institutional sectors:

– non-financial corporations
– financial corporations
– general government
– households
– non-profit institutions serving households.

The rationale for the grouping is that members of a sector behave in a similar way, from the viewpoint of economic analysis. So, for example, households' defining characteristics are (a) they derive their resources from returns to labour or capital, (b) they pay part of it to the government sector, and (c) they use the rest mainly for consumption and saving.[2)] On the other hand, the government draws its main resources from taxes.

The sector accounts proceed through a sequence of accounts, with the balance from each preceding account being the starting point for the next account. The various flows are recorded in a first series of accounts - the current accounts. The current accounts cover production, the generation of income, the distribution and redistribution of income, and finally the use of income. The balancing item emerging at the end of these current accounts is saving. Saving is then carried forward into the second sequence of accounts - the accumulation accounts. These record the net accumulation and disposal of financial and non-financial assets.

Financial assets are entered into the financial accounts, non-financial assets into the capital account. Finally, the balance sheets show the stock of assets and liabilities and net worth for each sector. The asset accounts show the link between the opening assets, the flows into the accumulation accounts, other changes in the volume and price of assets and the closing assets.

1.6.2 Supply and use framework

In the supply and use tables, a matrix structure is used to describe the supply of goods and services by product and by industry. They show how the domestic and imported supply of goods and services is allocated between various intermediate and final uses (consumption, exports, and capital formation). The production process – output produced through the combination of inputs – is described by industry.[3)] The use table also shows by industry the structure of production costs and the income generated. A brief description of these tables is given in ESA95, 9.01 to 9.09.

The supply and use tables are an important coordinating framework for the compilation of national accounts. The units underlying these tables are kind-of-activity units (KAUs, see ESA95, 2.106) which are most appropriate for the analysis of the process of production. They are the result of dividing institutional units into smaller and more homogeneous units in terms of the kind of production.

1.7 Overview of labour accounts

The labour market's accounting framework, the labour accounting system (LAS), was developed by the International Labour Organisation (Hoffmann, 2000). Some of the key variables in LAS are also found in ESA95, Chapter 11, and SNA93, Chapter 17. These are based largely on concepts and definitions from the LAS. The rationale for developing the labour accounting system was to obtain a complete and consistent picture of the labour market situation. Although most developed countries have been collecting labour market data since the beginning of the 20th century, there are some major problems in using these data to draw a consistent picture. The major difficulties are:

Occurrence of contradictory results between data sources: In general, the different labour market statistics describe different reference populations, and use different measurement units, reference periods and definitions. Like most statistics, they are also subject to sampling and non-sampling errors. This lack of comparability between the various sources often leads to contradictory results.

Lack of global overview of the labour market data: Each available data source on labour market has tended to describe only part of the labour market and related aspects. This fragmented approach leads to both overlaps and gaps.

The links between labour market data and other statistical systems are often missing: In the present context, the interest is in the links between labour market statistics and statistics used as the basis for the National Accounts estimates. (However, there is also the need for clear links with other areas such as population and education statistics.)

The objective of the LAS is to address these problems by combining various statistical data sources within an accounting framework so as to enhance their strengths and overcome their weaknesses. At the 15th International Conference of Labour Statisticians (ICLS) in 1993, the LAS was said to "provide a logical framework for obtaining internally consistent estimates of key labour market variables and their distribution over the population ..(which) .. are necessary for the description and analysis of the state and dynamics of the labour market and its interaction with the rest of the economy". An appropriate choice of basic definitions enables direct connections with other statistical systems, such as the National Accounts or Demographic Accounts.

The key units described in labour accounts are:
– jobs;
– employed, unemployed and underemployed persons;
– vacancies;
– hours of work and full-time equivalents;
– income from employment;
– labour costs;

A LAS provides a framework to bring together labour market data from all sources. The main variables incorporated in this framework are a) labour input aggregates in physical terms (the number of persons, jobs, hours etc.), which describe supply and demand on the labour market, and b) labour payments (income and costs). Each variable is categorised by relevant characteristics. The aggregates have to satisfy a set of identity relations. The identities are both in the static description of core objects and in the dynamic description of stock and flow data.

The LAS has many characteristics in common with SAMs and National Accounts in terms of purpose and processes. Though there is a common core in LAS and SAM, there are also important differences. LAS is designed to give a comprehensive description of the labour market, whereas SAM covers the relationship between the labour market and the rest of the economy.

The aspects of LAS that are covered in this handbook are the characteristics of and the relationships between people in employment, jobs, hours worked and compensation from employment. Those aspects of LAS that are not covered include supply imbalances (for example, those seeking work); demand imbalances (for example, vacancies) and the flows between different labour market states over time (labour market dynamics).

1.8 Classifications

As we have already seen in defining SAMs, and introducing national accounts and labour accounts, many of the relevant relationships are cross-classifications. This becomes even more apparent as the next three chapters examine NAMs, SAMs and labour accounts. Of particular importance is being able to define and then measure who transacted (paid, received, transferred etc.) with whom. Defining classifications for the different accounts in NAMs and SAMs is a vital phase in their construction (see particularly the section on compilation phases in Chapter 5).

It is particularly important for international comparability that NAMs and SAMs for different countries should be based on common classifications, and that (broad) standard groups are distinguished. Even so, the actual (detailed) classifications may have to be decided on the basis of local considerations.

One of the great strengths of the matrix presentation of accounts in NAMs and SAMs is that the units or classification of units in the various accounts in the matrix do not necessarily have to be the same. The most suitable units and/or classifications can be selected for each account.
So, for example, because of data limitations in some statistical sources, a more restricted classification may be necessary in one particular account. This does not affect the classifications used in other accounts. Households can be broken down into different categories in some accounts, and be treated in aggregate in others. Similarly, corporations, financial corporations, government expenditures (and so on) can be used with variable breakdowns in the various accounts within the same NAM or SAM. (See also section 2.2.3).

The classification used for industries is the NACE rev.1 This is the industrial classification of economic activities within the European Communities. The classification employed for products is the CPA. This is the product classification that shows the principal products of the industries according to the NACE rev.1. These classifications are fully aligned to each other (ESA 1995, 9.17).

The following paragraphs briefly review the different classifications available, and indicate how they are applied in the construction of NAMs and SAMs. (The account numbers refer to those used in the next chapter describing a NAM; see table 2.6).

1.8.1 Product groups

The goods and services account (Account 1) is classified by product groups. This gives the most relevant details about the consumption expenditure on goods and services by households. An example of the use of this breakdown is in sub-matrix (1,6) in Chapter 3, where different consumption patterns for various household groups are presented.

An important consideration for the classification of goods and services is the availability of data about the consumption of various household groups, for instance from a household budget survey.

In Table 2.6, the detailed NAM, six product groups are distinguished, with codes 1a – 1f. In the Annexes, more detailed classifications appear, but these can all be aggregated to the European classification.

1.8.2 Industries

The production and gross fixed capital accounts (Accounts 2 and 8) are classified by industries. In the production account, data are (usually) mainly derived from the supply and use table compiled within national accounts.
The NACE-classification used for the pilot SAMs is fairly aggregated. An aggregation to six groups from the standard NACE tabulation groups is used, codes 2a – 2f and 8a – 8f. Further subdivision is advisable where the statistics are available.
In the gross fixed capital formation account, a different (more aggregated) taxonomy of industries can be applied, depending on data availability. An example of this breakdown is the sub-matrix (8,7) of net fixed capital formation by sector of origin and industry of destination in Chapter 2.

1.8.3 Primary input categories.

The generation of income account (Account 3) is classified by primary input categories. Further elaboration of the generation and allocation of primary income plays an important role in the NAM. The NAM considers employed persons as the statistical units that receive wages and salaries in this account. They distribute these revenues to their household in the allocation of primary income account. For this purpose, the NAM introduces new primary input units, also called production factors, between the establishment unit (account 2) and the institutional unit (account 4).
The income generated is then classified into the following primary input categories:
– Compensation of various types of employees;
– Other taxes less subsidies on production;
– Net operating surplus;
– Net mixed income.

A further breakdown of compensation of employees by gender and educational level is a distinguishing feature of the SAM and will be discussed in chapter 3. Operating surplus can be broken down by sub-sector and mixed income by household sub-sector.

1.8.4 Institutional sectors

Allocation of primary income, secondary distribution of income, use of disposable income, and capital accounts (Accounts 4, 5, 6 and 7) are all classified by the institutional sectors defined by the ESA95 and SNA93, and listed in paragraph 1.5.1 (above).

For many purposes of a SAM, the classification of households is particularly important. In chapter 3, the household sector is further subdivided.

1.8.5 Financial assets

The financial account (Account 9) uses the following classification of financial assets:
– Monetary gold and special drawing rights (SDRs)
– Currency and deposits
– Securities other than shares
– Loans
– Shares and other equity
– Insurance technical reserves
– Other accounts receivable/payable

1.8.6 Geography

Some or all accounts for the rest of the world (R.o.W.), accounts 10 and 11, may be geographically subdivided. This could be especially important where the economy (country or region) under consideration belongs to a larger community where special (trade) regulations apply. For instance, in order to enable an aggregation of SAMs of EU Member States, accounts 10 and 11 should be split into EU and non-EU areas.

Notes

[1] In a SAM, these two sets of tables are integrated into a single (matrix) format. That integration is, in fact, an important presentational and analytical advantage of a SAM.

[2] A feature of the standard national accounting system is that households are assumed to earn wages and salaries, whereas in practice these earnings accrue to individual household members. This anomaly is remedied in a SAM.

[3] Intermediate inputs are described in great detail, whereas the main, primary inputs (labour, capital) are each described as a single input. It is assumed that just single, homogeneous type of labour and capital inputs are used in a production process, whereas in practice almost all production processes use (e.g.) labour of various skill levels that are certainly not perfectly substitutable (and have quite different wage rates). This omission is rectified in a SAM.

2 National Accounts Matrices – NAMs

2.1 Introduction

The previous chapter sets the scene by outlining the general principles and characteristics of accounting, providing very brief overviews of national and labour accounts, and describes the classification of the various units that are used in these accounts and in SAMs.
This chapter first describes how national accounts can be expressed in matrix format, and assesses the advantages and limitations of this alternative presentation. It then presents an aggregate National Accounts Matrix (NAM), and the eleven individual accounts that together make up the NAM. After explaining how NAMs can be used to show the circular flow of income, the chapter presents a detailed NAM, with descriptions of the detailed component accounts. The final sections outline some methods for compiling a number of specific cells in these accounts.

2.2 General introduction to a National Accounts Matrix

This section describes the main principles and properties of matrix accounting. This is done through a practical example by showing how the national accounts can be presented in matrix form. The example is developed to show the properties of matrix accounts and the operations which can be performed to expand them.

2.2.1 Presenting the national accounts in matrix form

The national accounts can be presented in matrix form at various levels of detail. At the highest level of aggregation, there is an aggregate national accounts matrix (NAM) that distinguishes between the different kinds of accounts, as in Table 2.1, and described in Section 2.3.

This can be elaborated by expanding the individual cells to show the kinds of transactions between the different product groups, industries, and sectors involved in the accounts. This presentation is described in section 2.5 as the detailed NAM (SNA93, Chapter 20, section B, and ESA95, 8.100 to 8.132).

The detailed NAM can be turned into a Social Accounting Matrix (SAM) by further expanding the cells by introducing more detailed classifications. The expansions are generally of social or socio-economic classifications, such as labour and households, rather than the traditional economic classifications used in national accounts. This broadens the analysis considerably beyond national accounts. This process is described in Chapter 3.

2.2.1.1 The aggregate national accounts matrix

Each account is represented by a row and column pair. The convention is that incomings or resources are shown in the rows, and outgoings or uses are shown in the columns.

The main feature of the matrix presentation is that each item which is presented twice in the (more traditional) T-accounts is only included once in the matrix. It appears at the intersection of the row of the account in which it is a resource (or the acquisition of an asset) and the column of the account in which it is a use (or the acquisition of a liability).

The first two rows and columns of table 2.1 are an aggregate version of the supply and use accounts, which are, in this presentation, explicitly linked to all other accounts. (The supply table, in column 1, has been transposed.) The distribution and use of income accounts are in rows and columns 3, 4, 5 and 6; the accumulation accounts in rows and columns 7, 8 and 9; and the rest-of-the-world accounts in rows and columns 10 and 11.

Table 2.1 Aggregate National Accounts Matrix

ACCOUNT		1. Goods and services	2. Production	3. Generation of income	4. Allocation of primary income	5. Secondary distribution of income	6. Use of disposable income	7. Capital	8. Gross fixed capital formation	9. Financial	10. Rest of the world, current	11. Rest of world, capital	12.Total
	Classifications	*product groups*	*industries*	*primary input categories*	*institutional sectors*	*institutional sectors*	*institutional sectors*	*institutional sectors*	*industries*	*financial assets*			
1. Goods and services	*product groups*	Trade and transport margins 0	Intermediate consumption 1 904				Final consumption expenditure 1 371	Changes in inventories* 38	Gross fixed capital formation 376		Exports of goods and services (f.o.b.) 536		4 225
2. Production	*industries*	Output (basic prices) 3 595											3 595
3. Generation of income	*primary input categories*		NET VALUE ADDED (basic prices) 1 469								Compensation of employees from the RoW 6		1 475
4. Allocation of primary income	*institutional sectors*	Taxes less subsidies on products 133		GENERATED INCOME, NET (basic prices) 1 473	Property income 341						Property income and taxes less subsidies on production from the RoW 66		2 013
5. Secondary distribution of income	*institutional sectors*				NATIONAL INCOME, NET 1 633	Current transfers 1 096					Current transfers from the RoW 10		2 739
6. Use of disposable income	*institutional sectors*					DISPOSABLE INCOME, NET 1604	Adjustment for the change in net equity of households on pension funds reserves 11				Adjustment for the change in net equity of households on pension funds reserves from RoW 0		1615
7. Capital	*institutional sectors*						SAVING, NET 233	Capital transfers** 68		Net incurrence of liabilities 603		Capital transfers from the RoW 1	905
8. Gross fixed capital formation	*industries*		Consumption of fixed capital 222					Net fixed capital formation 154					376
9. Financial	*financial assets*							Net acquisitions of financial assets 641				NET LENDING OF THE ROW -38	603
10. Rest of the world, current		Imports of goods and services (c.i.f.) 497		Compensation of employees to the RoW 2	Property income and taxes less subsidies on production to the RoW 39	Current transfers to the RoW 39	Adjustment for the change in net equity equity of households on pension funds reserves to the RoW 0						577
11. Rest of the world, capital								Capital transfers to the RoW 4			CURRENT EXTERNAL BALANCE -41		-37
12. Total		4 225	3 595	1 475	2 013	2 739	1 615	905	376	603	577	-37	

* Including acquisitions less disposals of valuables.
** Including acquisitions less disposals of non-produced non-financial assets.

2.2.1.2. Interpreting the matrix

To understand how the matrix should be read take the example of the production account in the form of a T-account (Table 2.2). The uses, intermediate consumption and consumption of fixed capital, are shown in the production column (with net value added, which is the balancing item) of the simplified national accounts matrix, and the resource production is in the production row of the matrix.

Most accounts are closed with a (meaningful) balancing item. This item is usually recorded in the column of that account and in the row of the next account, thus providing a link between successive processes. For example, the balancing item of the production account, net value added at basic prices, appears in cell (3,2), that is row 3, column 2. Each balancing item is computed as the row total minus the sum of the other items in the column. In Table 2.1, all the boxes containing a balancing item have been shaded.

Since the NAM distinguishes transactions with the rest of the world in separate accounts (10 and 11), the diagonal cells (4,4), (5,5), (6,6) and (7,7) contain only transactions among resident institutional units.

Row and column totals (in row and column 12) have not been named. Their main function in matrix accounting is to ensure that all the accounts represent complete balances, and that total incomings (row sums) equal total outgoings (column sums). Meaningful balancing items, which connect successive accounts, can only be derived if this condition is fulfilled.

Table 2.2 Production account

Uses			Resources		
P.2	Intermediate consumptio	1 904	P.1	Output	3 595
K.1	Consumption of fixed capital	222			
B.1n	Net value added	1 469			

2.2.2 Ways of expanding or condensing an accounting matrix

In principle, it is possible to break down each account in three ways: a) by subdividing the total economy into groups of units (or “players”), b) by distinguishing sub-accounts, or combining accounts, and c) by both a) and b) (SNA93, Chapter 20, section B2).

2.2.2.1 Subdivision of the total economy into groups of units

a) The most appropriate unit or classification of units for use in this breakdown will vary from account to account. Different accounts can be classified by product groups, by industries, by primary input categories, by institutional sectors or by types of financial asset (see section 1.8). These subdivisions enable us to highlight links such as: ‘which debtor unit is connected with which beneficiary unit’ or ‘who does what’. To take a simple example, the ‘output’ item of cell (2,1) can be disaggregated to show which branches of activity produce which types of products (see Table 2.6 – Detailed National Accounts Matrix). This is the make matrix, which is part of the supply and use table.

These detailed breakdowns reveal the connections between economic flows, more particularly in the case of a closed circuit sequence (see section 2.4). In this way, an analysis of the transmission mechanism of an external impulse (e.g. monetary policy) on the rest of the economy can be undertaken.

2.2.2.2 Distinguishing subaccounts

b) Table 2.3 shows a abbreviated (or “consolidated” – SNA93, table 20.3) national accounts matrix. For example, the three distribution of income accounts shown in Table 2.1 have been aggregated together into a single account in Table 2.3.

Expanding the matrix to distinguish sub-accounts gives rise to extra balancing items and new information. For example, in moving from Table 2.3 back to Table 2.1, the compiler creates a breakdown of the distribution of income account into three sub-accounts: a generation of income account, a primary distribution of income account and a secondary distribution of income account. This means that the diagonal item in Table 2.3 is split into two parts in Table 2.1 - property income flows, cell (4,4), flows of current taxes on income, wealth, etc. and current transfers, cell (5,5). Analogously, compensation of employees, property income, and taxes on production and imports from and to the rest of the world are separated from current taxes on income, wealth, etc., and current transfers from and to the rest of the world. As a consequence, a new balancing item, net national income (NNI), cell (5,4), is introduced in order to close the first sub-account (primary distribution of income). It will always be the case that the balancing item of the last sub-account (secondary distribution of income, in this instance) is the same as the balancing item of the aggregate account.

The transition from Table 2.3 to Table 2.1 involves a second step. Taxes less subsidies on products have been channelled directly from the goods and services account to the allocation of primary income account, cell (4,1) of Table 2.1. Therefore, in cell (3,2) the term net value added, at basic prices, replaces net domestic product, which is valued at market prices. In addition, compensation of employees receivable from and payable to the rest of the world are separated from property incomes and taxes on production and imports from and to the rest of the world.

The result of all this is that the generation of income account in Table 2.1 is closed with a new balancing item, between total net value added and NNI. This balancing item, total net generated income, at basic prices, (cell (4,3), gives total income earned by resident institutional units as a result of being engaged in production.

2.2.2.3 Link between two ways of expanding the matrix

c). The processes of subdivision (or aggregation) of categories of units and (de)consolidation of accounts are closely linked. In practice, a sub-account for one or a few transaction categories is inserted either because a separate classification is required for these categories, or because groups of receiving and paying units should be presented separately for the transactions in these categories. An important criterion for maintaining or introducing a separate account is also that it yields an economically meaningful balancing item.

2.2.2.4 Introduction of dummy accounts

There may be circumstances where there is a transaction category for which only total receipts and payments of transactors (the row and column totals of a sub-matrix) are known, and not who paid whom (the interior structure of the sub-matrix). In this case, it is useful to create a dummy account. This technique can be illustrated with an example. Cell (5,5) in Table 2.1 concerns current taxes on income, assets, etc. and current transfers, and shows transactions within the secondary distribution of income account. For analytical purposes, it would be useful to subdivide the cell to identify which of the various institutional sectors operate with which other institutional sectors (Table 2.4). However, there may not be sufficient data to allow all transactions to be broken down. In the example shown in Table 2.4, the total for miscellaneous current transfers is known but there is no information available on ‘who’ is paid ‘by whom’. The solution adopted is to show the detail of the secondary distribution of income for current transfers excluding miscellaneous current transfers (account 5A in Table 2.4), and to create a dummy account for the secondary distribution with these miscellaneous current transfers (account 5B).

Table 2.3 An abbreviated national accounts matrix

Accounts	Outgoings	Goods and services	Production	Distribution of income	Use of income	Capital	Rest of the world, current and capital transactions	Total
Incomings	Codes	1	2	3&4&5	6	7	10&11	12
Goods and services	1		Intermediate consumption *1 904*		Final consumption expenditure *1 371*	Gross capital formation *414*	Exports of goods and services *536*	*4 225*
Production	2	Production and taxes less subsidies on products *3 728*						*3 728*
Distribution of income	3 4 5		NET DOMESTIC PRODUCT/ Net value added *1 602*	Property incomes, current, taxes on income, assets, etc. and current transfers *1 437*			Compensation of employees, property income, current taxes and current transfers receivable from rest of the world *82*	*3 121*
Use of income	6			NET DISPOSABLE INCOME *1 604*	Adjustment for variation in households' rights to pension funds *11*		Adjustment for variation in households' rights to pension funds received from the rest of the world *0*	*1 615*
Capital	7		Consumption of fixed capital *222*		NET SAVINGS *233*	Capital transfers and acquisitions less disposals of land and other non-produced assets *68*	Capital transfers receivable from/payable to rest of the world acquisitions less disposals of other non-produced assets by rest of the world *-3*	*520*
Rest of the world, current and capital transactions	10 11	Imports of goods and services *497*		Compensation of employees, property income, current taxes and current transfers payable to the rest of the world *80*	Adjustment for variation in households rights to pension funds paid to the rest of the world *0*	FINANCING CAPACITY/REQUIREMENT OF THE TOTAL ECONOMY *38*		*615*
Total	12	*4 225*	*3 728*	*3 121*	*1 615*	*520*	*615*	

Table 2.4 Flows of current taxes on income, assets, etc. and current transfers between institutional sectors [4)]

				Secondary distribution of income				
				Current transfers, other than miscellaneous transfers				Miscellaneous transfers
				Corporations	General gov.	Households	NPIs	
				5A				5B
Secondary distribution of income	Current transfers other than miscellaneous transfers	Corporations	5A	14	4	84	0	8
		General government		35	92	446	0	10
		Households		76	289	–	1	1
		NPIs		0	0	1	0	35
	Miscellaneous transfers		5B	4	8	40	2	

2.2.3 Properties of accounting matrices

Some properties of accounting matrices can be listed (see SNA93, Chapter 20, sections B3 and B2):

1. An aggregate matrix (like the NAM presented in Table 2.1) can present a bird's eye view of an economy as a whole; i.e. one page is sufficient to show the interrelations between main transaction categories leading to a set of domestic and national balancing items.
2. Each entry in an aggregate matrix can be considered as the grand total of a detailed sub-matrix, which shows the different categories of transactors involved.
3. In a matrix presentation of accounts, different types and groupings of transactors can be selected in each account, without giving up the coherence and the integrated presentation of a complete accounting system. This means that "multiple actoring and multiple sectoring" can be used, by choosing in each account a unit and a classification of units which are most relevant to the set of economic flows under consideration.
4. An accounting matrix must always describe a complete economy, however small or large it may be. This implies that a matrix may not be the most appropriate format for presenting the full sequence of accounts and balancing items for an isolated institutional sector, that is, without distinguishing an (aggregate) outside world.
5. A detailed matrix presentation is very general; any sequence of (T-) accounts for a complete economy can be transformed into a matrix, but not the other way round, because of the possibility to apply multiple actoring and multiple sectoring in a matrix. This is particularly useful when integrating a detailed supply and use table and sector accounts.
6. A detailed matrix presentation is suitable for mathematical treatment using matrix algebra. This can also be of help when balancing the accounts.
7. A detailed matrix presents a simultaneous breakdown of interrelated transactions by paying and receiving units. As a consequence, it is an appropriate format to reveal, at a meso-level, interrelations among economic flows. This includes those flows which involve two different types of units (e.g. final consumption expenditure of various categories of goods and services by a number of household sub-sectors).
8. For a set of accounts giving a breakdown of transactions by paying and receiving units, a matrix presentation is more concise than other methods of presentation. The payment of one unit and the receipt of another unit involved in each transaction are represented by a single entry.
9. A matrix is not the most efficient format for presenting a set of accounts if, on the one hand, the same unit and grouping of units are used in each account (including e.g., the production account) and, on the other hand, transactions are not broken down by paying and receiving units. In addition, a matrix format is sub-optimal if one wants to portray for institutional sectors full details of the classification of transactions, without specifying who exchanged what with whom.
10. A detailed matrix is quite suited to experiments with alternative representations of transactions in non-adjacent accounts; in principle, transactions can be paid (= being a use) from one account and received (= being a resource) by any other account without upsetting the transparency of the system. However, this reshuffle generally leads to different balancing items.

2.3 Description of individual accounts in the aggregate NAM

Eleven accounts are distinguished in Table 2.1: supply and use of goods and services, production, generation of income, allocation of primary income, secondary distribution of income, use of disposable income, capital, gross fixed capital formation, financial and current as well as capital transactions of the rest of the world with the national economy. The names of the accounts appear in the row and column headings. The number of the various accounts is shown alongside their names. Each of of these accounts is described briefly in the next few paragraphs. They are discussed in more detail later in this chapter (SNA93, Chapter 20, section D; ESA95, 8.107ff).

2.3.1 Goods and services account (account 1)

This account, the first row and column, shows the total uses and supply of goods and services.

Row 1 records the uses of goods and services, at purchasers' prices: intermediate consumption - cell (1,2), final consumption expenditure- cell (1,6), changes in inventories - cell (1,7), gross fixed capital formation – cell (1,8), and exports of goods and services at f.o.b. (free on board) prices – cell (1,10).

Column 1 presents the supply of goods and services. The goods and services are produced by resident industries, cell (2,1) or imported, cell (10,1). The domestic output is valued at basic prices and imports at c.i.f. (cost, insurance and freight) prices. Taxes less subsidies on products are not included in the output value, but recorded directly in the allocation of primary income account for the government, cell (4,1).

Trade and transport margins are registered in cell (1,1). For the total economy, the balance of paid and received trade and transport margins is always nil. They are shown here because they are non-zero in a detailed NAM, and because the structure of the aggregate matrix and the more detailed tables should be the same.

The elements in column 1 add up to total supply of goods and services at purchasers' prices – cell (12,1). This equals total use of goods and services at purchasers' prices - cell (1,12).

2.3.2 Production account (account 2)

This account is represented by the second row and column.

Row 2 shows the output of the resident industries at basic prices – cell (2,1).

Column 2 shows the intermediate consumption – cell (1,2) and the consumption of fixed capital – cell (8,2), which is put directly on the fixed capital formation account (account 8) as a resource.

Because output is valued at basic prices, the sum of row 2 and the concomitant sum of column 2, are exclusive of taxes minus subsidies on products, which have been channelled directly from the goods and services account to the allocation of primary income account – cell (4,1). This means that this amount is not included in the balancing item of account 2. Therefore, the balancing item of account 2, in cell (3,2), corresponds with the total net value added at basic prices, and not net domestic product (NDP), which is valued at market prices. Of course, the sum of total net value added, 1,469, and total taxes minus subsidies on products, 133, equals NDP: 1,602.

2.3.3 Generation of income account (account 3)

This account is in the third row and column. It shows what kind of income has been generated by direct involvement in the processes of production. Taxes and subsidies related to the production process are included here.

This account is classified by primary input category: compensation of employees, net mixed income, net operating surplus and taxes less subsidies on production. Compensation of employees is recorded as a transaction (compensation in return for work) between an industry (employer) and a person (employee). In the NAM (and subsequently, the SAM), employed persons are considered as separate units who receive compensation of employees in the generation of income account and distribute this income to their household in the allocation of income account, account 4. (In the SAM, these units are subsequently classified into various groups of (self-)employed persons; see chapter 3). This is different from standard national accounts, in which generated income is directly received by households. It reflects the reality that individuals, not households, work and receive a compensation for that labour.

Row 3 shows the receipts of the various categories of primary input. The receipts from domestic industries are shown in cell (3,2) – domestic net value added, and the receipts from abroad in cell (3,10) – compensation of employees from the rest of the world.

In column 3, compensation of non-resident persons employed in resident enterprises is paid to the rest of the world, cell (10,3) – compensation of employees to the rest of the world.

The balancing item of account 3, the net national generated income (NNGI) at basic prices, gives the total income earned by resident institutional units as a result of being engaged in production. NNGI is carried forward to the allocation of primary income

account, cell (4,3). So, in figures (Table 2.1): 1,469 (net value added) plus 6 (compensation of employees from the rest of the world), minus 2 (compensation of employees to the rest of the world) equals 1,473 (net national generated income).

2.3.4 Allocation of primary income account (account 4)

This account, the fourth row and column, records the distribution of primary income among institutional sectors.
In row 4, net generated income – cell (4,3) is augmented with taxes less subsidies on products- cell (4,1), with property income from resident sectors – cell (4,4), with property income from the rest of the world - cell (4,10), and with taxes less subsidies on production from the rest of the word – cell (4,10).
Column 4 shows property income to resident sectors – cell (4,4), and to the rest of the world – cell (10,4), and taxes less subsidies on production paid to the rest of the world - cell (10,4).
This yields net national income (NNI) as balancing item of account 4. This is carried forward to the secondary distribution of income account in cell (5,4).
National, inter-sectoral property income flows are recorded on the diagonal of the matrix, cell (4,4), as they affect the distribution, but not the total, of national income.

2.3.5 Secondary distribution of income account (account 5)

This account, the fifth row and column, registers the redistribution of national income by current transfers (current taxes on income, wealth, etc., social contributions and benefits and other current transfers), taking into account that part of these current transfers flow from and to the rest of the world.
Row 5 shows that sectors receive NNI - cell (5,4), current transfers from resident sectors- cell (5,5) and current transfers from the rest of the world – cell (5,10).
Column 5 records current transfers to resident sectors – cell (5,5) as well as to the rest of the world – cell (10,5).
Account 5 is balanced by net disposable national income, which is carried forward to the use of income account in cell (6,5).
National inter-sectoral current transfers, which affect the distribution without changing total net disposable income, are shown on the diagonal of the matrix, cell (5,5).

2.3.6 Redistribution of income in kind account and Use of adjusted disposable income account

Although these two accounts are part of the NAM system described by ESA95, they are not included in the NAM (and SAM) exemplified in this handbook.
The redistribution of income in kind account shows the redistribution of disposable income of households, general government and NPISH after the payment of social transfers in kind. The balancing item is adjusted disposable income.
The adjusted disposable income account embraces the concept of “actual final consumption”. This measures the value of products actually consumed however they are financed (i.e. whether by households themselves, or by general government or by NPISH). Its balancing item is saving.

2.3.7 Use of disposable income account (account 6)

This account, the sixth row and column, records the use of net disposable income, that is, final consumption expenditure and net savings.
The disposable income appears in the row of account 6, cell (6,5), and the final consumption expenditure is recorded in the column, cell (1,6). Cell (6,6), on the diagonal of the matrix, records an adjustment for changes in net equity of households on resident pension funds reserves. Adjustments for changes in net equity of households on non-resident pension funds reserves are recorded in cell (6,10). The corresponding changes of non-resident households on resident pension funds are recorded in cell (10,6).The balancing item of this account is net national saving – cell (7,6), which is put on the resource side of the capital account.

In the design of this NAM, the capital and financial accounts are interlinked, with the financial account classified by type of financial asset. As a consequence, disaggregation

of this NAM, shows, both the acquisitions less disposals of financial assets, cell (9,7), and the incurrence less repayments of liabilities, cell (7,9), by institutional sub-sector. These two categories of transactions have been combined for the rest of the world. This serves to include the aggregate balancing item net lending in the NAM, cell (9,11), though with a reverse sign when viewed from the standpoint of the national economy, see accounts 7 and 9.

2.3.8 Capital account (account 7)

The row of the capital account presents the availability of funds to the total economy: net saving – cell (7,6), net incurrence of liabilities (borrowing) – cell (7,9), national inter-sectoral capital transfers receivable – cell (7,7), and capital transfers from the rest of the world, including acquisitions less disposals of non-produced non-financial assets by the rest of the world – cell (7,11).
The column records how these funds have been allocated: changes in inventories – cell (1,7), national inter-sectoral capital transfers payable – cell (7,7), net fixed capital formation – cell (8,7), net acquisitions of financial assets (lending) – cell (9,7), and capital transfers payable to the rest of the world – cell (11,7).

The balancing item, net lending of the nation (the sum of the net lending or borrowing of the resident institutional sectors), can be derived from this account, i.e. by subtracting borrowing, cell (7,9), from lending, cell (9,7). The net lending (+) or borrowing (-) of the total economy, cell (9,7) minus cell (7,9), is equal but of opposite sign to the net borrowing (-) or lending (+) of the rest of the world – cell (9,11). Net lending in figures from table 2.1 is 641, cell (9,7), minus 603, cell (7,9) giving 38. This is net lending of the nation. In other words, the net resources that the total economy makes available to the rest of the world. A negative figure would represent the net borrowing of the economy from the rest of the world.

2.3.9 Gross fixed capital formation account (account 8)

A large part of total volume changes in net worth usually consists of increases in fixed assets. It is important to show which industries have expanded their production capacity (to show the dynamics of an economy). This is why a separate fixed capital formation account is included in the NAM.
The eighth row and column show, in the case of a detailed NAM, in which industry what type of capacity is expanded – sub-matrix (1,8) and, perhaps even more importantly, which sector invests in what industry – sub-matrix (8,7).
Often, estimates of gross fixed capital formation – cell (1,8), and of the consumption of fixed capital – cell (8,2) are already available. As a consequence, the residual, net fixed capital formation should be found and recorded in cell (8,7).

2.3.10 Financial account (account 9)

In the financial account, lending is presented in row 9, as net acquisitions of financial assets – cell (9,7). Borrowing is presented in column 9, as net incurrence of liabilities – cell (7,9). The balancing item of the financial account is the net borrowing (or lending) of the total economy – cell (9,11). It is given in row 9, and not in column 9, because it is also the balancing item of the capital account for the rest of the world, account 11, but of opposite sign.

2.3.11 Current account for the rest of the world (account 10)

This account shows the current transactions of the rest of the world with the nation. Row 10 contains the payments from the nation to the rest of the world and column 10 records the receipts from the rest of the world. The elements in these accounts have all been discussed above.

The balancing item, the current external balance, is shown in cell (11,10). It represents the surplus (if it is negative) or the deficit (if it is positive) of the total economy on its current transactions with the rest of the world.
If the current external balance is viewed from the perspective of the national economy, it should be put in cell (10,11) and the sign reversed.

2.3.12 Capital account for the rest of the world (account 11)

Row 11 records, in addition to the current external balance, the capital transfers to the rest of the world, cell (11,7).
Column 11 records the capital transfers from the rest of the world – cell (7,11) and the balancing item net lending of the rest of the world - cell (9,11).

2.3.13 Row and column totals

These totals are recorded in the twelfth row and column. The row sums equal the column sums by definition.

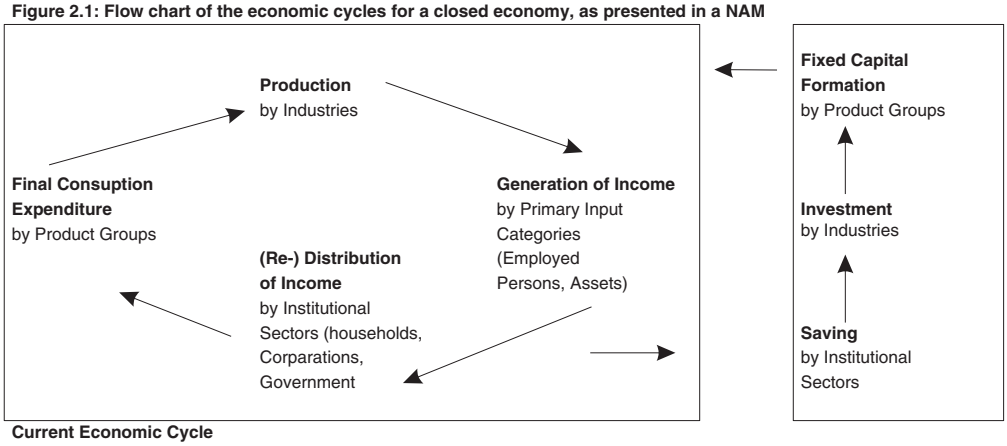
2.4 The circular flow of income in the NAM

The circular flow of income is a concept that underlies the national accounts (SNA93, Chapter 20, section E; ESA95 8.133ff). It is, however, more transparent in a matrix presentation, (see Table 2.9 at the end of this chapter) than in the more traditional T-accounts presentation. Figure 2.1 illustrates the circular flow for a closed economy. It shows the familiar interdependence between production, income generation, income (re-)distribution and consumption. It is a distinguishing characteristic of NAMs (and SAMs), except the most aggregate ones, that they show, at this meso-level, this circular flow of income in its entirety. The facility of being able to use different units or classifications of units in different accounts in the NAM or SAM (see section 1.8) for this analysis is a great strength of this matrix approach.

Production is shown at the top of the circular flow of income in Figure 2.1. In the more detailed NAM, production is shown in row 2, sub-matrix (2,1), of Table 2.6 (inserted at the end of chapter 2). The detailed NAM shows the output of products by industry. For example, the output of products of agriculture, hunting, forestry, fisheries and aquaculture by the agriculture, forestry and fishing industries equals 87, cell (2a,1a).

The second part of the circular flow of income - the generation of income by primary input categories – appears in sub-matrix (3,2) of the NAM. This shows the income generated by the production factors, labour and capital, including non-produced capital, by each industry. For example, reading from row 3a, compensation for employees is 9 in the agriculture etc. industries - cell (3a,2a), and 232 in 'other' services - cell (3a,2f). As the consumption of fixed capital is entered directly in the fixed capital formation account, sub-matrix (3,2) presents a decomposition of net value added at basic prices.

Figure 2.1: Flow chart of the economic cycles for a closed economy, as presented in a NAM



Sub-matrix (4,3) shows which institutional sectors receive the income generated in the domestic processes of production. The generated income, presented in columns 3a-3d, is transferred to the institutional sectors, in rows 4a-4e. This is the third element of the circular flow of income (income distribution). In terms of compensation of employees, all payments made by resident employers to resident employees relating to the input of labour in the domestic production process equals 762, (the sum of row 3a, columns

2a-2f). This income is distributed to households in column 3a. Before distributing this income, we need to add in the payments from the rest of the world to resident employees, 6 from (3a,10), and subtract the payments from resident employers to the rest of the world, 2 from (10,3a). This gives 766 – cell (4d,3a). The household sector is further broken down into socio-economic subgroups in chapters 3 and 4.

The row vector (4d, 3a-3c) shows the composition of income generated by households. In this example, 766 of the income of households comes from compensation of employees, 432 from mixed income and 60 from net operating surplus.

The sub-matrices (4,4) and (5,5) contain only transactions among residents institutional units. Those inter-sectoral income flows affect only the distribution of income and not the total.

Sub-matrix (4,4) shows how income is re-distributed through property income. The columns and the rows show the payments and the receipts of property income by each of the institutional sectors. In total, the household sector receives 133 in property income from non-financial and financial corporations, and government (the total of vector (4d, 4a-4c)) and pays out 44, all to financial corporations (cell (4b, 4d)).

The diagonal sub-matrix at the intersection of rows 5a-5e and columns 4a-4e gives net national income by institutional sector, which is also part of the third element of the circular flow of income.

The secondary distribution of income, mainly as a result of government policy (taxation, transfers, etc.) is recorded in sub-matrix (5,5). The rows contain receipts in the form of current transfers between institutional sectors, and the columns contain the payments. For instance, households paid 29 to the financial corporations, cell (5b,5d), and received 39 from them, cell (5d,5b).

The resulting disposable income, sub-matrix (6,5), is the link, on the one hand, to final consumption expenditure, sub-matrix (1,6) and, on the other, to saving, sub-matrix (7,6). Sub-matrix (1,6) represents the fourth part in the closed box of the circular flow of income. The final link, back to production, goes back to column 1.

Summarising, the six processes of the current economic cycle are represented in the NAM by the sub-matrices:
– (2,1), showing the production by industries of each product group
– (3,2), showing the generation of income by primary input categories in each industry
– (4,3), showing the distribution of generated income to institutional sectors for each category of primary units
– (5,4), showing the primary income by institutional sector after the allocation of property income to the various sectors
– (6,5), showing the disposable income per institutional sector after the redistribution of primary income by current transfers
– (1,6), showing the final consumption expenditure of product groups in each institutional sector.

This is schematically indicated in Table 2.9. The closed economy is illustrated inside the bold outlined box.

Since it is a circular flow, the start and end of the cycle can be selected at will.

The circular flow of income in the closed box is, of course, a simplification of reality. The picture in Figure 2.1 is made more complete by including a second circular flow showing savings and investments. This flow is also covered in a NAM.

Starting from production, sub-matrix (2,1), this flow also leads through the generation of income, sub-matrix (3,2), and the distribution and redistribution of income, sub-matrices

(4,3), (5,4) and (6,5). It continues to saving by the institutional sectors, sub-matrix (7,6), to investment by industries, sub-matrix (8,7), and to fixed capital formation by product groups, sub-matrix (1,8), to end up again with production, sub-matrix (2,1). The second economic cycle, shown on the right-hand side of Figure 2.1, is now closed as well.

This snapshot or, preferably, a time-series of such NAMs, provides both the analytical structure and the actual parameters for all kinds of modelling applications. Social aspects can explicitly be taken into account by, for example, including a breakdown of households in various accounts.

2.5 Structure of a detailed NAM

The general structure of the NAM is shown in Table 2.5. A detailed, numerical NAM (Table 2.6, inserted at the end of chapter 2) is also included. This table represents an intermediate stage from an aggregate NAM to a fully-fledged SAM. In moving to this detailed NAM, all the cells of the aggregate NAM shown in table 2.1 are specified into the sub-matrices or vectors of table 2.6. The accounts are sufficiently disaggregated to show the distinguishing features of a NAM (and SAM) framework, while still being presented in a single comprehensive table, and on a single page.
Table 2.5 provides a labelling convention for the SAM that will be used throughout this handbook. Each sub-account is labelled first according to its position in the aggregate NAM; And, second, according a standard national accounting label. This means, for example, that cell (6,5) is net disposable income. This labelling allows an easy linkage between detailed figures and the overall state of the economy. When describing the cells we always refer to Table 2.5, but all the numerical examples are taken from Table 2.6.

In the full sequence of accounts, from the production account to the rest of the world (R.o.W.) account in the detailed NAM (as in the aggregate NAM), the flows in the rows represent resources and the flows in the columns represent uses. For the Goods and Services account, however, the columns correspond to resources and the rows correspond to uses. Each balancing item is represented in both accounts to which it belongs: as a use of the account in which it is determined and as a resource of the following account.

The detailed links between the accounts and the sub-matrices of the NAM are described in this section. Each sub-matrix is discussed in turn, indicating the transactions that are represented by the cells. Some of the cells require the compiler to provide greater detail than is normally shown within national accounts.

2.5.1 Goods and Services account

This corresponds to the sub-matrices included in column 1 and row 1, respectively the resources and uses in the supply and use table. This account is always balanced. The minimum breakdown should be 6 products (P6 of Classification of Products by Activity-CPA) and 6 industries (A6 of NACE), but, of course, more detailed classifications can be used. The following sub-matrices are included:
(1,1) corresponds to the trade margins by product and its total is zero.
– (2,1) is the transposed matrix of output valued at basic prices.
– The row vector in (4c,1) represents the taxes less subsidies on products, by products paid to/received by the General Government sector.
– The row vector in (10,1) represents imports by products. It also includes the final consumption expenditure of resident households outside the economic territory. It includes taxes less subsidies on products by products paid to/received by the rest of the world. (These could be shown identifiably in a separate row vector in this sub-matrix.)
– (1,2) corresponds to intermediate consumption (products by industries).
– (1,6) corresponds to final consumption expenditure (products by institutional sectors) for columns 6c (general government), 6d (resident households) and 6e (NPISH). (Column 6c could be split into collective final expenditure and individual final expenditure.) The final consumption expenditure of resident households outside the

Table 2.5 Structure of the NAM

ACCOUNT					TOTAL ECONOMY									RoW		Total
					1. Goods and services (products)	2.Production (industries)	3.Generation of income (primary input categories)	4.Allocation of primary income (institutional sectors)	5.Secondary distribution of income (institutional sectors)	6.Use of disposable income (institutional sectors)	7.Capital (institutional sectors)	8.Gross Fixed Capital Formation (industries)	9.Financial (financial assets)	10.Current	11.Capital	
					1a 1b...1f	2a 2b.. , 2f	3a.1 ….3a.6 3b 3c 3d	4a 4b 4c 4d 4e	5a 5b 5c 5d 5e	6a 6b 6c 6d 6e	7a 7b 7c 7d 7e	8a 8b 8c 8d 8e	9a 9b 9c	10	11	
TOTAL ECONOMY	1.Goods and Services (products)	-Agriculture, forestry, fishery products		1a												
		-Industry including energy,		1b												
		-Construction		1c												
		-Wholesale and retail trade; repair of motor vehicles and household goods, hotels and restaurants, transport and communications		1d	(1,1)	(1,2)				(1,6)	(1,7)	(1,8)		(1,10)		
		-Financial, real estate, renting and business activities		1e												
		-Other service activities		1f												
	2.Production (Industries)	-Agriculture, forestry, fishery		2a												
		-Industry including energy,		2b												
		-Construction		2c	(2,1)											
		-Wholesale and retail trade; repair of motor vehicles and household goods, hotels and restaurants, transport and communications		2d												
		-Financial, real estate, renting and business activities		2e												
		-Other service activities		2f												
	3.Generation of income (primary input categories)	-Compensation of employees	Male	G1	3a.1											
				G2	3a.2											
				G3	3a.2											
			Female	G1	3a.4											
				G2	3a.5		(3,2)							(3,10)		
				G3	3a.6											
		-Mixed income, net			3b											
		- Operating surplus, net			3c											
		-Other taxes less subsidies on production			3d											
	4.Allocation of primary income (Institutional Sectors)	-Non-financial corporations		4a												
		-Financial Corporations		4b												
		-General Government		4c	(4c,1)		(4,3)	(4,4)						(4,10)		
		-Households		4d												
		-NPISH		4e												
	5. Secondary distribution of income (Institutional Sectors)	-Non-financial corporations		5a												
		-Financial Corporations		5b												
		-General Government		5c				(5,4)	(5,5)					(5,10)		
		-Households		5d												
		-NPISH		5e												
	6. Use of disposable income (Institutional Sectors)	-Non-financial corporations		6a												
		-Financial Corporations		6b												
		-General Government		6c					(6,5)	(6,6)						
		-Households		6d												
		-NPISH		6e												
	7.Capital (Institutional Sectors)	-Non-financial corporations		7a												
		-Financial Corporations		7b												
		-General Government		7c						(7,6)	(7,7)		(7,9)		(7,11)	
		-Households		7d												
		-NPISH		7e												
	8.Gross Fixed Capital Formation (industries)	-Agriculture, forestry, fishery		8a												
		-Industry including energy,		8b												
		-Construction		8c												
		-Wholesale and retail trade; repair of motor vehicles and household goods, hotels and restaurants, transport and communications		8d		(8,2)					(8,7)					
		-Financial, real estate, renting and business activities		8e												
		-Other service activities		8f												
	9. Financial (Financial Assets)	-Currency and deposits		9a												
		-Loans		9b							(9,7)				(9,11)	
		-Other financial assets		9c												
RoW		Current		10	(10,1)		(10,3)	(10,4)	(10,5)	(10,6)				(11,10)		
		Capital		11							(11, 7)					
Total																

economic territory is included but the final consumption expenditure of non-resident households in the economic territory is excluded.
– (1,7) represents the changes in inventories and the acquisitions less disposals of valuables. An alternative presentation would be to show these two transactions separately. These flows could be put in a vector as a total instead of representing it by institutional sector. Changes in inventories would be separated from the acquisitions less disposals of valuables.
– (1,8) corresponds to the gross fixed capital formation by industry and by product.
– (1,10) corresponds to the exports by products. It also includes the final consumption of non-resident households in the economic territory.

The grand total of the columns of these sub-matrices show, the total supply of goods and services broken down by product group – row vector (Total,1a-1f). Numerically, of the total supply of other services, 771 – cell (Total,1f), 731 is produced by domestic industries - cell (2f,1f), 18 is imported - cell (10,1f), taxes less subsidies on other services add up to 20 – cell (4c,1f) and the trade and transport margins to 2 – cell (1d,1f).

The total use of the different categories of goods and services is given by the grand total of the rows of the sub-matrices in the column at the far right of the NAM – column vector (1a-1f,Total). Sub-matrix (1,1) shows the treatment of trade and transport margins. On the row for these margins (row 1d), the margins on every group of goods and services are recorded in the column concerned.
The sum of the margins is recorded as a negative entry in the column for trade and transport margins, cell (1d,1d), so that the figures add across the rows to zero. Thus the valuation of uses (at purchasers' prices) in rows 1a-1f is not affected, while this method of recording ensures that total supply, the total of columns 1a-1f, is also valued at purchasers' prices.

The destination of domestically made and imported products is shown in the rows 1a-1f. For instance, two thirds of the mining/manufactured/energy products (1197, cell (1b,2a-2f)) is used as intermediate input and one third (575, cell (1b, 6d)) is consumed by households.

2.5.2 Production account

This is represented by the sub-matrices in row 2 and column 2:
– (2,1) corresponds to the transposed matrix of output;
– (1,2) represents intermediate consumption;
– (8,2) represents the consumption of fixed capital by industries and is diagonal (It could be shown as a row vector if an industry split was not included).
The balancing item determined in the production account is the value added (net), represented in sub-matrix (3,2) and broken down into its primary input categories.

The consumption of fixed capital is booked directly on the fixed capital formation account, sub-matrix (8,2), so that the current accounts yield balancing items that are net.

2.5.3 Primary Distribution of Income accounts

The primary distribution of income accounts is broken down into the generation of income account and the allocation of primary income account. Together, the transactions in these accounts constitute the major parts of the circular flow of income, and the core of the SAM (see chapters 3 and 4).

2.5.3.1 The Generation of income account

The generation of income account distinguishes four primary input categories. This account shows which primary input categories receive income from which industries.

Value added (net) (sub-matrix (3,2)) is also a resource of the Generation of Income account and it is presented by primary input categories by industry.
Compensation paid to labour input by industry is shown in (3a,2).
Other taxes less other subsidies on production are allocated by industry (in cell (3d,2)).

Table 2.6 Detailed National Accounts Matrix

Account			1. Goods and services						2. Production						3. Generation of income				4. Allocation of primary income				
	Classification		1a	1b	1c	1d	1e	1f	2a	2b	2c	2d	2e	2f	3a	3b	3c	3d	4a	4b	4c	4d	4e
1. Goods and services	Products of agriculture, hunting, forestry, fisheries and aquaculture (cpa a/b)	1a							4	66	0	11	2	8									
	Products from mining and quarrying, manuf. and energy prod. (cpa c/d/e)	1b							35	643	225	139	13	142									
	Construction work (cpa f)	1c							3	17	36	17	2	66									
	Trade, repair, hotel, rest., transport, comm. services (cpa g/h/i)	1d	6	70		–78		2	2	27	6	56	1	8									
	Financial intermediation serv., real estate, renting and bus. serv. (cpa j/k)	1e							1	42	31	42	54	46									
	Other services (cpa l to p)	1f							1	7	4	6	4	136									
2. Production	Agriculture, foresty, fishing (nace a/b)	2a	87																				
	Mining, quarrying, manufacturing, electricity, gas, water supply (nace c/d/e)	2b		1 504	15	10	4																
	Construction (nace f)	2c		7	417	6																	
	Trade, repair, hotels and rest., transport, storage and comm. (nace g/h/i)	2d		35		357	8																
	Financial intermediation, real estate, renting and bus. activities (nace j/k)	2e		11			396																
	Public adm./defence, education, health, soc. work, serv. n.e.c. (nace l to p)	2f		7				731															
3. Generation of income	Compensation of employees	3a							9	349	58	60	54	232									
	Net mixed income	3b							14	227	35	39	99	18									
	Net operating surplus	3c							9	30	18	7	112	41									
	Other taxes less subsidies on production	3d							–2	44	5	–6	12	5									
4. Allocation of primary income	Non-financial corporations	4a															139		33	27	9		
	Financial corporations	4b															–3		60	3		44	4
	General government	4c		84	10	12	7	20									16	58	19	4	1		
	Households	4d													766	432	60		19	84	30		
	Non-profit institutions serving households	4e															5			2			3
5. Secondary distribution of income	Non-financial corporations	5a																	72				
	Financial corporations	5b																		19			
	General government	5c																			191		
	Households	5d																				1 348	
	Non-profit institutions serving households	5e																					3
6. Use of disposable income	Non-financial corporations	6a																					
	Financial corporations	6b																					
	General government	6c																					
	Households	6d																					
	Non-profit institutions serving households	6e																					
7. Capital	Non-financial corporations	7a																					
	Financial corporations	7b																					
	General government	7c																					
	Households	7d																					
	Non-profit institutions serving households	7e																					
8. Gross fixed capital formation	Agriculture, foresty, fishing (NACE A/B)	8a							11														
	Mining, quarrying, manufacturing, electricity, gas, water supply (nace c/d/e)	8b								81													
	Construction (NACE F)	8c									11												
	Trade, repair, hotels and rest., transport, storage and comm. (NACE G/H/I)	8d										30											
	Financial intermediation, real estate, renting and bus. activities (NACE J/K)	8e											54										
	Public adm./defence, education, health, soc. work, serv. n.e.c. (nace l to p)	8f												35									
9. Financial (types of financial assets)	Monetary, gold and SDRs	9a																					
	Currency and deposits	9b																					
	Security other than shares	9c																					
	Loans	9d																					
	Shares and other equity	9e																					
	Insurance technical reserves	9f																					
	Other accounts receivable/payable	9g																					
10. Rest of the world	Current	10	37	61	288	58	36	18							2				14	18	6		
11. Rest of the world	Capital	11																					
Total			130	1 778	730	365	451	771	87	1 533	430	400	407	738	768	432	217	58	217	157	237	139	10

	5. Secondary distribution of income					6. Use of disposable income					7. Capital					8. Gross fixed capital formation						9. Financial							10. Rest of the world Current	11. Rest of the world Capital	Total
	5a	5b	5c	5d	5e	6a	6b	6c	6d	6e	7a	7b	7c	7d	7e	8a	8b	8c	8d	8e	8f	9a	9b	9c	9d	9e	9f	9g	10	11	
								2	28		1						2												7		130
									575		–1																		7		1 778
								3	3							8	47	14	19	42	30								423		730
									52		10			5		4	125	23	30	8									6		365
									130		18		3	2															81		451
								357	208	13							18		5										12		771
																															87
																															1 533
																															430
																															400
																															407
																															738
																													6		768
																															432
																															217
																															58
																													9		217
																													49		157
																													7		237
																													1		1 392
																															10
		5	5	14																											96
	9		48	29																									2		107
	29	25	6	523																									6		780
	8	39	316		3																								2		1 715
	2	14	18	3																											40
	48																														48
		22																													22
			352																												352
				1 145			11																								1 156
					37																										37
						48							31	9	0									6	71	26		37				228
							11																130	53		13	36				243
								–10			1				4								2	64	94			10		1	166
									160		15	7	1												28	5					216
										24															24	4					52
											1																				12
											77	–1	6	14	15																193
											26																				37
											12		1	7	4																54
											–1		–1	–1	–1																50
											–2			–1	–2																30
												–1																		1	0
											17	15	7	68	12															13	32
											18	53	26	29	12															–15	123
											27	167	45	5																–27	217
											2	3	36	3																4	48
														36																	36
											7		6	40	8															–14	47
		3	35	1																											577
													4																–41		–37
	96	107	780	1 715	40	48	22	352	1 156	37	228	243	166	216	52	12	193	37	54	50	30	0	132	123	217	48	36	47	577	–37	

Mixed income (net) (3b,2) and the operating surplus (net) (3c,2) by industries, depending on the nature of the enterprise, should be presented in separate rows. If this is not possible, these two balancing items can be put in one row.
The amount of compensation paid by non-residents to resident households is recorded in cell (3,10) and the amount of compensation received by non-resident households is shown in cell (10,3).

The balancing item that results from the generation of income account is the generated income (net) at basic prices in sub-matrix (4,3).

Sub-matrix (3,2) in table 2.6 shows that 762 of the total of 1,469 of net value added accrue to compensation of employees, 432 to net mixed income and 217 to net operating surplus. The remainder is other taxes less subsidies on production. Net value added of the public services industry of 296, the total of column vector (3a-3d,2f), mainly consists of labour costs, cell (3a,2f), (232 out of 296). For financial and business services, net operating surplus is the biggest part of value added, (cell (3c,2e)). For the mining/manufacturing/energy industry, value added consists mainly of compensation of employees (cell (3a,2b)), and of net mixed income, (cell (3b,2b)). In a SAM, sub-matrix (3,2) is broken down further to show, for example, the distribution of wages and salaries among categories of labour by industry. This is discussed in chapter 3.

2.5.3.2 Allocation of primary income account
This is made up of sub-matrices (4c,1), (4,3), (4,4), (4,10) and (10,4)

The national generated income in sub-matrix (4,3) represents the total income earned by resident institutional units in remuneration for their participation in the production process. The input factors in the columns make payments to each of the institutional sectors in the rows.
Taxes less subsidies on production are paid to the general government and the rest of the world (both vectors (4c,1) and (4c,3c-3d).
Compensations of employees received by resident households are shown in cell (4d,3a).

The operating surplus can be received by all resident sectors. Mixed income is received by households (the self-employed). This could be broken down further by separating the mixed income by e.g. industry and household group.
Sub-matrix (4,4) describes how property income is distributed to the resident institutional sectors.

Sub-matrix (4,3) shows which input factor (in the column) pays what to which resident sector (in the row), i.e. who pays to whom. Table 2.6 shows that 139 of the total of 217 of net operating surplus is distributed to the non-financial corporations, cell (4a,3c), and 60 accrues to households, cell (4d,3c); (the latter relates to services of owner-occupied dwellings). Row vector (4d,3a-3d) gives the total generated income allocated to the household sector and its distribution. The total is 1,258 and the sources are compensation of employees, 766 - cell (4d,3a), net mixed income for 432 - cell (4d,3b), and net operating surplus for the remaining 60. – cell (4d,3c).

Compensation of employees paid to the household sector (cell (4d,3a) does not equal nationally generated income. Cell (3a,10) shows that 6 have been received from the rest of the world as compensation of employees of resident workers. Cell (10,3a) shows that 2 have paid to the rest of the world as compensation of non-resident persons employed in resident enterprises. The total compensation of employees paid to resident persons equals 766 –cell (4d,3a), i.e. 762 – row vector (3a,2), plus 6 – cell (3a,10) minus 2 – cell (10,3a).

Sub-matrix (4,4) reveals from whom sectors receive their property income and to whom they pay it. Non-financial corporations pay 60 of property income (interest, dividends, etc.) to financial intermediaries - cell (4b,4a), 33 to other non-financial corporations - cell (4a,4a), 19 to general government and households - cells (4c,4a) and (4d,4a).

The general government sector could be broken-down into its sub-sectors. The financial and non-financial corporations could also be split up according to the ESA95 breakdown. The property income paid to the rest of the world is shown in sub-matrix (10,4) and the property income received from the rest of the world is recorded in the sub-matrix (4,10).

The balancing item that results from the allocation of net primary income account by institutional sector (the diagonal sub-matrix (5,4)) represents national income (net) for the total economy.

Taxes less subsidies on production (D2-D3)

For some countries, it may be difficult to split up the taxes on products received by the General Government sector from those received by the rest of the world broken-down by products (similarly for subsidies). In these cases, both row and column 3d would refer to taxes less subsidies on production (D.2-D.3, ESA classification codes):

– The total amount of taxes less subsidies on products (D.21-D.31) broken-down by product would be recorded in the sub-matrix (3d,1) (which could not be allocated to any sector).
– The amount of taxes less subsidies on production (D.2-D.3) received/paid by general government would be recorded in sub-matrix (4c,3d) and the amount received/paid by the rest of the world sector would be recorded in sub-matrix (10,3d).

2.5.4 Secondary distribution of income account

The secondary distribution of income shows how the primary income of each institutional sector is redistributed. This is described in the sub-matrices (5,4), (5,5), (5,10) and (10,5). The sub-matrix (5,5) corresponds to current transfers between sectors on income, wealth, etc, social contributions and social benefits (excluding social transfers in kind) and other current transfers. It could be expanded by using ESA95 breakdowns in the general government and/or the financial and non-financial corporations sectors. Sub-matrix (5,10) shows the current transfers received from the rest of the world and the flows paid to the rest of the world are shown in sub-matrix (10,5).

For example, the household sector receives 366 as transfer income - row vector (5d,5a-5e). Of this, 316 comes from government – cell (5d,5c), 39 from financial corporations – cell (5d,5b), and 8 from non-financial corporations – cell (5d,5a). On the other hand, the household sector pays out 569 as current transfer – column vector (5a-5e,5d), 523 to the government sector, 29 to financial corporations, and 17 to the other sectors.

The balancing item that is determined in the secondary distribution of income account is disposable income, the diagonal sub-matrix (6,5).

2.5.5 Use of disposable income account

The use of disposable income account is shown in sub-matrices (6,5), (6,6), (6,10), (1,6), and (10,6). This account describes how the disposable income is used in final consumption or savings.

Disposable income is shown in sub-matrix (6,5).
Sub-matrix (6,6) corresponds to the adjustment for the change in net equity of households on pension funds reserves in cell (6d,6b). The adjustment for the change in net equity of households on pension funds reserves received from the rest of the world is recorded in (6,10) and the amount paid to the rest of the world in (10,6). Both amounts are equal to zero in this case.

Sub-matrix (1,6) corresponds to final consumption expenditure.
Total final consumption expenditure of households adds up to 996 – column vector (1a-1f,6d), that of non-profit institutions serving households to 13 – cell (1f,6e) and general government's final consumption expenditure to 362 – column vector (1a-1f,6c). Column vector (1a-1f,6d) shows the consumption pattern of the household sector by product group. For example, manufactured/energy products account for 57.7% (575) of households' spending, other services for 20.9% (208), and products from the financial and business services industry for 13.1% (130). A further subdivision of the households, showing demand patterns across socio-economic subgroups, is discussed in chapter 3.
NPISHs spend 100% of their consumption budget on other services (e.g. medical, health and community services).
The balancing item is the saving in sub-matrix (7,6) which is diagonal.

2.5.6 Accumulation accounts

These are shown as two accounts: the capital account (accounts 7 and 8) and the financial account (account 9). They both determine the symmetrical balancing item (net lending/net borrowing).

2.5.6.1 Capital account

The Capital account (accounts 7 and 8) describes the changes in net worth due to savings and capital transfers.

- Savings is shown in sub-matrix (7,6).
- Sub-matrix (7,7) represents capital transfers, and includes acquisitions less disposals of non-produced non-financial assets. These two flows could be recorded separately. Similarly, institutional sectors could be broken down further.
- Capital transfers received from the rest of the world are recorded in (7,11), and the amounts paid to the rest of the world in (11,7).
- Sub-matrix (8,2) shows the consumption of fixed capital by industry, and is diagonal.
- Sub-matrix (8,7) shows how much gross fixed capital formation is invested in each industry by each institutional sector. If data by industry are not available this becomes a row vector (and consumption of fixed capital would be a row vector as well).
- The columns of sub-matrix (1,8) indicate which product groups the different industries acquire for their investments.

The diagonal sub-matrix (7,6) shows net saving by institutional sector, totalling 233. Households account for 160, non-financial corporations for 48 and NPISHs for 24. General government has negative savings of -10 – cell (7c,6c).

Capital transfers received from other sectors are recorded in the rows of sub-matrix (7,7). The most important capital transfer, 31 in cell (7a,7c) is from general government to non-financial corporations. Households receive 15 from non-financial corporations – cell (7d,7a), 7 from financial corporations – cell (7d, 7b) and 1 from the government – cell (7d,7c). Non-financial corporations receive 9 from the household sector – cell (7a,7d) and general government 4 from NPISHs.

Sub-matrix (8,7) shows, for example, that non-financial corporations invest 77 in the mining/manufacturing/energy industries – cell (8b,7a). Households, NPISHs, and general government invest 14 (cell (8b,7d)), 15 (cell (8b,7e), and 6 (cell (8b,7c)) respectively in these industries. So, the expansion of the production capacity of the mining/manufacturing/energy industries has been financed by investment of 68.7% from the non-financial corporations, 12.5% from the household sector, 13.4% from NPISHs and 5.4% from government.

2.5.6.2 Financial account

The financial account (account 9) shows the changes in the financial assets and liabilities, and is recorded by type of financial instrument. Net incurrence of liabilities are shown in sub-matrix (7,9), and net acquisitions of financial assets in (9,7). Net lending/net borrowing is in (9,11), and the current external balance is in cell (11,10).

2.5.7 Rest of the world accounts

Account 10 is the current account for the rest of the world, while account 11 gives the external capital account. All items on these accounts have been discussed above, except the balancing item. That is the current external balance in cell (11,10), which equals –41. This balancing item is viewed from the perspective of the rest of the world. In other words, the negative sign means that the economy under consideration has a positive current external balance.

2.6 Methods for Compilation of specific sub-matrices in the NAM

The previous sections of this chapter have explained what a NAM is. This final section looks at the way some of the elements of a NAM might be compiled. It discusses the estimation of three sub-matrices that contain inter-sectoral flows. These are property income in the primary distribution of income account (4,4), current transfers in the secondary distribution of income account (5,5), and capital transfers in the capital account (7,7). By expanding these accounts, more detail can be seen on who is paying what to whom.

It is, of course, not necessary always to compile a whole NAM. Emphasis or priority can be given to different parts of the matrix to meet particular users' needs. These parts may, for example, be estimated in more detail, more quickly, or with greater frequency (e.g. quarterly rather than annually). This section looks at how a compiler might set about estimating sub-matrices where this extra degree of detail is needed. ESA95, for example, requires sector accounts to record breakdowns of type of flow such as the different categories of property income. Each of these categories requires its own inter-sectoral sub-matrix, which can then be summed to produce the NAM's inter-sectoral sub-matrix (e.g. for property income).

Also outlined are the sources that are typically available to compilers in European (and other) countries, and some of their shortcomings. For example, there may be gaps where data are less than complete for the chosen degree of disaggregation. For some items, there may, on the other hand, be more than one source, and the compiler has to reconcile these (see section 1.3), or chose between them.

Figure 2.2 is the generic form of an inter-sectoral account. Each cell of the matrix indicates the flow to the sector in the row, from each of the sectors in the columns. The compilers' challenge is to obtain information to complete the matrix, using existing sources where possible. The row and column totals are usually available from national (or integrated economic) accounts. Data may be available (sometimes from the integrated accounts) to fill in some cells directly. Other cells may have to be estimated by indirect methods, some of which are discussed below. Some cells are calculated as residuals. If very little information is available for a sub-matrix for any type of transaction (such as one type of property income) then a "top down" approach may have to be used. Such methods are discussed in chapter 5.

Figure 2.2 Table sector by sector

Sectors		a	b	c	d	e	f	Total
a.	Non-financial Corporations	(a,a)	(a,b)	(a,c)	(a,d)	(a,e)	(a,f)	A (Resources)
b.	Financial Corporations	(b,a)	(b,b)	(b,c)	(b,d)	(b,e)	(b,f)	B (Resources)
c.	General Government	(c,a)	(c,b)	(c,c)	(c,d)	(c,e)	(c,f)	C (Resources)
d.	Households	(d,a)	(d,b)	(d,c)	(d,d)	(d,e)	(d,f)	D (Resources)
e.	NPISH	(e,a)	(e,b)	(e,c)	(e,d)	(e,e)	(e,f)	E (Resources)
f.	Rest of the World	(f,a)	(f,b)	(f,c)	(f,d)	(f,e)	(f,f)	F (Resources)
	Total	A (Uses)	B (Uses)	C (Uses)	D (Uses)	E (Uses)	F(Uses)	Total economy

2.6.1 Expansion of property income in the allocation of primary income account

In ESA95, property income (D.4) in the allocation of primary income account (both in the domestic economy and the rest of the world) is the sum of the following components:

– Interest (D.41);
– Distributed income of corporations (D.42)
– Dividends (D.421);
– Withdrawal from the income of quasi-corporations (D.422);
– Reinvested earnings on direct foreign investment (D.43);
– Property income attributed to insurance policy holders (D.44);
– Rents (D.45).

Ideally, to produce inter-sectoral tables for each of these components, the compiler should have estimates of all inter-sectoral flows for each component, as in figure 2.2. In the case of interest and dividends, it is even better if equivalent inter-sectoral financial flows and stocks are also available. This enables the compiler to check for coherence between income, financial flows, and financial assets and liabilities. Not all this information will be available in all countries, and indirect methods, sometimes using other sources, have to be used.

The quality of the data and the level of detail is likely to vary by component. Table 2.7 below gives an indication, by data source, of what information may be available in European (and other developed) countries, and how comprehensive the coverage is.

Table 2.7 Data sources used for the expansion of property income

Sources	Information	Coverage
Financial Corporations Sector Accounts: surveys or administrative sources (including the central bank and the bodies in charge of supervising the insurance activity)	Interest paid and received by institutional sector Dividends paid and received Discrimination of the financial instruments by type of instrument and composition of the portfolio of their own funds Eventual rents paid and received Premiums paid and claims received for the financial corporations, except the insurance corporations and pension funds Life and non-life insurance premiums and claims (by insurance corporations and pension funds) Central Bank: money and banking statistics (monthly basis) Central Bank: interest rate statistics (monthly basis)	Exhaustive or Sample
General Government Accounts	Interest paid and received by institutional sector Dividends received Rents paid and received Provision of data concerning financial instruments by type of instrument	Information concerning this sector is usually exhaustive
Balance of Payments	Transactions between resident and non-resident units. Interest Dividends Reinvested earnings on direct foreign investment Life and non-life insurance premiums Life and non-life insurance claims Rents	Exhaustive
Tax sources	Accounting information that is relevant for tax purposes.	All institutional units that are taxable
Non financial corporations sector: Business Survey or administrative sources	Interest Dividends paid (composition of the share capital) Dividends received (composition of the portfolio) Premiums paid and claims received Rents paid and received	Sample
Central register of statistical units	Reference structures for dividends: Composition of the share capital of a corporation to determine a structure whether the unit is held by a public or a foreign unit	All statistical units engaged in market and non-market production
Household Survey	This information is used as reference structures Interest paid and received Dividends received Rents paid and received Premiums paid and claims received	Sample
Other sources : surveys or administrative data	Data concerning property income related to institutional sectors or industries	

2.6.1.1 Interest (D.41)

The data that are most likely to be available in this sub-matrix are payments and receipts of interest by financial corporations, government and rest of the world. These sources are usually exhaustive, and reliable estimates of row and column totals in B, C, and F can be included. In some countries, data are provided by institutions (notably financial corporations and government) by sector. This enables the cells and columns, particularly B and C, to be completed. Similarly, balance of payments sources may be sufficiently detailed to provide at least some of the cells in row and column F.

Filling in the rest of the sub-matrix clearly depends on data availability. Where the information is not available in a way that is wholly compatible with the cross-classified structure of the sub-matrix, indirect methods and assumptions have to be applied. A few examples of these are given below. (See also Chapter 5 for a wider discussion of methods).

Information on assets and liabilities by sector may be accessible. Appropriate average interest rates can be applied to these to obtain estimates for various cells. Tax sources may provide useful information. The compiler may make assumptions that interest flows between two sectors are so unlikely, or are likely to be so small that they can be assumed to be zero. So, for example, both flows between NPISH and the rest of the world, and between NPISH and households could be assumed to be zero. Certain cells may have to be calculated as a residual of the column or row where the total and other cells are estimated with some confidence. This is most likely to happen for households or NPISH. A common problem is being able to split between households and NPISH. It may be necessary in these cases to resort to using any other related information that gives clues about the distribution of interest flows. Indeed, where information is sparse, this very indirect method may have to be used for other sectors too.

Box 2.1: Case study - Netherlands

Sometimes the sources on which estimates of receivers/payers of interest are based show the interest received on a cash basis. According to the ESA95 (4.50) interest should be registered on an accrual basis. This problem appears especially in sources of the household sector like budget surveys or fiscal data. It is possible that the sources contain an amount of interest received after the deduction of withholding tax.
Sometimes there is no information in the source for the financial institutions and the government sector on interest paid and received by counterparty. On the other hand this information by counterparty may be available for (a part of) the financial assets and liabilities. With the help of an average interest rate and the average of the holding of assets or liabilities over the year it is possible to make a rough distribution of the interest. It can be assumed that, in the integration process, that total interest paid and received will balance the amount recorded in the source. The method can be refined if the data in the balance sheet and the related interest rate are available for different types of assets.

Sometimes, additional information is available based on statistics that show a description of a certain type of financial asset. This can be fully imputed to a sector. For example, interest on saving accounts can be attributed to households or to the rest of the world. The interest on consumer credit and on mortgages on houses can often be fully allocated to a specific sector. Finally, it is possible to gather from production statistics data on interest flows of self-employed business.

Box 2.2: Case study - Portugal

The sources for the financial sector provide information on interest paid and received on an accrual basis, as recommended in ESA95, 4.50. The information can also be obtained by counterpart sector for a large part of the interest. However, for some sectors this information is aggregated, making it necessary to use other sources like tax sources. In tax sources, especially for households, NPISH and corporations information on interest is on a cash basis and therefore it is necessary to add the corresponding income tax. Recently, a new methodology has been developed for interest received and paid on deposits and loans using information by counterpart sector based on an average interest rate.
Information about interest paid and received by the general government sector is

available by counterpart sectors. For some units within this sector it is available on an accrual basis, whereas for the majority of others, it is only available on a cash basis. All units in the government sector provide additional information about the type of financial instrument that generates interest as well as the interest itself. In some cases, these units are exempt from tax, but in those cases in which there is no exemption a correction is made in order to obtain a figure on an accrual basis.

In cases where information concerning NPISH is of low quality, interest paid and received by this sector is estimated as a residual.

There may be three sources of information on non-financial corporations : business surveys (data on interest paid and received on an accrual basis), tax sources (information on a cash basis), and information from financial corporations. For the non-financial corporations, their financial assets and liabilities are analysed together with these three sources.
For the rest of the world account the most important source is the balance of payments, but other sources may provide additional information on interest paid and received

2.6.1.2 Distributed income of corporations (D.42)
The distributed income of corporations is subdivided into dividends and the withdrawal from the income of quasi-corporations.

Dividends (D.421)
Dividends are only paid by non-financial and financial corporations and the rest of the world. Total dividends paid (and received) are recorded in the total use columns A, B and F.

Filling in the rest of this sub-matrix is very much like filling in that for interest flows. The process depends very much on the data that are available to the compiler. The (resources) row totals should be available from national (sector) accounts, but these estimates, of course, rely upon suitable data being available, and may themselves be based on indirect methods and/or assumptions. For example, the split of dividend receipts between households and NPISH may be uncertain, and have to be based on assumption, or on information on just one of these sectors.
Information on receipts by general government (row C) is usually available from government accounts. Information on dividends received by financial and non-financial corporations may be available from business surveys, or, more indirectly, from knowledge of the ownership of shares in these corporations. These sources will enable most cells in rows A and B to be completed. The balance of payments should provide the source for completing the cells in both row and column F. Households and NPISH are once again the sectors where data is least likely to be available. The sum of dividend receipts for the two sectors together is likely to be available as a residual if all other cells are known. Splitting between them may have to rely upon assumption, possibly based on supplementary information. Tax sources may be helpful.
One particular difficulty in estimating payments of dividends to the various sectors is that the institution paying the dividend may not have full information about who is the beneficial holder of their shares. It is not uncommon for shares to be held in nominee accounts. In these circumstances, the compiler has to find some way of “looking through” to the beneficial holder.

Withdrawals from the income of quasi-corporations (D.422)
As long as there is good information on who owns quasi-corporations, the allocation of this income (and payment) is straightforward – from the sector that is owned to the sector that owns.

Box 2.3: Case study – Netherlands

In order to estimate dividend flows it is often useful to separate between (private) dividends which have been paid to private shareholders, (participation) dividend that has been received from or paid to another part of the same corporation (especially foreign parts) and the (imputed) dividend of the investment funds. By separately estimating these different parts it becomes possible to define by type of dividend another sector distribution to which the balance of these (partial) transactions are allocated. For example, the household sector will in general not receive participation dividends.

For these (partial) transactions non-financial corporations can be taken as the recipients. For private dividends, the amounts will be paid either to households or to non-profit institutions serving households. The imputed dividends that will be paid by investment funds will not normally be paid to non-financial corporations or government. The breakdown into a number of types has the advantage not only that the distribution can be computed, but also that the results are easier to interpret, better to analyse and better to confront with other information available, such as withholding tax paid, dividends quoted by companies, etc.
If it is possible to construct a separate matrix of the participation dividend, this will often mean a large improvement of the dividend matrix, since large amounts are involved. This transaction is quite often recorded separately on the balance of payments. If the source for non-financial corporations and financial institutions is an annual business report, the participation dividend paid and received will be in the statement on financial relations with the foreign branches. The figures on these foreign branches must have been deconsolidated to get the statistical unit that we want to describe. In the deconsolidated annual report of the company, the total profit of the foreign branches is registered, including the profit that is not distributed in the form of dividends. So the profit must be split into dividend and reinvested earnings on direct foreign investment.

It is possible that the private dividends paid by non-financial corporations and financial institutions have been based on business reports. If this is the case, the dividends paid will have been allocated to the year of the annual report. In practice, the actual payments occur later. Since dividends must be registered at the time the dividend becomes payable (ESA95, 4.55), the dividend registered in the annual report over year t, becomes payable in the year t+1. If a company paid every year the same interim dividend this would not lead to a correction of the dividend paid. Only if this interim dividend changes from year to year is a correction needed. We assume that only enterprises that are quoted on the stock exchange have such yearly changes. The estimates for this correction are based on the annual accounts of these enterprises.

In the Dutch sources for the non-financial corporations, there are two possibilities concerning dividends paid, namely:
1. dividends paid to the parent company and
2. dividends paid to other shareholders.

Dividends that are reported as dividends to parent company are characterised as participation dividends, and those paid to other shareholders as private dividends. The biggest part of the dividend paid by financial corporations is private dividends. In the Netherlands, a very small number of financial corporations are part of a conglomerate with a parent company abroad. The estimates for this (small) amount of dividends is based on individual information of the “biggest” companies with a parent abroad.

The non-paid gains and losses of investment funds should, according to the ESA95 (4.54b), be paid as imputed dividends to shareholders. A fiscal source (withholding

tax) usually does not contain data on the volume of these imputed dividend flows. The balance of payments too does not always register this type of dividend. Information on the imputed dividends is based on the source for the investment funds. The distribution of this imputed dividend over sectors is based on the distribution of the shares of the investment funds across the sectors. A problem is the imputed dividends from abroad. We have some investment funds that are founded in another country. In practice, most of their shareholders are people in the Netherlands. In this case, imputed dividends from abroad are based on annual accounts of these investment funds.

A number of sources register a net amount dividends received, i.e. after deducting withholding tax. This is the case, for example, where data on the balance of payments are estimated on a cash basis. The actual dividend received should be calculated by adding the dividend and the withholding tax. Different tax tariffs should be used for different types of dividend.

Where withholding tax data are used to estimate dividend flows, account needs to be taken of those case where no withholding taxes are imposed. Dividends received by government, pension funds and insurance companies are in a number of cases free from taxes. Finally, it is possible that certain specific dividend payments are paid tax-free. In the Netherlands this is the case when a dividend in share is paid chargeable to the agio reserve.

In ESA95 and in the manual on government deficit and debt (section II 1.2. under D.42 (dividends)) a dividend is defined more narrowly than in most annual reports of companies. Special dividend payments over and above “normal” payments are not defined as dividend but as a repayment of share capital. In ESA95, that part of a distribution to shareholders that can be related to the sale or revaluation of a financial or non-financial asset and is recognisable as a special dividend is deemed not to be a dividend but a repayment of share capital. An example of this is when a company sells a large part of itself, and the proceeds are paid to the shareholders. Another example is a central bank selling part of its gold stock and paying the proceeds to the State in the form of a dividend. This type of dividend payment is not uncommon in the Netherlands, and there are, on average, two a year. However, it is impossible to have a reliable method to pick up all these cases. It may be spotted in a press release or in a newspaper report. The information should also be available in companies’ annual reports, but these are not seen by Dutch compilers as a “normal” source for dividends. Another method is to compare the dividends paid with the profit (excluding extraordinary items) of a company.

Box 2.4: Case study – Portugal

For financial corporations, the sources are exhaustive and there is breakdown of payments to some sectors. The amount of dividends received and paid are recorded on an accrual basis. The total amount of dividends paid and received by the insurance corporations is available from the Portuguese Insurance Institute. In order to break down dividends received by these units a structure of the distribution of the companies held by the insurance corporations is used. The composition of share capital of insurance companies is also available to be used as a key structure to break down dividends paid by sector.

For the non-financial corporations, data are taken from business surveys where the time lag is adjusted to bring the time of recording in line with ESA95. Published financial statements of larger enterprises are also taken into account, as are fiscal sources. Business surveys give information about the structure of the participation

of the non-financial corporations in the share capital of other non-financial corporations, resident and non-resident.

Estimates of dividends paid to households come from tax sources supplied by the Ministry of Finance. Because this figure is on a cash basis, appropriate adjustments are made to include the taxes due. The Ministry of Finance provides information on the shares that are held by households that are exempt from taxes.

Dividends paid to NPISH by non-financial corporations are estimated as a residual.

Information on total dividends received by general government is taken from its accounts. The amount of dividends received is broken-down by sector on the basis of the known participation of general government units as shareholders. These data are compared with information from two other sources:

1. a list of the percentage of public share capital, supplied by the Ministry of Finance;
2. a list of the percentage of public share capital, from the Business Register.

Dividends paid to and received from the rest of the world are taken from the balance of payments, which is already on an accrual basis.

Box 2.5: Case study - Portugal

The total figure received and paid is taken from the balance of payments.
The amount received by resident sectors is broken-down on the basis of their shareholding in the non-resident companies. The sources for financial and non-financial corporations provide data on their participation as shareholders in foreign companies.

Normally only financial and non-financial corporations pay reinvested earnings on direct foreign investment. The breakdown by sector is known from information in the business register and collected in business surveys. It is supplemented with information from financial corporations.

2.6.1.3 Reinvested earnings on direct foreign investment (D.43)

This transaction is a flow between the domestic economy and the rest of the world. Only row and column F are filled in. A common source for direct investment earnings for balance of payments is business surveys. These provide information about flows both to and from the rest of the world for each of financial and non-financial corporations. Another (indirect) source is the composition of share capital of these corporations available in statistical registers.

2.6.1.4 Property income attributed to insurance policy holders (D.44)

Property income attributed to policyholders is paid only by financial corporations (insurance companies and pension funds), and by the rest of the world. It is an imputed transaction in the ESA95, and corresponds to the primary income received from the investment of insurance technical reserves.

The distribution of insurance technical reserves is unlikely to be available. The total (in column B) paid by financial corporations can best be broken-down by sector using a distribution based on premiums paid to resident insurance corporations and pension funds on life and non-life insurance.

The balance of payments provides the total of premiums paid by resident sectors to non-resident insurance corporations and pension funds. Property income attributed to policyholders paid by non-resident insurers to resident sectors can be estimated using methodology proposed in ESA95, annex III, 33 and 38. Again, allocation by sector can be based on premiums paid.

Box 2.6: Case study - Portugal

The total figures are obtained from data on the insurance corporations and pension funds, and from the balance of payments. These totals are allocated to sectors by type of premium paid (for life and non-life insurance separately. For instance, property income from life insurance premiums is totally allocated to households.

2.6.1.5 Rents (D.45)

Rents can be sub-divided into rent on land used for agriculture and forestry, rent on land used for other purposes, and rent on subsoil assets in the form of royalties.

Information on the allocation of rents may not be in abundance. There are two sources that are most likely to provide the data: tax sources and business surveys (both for agriculture and for other industries). Tax sources will, of course, be particularly useful if there are special taxes, but may also provide information more generally on rents received (and then taxed). Business surveys can provide data on both rents paid and received by corporations. If sufficiently detailed, they might also provide information on the sector to whom rent is paid, or from whom received.

Useful supplementary information to assist in the allocation of rents between sectors may be available in the form of land ownership. As with other components of property income, data on households and NPISH may be sparse, and these sectors may have to be treated as residuals.

Because of the way the residency concept is applied in national accounts, rents between residents and non-residents are unlikely to be significant (though there could be small transactions between non-residents and resident households, on for example, second /vacation homes).

Royalties for the use of sub-soil assets are usually payable to and receivable by general government, whose accounts usually provide the necessary information.

2.6.2 Secondary distribution of income

The NAM sub-matrix (5,5) is the aggregation of the following transfers defined in ESA95:

- Current taxes on income, wealth, etc (D.5);
- Social Contributions (D.61);
- Social benefits other than social transfers in kind (D.62);
- Net non-life insurance premiums (D.71);
- Non-life insurance claims (D.72);
- Current transfers within general government (D.73);
- Current international co-operation (D.74);
- Miscellaneous current transfers (D.75).

Sector by sector tables for these eight components can be compiled, often directly from integrated economic accounts, and then aggregated to produce sub-matrix (5,5). The main sources for these components are shown in table 2.8.

2.6.2.1 Current taxes on income, wealth, etc. (D.5)

Only general government (row C) and the rest of the world (row F) can receive taxes. The main sources are government accounts and the balance of payments. The allocation to sectors that pay these taxes is usually done tax by tax.

Box 2.7: Case study - Portugal

Rent is divided into two categories: rent on land used for agriculture, and rent on land used for other purposes.

General government sources provide information on the total amount of rents paid and received (it excludes rents for land used for agriculture). Based on studies carried out in respect of the base year, it was decided to assume that government only pays rents to households and receives from both households and non-financial corporations.

Business surveys have information on the total amount of rents paid and received (on both land used for agriculture and other). The total amount of rents received by the non-financial corporations is assumed to be paid within the sector.

Agriculture and forestry statistics supply an estimate for the total paid for land used in agriculture. This amount is allocated to households and non-financial corporations based on agricultural production by these two sectors.

As a result, the breakdown of the rents for land use for agriculture is as follows:
Households only pay rent to households. Non-financial corporations pay rent to both households and non-financial corporations.

The amount paid to non-financial corporations *is equal to* total rents received by the sector *times* production of corporations engaged in agriculture *divided by* total production.

The amount paid to households *is equal to* the total amount paid by non-financial corporations to both households and non-financial corporations *minus* the amount paid to non-financial corporations.
The amount of rent paid by the non-financial corporations for land used for other purposes is the difference between the total paid and the amount paid for land used for agriculture. Non-financial corporations are estimated to receive the total amount received by the sector *less* rent on land used for agriculture. The residual is rent paid to general government.

Royalties paid for the use of subsoil assets are derived from government sources (as income received), and from business surveys.

2.6.2.2 Social Contributions (D.61):
Social contributions are paid by resident (column D) and non-resident (column F) households into government social security schemes, and into funded and unfunded social insurance schemes managed by financial corporations.

Figures on social contributions paid are available in general government accounts, and from surveys (or published accounts) of insurance corporations and pension funds. The balance of payments supplies information for the social contributions paid to the rest of the world.

Some contributions are imputed, and these are allocated to sectors by the compiler of the integrated accounts at the time the imputation is made.

Table 2.8 Data sources for current transfers

Sources	Information	Coverage
Financial Corporations Sector Accounts: surveys or administrative sources (including the central bank and the bodies in charge of supervising the insurance activity)	Social contributions paid Social contributions received by the insurance corporations and pension funds Social benefits paid Taxes paid by type of tax Premiums paid and claims received for the financial corporations, except the insurance corporations and pension funds Life and non-life insurance premiums and claims (by insurance corporations and pension funds) Other data that could be classified under current transfers	Exhaustive or Sample
General Government Accounts	Taxes received at a detailed level Social contributions paid Social contributions received by social security schemes Social benefits paid in cash Social benefits paid in kind Premiums paid and claims received Current transfers at a detailed level by institutional sector	Information concerning this sector is usually exhaustive
Balance of Payments	Transactions between resident and non-resident units. Life and non-life insurance premiums and claims Current transfers	Exhaustive
Tax sources	Accounting information that is relevant for tax purposes.	All institutional units that are taxable
Non financial corporations sector: Business Survey or administrative sources	Social contributions paid Social benefits paid Taxes paid by type of tax Premiums paid and claims received Other data that could be classified under current transfers	Sample
Household Survey	This information is used as reference structure Social contributions paid as employees Social benefits received Taxes paid by type of tax Premiums paid and claims received Other current transfers by type	Sample
Other sources: surveys or administrative data	Data concerning current transfers	

2.6.2.3 Social benefits other than social transfers in kind (D.62)

Social benefits are received by resident households and by non-resident households (the rest of the world). Most are paid to resident households by government (cell (d,c)), and by insurance companies and pension funds in the home country (cell (d,b)) and abroad (cell (d,f)). Non-resident households receive benefits from the government (cell (f,c)), and from resident insurance companies and pension funds (cell (f,b)). In addition, payments from unfunded schemes are paid directly from employers (which may be in the corporation sectors or government). Some grants may be payable to NPISH.

Most of the figures for this table are directly available from integrated economic accounts and balance of payments.

2.6.2.4 Net non-life insurance premiums (D.71)

Most sectors (except government where, as a matter of policy, it does not insure) pay non-life insurance premiums to resident (row B) and non-resident (row F) insurance companies. Surveys (or published accounts) of resident insurance companies and balance of payments provide information on premiums received. Data on who has paid the premiums is often less accessible. They have to be estimated for the integrated economic accounts, where it may well be that assumptions have had to be made, for example, that the sectoral distribution of premiums paid abroad is the same as that paid to resident companies.

2.6.2.5 Non-life insurance claims (D.72)

This table is very much like that on premiums. Most sectors receive claims from resident (column B) and non-resident (column F) insurance companies and pension funds. The sources (and their shortcomings) are also similar.

2.6.2.6 Current transfers within general government (D.73)

This table is restricted to cell (c,c), and is only relevant when the general government sector is expanded into its sub-sectors. Government accounts provide any necessary data.

2.6.2.7 Current international co-operation (D.74)
This is a flow between general government and the rest of the world, (cells (c,f) and (f,c)). Data for the cells come from the balance of payments or from general government sources.

2.6.2.8 Miscellaneous current transfers (D.75)
This category includes a range of different transactions ranging, for example, from gambling, fines, to payments to European Institutions. As can be expected, in a heterogeneous group like this, the sources are varied (both between category and between country). Many of the categories involve government, and their accounts are usually an important source.

2.6.3 Capital Account

Expansion of capital transfers in the capital account

Capital transfers (D.9) in the capital account both in the domestic economy and the rest of the world comprise the following ESA95 transactions:

– Capital taxes (D.91)
– Investment grants (D.92)
– Other capital transfers (D.99).

Sector by sector tables for these three components can be compiled, often directly from integrated economic accounts, and then aggregated to produce sub-matrix (7,7).

2.6.3.1 Capital taxes (D.91)
Only general government and the rest of the world can receive capital taxes (though, in practice, payments to the rest of the world are likely to be small). The sources for these transactions are government accounts and the balance of payments.

2.6.3.2 Investment grants (D.92)
Investment grants can only be paid by general government and the rest of the world. Again, the sources for these data are government accounts and balance of payments. If less than full information is available from these sources, an allocation amongst recipient sectors could be based on the distribution of gross fixed capital formation by sector; or, the distribution of receipts from the rest of the world could be assumed to be the same as that from government. Government can be a useful source of information when it is responsible for the distribution of grants from the rest of the world (e.g. European Union institutions) to domestic sectors.

2.6.3.3 Other Capital transfers (D.99)
Government accounts and balance of payments are again reliable sources for transactions involving government and the rest of the world. Surveys (and published accounts) of financial institutions, used to estimate national sector accounts, provide data for row and column B. These sources usually provide breakdowns of their payments and receipts with all other sectors.

Information about legacies and large gifts between households and from households to NPISH may be available from tax sources. These transfers can be important in a SAM.

Notes

[4)] The figures of this Table have no link with the figures of Table 2.1

Table 2.9 : Aggregate National Accounts Matrix showing the Circular Flow of Income for a Closed Economy

ACCOUNT	1, Goods and services	2. Production	3. Generation of income	4. Allocation of primary income	5. Secondary distribution of income	6. Use of disposable income	7. Capital	8. Gross fixed capital formation	9. Financial	10.ROW current	11.ROW capital	12.TOTAL
1. Goods and services	Trade and transport margins 0	Intermediate consumption 1 904				FINAL CONSUMPTION EXPENDITURE 1 371	Changes in inventories 38	GROSS FIXED CAPITAL FORMATION 376		536		4 225
2. Production	OUTPUT (basic prices) 3 595											3 595
3. Generation of income		NET VALUE ADDED (basic prices) 1 469								6		1 475
4. Allocation of primary income	Taxes less subsidies on products 133		GENERATED INCOME, NET (basic prices) 1 473	Property income 341						66		2 013
5. Secondary distribution of income				NATIONAL INCOME, NET 1 633	Current transfers 1 096					10		2 739
6. Use of disposable income					DISPOSABLE INCOME, NET 1604	Adjustment for the change in net equity of households on pension funds reserves 11				0		1615
7. Capital						SAVING, NET 233	Capital transfers 68		Net incurrence of liabilities 603		1	905
8. Gross fixed capital formation		Consumption of fixed capital 222					NET FIXED CAPITAL FORMATION 154					376
9. Financial							Net acquisitions of financial assets 641				-38	603
10. ROW current	497		2	39	39	0						577
11. ROW capital										-41		-37
12.TOTAL	4 225	3 595	1 475	2 013	2 739	1 615	905	376	603	577	-37	

3 Elaboration of a Social Accounting Matrix - SAM

3.1 A labour-oriented SAM

The detailed national accounts matrix (NAM) is described in chapter 2. A social accounting matrix (SAM) is built within this framework, with each control total of the national accounts matrix being expanded into a sub-matrix whose rows and columns use more detailed breakdowns of transactors and transactions. The expansion provides a coherent set of sub-matrices. This chapter describes this expansion. The expansions focus on the role of people in the economy. For example, the household sector may be broken down into categories of households to show a detailed presentation of the labour market (see ESA95, 8.134). Alternatively, households may be grouped by size or according to the education attainment of the head of the household. It is possible to apply several different classifications to the same group of transactors. For example, households may be grouped by income class in the allocation of primary income account, and by main source of income in the use of income account. The choice of the classification depends on the analytical purposes of the proposed SAM.

One of the main purposes of the SAM presented in this handbook is to provide detailed information on the (met) *demand and supply of labour* in monetary terms, where this labour is employed in the production system. This is called a labour-oriented SAM.

The *demand for labour* is linked to the value added sub-matrix (3,2) in tables 2.1 and 2.6, and to the sub-matrix showing the compensation of employees paid by the rest of the world (3,10). In the previous chapter, the transition to the detailed NAM transforms the value added cell of the aggregate NAM into a sub-matrix where columns correspond to industries and rows to components of value added. The labour-oriented SAM focuses on the value added categories that remunerate labour, i.e. on compensation of employees and on mixed income. Compensation of employees is broken down according to demographic, social or economic characteristics of employees. Mixed income may be analysed by characteristics of the self-employed. The expansion of these sub-matrices shows the amount of money paid by industries to the categories of labour used (*demanded*) in the production process. Section 3.2 describes the sub-matrices generated by this expansion process.

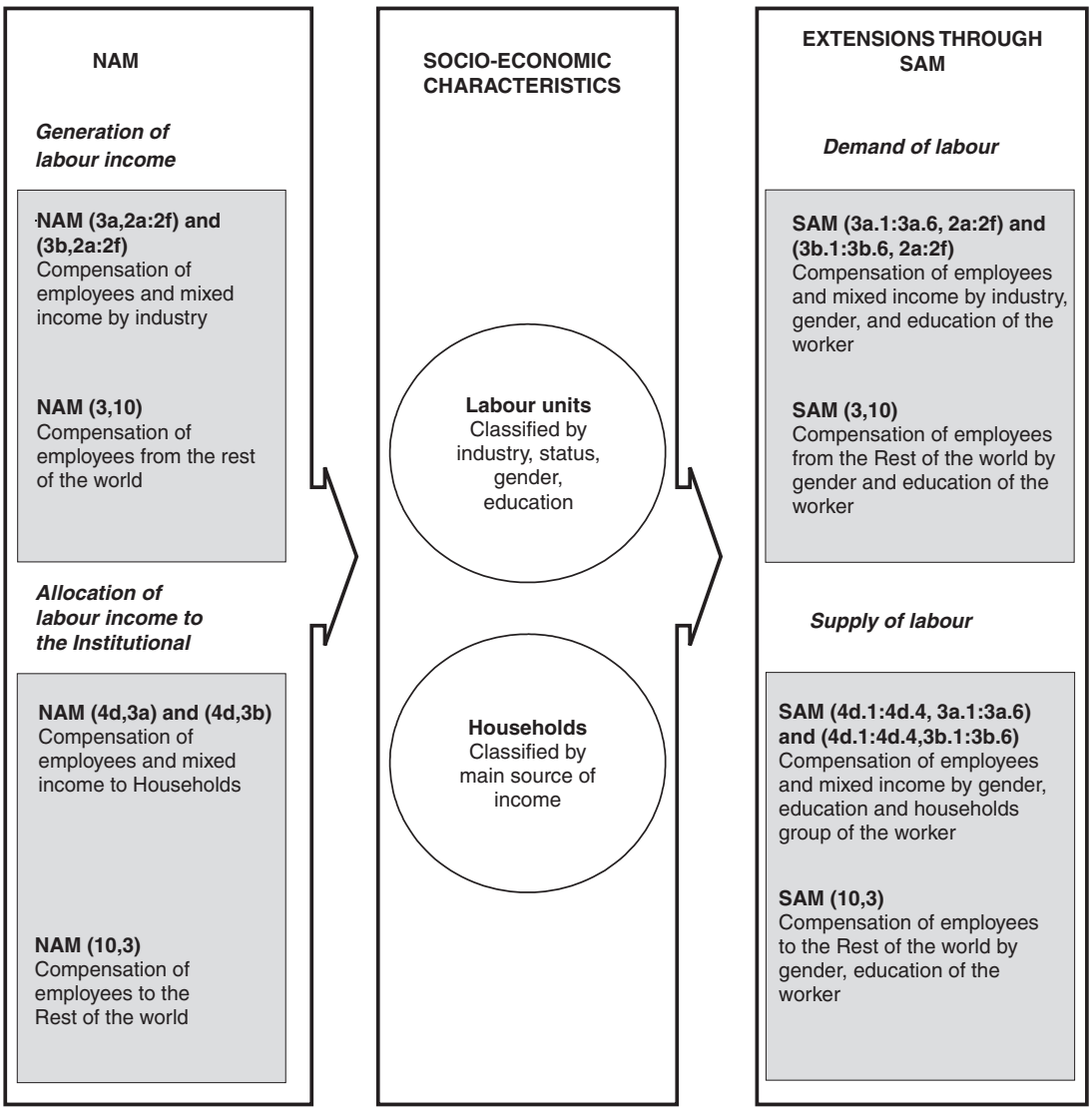
The *supply of labour* in monetary terms is shown by the generated income sub-matrix (4,3) and by the sub-matrix that records the compensation of employees paid to non-resident workers (10,3). The SAM requires an expansion of compensation of employees by both the characteristics of employees, and by the group of households to which the workers belong. The sub-matrices generated by these disaggregations show the amount of money received by each household group for having *supplied* different kinds of labour in the production process. Section 3.3 describes these sub-matrices.
The detailed NAM serves as a conceptual reference matrix, and, at the same time, provides numerical constraints. The following figure synthesises the transition from the NAM sub-matrices to the detailed tables of the SAM where the demand and supply of labour in monetary terms are described. The key element is the introduction of social and demographic characteristics into the NAM sub-matrices.

The division of households into sub-groups affects all the sub-matrices of the detailed NAM where households are included as a sector. Particularly relevant are the sub-matrices that describe the allocation of primary income (4,4), (4,10), and (10,4), the secondary distribution of income (5,5), (5,10), and (10,5), and the derived balancing items (5,4), and (6,5). Section 3.4 describes the sub-matrices generated by the division of households into sub-groups. It focuses on the distribution of property income and on the secondary distribution process. Finally, section 3.5 discusses the final consumption expenditure sub-matrix of the SAM, which analyses national consumption not only by

groups of products but also by groups of households. As in the other chapters, the following sections support theoretical concepts with numerical examples based on figures in the ESA95 manual. Examples on the methods used to breakdown the NAM figures are also given. In most countries, data are not always available for a full breakdown of the flows from and to the rest of the world, especially when the flows are negligible. This is particularly evident for the secondary distribution of income flows (see section 3.4).

This chapter makes considerable use of concepts and definitions of labour. Box 3.1 provides some of the main ESA95 definitions.

Figure 3.1 Transition from the NAM cells to the SAM tables on the labour market



Box 3.1: ESA95 definitions of labour and its remuneration

ESA95 identifies the following measures for the input of labour:

Employed persons: "Employment covers all persons – both employees and self-employed – engaged in some productive activity that falls within the productive boundary" (ESA95, 11.11).
Employees "are defined as all persons who, by agreement, work for another resident institutional unit and receive a remuneration (recorded as D1 - compensation of employees)" (ESA95, 11.12).
Self-employed persons "are defined as persons who are the sole owners, or joint owners, of the unincorporated enterprises in which they work, excluding those unincorporated enterprises that are classified as quasi-corporation" (ESA95, 11.15).

Jobs: " … a job is defined as an explicit or implicit contract between a person and a resident institutional unit to perform work in return for compensation for a defined period or until further notice" (ESA95, 11.22).

Hours worked: "Total hours worked represent the aggregate number of hours actually worked as an employee or self-employed during the accounting period**,** when their output is within the production boundary." (ESA95, 11.26)
Full time equivalent employment "is defined as total hours worked divided by the average annual number of hours worked in full-time jobs within the economic territory" (ESA95, 11.32).
In ESA95, employees are remunerated with compensation of employees whereas self-employed persons are remunerated with mixed income.

Compensation of employees: "Compensation of employees (D.1) is defined as the total remuneration, in cash or in kind, payable by an employer to an employee in return for work done by the latter during the accounting period." (ESA95, 4.02)
Compensation of employees is broken down into:
a. wages and salaries (D.11): in cash and in kind;
b. employers' social contributions (D.12): employers' actual social contributions (D.121); employers' imputed social contributions (D.122).

Mixed income: mixed income is the balancing item of the generation of income account for the unincorporated enterprises of households. This aggregate "contains an element corresponding to the remuneration for work carried out by the owner or members of his families which cannot be distinguished from his profit as entrepreneur" (ESA95, 8.19), i.e. by self-employed.

3.2 The demand side of the labour market

In this section, we focus on the sub-matrices that relate to the *demand* for labour, i.e. value added and compensation of employees from the rest of the world. The value added sub-matrix reflects monetary flows from productive units to kinds of primary inputs (labour, capital). Columns correspond to industries, and rows to primary inputs.
The value added sub-matrix plays a crucial role in a labour-oriented SAM. It describes the characteristics of the labour employed in the productive process. It displays what kind of labour (social, demographic or economic categories of employed and self-employed) *is demanded* by which industries. Sub-matrix (3,10) describes the kind of resident labour, which is *demanded* by non-resident "kind of activity unit" (KAU – see ESA95, 2.106). The operating surplus and the mixed income (possibly after deduction of imputed compensation for the labour input of the self-employed) remain within the producing

units. These producing units may be classified differently as in the production account. For example, in SNA93, table 20.6, the operating surplus is analysed by institutional sector with a further subdivision of corporations into public, national private and foreign-owned corporations. An interesting alternative breakdown would be by firm size. This kind of analysis requires a cross-classification of operating surplus by industry and institutional sub-sectors.
In these sub-matrices, value added is not yet assigned to the final recipients, i.e. the institutional units. Instead, it is assigned to value added categories. The *actual* recipients of factor compensation are the *factors' owners*. In the case of labour, the factor owner is an employee or a self-employed person, not a household. Value added is distributed to institutional units through the allocation of income account (i.e. through the generated and property income sub-matrices). This is discussed in section 3.3.

3.2.1 Towards a detailed analysis of compensation of labour

Table 3.1 reproduces, from table 2.6, the value added sub-matrix (3,2) and the column vector (3,10) recording the compensation of employees from the rest of the world. Both of these use standard national accounts classifications.
In countries that do not have sufficiently detailed data, mixed income and operating surplus may need to be aggregated. Similarly, lack of information on consumption of fixed capital by industry may mean figures have to be shown gross.
Value added is analysed by (net) primary input categories: compensation of employees, (net) mixed income, (net) operating surplus, and other taxes and subsidies on production. Value added is at basic prices. So, taxes include only taxes (less subsidies) on production i.e. current taxes (less subsidies) on the labour and capital employed in the enterprises, such as payroll taxes or taxes on vehicles or buildings. Industries are grouped in six branches (see section 1.7).

Table 3.1 The remuneration of primary inputs in the detailed NAM

Generation of income account		Production account							R.o.W. (current) account	Total
		Agri-culture etc.	Mining, quarryin, manufac. etc.	Con-struct.	Trade, repair, hotels, etc	Financial intermed. etc	Public administ. etc.	Total		
	codes	2a	2b	2c	2d	2e	2f		10	
Compensation of employees	3a	9	349	58	60	54	232	762	6	768
(Net) mixed income	3b	14	227	35	39	99	18	432	0	432
(Net) operating surplus	3c	9	30	18	7	112	41	217	0	217
Other taxes less subsidies on production	3d	–2	44	5	–6	12	5	58	0	58
Total		30	650	116	100	277	296	1,469	6	1,475

Compensation of employees can be broken down in several ways. For example, we may classify employment by firm size. This would be relevant not only from the production perspective but also from households' point of view. Turnover per person of small enterprises tends to be larger than that of large enterprises; and workers of small enterprises tend to earn less. An alternative might be to breakdown employment between regular and irregular workers (though the necessary information is rarely available).

This handbook focuses on the social characteristics of the worker. In particular, compensation of employees is sub-divided by gender and education level. Education is a suitable indicator for international comparisons as data are available for all the European countries on the basis of the same international classification. Education is a characteristic of the person *per se,* and not just of the person as a worker. This allows comparison of education attainment of the met and unmet supply of labour. Even so, this classification cannot give a measure of the overall "education" of employment because it does not take into account lifelong learning. (Net) mixed income can also be sub-divided by gender and the educational attainment of the self-employed.
Three levels of education attainment are distinguished:
– lower: this includes primary and lower secondary school (ISCED 1-2)
– medium: this includes upper or post secondary school (ISCED 3-4)
– higher: this corresponds to tertiary education (ISCED 5-6)
Table 3.2 shows a value added sub-matrix where such classifications have been applied

Table 3.2 The remuneration of primary inputs in the SAM

Generation of income account			Production account						Total		R.o.W. (current)	Total
			Agri-culture etc.	Mining, quar-rying manu-fact. etc.	Con-struct.	Trade, repair; hotels, etc.	Finan-cial inter-med. etc.	Public admini-strat. etc.				
		codes	2a	2b	2c	2d	2e	2f			10	
Comp. of employees												
Male	Lower	3a-1	6.3	179.79	49.0	30.7	13.2	34.2	313.1		2.4	315.5
	Medium	3a-2	0.2	29.7	3.4	5.7	10.3	10.2	59.5		0.5	60.0
	Higher	3a-3	0.4	34.6	3.2	5.6	14.3	70.8	129.0		1.0	130.0
Female	Lower	3a-4	1.9	82.0	1.0	11.2	6.5	40.6	143.2		1.1	144.0
	Medium	3a-5	0.2	12.4	0.7	3.6	5.1	10.6	32.6		0.3	32.9
	Higher	3a-6	0.0	10.6	0.7	3.2	4.6	65.6	84.7		0.7	85.4
(Net) Mixed income												
Male	Lower	3b-1	8.5	128.4	31.4	21.6	21.6	5.0	216.5		0.0	216.5
	Medium	3b-2	0.3	28.0	2.0	5.0	23.2	1.9	60.4		0.0	60.4
	Higher	3b-3	0.0	12.0	1.5	1.5	35.0	1.9	52.0		0.0	52.0
Female	Lower	3b-4	5.1	47.9	0.1	8.2	5.6	5.8	72.7		0.0	72.7
	Medium	3b-5	0.1	8.7	0.0	2.2	4.8	2.4	18.2		0.0	18.2
(Net) operating	Higher	3b-6	0.0	2.0	0.0	0.4	8.8	1.0	12.2		0.0	12.2
surplus		3c	9.0	30.0	18.0	7.0	112.0	41.0	217.0		0.0	217.0
Other taxes less subsidies onproduction		3d	–2.0	44.0	5.0	–6.0	12.0	5.0	58.0		0.0	58.0
Total			30.0	650.0	116.0	100.0	277.0	296.0	1,469.0		6.0	1,475.0

Table 3.3 A labour-oriented value added sub-matrix

Generation of income account		Production account						Total
		Agri-culture etc.	Mining quarrying. manu-fac-turing	Construc-tion	Trade. repair. hotels. etc	Financial interme-diat. etc	Public admini-stration etc.	
	codes	2a	2b	2c	2d	2e	2f	
Compensation of labour								
Employees	3a-1	9	349	58	60	54	232	762
Selfemployed	3a-2	7	120	19	21	52	10	229
(Net) operating surplus*	3b	16	137	34	25	159	49	420
Other taxes less subsidies on production	3d	–2	44	5	–6	12	5	58
Total		30	650	116	100	325	296	1,469

* Excluding imputed labour compensation of self-employed

Table 3.4 A more detailed version of the labour-oriented value added sub-matrix

Generation of income account			Production account						Total
			Agriculture etc.	Mining. quarrying. Manu-facturing etc	Con-struction	Trade. repair. hotels. etc	Financial inter-mediat. etc	Public admini-stration etc.	
Employees		codes	2a	2b	2c	2d	2e	2f	
Male	Lower	3a-1	6.3	179.79	49.0	30.7	13.2	34.2	313.1
	Medium	3a-2	0.2	29.7	3.4	5.7	10.3	10.2	59.5
	Higher	3a-3	0.4	34.6	3.2	5.6	14.3	70.8	128.99
Female	Lower	3a-4	1.9	82.0	1.0	11.2	6.5	40.6	143.2
	Medium	3a-5	0.2	12.4	0.7	3.6	5.1	10.6	32.6
	Higher	3a-6	0.0	10.6	0.7	3.2	4.6	65.6	84.7
Self-employed									
Male	Lower	3b-1	5.0	62.0	16.0	11.0	13.0	1.0	108.0
	Medium	3b-2	0.0	10.0	1.0	2.0	10.0	0.0	24.0
	Higher	3b-3	0.0	12.0	1.0	2.0	14.0	3.0	32.0
Female	Lower	3b-4	2.0	28.0	0.0	4.0	6.0	2.0	42.0
	Medium	3b-5	0.0	4.0	0.0	1.0	5.0	0.0	11.0
	Higher	3b-6	0.0	4.0	0.0	1.0	5.0	3.0	12.0
(Net) operating surplus*		3c	16.0	137.0	34.0	25.0	159.0	49.0	420.0
Other taxes less subsidies on production		3d	–2.0	44.0	5.0	–6.0	12.0	5.0	58.0
Total			30.0	650.0	116.0	100.0	278.0	295.0	1,469.0

*Excluding imputed labour compensation of self-employed

Mixed income includes both the remuneration of the labour input of the self-employed and a return to the capital input used by the self-employed in the production process. To get a proper labour-oriented SAM, the remuneration of self-employed labour should be

separated out from within mixed income. In table 3.3, this labour remuneration (229 in the total column) is included in compensation of labour. Labour income now reflects the remuneration of all labour provided in the production process. That part of mixed income that remains (432 *minus* 229 *equals* 203, in the total column) when the imputed remuneration of self-employed labour is taken out (which may be negative) is included in the operating surplus (217 *plus* 203 *equals* 420 in the total column).

Chapter 4 discusses labour accounts, which are the volume counterparts of these value matrices. In parallel, with the demand-side labour matrix described in chapter 4 (table 4.1), both self-employed and employee compensation can be analysed by gender and educational attainment of labour units. This is shown in table 3.4.

From an analytical point of view, the sub-matrix displayed in table 3.4 has some advantages:
– it shows the labour income share of gross/net value added for each industry;
– it allows the calculation of the labour remuneration per unit of output for each industry; and
– where the volume component corresponds exactly to the demand-side labour matrix described in chapter 4, it is possible to decompose labour income into a *volume* and a *price* component.

A major difficulty in this framework is separating labour remuneration of the self-employed from the return to the capital of the self-employed. A split is required particularly for those countries where self-employed labour is very significant. Box 3.2 and the annex on the Italian pilot-SAM show how mixed income is split in their national accounts.

3.2.2 The methods used to construct a value added sub-matrix

Both the labour-oriented value added matrix (table 3.4) and the standard value added sub-matrix shown in table 3.2 require estimation of compensation of 36 kinds of employee, and (net) mixed income generated by 36 kinds of self-employed. This section discusses the compilation of these matrices.

There are two methods of estimating this breakdown. The first consists of attributing a per capita remuneration to the labour units employed in the production process - the “labour-funded method”. The second method uses data sources which break compensation of employees and (net) mixed income down by industry, gender, and education of the employed persons - the top-down approach. Boxes 3.2, 3.3 and 3.4 describe the methods used by Italy, Portugal and Finland.

Both methods start with the compensation of employees by industry and mixed income by industry as given in the detailed NAM. These provide control totals. Reconciliation between the estimates and the control totals can be reached through iterative processes aimed at distributing discrepancies. (This is discussed further in Chapter 5). Both the methods belong to the general class of top-down methods. The choice between the methods depends on the availability of data.

The labour-funded approach uses per capita compensation of employees – composed of wage and salaries and employers’ social contributions – and mixed income suitably disaggregated. The European Structure of Earnings Survey (ESES) provides useful inputs for differentiating wage and salaries by industry, gender and education. The disadvantages of this source are that it is only carried out every four years, it does not cover all industries, and it is directed only to enterprises with more than 9 employees. Other sources are enterprise or establishment surveys and social security files. Unfortunately, these do not provide information for differentiating employers’ social contributions. So, if these sources are to be used, employers’ social contributions may need to be distributed among labour categories in proportion to wages and salaries.

Ideally, mixed income per capita should be estimated using data sources that collect income of self-employed classified by industry, gender and education. (In ESA95, mixed income also includes the surplus arising from the production of housing services. The own-account part of housing services is remunerated with an imputed income, which is recorded in national accounts as operating surplus (ESA95, 8.20, SNA, 4.143, 4.150)).

The pure top-down method consists of splitting compensation of employees and mixed income of each branch using a detailed data source. For example, an administrative source may collect compensation of employees and mixed income which can be linked to information on the gender and education level of employee/self-employed. The Finnish box gives an example of this method. While the labour-funded method requires a preliminary estimate of labour matrices coherent with national accounts constraints on employment, a pure top-down method obtains the labour matrix as an indirect result.
The use of characteristics like gender and education generally improve the quality of national accounts. The methods described above tend to give results that differ from national accounts for both employment and remuneration. Analysis and feedback of these differences may lead to an improvement in the methods for estimating national accounts aggregates.

Box 3.2: Case study - Italy

Italy applies a labour-based method to estimate compensation of employees in the national accounts. First, we estimate a labour matrix, which contains full time equivalent labour units, classified according to specific criteria. Then we estimate compensation of employees per capita for each labour category. Finally, we multiply labour units by per FTE values, thus obtaining compensation of employees in national accounts. We use the same procedure for estimating the SAM compensations of employees
The first step is to estimate a labour matrix (see Chapter 4 and Annex X) where labour units are classified by gender, education and industry. As far as compensation of employees per capita values are concerned, we follow these steps (for details see Annex Pilot-SAM for Italy):
– first, we calculate wage and salaries per capita by industry, on the basis of national accounts data.
– then, we estimate the differentials of remuneration due to gender and education for each industry, using administrative and survey data.
– by multiplying these coefficients by the industries' average wages and salaries, we get a first estimate of wage and salaries per capita by industry, gender and education.
– we distribute social contribution in proportion to wage and salaries, giving a first estimate of compensation of employees per capita by industry, gender and education.
– finally we reconcile these estimates with national accounts. The constraints are national accounts estimates of compensation of employees by industry and NA full time equivalents by industry.
In the Italian view, the value added sub-matrix should show the remuneration of *all* the labour used in the production process, including self-employed labour. This is particularly significant for countries (like Italy) where self-employed labour forms a large part of the economy, and is organised in an unusual way.
In Italy, the self-employed do not necessarily work in unincorporated enterprises. Surveys on employment, indeed, record self-employed in corporations and quasi-corporations as well. For this reason there are two kinds of self-employed:
– self-employed belonging to households who are remunerated through mixed income;
– self-employed belonging to corporations who are paid through operating surplus.
As a consequence, the Italian national accounts record self-employed remuneration in a slightly different way to the ESA95. In the Italian case, self-employed labour is compensated* exactly the same as the labour supplied by employees of the same gender and education level, provided they work in the same kind of activity and in enterprises of similar size. Furthermore, the number of hours actually worked is taken into account. The mixed income left is considered to remunerate self-employed capital and entrepreneurial activity. The estimate of

self-employed labour is useful also for checking (and eventually changing) the national accounts estimate of mixed income.

* See the Annex on the Italian pilot-SAM for details

Box 3.3: Case study - Portugal

In the national accounts of Portugal, compensation of employees is estimated by multiplying per capita values by the volume of labour employed in production. Estimates are made independently for each industry.
The same procedure is used to estimate compensations of employees by gender and education level (for details see the Annex on the Portuguese pilot-SAM).

– The first step is the estimation of earnings by industry, gender and level of education, on the basis of the administrative data source "Quadros de Pessoal". This source collects data from enterprises with at least one employed person. The result is a matrix W_{ij} (i=1 to 6, and j=1 to 14) where "i" refers to the type of labour (gender by educational levels) and "j" refers to the industry.
– The W matrix values are adjusted in order to incorporate the employers' actual and imputed social contributions. Control totals for these are available in the national accounts for each industry. We calculate the ratios with respect to wages and salaries, so getting the implicit rates $\mathbf{t}_j^{isc}$ (implicit rate of imputed social contributions) and $\mathbf{t}_j^{asc}$ (implicit rate of actual social contributions). Then we assume that these rates are the same within each industry. As far as actual contributions are concerned the assumption is very close to reality. For imputed social contributions the assumption must be seen as a necessary simplification because of the unavailability of data but it is unlikely to have significant measurement effects given the size of the variable. Finally estimates are adjusted to an annual scale. The result is matrix W_{ij}^{*Y}.
– Using the Quadros de Pessoal source, we estimate a matrix of annual hours worked in each industry by gender and education level (H_{ij}). We also estimate another matrix of actual hours worked (H_{ij}^{w}) using the Labour Force Survey data.
– The ratio between the W_{ij}^{*Y} and H_{ij} values is equal to the average hourly compensations of employees by gender, education and industry. These values are multiplied by the actual hours worked of matrix H_{ij}^{w}, thus getting a first estimate of compensations of employees. The result is matrix C_{ij}.
– As a last step. C_{ij} matrix is reconciled with national accounts data through iterative processes. The constraints are national accounts compensation of employees by industry and the weights of each kind of labour obtained by matrix C_{ij}.

Box 3.4: Case study - Finland

In the Finnish national accounts, estimates of wages and salaries by industry are mainly based on sources in money (value) terms: the register of enterprises and establishments (BR), the structural business statistics (SBS), financial statement statistics of central and local government and social security funds, banking and insurance statistics. Compensation of employees also include employers' social contributions. Social contributions are calculated in the Finnish national accounts for each industry by applying the percentages imposed by central government and using estimates of voluntary and imputed contributions.
In the Finnish pilot SAM, indicators of income by industry and type of labour are based on a provisional dataset drawn from different administrative sources (e.g. tax registers), which are combined by using personal identification numbers [5)]. Because the annual incomes of persons are affected by the duration of employment during the year, and as Finland does not use full-time equivalents, we

estimate average annual incomes. As a preliminary solution, we estimated the income in the job with longest duration. Data on job duration were taken from the registers of pension insurance companies. Average wages by industry, gender and education were used as a starting matrix and as constraints for later adjustments. Data on education are derived from the annual population census that utilises the register of completed education and degrees. National labour force data were used for the number of employees and for total actual hours worked.
National accounts estimates of wages and salaries by industry are further detailed by gender and education by using the provisional dataset based on administrative sources (see Annex: Finnish pilot). We applied the following top-down method:

– first, annual wages and salaries per capita are calculated by gender, industry and education using the provisional dataset
– then wage sums by type of labour are estimated by multiplying per capita wages and salaries by the annual average number of employees taken from national LFS. This gives a matrix W_{ij} (i=1 to 6, and j=1 to 6) (*i* refers to type of labour and *j* to the branch of industry)
– finally, estimated wage sums of matrix W_{ij} are calibrated using national account totals by industry, and national accounts distribution by type of labour, as row and column constraints.
– annual averages of employees and total hours actually worked from the national LFS are similarly calibrated to national accounts totals by industry.

Compensations of labour (wages and salaries plus employers' social contributions) were estimated using the estimated W'_{ij} matrix and calibrated using the national compensations by industry.

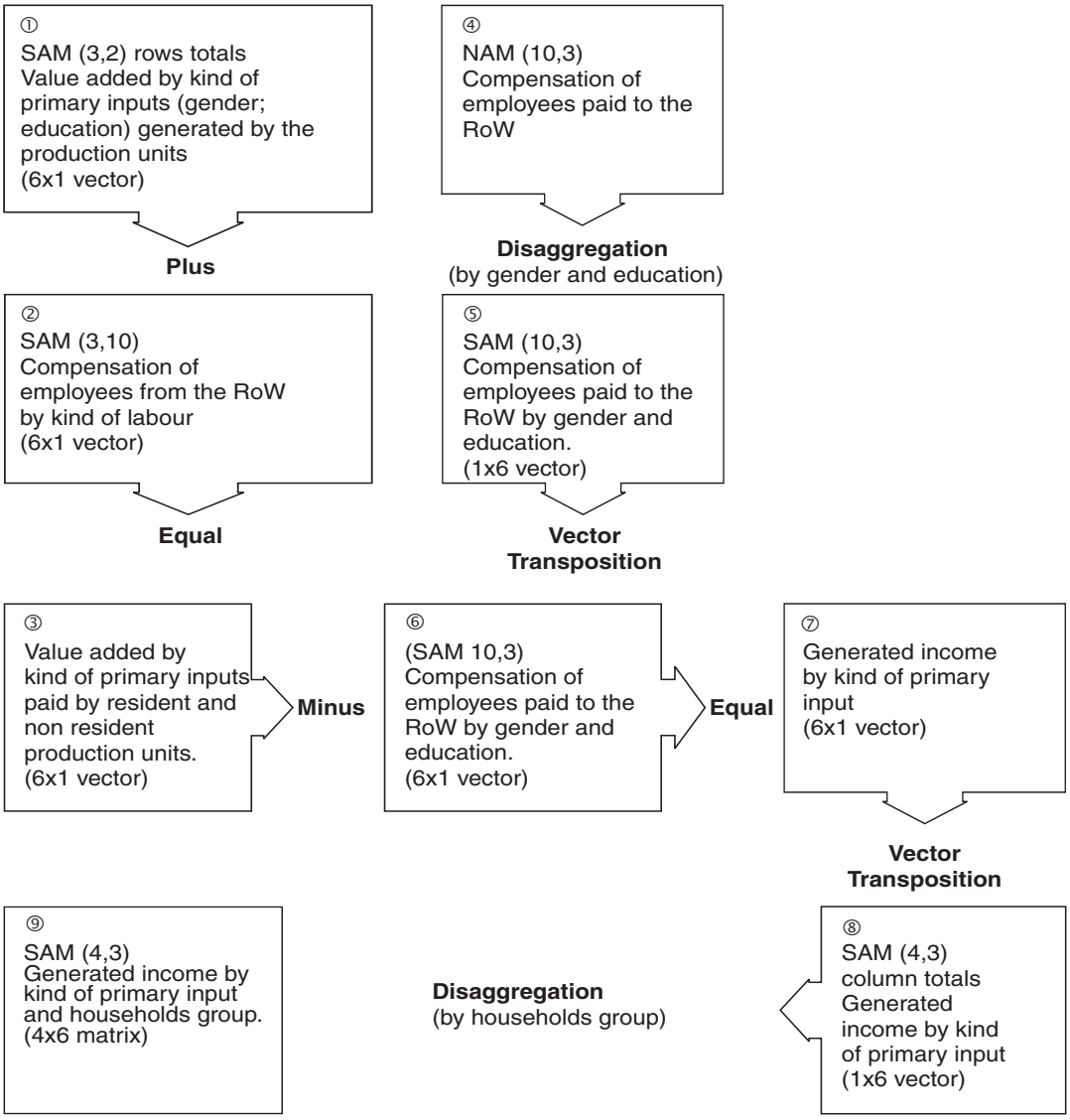
A similar method was used for the mixed income of self-employed persons. Estimation of hours worked by self-employed in construction (NACE F) caused a problem. The NA hours in NACE F include hours worked in construction for own use. It was not possible to estimate these hours by type of labour (gender and education); and hours may also be worked by employees. Thus, hours worked in construction for own use are presented separately. Otherwise, mixed income per capita in NACE F would be distorted.

3.3 The supply side of the labour market

The value added sub-matrix allocates value added to the primary inputs employed in the production process. This income is allocated to the actual recipients of the income i.e. to the institutional sectors (see chapter 2) through the generated income sub-matrix. This section details how this is achieved.
The transition from the detailed NAM to the SAM implies disaggregation of both the generation of income and the allocation of primary income accounts. Compensation of employees and mixed income are disaggregated by characteristics of employees/self-employed (as in 3.2.1). Allocation of income requires households to be divided into sub-groups.
The classification of households in the pilot SAM is based on the main source of income of the household, and contains a minimum of four classes. These link to the ESA95 household classification (S.14) as follows:

1. Wages and salaries - employees (S.143)
2. Mixed income including property income – employers (including own-account workers) (S.141 + S.142) and recipient of property income (S.1441)
3. Income in connection with old age (retirement) – recipients of pensions (S.1442)
4. Other transfers income (including other households) - recipients of other transfer incomes (S.1443) and other households (S.145) [6].

Figure 3.2 Transition from the value added sub-matrix to the generated income sub-matrix



The household sector also includes small non-profit institutions (see ESA95, 2.88). In the SAM, small non-profit institutions and "other" households should be treated as separate categories. This may not always be possible in practice. In the pilot SAMs, in the annexes, each country has used the most detailed classification allowed by available data.

Household sub-groups should be based on the largest income category of the whole household, or the total income within each category when there is more than one income of a given category (ESA95, 2.78). In countries that do not conduct a combined household income and expenditure (or budget) survey it may not be easy to get information on the main source of household income. These countries may have to rely on the main source of income of the head of the household (main income earner) for classifying households.

It is difficult to estimate the actual amount of the household's income, especially for the very poor and very rich families. Information on the source of income tends to be more stable. So, in this handbook, classification based on the source of income is used.

The demand side of the labour market is seen from the point of view of the employer. So, the concern is with labour costs, and the kinds of labour employed. This information is usually obtained from employers' sources (e.g. surveys of producers), which should be

used for compiling sub-matrix (3,2). In contrast, the supply side is seen from the point of view of employees and the self-employed. So, the concern is with the composition of their labour income, and its allocation to households. These data are mainly obtained from person- or household-based statistics (e.g. household surveys), which should be used for compiling sub-matrix (4,3). If the sources used for compiling these two sub-matrices categorise household types in different ways, comparisons between the two sub-matrices become more difficult. Analyses based on a SAM with this weakness will be less reliable.

3.3.1 A focus on generated income

Table 3.5 reproduces the domestically generated income sub-matrix (4,3), and compensation of employees from the rest of the world (vector (3,10) from table 2.6.

Table 3.5 Allocation of generated income in the detailed NAM

Allocation of primary income		Generation of income				Total
		Compensation of employees	Net mixed income	Net operating surplus	Other taxes less subsidies on production	
	codes	3a	3b	3c	3d	
Non-financial corporations	4a			139		139
Financial corporations	4b			–3		–3
General government	4c			16	58	74
Households	4d	766	432	60		1.258
Non-profit institutions serving households	4e			5		5
Total		766	432	217	58	1.473
Rest of the world (current)	10	2				2
Total		768	432	217	58	1,475

Table 3.5 can be expanded by sub-dividing the columns for compensation of employees and mixed income by the same six gender and education attainment categories used in section 3.2. Similarly, the row for households receiving the income can be subdivided as before. These expansions are shown in table 3.6

Table 3.6 Allocation of generated income in the SAM

Allocation of primary income		Generation of income												Net operating surplus	Other taxes less subsidies on production	Total
		Compensation of employees						Net mixed income								
		Male			Female			Male			Female					
		Lower	Medium	Higher	Lower	Medium	Higher	Lower	Medium	Higher	Lower	Medium	Higher			
	codes	3a-1	3a-2	3a-3	3a-4	3a-5	3a-6	3b-1	3b-2	3b-3	3b-4	3b-5	3b-6	3c	3d	
Non-financial corporations	4a													139		139
Financial corporations	4b													–3		–3
General government	4c													16	58	74
Households	4d															
Wages and salaries	4d-1	3 036	56.3	127.2	127.3	28.8	79.7	33.9	17.5	24.4	22.3	6.8	9.6	35		872
Mixed income (including propertyincome	4d-2	6.0	2.0	1.3	9.8	2.7	3.1	175.4	36.2	25.7	43.1	9.7	2.3	16		333
Income in connection with old age (retirement)	4d-3	3.0	1.2	0.4	3.0	0.8	1.9	4.6	4.6	1.0	5.3	1.3	0.3	8		35
Other transfers income (including other households)	4d-4	2.4	0.7	1.0	2.9	0.4	0.4	2.8	2.0	0.8	1.9	0.4	0.0	2		18
Non-profit institutions serving households	4e													5		5
Total national generated income		315	60	130	143	33	85	217	60	52	73	18	12	217	58	1,473
Rest of the world (current)	10	1			1											
Total		316	60	130	144	33	85	217	60	52	73	18	12	217	58	1.475

This fully-fledged generated income sub-matrix identifies the kinds of labour supplied by each group of households. The link between kinds of labour and industries in sub-matrix (3,2) tracks households' labour income back to industries' value added (except for flows

from the rest of the world). Comparing row totals of table 3.2 with column totals of table 3.6 shows that, for each labour category, resources are equal to uses.

Table 3.6 is the monetary counterpart of the labour supply - labour supplied by residents (engaged in domestic and foreign production) and labour supplied by non-residents to the domestic production system. In particular, labour underlying the generated income sub-matrix corresponds to national employment. For each category of labour total supply must be equal to total demand (see chapter 4).

Again, in table 3.6, it would be better to break mixed income down into its two component parts, self-employment income and operating surplus. This would lead to a generated income sub-matrix with column headings corresponding to the row headings of table 3.4 (i.e. showing a three way split into employees, self-employed, and operating surplus; the first two being further split by gender, and educational attainment).

3.3.2 Methods and sources for supply side of labour

There are two generally used methods for subdividing labour income by gender, education and type of household. Wages and salaries or mixed income can be broken down directly into sub-categories using whatever data are available, such as administrative information. Alternatively, the breakdown can be estimated indirectly by applying per capita income to the volume of labour input units (which is often estimated from a different source). Both methods are top-down methods, as they have to be adjusted to national accounts aggregates.

In practice, the choice depends mainly on data availability. For example,
– existence of labour accounts; their usefulness will depend on whether they are developed differently from national accounts, conceptually harmonised with them, or entirely integrated with them;
– miscellaneous statistical data will be more useful if their coverage and concepts are aligned with national accounts; and
– registers linked to administrative data at the detailed level; this is effectively a bottom-up method.

A third, less often used method depends on detailed and integrated data sources. This bottom-up approach is clearly preferable when administrative data and registers exist, and can be linked together at a level detailed enough for statistical and research purposes, which is the case in Nordic countries. At its best, the bottom-up method provides SAM sub-matrices (3,2) and (4,3) that are consistent with each other at a micro level, producing consistent links between labour costs, labour incomes, and households. This method is operationally complex, but has the advantage of reducing the number of assumptions (such as assuming the same per capita income for all gender and education categories in an industry) that have to be made in calculating the SAM.

The second of the two generally used methods involves calculating labour income by combining the values in the national accounts with labour volumes and other disaggregated indicators. The three sources have to be cross-checked, matching the volume and value matrices together, and making adjustments to figures which are based on indirect indicators. The key steps are [7]:
1. Calculation of per capita values by gender, industry and education based on administrative or other data (compensation of employees) (X)
2. Calculation of labour volume matrix based on LFS or other data (employment, hours)
3. Adjustment of the labour matrix to align it with national accounts employment estimates (Y)
4. Multiplication of labour volumes with average per capita values (X *times* Y)
5. Adjustment of the resultant labour incomes to align them with national accounts.

Dividing the labour value matrix (after step 5) by the corresponding volume matrix (after step 3) checks the resulting average per capita values. Consistency between the two

Box 3.5: The Portuguese method for the expansion of the generated income sub-matrix

In order to breakdown the compensation of labour by type of households and types of labour the following steps were taken:

Step 1 The Household Budget Survey (HBS) supplies a matrix with compensations - matrix R. The rows correspond to kinds of households based on main source of income (a total of 11categories, reduced to 4 - see Annex x for details), and the columns to kinds of labour (3 groups of branches of activity, 2 gender, and 3 levels of education attainment).
Matrix R

	Activity branches	A/B				C/D/E		(...)	L/M/N/O/P/Q		
	Labour/branch	G1-M	G1-F	(...)	G3-F	G1-M ...	G3-F	(...)	G1-M ...	G3-F	Total
Households' sub-sectors	1		r_{12}								
	2										
	3					r_{ij}		(...)			$R_{i.}$
	4										
	Total	$R_{.1}$				$R_{.j}$		(...)			

A/…/Q: NACE groups of economic activities
G = levels of education: G1= ISCED 1-2; G2 = ISCED 3-4; G3 = ISCED 5-6
M= male; F= female
r_{ij} = compensation of household i from the branch j
$R_{.j}$ = compensations of all households by type of labour
$R_{i.}$ **=** compensations of a certain household of all types of labour

Step 2 The following matrix corresponds to the value added sub-matrix described in section 3.2.
Matrix C

Activity branch / Type labour	A/B	C/D/E	F	G/H/I	J/K	L/M/N/O/P/Q	TOTAL
	1	2	3	4	5	6	
G1-M G1-F G2-M G2-F G3-M G3-F	C_{21}	C_{22}	C_{ij}				$C_{2.}$
TOTAL		$C_{.2}$	$C_{.j}$				

An identity relationship can be established between each generic element of matrix C, c_{ij}, and the total of each column in matrix R, $R_{.i}$. In fact c_{ij} - total compensations of a certain type of labour in a given industry, has the same meaning as the generic element of the last row of matrix R - total compensations of a certain type of labour supplied by all types of households to a given industry. As these values of matrix C are completely reconciled with national accounts figures they are constraints.
The HBS supplies the breakdown of compensation by gender, three levels of education and (only) three major branches of activity, primary, secondary and tertiary sectors). Matrix R has a dimension of (4 by 18). In order to reconcile both matrices, the C matrix was aggregated to the dimension of (6 by 3), 6 types of labour, 3 major sectors.
Step 3 R is transformed into a new matrix, R_w. This matrix is filled in with the relative weights of each cell of matrix R in the total of the respective column, $r_{ij}/R_{.j}$. Thus the

generic element of matrix R_w corresponds to the relative weight of a given type of labour in a certain branch offered by a certain type of household (r_{ij}) on the total value for all types of households ($R_{.j}$). The sum of each column of matrix R_w is, therefore, 1. To preserve the structure of R_w and the values of matrix C (used as constraints), we distribute each value of matrix C, c_{ij}, through all the elements of column "j" of matrix R. The result is a matrix of compensations, called matrix R1, with dimension (4x18), compatible with national accounts. The last row of R1 has now the same values as matrix C.

Step 4 The objective is to estimate a matrix of compensations by type of labour and type of household. The values of the different branches must then be aggregated according to each type of labour and household. The resulting matrix - matrix C* - has dimension 4 by 6.

Matrix C*

	labour	G1-M	G1-F	G2-M	G2-F	G3-M	G3-F	Total
Households	1							
	2		c^*_{ij}					$C^*_{i.}$
	3							
	4							
	Total		$C^*_{.j}$					

c^*_{ij} = compensations by household "i" and type of labour "j" in the economy.

$C^*_{.j}$ =compensations / type of labour / all types of households in the economy.

$C^*_{i.}$ = compensations / type of household / all types of labour in the economy.

Step 5 C* is consistent with the domestic concept of compensations but the value of compensations in cell (4d,3a) is a national concept. We have to build a matrix C** with relative weights by row of matrix C*, the weights of each type of labour within a type of household. The generic element of matrix C** is $c^{**}_{ij} = c^*_{ij} / C^*_{i.}$ The value of national compensations is broken down by household by applying a distribution of compensations from HBS. The result is a vector with dimension 4 by 1. The distribution in row of matrix C** is applied to this vector in order to show compensations of different types of labour.

Step 6 Mixed income is calculated by subtracting the value of "housing services" from the value of gross operating surplus (GOS) given from national accounts. To break this down by type of household we use the same method and sources as for the compensations.

Step 7 Gross operating surplus refers to "housing services" and it is broken down by household with a distribution of "housing services" from HBS.

Box 3.6: The Dutch method for the expansion of the generated income sub-matrix

Establishing the link between persons and household types

For the composition of SAM matrix (4.3), each individual of the population of the LFS is classified into a household group. These household groups are defined according to the main source of the income and the composition (or economic activity, in case of own account workers) of the household for a total of 13 groups (see Annex x for details). Each individual is assigned to one of these household groups following the five steps described below (see also the scheme in annex 1):

Step 1: Determine the main source of income of each household

As the LFS does not have information about income, the main source of income for each household is determined mainly by the economic status of the reference person of each household. The reference person is chosen from the core of the household. The core exists of one person (in case of a single person household) or two persons (all other households). Once the core of the household is identified the male member of the core is appointed as the reference person. In cases where the

core consists of two members of the same gender, the first person interviewed by the interviewer is considered to be the reference person.
After identifying the reference person, the households are classified into three groups – main income source wages and salaries, mixed income, transfer income – according to whether the reference person is an employee (working more than 12 hours), self-employed, or not in employment. When the reference person is not in employment, the household is moved to the wages and salaries group if another person in the household receives wages.
Step 2: Determine the branch of industry for own account workers
If a household is categorised as a household with mainly mixed income in step 1, a branch of industry is assigned to the household using the job description that respondents provide in the labour force survey. Four branches of industry are used: agriculture and fishery; trade, restaurants and repair services; business and personal services; and other activities (the branch of industry is also determined for employees; this is not needed directly for matrix (4.3) but is used to calculate the wages received by households).
Step 3: Determine the type of transfer income
When step 1 has led to the conclusion that the main source of income of the household is transfers income, we need next to determine whether this is from a retirement pension or from other transfer income. The type of transfer income is determined from the information provided by the reference person, and the age of the reference person.
Step 4: Determine the composition of the household
For households with mostly income from wages or transfers the composition of the household is broken down further according to whether it is a single or multi-person household with or without children.
Step 5: Determine the level of education
The level of education for each working person (employee or own-account worker) is provided by the LFS.
Filling the matrix: labour volumes
After these five steps all individuals have been linked to one of the SAM household types. The next step is to fill the table with labour volume figures. This is relatively easy, since the LFS contains information on hours worked by employees and own-account workers. These labour volume figures still have to be raised to the level of the labour accounts.
Filling the matrix: wages and salaries
The last step is to calculate the wages received by the households. Unlike the labour volume, this cannot be obtained from the LFS (information on the level of wages is not available in the LFS). We use the information from the labour accounts and from the Dutch Socio-Economic Accounts (SEA) to fill in the wages in matrix (4.3). The procedure is as follows:
– The labour accounts supplies wages by gender, education level and branch of industry (information used to fill matrix (3,2));
– From the five-step exercise above we know the labour volume of different types of labour supplied by each type of household.
– Using the labour volume figures as a distribution code, we can divide the total wage sum of a labour category (for example, high educated male employees in the business services) over the 12 household types. This procedure uses the (reasonable) assumption that the hourly rate of the employee is not influenced by the type of household to which he belongs.
– From the Dutch SEA, data on wages and salaries are available by type of household, and in this case the type of household is based on the main source of income of the whole household. So, using this information and the structure of wages and salaries obtained above, a balancing method is used to fill in the final wages and salaries matrix.
– It is not possible to breakdown mixed income and operating surplus by households groups based on available data sources.

matrices and national accounts is achieved by constraining both the value and volume matrices to the totals that are given for each in the national accounts. This is particularly important when the sources for labour income differ from the sources for the volume matrix. Some countries (e.g. The Netherlands, Italy and Norway) produce labour accounts that are fully integrated with national accounts, using such cross-checks extensively. The use of survey data in constructing the supply of labour varies from country to country. In countries that compile labour accounts, the types of labour input are linked to households using data from the Labour Force Survey (LFS). This is not possible in Denmark, Sweden and Finland, where the LFS is based on individuals only (and not on households). In countries without labour accounts, the LFS is used to estimate labour volumes by gender, education, industry, and to link individuals to type of household.
The Household Budget Survey (HBS) is widely used for data on households' income by type of labour and by type of household. Another source is Income Distribution Statistics (IDS), which is a household income survey. Data are collected through interviews, and combined where possible with data from administrative registers. In Finland, IDS data on household composition and economic activity (socio-economic status) are based on interviews, whereas incomes are mainly derived from registers. Generally, in the IDS, more emphasis is devoted to the quality of estimation of various income components than in the HBS.

3.4 Expansion of primary and secondary distribution of income

This section explores the expansion of the NAM sub-matrices through to the end of the income distribution process – disposable income. The first sub-matrices to be expanded are allocation of property income (4,4), (4,10), and (10,4) which complete the primary distribution of income. The next is the balance carried forward as national income (5,4). This is followed by the secondary distribution of income (5,5), (5,10), and (10,5). The balance carried forward is disposable income (6,5), the last sub-matrix in this section to be expanded.

3.4.1 Expansion of the property income by groups of households

Table 3.7 reproduces from table 2.6 the sub-matrices on the allocation of property income among residents (4,4), and on transactions with the rest of the world, (10,4) and (4,10).

Table 3.7 The allocation of property income in the detailed NAM

Allocation of primary income		Allocation of primary income					R.o.W.
		Non-financial corporations	Financial corporations	General government	Households	Non-profit institutions serving households	
	codes	4a	4b	4c	4d	4e	10
Non financial corporations	4a	33	27	9	0	0	9
Financial corporations	4b	60	3	0	44	4	49
General government	4c	19	4	1	0	0	7
Households	4d	19	84	30	0	0	1
Non-profit institutions serving households	4e	0	2	0	0	3	0
R.o.W.	10	14	18	6	0	0	

In the SAM, the household row and column in sub-matrix (4,4) can be expanded using the same household categories as in sections 3.2 and 3.3. The expanded row 4d shows the property income received by each group of household. The expanded column 4d shows property income paid by each group of household. The results are in table 3.8.

This expanded sub-matrix can be constructed for each component of property income that is paid or received by the household sector. Some of these can only flow in one direction, usually payments to households.
This simplifies the process. These component sub-matrices can be aggregated to produce the SAM sub-matrix of property income (4,4). Categories of property discussed below are:
– Interest;
– Distributed income of corporations;

  - Dividends;
  - Withdrawals of income of quasi-corporations;
- Reinvested earnings on direct foreign investment;
- Property income attributed to insurance policy holders; and
- Rents.

Table 3.8 The allocation of property income in the SAM

Allocation of primary income		Allocation of primary income (Institutional sectors)								R.o.W.
		Non-financial corporations	Financial corporations	General government	Households*				Non-profit institutions serving households	
					Wages and salaries	Mixed income (including property income)	Income in connection with old age (retirement)	Other transfers income (including other households)		
	codes	4a	4b	4c	4d-1	4d-2	4d-3	4d-4	4e	10
Non-financial corporations	4a	33	27	9	0	0	0	0	0	9
Financial corporations	4b	60	3	0	36	6	1	1	4	49
General government	4c	19	4	1	0	0	0	0	0	7
Households*										
Wages and salaries	4d-1		4	25	8	0	0	0	0	
Mixed income (including property income)	4d-2		14	46	17	0	0	0	0	1
Income in connection with old age (retirement)	4d-3		0	9	3	0	0	0	0	0
Other transfers income (including other households)	4d-4		0	4	1	0	0	0	0	0
Non-profit institutions serving households	4e	0	0	2	0	0	0	0	3	0
R.o.W.	10	14	18	6	0	0	0	0	0	

* Household sector is subdivided into sub-sectors on the basis of the main source of income of the household

Each type of property income is distributed across the matrix using totals from the national accounts (row 4d and column 4d in table 3.7). Household budget surveys or tax sources are usually reliable sources of micro data for providing breakdowns of each of the various components of property income paid and received by the different household types.

3.4.1.1 Interest (D.41)

Households both pay and receive interest. They receive it mainly from financial corporations and general government, and maybe small amounts from the rest of the world. Similarly, they pay it to financial and non-financial corporations, and to the general government sector. They may also pay small amounts to the rest of the world.

To analyse who pays interest to which types of household, and who receives interests from which types of household, survey and tax data need to be combined with the national accounts totals. Where data on interest flows in the required detail are not directly available, information on assets and liabilities that lead to the flows to and from the different household types are an important aid to allocation liabilities (e.g. wealth statistics, possibly from wealth surveys). A breakdown of the different types of assets and liabilities on which households pay or receive interest may also help the allocation to different types of household. These sources should provide sufficient information to complete the final column of a table like table 3.9 for interest receipts, and the final row in a table like 3.10 for interest payments.

They may also give enough detail to help to fill some of the cells within the tables (e.g. where surveys specifically collect data on interest received from government). The final row of the receipts table (3.9), and the final column of the payments table (3.10) are completed with national accounts data. Where insufficient detail is available to fill in all the cells of the tables, the distribution of interest received/paid by the four household types may have to be assumed to be the same for each of the sectors. A balancing method can be used to make the final apportionment by household types to complete tables for interest received and paid.

Table 3.9 Distribution of a component of property income received by groups of households

Payers-Instutional sector	Non-financial corporations	Financial corporations	General government	Households	NPISHs	Rest of the world	Property income received – to be used as a structure
Recipients-households 4d-1 4d-2 4d-3 4d-4 Property income paid by the institutional sectors to Households in national accounts							

Table 3.10 Distribution of a component of property income paid by groups of households

Payers- Households	Groups of households				Property income received from Households in the NA's
	4d-1	4d-2	4d-3	4d-4	
Receivers -Institutional sectors Non-financial corporations Financial corporations General government Households NPISHs Rest of the world Property income received by households -to be used as a structure -					

3.4.1.2 Distributed income of corporation (D.42)

Dividends (D.421)

Households receive dividends from financial and non-financial corporations, and perhaps small amounts from the rest of the world. Dividends received can be distributed to the groups of households using household survey results on income from dividends. A balancing method will be needed finally to allocate national accounts data on dividends across the types of households. It may have to be assumed that the distribution of dividends paid by each sector to the households is the same. The results, after applying the balancing method, complete a table like 3.9.

Withdrawals of income of quasi-corporations (D.422)

Households receive withdrawals of income of quasi-corporations, mainly from non-financial corporations. If households are owners of housing or land in the rest of the world they will have some, but usually small, receipts from this source. Most of the income under this classification will be payable to households that own enterprises. One likely source to distribute this income is the European Community Household Panel (ECHP), which provides data to breakdown these withdrawals by type of household:

– whether the household owns an enterprise;
– the size of the enterprise; and;
– the amount of income that the owner has withdrawn from the enterprise.

3.4.1.3 Property income attributed to insurance policy holders (D.44)

Property income attributed to insurance policy holders is paid by financial corporations (and a small amount by the rest of the world) to households (amongst others). Totals for these payments, from national accounts, can be distributed by household type using a distribution usually supplied by household surveys.

In a SAM, it is important to make an estimate of the property income attributed to insurance policy holders for pensioners. This can be based on information about the part of the net equity of households in life insurance reserves and in pension funds reserves on which pensions are claimed. The residual can be distributed using the distribution of premiums paid by household types to resident units (after deducting the service charge).

There is usually no information in household surveys to differentiate, for household types, those receipts from domestic financial corporations from those receipts from the rest of the world. It is therefore necessary to assume the distribution is the same whether the payments are from resident or non-resident insurance corporations. As before, a table like 3.9 can be completed for this category of property income.

3.4.1.4 Rents (D.45)

Households both pay and receive rents. Household sources provide data on rents received and paid by household type. Households receive rents from most sectors including the household sector and the rest of the world. Similarly, they pay them to most sectors. Total rents received/paid from each sector, from the national accounts, are combined with household sources which provide the breakdown of receipts/payments by different household types. Again, it may have to be assumed that the distribution of receipts/payments by type of household remains the same across all institutional sectors. The values obtained, after applying a balancing method, enable us to fill in tables like 3.9 for receipts, and 3.10 for payments.

When all these various categories of property income have been calculated in the form of tables 3.9 for receipts, and 3.10 for payments, they can be summed to give the allocation of all property income – sub-matrix (4,4). This completes the primary distribution of income, and leads to national income of the whole economy. This is shown in table 3.11, which is the SAM sub-matrix (5,4), including breakdowns into the four different household types.

Table 3.11 Net national income

Secondary distribution of income		Allocation of primary income (Institutional sectors)							
		Non-financial corporations	Financial corporations	General government	Households				Non-profit institutions serving households
					Wages and salaries	Mixed income (including property income)	Income in connection with old age (retirement)	Other transfers income (including other households)	
	Codes	4a	4b	4c	4d-1	4d-2	4d-3	4d-4	4e
Non-financial corporations	5a	72							
Financial corporations	5b		19						
General government	5c			191					
Households*									
Wages and salaries	5d-1				873				
Mixed income (including property income)	5d-2					406			
Income in connection with old age (retirement)	5d-3						47		
Other transfers income (including other households)	5d-4							22	
Non profit institutions serving households	5e								3

* Household sector is subdivided into sub-sectors on the basis of the main source of income of the household

Table 3.12 The allocation of current transfers in the detailed NAM

Secondary distribution of income		Secondary distribution of income					R.o.W.
		Non-financial corporations	Financial corporations	General government	Households	Non-profit institutions serving households	
	codes	5a	5b	5c	5d	5e	10
Non-financial corporations	5a	0	5	5	14	0	0
Financial corporations	5b	9	0	48	29	0	2
General government	5c	29	25	6	523	0	6
Households	5d	8	39	316	0	3	2
Non-profit institutions serving households	5e	2	14	18	3	0	0
R.o.W.	10		3	35	1		

3.4.2 The secondary distribution of income in the SAM

Table 3.12 reproduces from table 2.6 the sub-matrices on the allocation of current transfers amongst resident sectors (5,5), and on current transfers to and from the rest of the world (10,5) and (5,10)[4].

In the SAM, the household row and column in sub-matrix (5,5) can be expanded using the same household categories as before. The expanded row 5d shows the current transfers received by each household type. The expanded column 5d shows current transfers paid

by each household type. The results are in table 3.13. As with (4,4), expanded sub-matrix (5,5) is the sum of a number of (equally dimensioned) sub-matrices each recording a different type of current transfer. This section details how each of these different transfers is paid to and by the various household types. It also considers the sources and methods used to break down national accounts totals among the types of households. The main sources are once again household surveys and tax sources. This part of the SAM shows the consequences of government intervention on the distribution of income by household types, and helps to explain the link between fiscal policy and household behaviour.

3.4.2.1 Current taxes on income, wealth, etc (D.5)

Micro data sources, such as the Household Budget Survey, provide information on taxes paid by different household types. This can be used to break down national accounts totals on current taxes on income and wealth.

There are usually a number of different taxes on income, wealth, etc.. Household surveys are unlikely to provide specific information on each individual tax. The more these taxes can be separately identified the better the quality of the decomposition by household type. However, income tax is likely to be the main type of tax paid by households, and should, in itself, provide a reasonable approximation to the proportion of taxes paid by the different household types.

3.4.2.2 Social contributions (D.61)

Actual social contributions

Households pay social contributions to general government, insurance corporations, and pension funds [8]. Because social contributions are usually based on compensations (wages and salaries etc.), their breakdown by groups of households can be assumed to be the same as that for compensations. This method was described in section 3.2 and in tables 3.5 and 3.6 where the SAM sub-matrix (4d,3a) was expanded. For the self-employed (with and without employed people), the distribution across household types can be based on labour income of the self-employed from the Household Budget Survey or the European Community Household Panel.

Imputed social contributions

Households pay imputed social contributions to all the institutional sectors. (It can be assumed that imputed social contributions to and from the rest of the world are nil). The totals to be distributed are taken from national accounts. These total contributions are equal to the social benefits paid directly by employers to employees. Their breakdown by groups of households can be based on any similar distribution of benefits granted to households, such as the distribution of pensions.

3.4.2.3 Social benefits other than social transfers in kind (D.62)

All institutional sectors can pay these benefits to households. The totals come from national accounts.

The distribution of social benefits to different household types can vary markedly depending on the specific benefit being paid. It is therefore very important to consider the different benefits separately. In most countries, detailed information about the receipt of individual benefits is available either from the social institutions or agencies that make the payments, or from surveys of the households receiving the transfers. Information about the distribution of individual benefits by type of households should also be sought from the Acts or Regulations that determine their distribution. The special purpose of the regulation should be linked to the type of household that qualifies for the benefit (see ESA95, 4.84). So, for example, the best estimate of the distribution of a family (or child) based benefit may be one based on the composition of the family.

3.4.2.4 Net non-life insurance premiums (D.71)

All institutional sectors pay non-life insurance premiums to insurance companies (part of the financial corporations sector). The value of premiums paid by different household types can be based on information supplied by the insurance companies or by household surveys. In particular data on non-life insurance premiums (after deduction of service charge) should be available from the HBS.

3.4.2.5 Non-life insurance claims (D.72)

All institutional sectors receive non-life insurance claims from insurance companies. Those payable to the household sector can be broken down using the distribution of non-life insurance claims from the HBS or European Community Household Panel (ECHP).

3.4.2.6 Miscellaneous current transfers (D.75)

Households pay these to and receive them from almost all institutional sectors. A distribution of these to different household types should be based on information from household surveys. For example, the distribution may be made on the basis of miscellaneous expenditure and income in the HBS or ECHP.

The sum of these sub-matrices for each of the components of current transfers gives the expanded SAM sub-matrix (5,5) and vectors (5,10) and (10,5), shown in table 3.13.

Table 3.13 The allocation of current transfers in the SAM

Secondary distribution of income		Secondary distribution of income (Institutional sectors)								R.o.W.
		Non-financial corporations	Financial corporations	General government	Households*				Non-profit institutions serving households	
					Wages and salaries	Mixed income (including property income)	Income in connection with old age (retirement)	Other transfers income (including other households)		
	Codes	5a	5b	5c	5d-1	5d-2	5d-3	5d-4	5e	10
Non-financial corporations	5a	0	5	5	3	1	9	0	0	0
Financial corporations	5b	9	0	48	18	4	6	1	0	2
General government	5c	29	25	6	443	46	27	7	0	6
Households*										
Wages and salaries	5d-1		2	9	74				1	1
Mixed income (including property income)	5d-2		1	4	29				0	0
Income in connection with old age (retirement)	5d-3		5	25	204				2	1
Other transfers income (including other households)	5d-4		0	1	9				0	0
Non-profit institutions serving households	5e	2	14	18	2	1	1	0	0	
R.o.W.	10		3	35	1					

* Household sector is subdivided into sub-sectors on the basis of the main source of income of the household

Table 3.14 Disposable income

Use of disposable income		Secondary distribution of income (Institutional sectors)							
		Non-financial corporations	Financial corporations	General government	Households*				Non-profit institutions serving households
					Wages and salaries	Mixed income (including property income)	Income in connection with old age (retirement)	Other transfers income (including other households)	
	Codes	5a	5b	5c	5d-1	5d-2	5d-3	5d-4	5e
Non-financial corporations	6a	48							
Financial corporations	6b		22						
General government	6c			352					
Households*									
Wages and salaries	6d-1				493				
Mixed income (including property income)	6d-2					388			
Income in connection with old age (retirement)	6d-3						241		
Other transfers income (including other households)	6d-4							24	
Non-profit institutions serving households	6e								37

* Household sector is subdivided into sub-sectors on the basis of the main source of income of the household

3.4.3 Disposable income

The balancing item of the secondary distribution of income account is disposable income (the NAM sub-matrix (6,5)). The processes described above have created an expanded version of this – the SAM sub-matrix of disposable income. This is presented as table 3.14, which shows disposable income accruing not only to each institutional sector but also to each group of households.

3.5 Consumption expenditure and saving of households.

An important part of the SAM, especially when it comes to analysing welfare issues, is final consumption expenditure for different household types. This section develops the SAM further, by describing the expansion of the final consumption matrix, and some of the sources and methods that can be used in its compilation.

3.5.1 Expansion of the final consumption expenditure cell

The detailed NAM sub-matrix (1,6) records *national* final consumption expenditure by categories of products and by institutional sectors. Table 3.15 reproduces the final consumption sub-matrix (1,6), from table 2.6. In a SAM final consumption expenditure of households is broken down by household type. Households include institutional households and small non-profit institutions, which probably have unusual expenditure patterns in comparison to "typical households". It would be better to consider them as a separate category, but this is usually difficult in practice. Table 3.16 shows the SAM sub-matrix (1,6) with the expansion of column 6d into household groups used in previous sections

Table 3.15 Final consumption expenditure in the detailed NAM

Goods and services (CPA groups)		Use of income (Institutional sectors)					**Total**
		Non-financial corporations	Financial corporations	General government	Households	Non-profit institutions serving households	
	codes	6a	6b	6c	6d	6e	
Products of agriculture, etc (CPA A/B)	1a			2	28	0	30
Products from mining and quarrying, manufactured products and energy products (CPA C/D/E)	1b			0	575	0	575
Construction work (CPA F)	1c			3	3	0	6
Wholesale and retail trade services; repair services, etc. (CPA G/H/I)	1d			0	52	0	52
Financial intermediation services, real estate, etc. (CPA J/K)	1e			0	130	0	130
Other services (CPA L to P)	1f			357	208	13	578
Total				362	996	13	1,371

Table 3.16 Final consumption expenditure in the SAM

Goods and services (CPA groups)		Use of income (Institutional sectors)								Total
		Non-financial corporations	Financial corporations	General government	Households*				Non-profit institutions serving households	
					Wages and salaries	Mixed income (including property income)	Income in connection with old age (retirement)	Other transfers income (including other households)		
	codes	6a	6b	6c	6d-1	6d-2	6d-3	6d-4	6e	
Products of agriculture, etc (CPA A/B)	1a			2	9.4	10.3	7.8	0.5	0	30
Products from mining and quarrying, manufactured products and energy products (CPA C/D/E)	1b			0	218.1	219.5	126.4	11.0	0	575
Construction work (CPA F)	1c			3	1.0	0.8	1.2	0.1	0	6
Wholesale and retail trade services; repair services, etc. (CPA G/H/I)	1d			0	22.1	19.5	9.4	1.0	0	52
Financial intermediation services, real estate, etc. (CPA J/K)	1e			0	88.4	28.7	9.8	3.1	0	130
Other services (CPA L to P)	1f			357	86.7	71.9	45.3	4.1	13	578
Total				362	426	351	200	20	13	1,371

* Household sector is subdivided into sub-sectors on the basis of the main source of income of the household

3.5.2 Data sources for final consumption expenditure by type of household

The household budget survey is a particularly suitable data source for compiling estimates of consumption by household type. Information from the supply side (retail trade statistics, or sources that give quantity information) have no information about the user side of the transaction. However, the data collected in the HBS combines information on consumption of products and services, with information about the household. Different characteristics of the respondent household are collected, such as number of household members, age, main source of income/status in employment (often only for a reference person), place of residence, and number of children.

In some countries, the budget survey also includes information on household income. In this case the information obtained is even better suited as a data source in the compilation of SAMs. With this type of data, countries have the opportunity to disaggregate the household sector even further (subject to adequate sample sizes). In countries that conduct a consumption-only household survey, it may be possible to link respondents to registers or income surveys.

A problem that might arise when using different statistical sources to disaggregate the income and expenditure accounts in a SAM, is lack of inner-consistency. The problem can be related to different definitions of the target population (households), and to the different sizes and qualities of the surveys. If definitions or grossing-up procedures differ in the surveys used to disaggregate different cells of the SAM, statistical methods may have to be applied to assure inner consistency between the indicators.

Consumption expenditure estimated from budget surveys is different from that estimated in national accounts. There are three main reasons for this.

First, the definition of the population differs between the two statistics. The budget survey covers only private households. The national accounts also includes the expenditures of institutional households. Second, there are differences in definition. Consumption expenditures in national accounts contain payments which are not included in the budget survey (and vice versa). The expenses on Medicare (health) are seen as consumption in the national accounts, but not in the budget survey.

Third, there are observation differences. For example, household budget surveys under-record the consumption of alcohol and tobacco. Surveys often under-represent certain household types, particularly the very rich and the very poor. National accounts provide the best estimates of the level of consumption. Surveys supply the split of consumption by household type. This split is essential for the compilation of SAMs.

3.5.3 Actual final consumption of households

SNA93 introduced the term “actual final consumption expenditure”. The boundary between individual and collective consumption varies considerably between countries. So, introducing this term makes comparisons of consumption levels and patterns between countries more meaningful. There are three sectors in the economy in which final consumption expenditure takes place: the household sector, NPISH and the general government sector. Actual final consumption expenditure consists of two parts: individual and collective consumption expenditure. The individual part consists of final consumption expenditure of households and NPISH’s and the individual part of actual final consumption expenditure of general government (SNA93, 9.93-9.99, and ESA95, 3.81-3.88, and 8.40). Knowing the distribution of government and NPISH’s individual expenditure amongst the different types of household could be important for analysis of, for example, the welfare effects of different social policy stances. Omitting this expenditure from a SAM could distort the analysis. However, data to enable such distribution is unlikely to be readily available. For example, the HBS excludes people in institutions.

Box 3.7: Case study - Norway

Before the discussion on how to break down consumption by type of household, it will be useful to give a short description of the way household final consumption expenditure is compiled in the Norwegian national accounts (NNA). Most EU countries make use of similar data sources and compilation methods.
Four main data sources are utilised in the NNA estimation of final consumption expenditure of households:
– Household budget survey (HBS);
– Retail trade statistics;
– Various price and quantity information and other supplementary statistical information;
– Balancing within a supply- and use table.

The compilation is in three steps. Step 1: HBS data are aggregated to detailed consumption groups, while totals are related to retail trade statistics of NACE branch totals. Step 2: other sources might be preferred for some consumption groups (e.g. detailed information of sales of new and imported used cars, and information on purchases of electricity, tobacco and beverages). Step 3: final adjustments are made on the product level (CPA) using balancing within the supply and use table or direct use of HBS data. The balancing method is mainly used for the compilation of consumption of services, and, to a lesser extent, for the compilation of goods consumption.

The final consumption expenditure of households in the NNA specifies approximately 100 consumption groups, involving approximately 500 products.
Only HBS can be used to break down consumption by household type. As a consequence, discrepancies will automatically occur. The most obvious starting point is to take national totals as a constraint, and then divide consumption according to the distribution given in the HBS. This is a straightforward “top-down” method of compilation.

Matrix A serves as a starting point for compilation of final figures, which must be consistent with national accounts totals.
Matrix A

COICOP headings	Households (by main source of income)				Total
	Wages and salaries	Mixed income (including property income)	Income in connection with old age (retirement)	Other transfers income (including other households)	
q1					
q2					
.		a_{ij}	....	....	$A_{j.}$
.		.			
.		.			
qn					
Total		$A_{.j}$			A..

The next step involves distributing total consumption expenditure from NA to types of household according to their relative share given by the HBS. This is done by multiplying total household consumption expenditure from NA by the socio-economic household group’s relative share of total consumption expenditure from the HBS.
When the total has been distributed, this figure has to be broken down by consumption groups. Given the structure of consumption from the HBS, it is possible to break down total consumption by simply multiplying total consumption by the percentage share of consumption given in matrix A. This ensures that the structure of consumption within each socio-economic household group is kept.

However, in doing so, the row sums of the resulting matrix will deviate from the national accounts totals, which use sources other than the HBS. The construction of a table like matrix B allows the results to be assessed after applying the simple method described above.

Matrix B

COICOP headings	Households (by main source of income)				Total	NA-totals	Deviations from NA-totals (NA minus row-sums)
	Wages and salaries	Mixed income (including property income)	Income in connection with old age (retirement)	Other transfers income (including other households)			
q1							
q2							
.		a_{ij}	....	....	$A_{j.}$	$Na_{j.}$	$Na_{j.} - A_{j.}$
.		.					
.		.					
qn							
Total		$A_{.j}$			$A_{..}$	$Na_{..}$	$Na_{..} - A_{..}$

Deviations for some consumption groups may be quite large. This is often the case when the HBS is not used extensively in the compilation of national accounts figures. It is possible to use the RAS method (see Chapter 5) on matrix A, keeping the NA figures as constraints on the row sums, and the totals compiled from the HBS and national accounts as constraints on the column sums.
In the SAM final consumption expenditure is analysed by type of household and by product group. This means that, as a final step, it is necessary to convert COICOP categories into CPA groups. In national accounts, proper “bridge matrices” are usually available. In principle this shows a better picture of the consumption expenditures than the matrix for the CPA groups and types of households as described in the SAM. However, in the SAM we need the former presentation as account 1 has classification by CPA-group. Nevertheless, it is possible to make a matrix of consumption expenses by function and by type of household as an extra table.

Box 3.8: Case study - Portugal

In order to fill in the NAM (National Accounts Matrix) the final consumption is broken-down into two vectors:
– final consumption of resident households by products;
– final consumption of non-resident households by products.
Final consumption of resident households in the NAM is vector (1a...1f; 6d). This vector is obtained by subtracting from final consumption, final consumption of non-resident households by products. Final consumption of non-resident households is part of the NAM vector (1a...1f; 10). These figures are added to the exports by product. The figures on total final consumption of non-resident households are from the balance of payments, and are broken-down by product using a key structure (or distribution) from the survey on the Expenditure of the Non-Residents in Portugal.
In the NAM, the value of consumption is broken-down by 6 products, those figures are taken from national accounts. Households are classified by main income source and household dimension (11 types).
Information used to fill this 6 by 11 matrix are from micro data sources, such asthe Household Budget Survey.

Method
A matrix with dimension (6 by 11) and data on household consumption broken-down by 6 types of products (i) and 11 types of households is supplied by the HBS.

1st step: The first adjustment is to Financial services in activity branch (J+K). It includes the total amount of premiums payable, whereas, only the service charge is final consumption. Only the percentage of service charge is allocated to the J+K branch. The remaining amount is allocated to branch (G+H+I) , in the case of non-life insurance premiums, or to branch (L to P), in the case of workers' compensations.

2nd step: The adjusted matrix is then constrained to the national accounts totals by type of product through an iterative process, the RAS (see Chapter 5), taking into account the structure of the total consumption by type of household. The types of household are then reduced to four: wage household, mixed income / property income household, pension household and other transfers household. This is shown in the table:

	Households sub-sectors					
Products	**salaries**	**mixed/property income**	**pensions**	**other transfers**	**Total-HBS**	**Total-CN**
A+B						C1j
C+D+E						
F		c_{ij}				
G+H+I					$C_{.j}$	
J+K						
L+...+P						
Total		$C_{i.}$	(...)	C_{i4}	Total-HBS	Total-CN
structure HBS:		c_{ij} / Total-HBS			1	

cij - Consumption of product i by family j
Ci. - Consumption / type of household / all types of products
C.j - Consumption / type of product / all types of households
(After the RAS, column "Total-HBS" is identical to column "Total-CN")

3rd step: At this stage, the average propensity of consumption of the "Other transfers" households (OTH) is too high. An adjustment is made to consumption because the income estimates are more soundly based. It is then (not unreasonably) assumed that the per capita consumption of OTH is similar to the per capita consumption of "Pensions" households. The new total consumption of the OTH is broken down by type of product using the distribution of OTH in the final RAS table. The new total of consumption, net of OTH consumption, is similarly adjusted using the distribution in the final RAS table.

Because of this data shortage, and because individual consumption expenditure is an important part of actual consumption expenditure of households, compiling a satellite account on health and education might provide a better way forward.

3.6 Savings and savings ratios

Saving is the balancing item of the use of income account. In the detailed NAM it is presented in a sector-by-sector sub-matrix (7,6) with each sector's saving on the diagonal. In the SAM, saving is further distributed among the four sub-sectors of households (see table 3.17). By combining this information with income by household type, the SAM provides estimates of savings ratio by household types, which are consistent with national savings ratio in national accounts.

Table 3.17 Saving in the SAM

Capital		Use of income (Institutional sectors)								**Total**
		Non-financial corporations	Financial corporations	General government	Households*				Non-profit institutions serving households	
					Wages and salaries	Mixed income (including property income)	Income in connection with old age (retirement)	Other transfers income (including other households)		
	codes	6a	6b	6c	6d-1	6d-2	6d-3	6d-4	6e	
Non-financial corporations	7a	48								48
Financial corporations	7b		11							11
General government	7c			-10						-10
Households	7d				74	41	41	4		160
Non-profit institutions serving households	7e								24	24
Total		48	11	-10	74	41	41	4	24	233

* Household sector is subdivided into sub-sectors on the basis of the main source of income of the household

Notes

[5] In some countries it is not possible to match individual records for confidentiality reasons.

[6] "Other households" consists of persons permanently living in institutions. These "are classified separately because the criterion of the largest source of income does not allow a meaningful classification of these persons"(ESA95, 2.84).

[7] The situation is different in countries where labour accounts are integrated with the national accounts.

4 Labour Accounting System - LAS

4.1 Introduction

Economic and social statistics meet in the area of labour statistics. Expanding sub-matrices in the NAM with socio-economic variables introduces variables and characteristics which, for most countries, have to be gathered from a variety of sources. This chapter focuses on the labour market. It describes the possibilities and advantages of integrating labour market statistics in a labour accounting system (LAS), and in a socio-demographic oriented NAM - the SAM. SAMs and labour accounts partly overlap. This is where supply of and demand for labour meet. The monetary part of the overlap has been described in chapter 3, and the non-monetary (or labour volume) part is described at the end of this chapter (section 4.6).

Most developed countries have been collecting labour market data since the beginning of the 20th century. Population and establishment censuses, household and enterprise surveys on the labour force, hours of work, earnings and labour costs, as well as registers of population, taxes and social security provide data for monitoring labour market development on a regular basis.

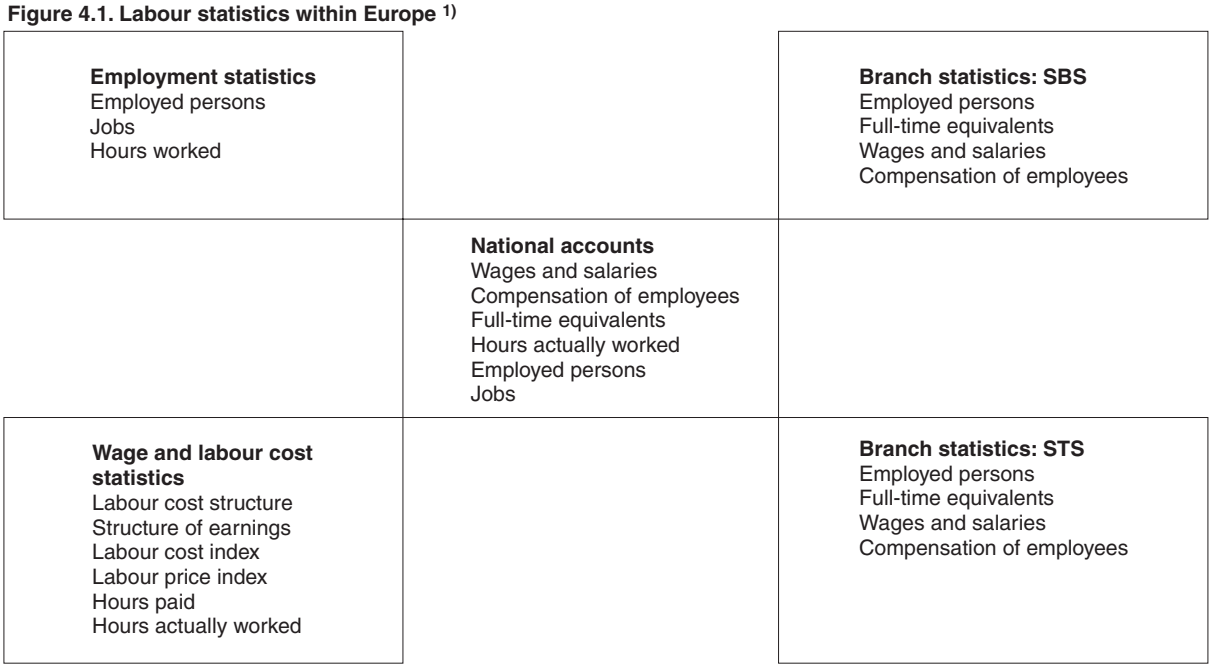
Despite the availability of a large amount of statistical information, researchers, statisticians and politicians encounter major problems in obtaining a complete picture of the labour market. According to Buhmann et al (2000) these difficulties are due to:
– contradictory results between data sources;
– incomplete coverage;
– difficulties and limitations in describing labour market dynamics;
– absence of links between labour market statistics and other social and economic statistics.

This chapter describes:
– how these problems affect labour market statistics in the EU (section 4.2);
– how they led to the development of a labour accounting system (section 4.3);
– the conceptual framework for LAS that was developed in the 1980s (section 4.3);
– how this framework is used in practice (section 4.4);
– the inter-connections between national accounts, SAMs and LAS (section 4.5);
– the compilation of the non-monetary part of these systems which complements the description of the monetary part in Chapter 3 (section 4.6).

4.2 Labour statistics at the European level

The labour market is a complex part of an economy covering a variety of agents, exchanges and events, which can be described from different point of views, and from different time perspectives. Labour market data are provided both by social and economic statistics; they can be both short term and detailed structural statistics, and both cross-sectional and flow statistics. Specific surveys are carried out to measure particular aspects of the labour market. Some surveys are about demand for labour (the enterprise point of view); others are about supply of labour (the household and persons point of view). No single data source can measure all aspects of the labour market. National statistical institutes have to deal with these various statistics which are not always intended to provide the same measures, and which, as a result, may lack consistency. This complexity is compounded at the European level, which relies upon statistics from member countries, whose statistical systems and sources of labour market data vary considerably. An illustration of the variety of sources typically available in EU member states and at the European level is shown in figure 4.1.

Figure 4.1. Labour statistics within Europe [1)]



1) SBS is Structural Business Statistics. STS is Short Term Statistics

The various headings in figure 4.1 reflect the different sources from which labour statistics are gathered and published by Eurostat. It does not necessarily mean that, in each case, different sources are used to compile figures of the variables described. Sources used may differ from country to country.

To be able to combine labour market data from different sources and to achieve consistency with data from other areas, countries need to adopt international standards. The labour accounting system was developed to be a tool that would encourage and enable countries to harmonise the compilation and presentation of these statistics.

4.3 The ILO Labour Accounting System

4.3.1 Introduction

In the early 1980s, a broad-based international discussion took place on how to overcome some of the difficulties listed above. The proposed solution was an integrated framework of labour accounts, or labour accounting system (LAS).

The aim of labour accounts is to combine statistical data sources to enhance their strengths and overcome their weaknesses, to produce new series of superior quality to the original data. The choice of definitions enables direct connections with other statistical systems, such as the national accounts or demographic accounts.

Labour accounts are a statistical framework describing relationships between units and core variables of labour. They are a set of tables providing a systematic and consistent overview of labour variables, at particular points in time, and over time.

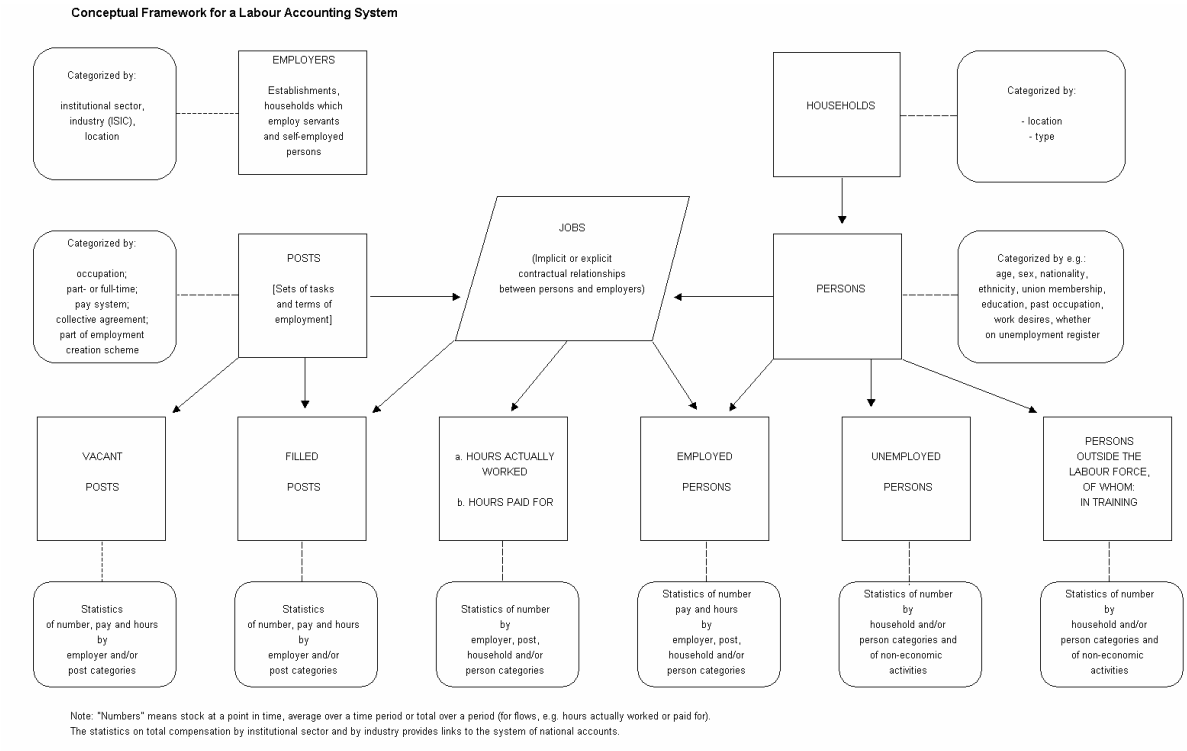
A report of the 15th International Conference of Labour Statisticians (ICLS), in 1993,said ”labour accounts provide a logical framework for obtaining internally consistent estimates of key labour market variables and their distribution over the population necessary for the description and analysis of the state and dynamics of the labour market and its interaction with the rest of the economy".

4.3.2 Conceptual framework

The following paragraphs give a brief description of the labour accounting system as it was presented at the ICLS congress in 1993. There is a graphical representation of the many relationships. This is followed by a description of the basic units used in labour accounts, and their characteristics – activity and distributive variables. There is a brief discussion of reference periods, and of the measurement units used. The section ends with an outline of the key accounting relationships.

Figure 4.2 gives an overview of the system, showing the links between the various players, and variables.

Figure 4.2



Basic units

The basic units, which are the building blocks of the LAS, are:
– Persons;
– Posts;
– Jobs.

A *post* is defined as a set of tasks which are (designed to be) carried out by one person. A *job* is an implicit or explicit contractual relationship between a specific person and a specific post. Each job represents the link between an employed person and a filled post.

These units have characteristics that are of interest to users of labour market statistics. Additional characteristics can be derived from the link between posts or persons and other units, such as employers and households, which are often sample units in surveys and registers. A household is important in setting the context of a person's participation in the labour market. Characteristics of households are therefore important in analysis and description of labour supply. An employer may be a corporation, a government unit, a non-profit institution, or a person in his/her capacity as owner of an unincorporated enterprise [9]. Employers also have characteristics that are important when describing posts and, through them, also jobs and/or persons.

Characteristics of the basic units
The LAS distinguish between, those attributes of posts and persons which describe their relation to the labour market, (i.e. those describing activity situations), and, their characteristics (distributive variables). The latter are used to describe the structure of the basic units found in different activity situations.

Activity variables
The following activity situations are most important:

(i) for posts:
  (a) filled posts
  (b) vacant posts
(ii) for persons:
  (a) employed persons
  (b) unemployed persons
  (c) persons outside the labour force

The number of activity-descriptive classes can be expanded with, for example, training and education attributes.

The international recommendations for the definition of activity situations are included in the resolution on statistics of the economically active population, employment, unemployment and underemployment, adopted by the 13th ICLS in 1982. ILO recommendations do not exist for posts or jobs, but some elements of definitions that might be promulgated in future follow from their inclusion in the LAS. In ESA95 the concept of a job is defined (see section below)

Distributive variables
Listed below are the distributive variables outlined in ILO (1992). This is not an exhaustive list, but it shows how some of the most important variables are linked to the basic units. This is important when designing surveys and reconciling data from different sources. Variables used in the pilot SAM are presented in bold. An (*) indicates there is an international recommendation of the definition and classification of this variable.

Distributive variables in LAS, by primary units.
1. Employers
   – Type of ownership;
   – **Industry***
   – Size*
   – Location

2. Posts
   – **Status in employment***
   – Occupation*
   – Contractual working hours
   – Shift system
   – Pay system
   – Collective agreement

3. Jobs [10)]
   – **Income from employment***
   – **Amount of labour costs***
   – **Amount of compensation of employees***
   – **Amount of net operating surplus for self-employed persons (of unincorporated enterprises)***
   – Normal or usual hours worked*
   – Hours paid for
   – **Actual hours worked***

4. Persons
   - **Gender**
   - Age*
   - Nationality
   - Ethnic group
   - Union membership
   - Education obtained*
   - Past occupation* (and other life history variables)
   - Work desires
   - Activities (other than those defining status)

5. Households
   - Domicile (location)
   - **Type of household***

Both pay and hours are linked to jobs, and are important for compilation of national and labour accounts and SAMs. Pay, or compensation of employees, is the most important for national accounts and SAMs linking the labour market with the rest of the economy. It describes that part of total labour cost that can be directly attributed to a job, and to an employee. Labour costs include wages and salaries in cash and in kind (ESA95, 4.03 to 4.07), and employers' actual and imputed social contributions. Pay is a major part of income from employment, which also contains the income from self-employment. Hours, both actual hours worked and hours paid for, are central to LAS, national accounts, and SAMs. Normal (or usual) hours or contractual hours are often collected in surveys, and used as proxies for actual hours.

The list of distributive variables are used to
- describe the distribution of important characteristics of the units used in LAS e.g. the stock of persons in different activity situations, or the changes in the stock or the amount or value of services provided by the unit during a reference period;
- detect incomplete coverage of units, and the way in which coverage varies between sources. Identification of gaps and overlaps in the different sources in terms of the distributive variables provides a basis for making adjustments.
- make explicit to which primary unit the definition of a specific distributive variable relates

Reference periods
Like all accounting systems, LAS requires reference periods to be clearly identified. This is particularly important when reconciling data from different sources. In SAMs, the most frequent reference period is a calendar year or a quarter. Stocks (or inventories) and events are measured at a point in time – stocks usually at the end of a year or quarter; events when they occur. Flows are measured over a period of time, usually a month, a quarter, or a year.

Measurements of quantities
The main *quantities* used in LAS are:
a. number of units, i.e. number of posts, jobs and persons;
b. amount of productive services provided by employed persons in filled posts; and
c. value of productive services provided by employed persons in filled posts.

While there are accepted conventions on how to measure the number of persons and the *value* of labour services, there are different ways of measuring the *amount* and quality of services provided, using:
- number of persons employed (or maybe the sub-set of persons at work);
- number of jobs;
- number of full-time equivalents;
- number of actual hours worked; or
- value of wage bill at constant wages (ESA95 (11.35) proposes this as a way of quality adjusting labour input).

In ESA95, total hours worked is the preferred measure of the amount of labour input. Box 4.1 reproduces the ESA95 definitions of four measures of employment.

Box 4.1: ESA95 definitions of labour input

Employed persons: "Employment covers all persons – both employees and self-employed – engaged in some productive activity that falls within the productive boundary" (ESA95, 11.11). "The employed comprise all persons who, during the reference period, performed some work …" According to international convention, the notion of some work is interpreted as work for at least one hour in the reference week. *Employees "*are defined as all persons who, by agreement, work for another resident institutional unit and receive a remuneration (recorded as D.1 compensation of employees" (ESA95, 11.12). *Self-employed persons* "are defined as persons who are the sole owners, or joint owners, of the unincorporated enterprises in which they work, excluding those unincorporated enterprises that are classified as quasi-corporation"(ESA95, 11.15).

Jobs: " … a job is defined as an explicit or implicit contract between a person and a resident institutional unit to perform work in return for compensation for a defined period or until further notice" (ESA95, 11.22).

Hours worked: "Total hours worked represent the aggregate number of hours actually worked as an employee or self-employed during the accounting period**,** when their output is within the production boundary."(ESA95, 11.26)

Full time equivalent employment, "which equals the number of full-time equivalent jobs, is defined as total hours worked divided by the average annual number of hours worked in full-time jobs within the economic territory" (ESA95, 11.32).

Employee labour input at constant compensation: "current labour inputs at the levels of compensation of employee jobs ruling during a selected base period" (ESA95, 11.35).

Accounting relationships in the LAS

Accounting (or identity) relationships in LAS specify the logical and definitional interdependence of various labour market variables. They can also identify inconsistencies in data. Relationships relate to stocks of and changes in persons (for the supply side) and posts (for the demand side), and to 'flows' of hours and income/costs. These relationships are in line with corresponding parts of the System of National Accounts and the Framework for Social and Demographic Statistics (FSDS). In practice, co-ordination between a LAS and ESA95 and FSDS systems depends more on the co-ordination of scope, units, reference periods and classifications.

The fundamental relationships that need to be satisfied are, first

total population = employed persons + unemployed persons + persons outside the labour force;

and on the demand side

total number of posts = filled posts + vacant posts; and

linking labour supply (persons who work or want to work) to labour demand (work to be done),

employment national concept (living in the country)
+ non-resident workers employed in resident production units
– resident workers employed in non-resident production units
= employment domestic concept (working in the economic territory of the country)

To link production and labour costs, the reference population in national accounts is defined as all labour provided to production units in the production process. Domestic employment is defined with respect to the residence of the production unit, and not to the residence of the population. ESA95 gives a complete list of the categories of workers included in and excluded from domestic employment (ESA95, 11.17-11.19). National employment, also used in national accounts, is based on the residence of the labour factor, and is relevant for income from labour for the resident population.

In early discussions about LAS, much attention was paid to gross changes from one point in time to another, covering all possible forms of these changes (see Denton et al, 1976). Change accounts (or longitudinal accounts), account for births and deaths of posts and persons, as well as transfers from one activity situation to another. There is no problem in principle in defining activity transfers or births and deaths of persons (including migration, as well as real deaths and movements between age limits). Data for these are also likely to be available. More difficult are the status transfers, i.e. births and deaths of posts, as they can only be defined on the basis of recruitment activities (vacant posts) or observed jobs (filled posts). Most employers find it difficult to give information about activity changes of posts. They may not know whether a newly hired person has come into a vacant post or into a new post; or whether the departure of a person has created a vacant post or has led to the loss (death) of a post.. The distinction between the death and vacating of a post must be tied to a decision to replace the departed worker (Hoffmann, 1999).

A complete time accounting system (Denton, 1986) serves as a basis for defining a third type of LAS accounting relationships. Accounting for hours actually worked should reflect the conventions developed for time use-studies. These studies account for the total use of time, and cover sleeping, eating, studying, travelling, working etc. Work may be paid or unpaid overtime for a paid job, or unpaid home-keeping or volunteer work. Total hours can therefore be defined as:

total hours = hours actually worked according to SNA production boundary
+ voluntary work + home-keeping work + time spend on education
+ leisure time + hours not elsewhere specified

Starting from the hours actually worked, accounting relationships can be constructed which quantify the identity relationship to other hours of work concepts[11]. Monetary accounts of the LAS should link income of employed persons to the cost of employing them. From a measurement perspective, and conceptually, this is much easier for income and cost of paid employment than for self-employment.

The ICLS resolutions (e.g. ILO, 2000), as well as the SNA93 conventions, should be consulted for the corresponding income and cost concepts.

4.4 Labour accounts in practice

There are no formal international guidelines on LAS. The 15th International Conference of Labour Statisticians in 1992 concluded that more work should be done before guidelines could be agreed and published. However, Hoffmann (2000) and ILO (2001) explain the basic ideas, and discuss some national experiences in more detail.

The Dutch CBS (Statistics Netherlands) has made the most systematic use of LAS. They also took part in a European project with Denmark, UK and Switzerland with the aim of

bringing implementation of the system a step closer (Buhmann et al, 2002). This project focused on how to use LAS by integrating different statistical sources. It looked at how relationships could be used to expand statistical output beyond what a single data source can offer. It also explained how to improve quality in basic data and in final results.

Labour accounts can be compiled using a cross-sectional or a longitudinal approach. The longitudinal approach has been developed in German speaking countries (Arbeitsmarktgesamtrechnung). The Netherlands has concentrated on a cross-sectional approach. Switzerland has developed both cross-sectional and the longitudinal approaches in the same framework. Denmark has developed two separate systems for Working Time Accounts (cross-sectional accounts), and Labour Market Accounts (longitudinal accounts).

Common to the work undertaken in all three of these countries is the importance attached to identity relationships. They are at the heart of labour accounts. Without the consistency they bring, there are effectively no labour accounts. They are important for users who will be confident that they have consistent estimates. They provide producers with the framework for checking the quality and consistency of their data sources.

In **Denmark**, the most important identity relationships of the Working Time Accounts covering registered paid employment are the three main relational equations for employees:
– *Jobs = employed persons* minus *employed persons on leave* plus *secondary jobs*
– Total hours worked = number of jobs *times* actual hours per job
– Total compensation = number of jobs *times* compensation per job

The calculations are performed for 2000 groups, formed by cross-classifying 125 industries, gender and four categories of hours worked, for the public and private sectors. The core of the system estimates the total number of annual hours worked. This is based on total hours worked per job (from wage statistics) multiplied by the (average) number of jobs from employment registers, which cover the total population of jobs. The model for self-employed involves jobs, employment and actual hours worked.
Labour accounts are primarily aimed at meeting regular demands from both end-users and users in Statistics Denmark for comprehensive and harmonised information on full-time equivalents. In 2000, a pilot study examined the data sources on duration and extent of employment. The eventual aim is to build a micro-register of the whole population, with Working Time Accounts and the labour account merging into one micro-based system. This will need major improvements to the basic data sources.

The Dutch Labour Accounts [12)] give prominence to
– the relationship between persons employed and jobs. This links data from household surveys (persons employed as well as jobs) and from establishment surveys (jobs);
– the relationship between number of employee jobs, average annual earnings and total wages. Jobs are estimated by reconciling LFS and establishment survey data on employment. Annual earnings come from the annual survey on employment and earnings, and total wages from social security files.

Both relationships offer good opportunities to analyse and improve the quality of the basic sources. Estimates of quarterly average earnings and average hours of work are not measured directly, but are derived from hourly earnings, weekly hours of work, annual earnings, and annual hours of work. Regular earnings, special bonuses, and allowances are separately identified on a quarterly basis. Annual average earnings are split between regular and irregular payments.

In **Switzerland**, priority is given to
– the relationship between persons employed and jobs. Data from household surveys (persons employed) and from establishment surveys (jobs) are linked;
– the relationship between number of persons employed, hours worked and full time equivalents; again the comparison is made between data from household surveys and establishment surveys;

– the relationship between the number of unemployed persons according to the labour force survey (international definition) and the number according to the unemployment registers; and
– the relationship between demographic statistics and labour market statistics. The total number of persons employed, unemployed, or out of the labour market add up to the total population. Net and gross changes (immigration, emigration, death and births) are taken into consideration.

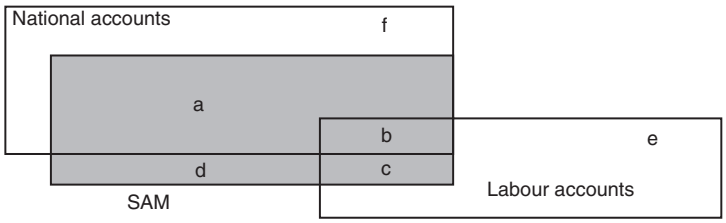
Wherever possible, unexplained differences between sources are analysed, and published. The monetary dimension of the labour market (wages and earnings) is not yet part of Swiss labour accounts.

Norway compiled their first LAS in 1989 (Skoglund, 2001). They focused on improving quality, and on expanding estimates for labour input in national accounts, from just employed person to hours worked and full time equivalent units (FTEU), as well. A framework was specified by employment statisticians in the late 1970s. The system was then developed by national accountants, and feedback to labour statisticians was limited for many years.

4.5 National accounts, SAMs, and Labour accounts

Positioning of the SAM
Figure 4.3 illustrates schematically the relationship between SAMs, national accounts and labour accounts showing which variables are part of which system.

Figure 4.3 Relationships between accounts



The *job* is the main unit linking labour accounting system and national accounts and SAMs. Jobs connect demand and supply sides of the labour market. **Part b** in figure 4.3 represents the volume of work relating to jobs (hours worked and/or full time equivalents), and the compensation (e.g. wages and salaries). It is part of all three accounts.

Part c are where that volume of work and its compensation are distributed by socio-economic variables such as education level, gender and status in employment in the SAM. This, together with **part b**, is where SAMs and labour accounts overlap. The remaining part of labour accounts (part e) relates to aspects that are not included in national accounts and SAMs, like other distributive variables, unmet supply (unemployment), unmet demand (vacancies) and organisation of the labour market. (Unemployment is defined in ESA95, 11.20, but “unmet supply of hours” is not. Unemployed persons are, of course, included in the household sector, and the receipt of unemployment benefits is included as transfer income in national accounts).

Part a relates to those flows which, together with those included in **part b**, are recorded in national accounts and SAMs, (for example redistribution of income and consumption). **Part d** is the expansion of the flows included in **part a,** and described in Chapter 3 where the SAM is developed. **Part f** is those parts of national accounts not subject to SAM expansions (e.g. the capital accounts).

SAMs and the labour accounts are linked by a set of tables that expand national accounts estimates of monetary and non-monetary labour market variables. These expansions use the same classifications that are used in the development of a SAM.

In practice, analysis of labour within a SAM or labour accounts scheme requires macro-economic aggregates to be split into volume and price measures. Input volumes of labour are persons employed, jobs, full time equivalent units and hours worked. Price measures are wage rates, and earnings or income per unit of labour volume. Both volume and price measures need to be subjected to the same expansions that are applied to the values in the various SAM sub-matrices. Labour matrices, elaborated in this way, are part of a satellite account of the SAM. Extensions of this sort are described in SNA93 (20.29, 20.101 to 102) as SESAME (System of Economic and Social Accounting Matrices and Extensions).

Definitions and coverage
The definitions of labour market variables in SNA93 (and ESA95) and ILO are broadly consistent. SNA93 uses ILO definitions of employment etc. ILO uses SNA93 definitions of the production boundary.
There are however some differences of detail:
– the ILO has an age limit on people classified as employed; national accounts has no such limit;
– national accounts includes in employment persons temporarily absent from work, but excludes them from the definition of a job. The definition of employment is in line with the ILO definition, but ILO adds a qualification. A recommendation of the 16th ICLS, in 1998, defines those temporarily absent from work as not employed if they are no longer paid by the employer, and if the period of absence exceeds a certain limit (except for those on maternity leave). ILO does not restrict a job only to those "employed and at work". The most relevant employment concept in national accounts when looking at labour input in production is "employed and at work", and this corresponds to hours worked and full time equivalence; and
– ILO classifies owners of incorporated enterprises as either self-employed, or employees if they are working in their own firm (Article 14 of the International Classification of Status of Employment, approved by the ICLS in 1993). In national accounts, they are always classified as employees. The flexibility of the ILO definition could lead to compilers of labour market statistics using different definitions from their national accounts colleagues.

Measurement problems and reconciliation
Overshadowing these small differences in definitions, are the more serious difficulties in applying these definitions using existing statistical sources. For example, administrative registers, and even statistical surveys, may not use ILO or ESA95 definitions. Some concepts are inherently difficult to measure in practice, and approximations have to be made in, for example, survey questions. Coverage of registers and surveys may not accord exactly with international guidelines. Estimates of the same variable may be different when derived from different sources. Choices have to be made as to which estimate to use, or which to adjust to achieve reconciliation. Chapter 5 discusses methods for addressing these issues of reconciliation and integration. Reconciliation at the most disaggregated level has advantages for both the quality of the (national or labour) accounts or SAM, and for feedback on quality to the compilers of source data.

4.6 Labour input: from source data to the inclusion in National accounts, SAMs, and Labour accounts

4.6.1 Coverage
Estimates of labour input, in national accounts, measure the value and volume of labour underlying output in the economic system in a given period. It is therefore linked to the production boundary set by ESA95 (11.11-11.16). Definitions of employment in household and business surveys and in administrative registers rarely meet ESA95

requirements exactly. Differences stem from differences in coverage of both the reference populations and the activities included.

Household surveys and administrative registers cover people who **live** in the country, and this aligns with national employment. These sources are not wholly appropriate for measuring people who **work** in the country (domestic employment), which is needed in national accounts to align with output of the economic system. National accounts also need data consistent with the national employment. This is measured by household surveys, but, even here, adjustments may be needed. For example, persons outside the age limit, conscripts, collective households, etc. may be excluded from LFS results, but need to be included in the national accounts (ESA95, 11.17-11.18). (For more detail, see chapter 5).

The non-observed economy [13] is by definition, included in national accounts production boundary. It relates to illegal activities, informal activities and legal activities which are deliberately concealed from public authorities ("underground economy") (SNA93, 6.30-6.36). It also includes activities not surveyed because of inefficiencies of the statistical system (for example, failure to up-date statistical registers of employment), or because of non-response in surveys. Consistent with the production boundary, estimates of labour input must also be exhaustive, i.e. include non-directly observed labour.

Countries have implemented a variety of different methods to include estimates of the non-observed economy in national accounts (see, for example, the comprehensive work carried out by the EU GNP Committee). Since no single source is specifically aimed at surveying the non-observed economy, integration and comparison of different sources of information is the basis of many countries' methods. Knowledge of differential response behaviour could lead to at least part of these differences between surveys being attributed to labour that is not directly observed. For example, household surveys may include some employment that is under-reported by enterprises in business surveys and registers. Enterprises may deliberately not declare employees not registered on the payroll. Employees answering the LFS, on the other hand, may declare that work. In other cases, it could be that enterprise surveys include employment which respondents to household surveys or to tax enquiries, for one reason or another, prefer not to declare. (In box 4.2, the Dutch and Italian approaches to these issues are explained).

4.6.2 Measurement units

ESA95 lists five different measures of employment: employed persons, jobs, full-time equivalent units (FTEU), hours worked, and employee labour input at constant compensation [14].

Jobs cover all filled posts. One person may have more than one job. The LFS asks additional questions of multiple jobholders to get information, at least, about their primary and secondary jobs. On the other hand, business surveys cover the number of employed persons in enterprises/establishments, which do not know whether their employees have other jobs. Aggregating figures on employed persons over firms measures jobs not persons. Social security records or tax registrations might be another way of showing the relation between jobs and persons.

Both jobs and employed persons are very crude measures of the amount of labour input since they do not take into account the amount of work done by a person during the reference period. Knowledge of the amount of work done is essential when looking at remuneration and labour productivity. ESA95 identifies number of hours worked as the most suitable measure for the input of labour (within the production boundary) in national accounts. A detailed description of what to include and exclude in its estimation is in ESA95, 11.27-11.31. The accuracy of available data on hours actually worked is often poor. Contractual hours and hours paid for are often well recorded in establishment surveys. Absence from work and unpaid overtime can only partially be estimated from these surveys. In household surveys, hours actually worked are often sought directly, but the data might be biased. For example, sick people and people on holiday are likely to

have relatively low response rates. Peoples' interpretation of their hours work can be quite different, leading to differences in the way respondents answer questions. Actual hours worked appear to be exaggerated in a LFS (which asks directly about hours worked) compared with time-use surveys [15]. An alternative is to use a component method. Statistics on contractual hours or on paid hours are adjusted for overtime and absences (hours not worked), and for hours of paid absence and hours of unpaid work. Which method is used depends on the coverage and quality of the relevant statistics in the compiling country.

FTEU are defined as the ratio of the total number of hours worked and the average number of hours worked in full-time jobs (ESA95, 11.32). When an estimate of the number of hours worked is available, it is obviously used as the numerator. If estimates of the average hours worked in a full time job are not available, estimates of average contractual hours in full-time jobs can be used as the denominator . When no estimate of total hours worked is available, FTEU are calculated using coefficients reflecting the size of a job relative to a full-time job. FTEU are obtained by multiplying jobs by the estimated coefficients. FTEU should be calculated separately for different employment categories (i.e. for economic activities and status in employment), and then summed (ESA95, 11.33). This approach means that the amount of hours attributable to a full-time job can change over time, and can be different between industries, and between employment categories. Definitions of FTEU can also differ between countries. For example, some countries treat a job with overtime as more than one FTEU; others treat it as just one FTEU.

4.6.3 Reference periods

Employed persons and jobs are stock measures that in (annual) national accounts should be expressed as annual averages. Hours worked and FTEUs are flow measures covering the whole year. Basic sources do not always provide data for the periods (quarters and years) used in national accounts. For jobs,

a. data from LFS refer to a week. Business surveys usually collect the number of persons employed on a day at the end of the month or quarter. Data from business surveys could (wrongly) include all the jobs that have been on the payroll for the last month and could therefore be higher than LFS;
b. an average of all the weeks in a month can give a different result from a figure based on one week in that month, or the average of one day in each week of that month (and similarly for quarters and years); and
c. the few countries that have registers which are updated by continuous reporting of hirings and separations may be able to measure the effects of (a) and (b). Even so, there are difficulties surrounding the dates of hirings and separations. Studies show that hirings tend to be on Mondays, at the start of the month, and after public holidays. Separations tend to be before the weekend, at the end of the month, and just before public holidays. The stock of employees tends to increase over a calendar week, and this may significantly effect estimates of changes from the last day of one month to the last day of the next if the two observations are on different week-days. So, measurements should be made for the same week day, e.g. the last Thursday of each month.

The annual number of hours worked in a job depends on the intensity (actual hours per week), and the duration of the job (the whole period or less). Few, if any, statistical sources give information in such detail, and of acceptable quality, for each job.

Normally, data on hours worked are available for short reference periods like a week or a pay-period. These may be available over the whole year. Adding the number of hours worked in all weeks (labour force surveys) or all months/quarters (business surveys) gives the annual total. Since a calendar year does not consist of only full weeks an adjustment has to be made for week 1 or 52, as well as for public holidays.

Some statistics based on administrative records do give information for a whole calendar year. This may be duration of the job contract and the number of hours per week according to the contract. These sources may be used to adjust for flexibility and duration of jobs. To estimate annual hours worked adjustments are needed for hours not worked and overtime, using the component method mentioned above.

4.6.4 Estimating labour input - two national examples

Box 4.2 describes how two countries, Italy and the Netherlands, approach the issues discussed in the last three sections. It explains how estimates of labour input are prepared for the national accounts, consistent with ESA95.

Estimates of the input of labour, like all other national accounts estimates, can be (and are) used for international comparisons and economic analysis [16]. Labour input is the variable used in the building up of performance indicators (productivity of labour in terms of value added or production). It underpins indicators of intensity of labour or intensity of capital. It is the volume component of economic aggregates, such as compensation of employees, allowing separate analysis of volume and price effects. For example, employee labour input at constant compensation leads to implicit price indices for labour.

Box 4.2: Estimation of the input of labour in national accounts: Italy and the Netherlands

Both Italy and the Netherlands base their estimates of the labour input on the integration of different sources of data, and on the analysis of discrepancies between them. The following steps lead to the estimation of jobs and full-time equivalent units.

Italy

1. Harmonisation of concepts, classifications and reference period of different sources (Census data, sample surveys and administrative sources);
2. grouping of sources in two main blocks: sources on labour demand (establishments) and sources on labour supply (households). Integration of existing sources within each block in order to reduce gaps due to coverage of registers, type and size of the population surveyed (for example integration of surveys on establishments and administrative sources in order to account fully for self-employed; adjustment of surveys on households in order to harmonise with national accounts definitions of domestic employment);
3. correction of main errors within the sources (for example correction of classification by economic activity in households surveys through the “filière” approach) [17];
4. comparison of integrated figures on labour demand (establishment surveys) with figures on labour supply (households surveys). This leads to the estimation of the following six main components of employment, disaggregated by economic activity:
   – registered main jobs,
   – non registered jobs,
   – multiple registered jobs,
   – multiple non registered jobs,
   – other non registered jobs,
   – foreign workers[18];
5. transformation of jobs into full-time equivalent units;
6. multiplication of FTEU by per job values in order to estimate value added, production, wages and salaries in the national accounts [19];
7. check of consistency among monetary data and labour data through the balancing of national accounts, i.e. balancing of estimates on the supply side (based on FTEU) and estimates on the demand side, through the Stone, Champernowne and Meade procedure [20];
   when the balancing procedure shows discrepancies, adjustments may be made to the labour data.

Netherlands

1. Harmonisation of concepts, classifications and reference period;
2. achievement of full-coverage for all the surveys considered by integrating existing sources in order to
   reduce discrepancies due to coverage of registers, type and size of the population surveyed (for example adjustment of the LFS in order to account for secondary jobs, persons over 65, etc…);
3. check of definitional equations with respect to jobs and persons employed and adjustments aimed at minimisation of measurement errors;
4. combination of jobs, hours worked and earnings in the context of the labour accounts system and minimisation of measurement errors resulting from the analysis of discrepancies; balancing of remaining minor discrepancies by a mathematical procedure (Powell algorithm) [21];
5. transformation of figures into: full-time equivalents, hours actually worked, compensation of employees;
6. comparison with National Accounts figures and elimination of discrepancies by adjusting variables at the NA and/or the LA side;
7. iteration through steps 3-6.

Both approaches allow estimation of the input of labour including the non observed economy and secondary jobs.
There are three main differences between the two approaches:

1. **the general approach**. In Italy, only benchmark-year figures are estimated using the method described above, and benchmark years usually coincide with Census years. Time series are then obtained by extrapolating benchmark estimates using a large set of indicators of change derived from sample surveys and registers. The Netherlands apply their method quarterly and annually;
2. **the way jobs are estimated**. In Italy, discrepancies between surveys on households and surveys from establishments are analysed: those due to statistical reasons are reduced as much as possible; remaining discrepancies are then maintained and interpreted in an economic way [22]. In the Netherlands, surveys from households and establishment are adjusted to measure the number of jobs (main and secondary; non-observed economy) and persons employed, and then the estimates are balanced by iterative procedure; and
3. **the use of such estimates in national accounts.** In Italy, the estimation of labour input is integrated into the national accounts, and is directly affected by the balancing of the accounts. Consistency between input of labour and monetary aggregates is automatically obtained. In the Netherlands, both labour input and monetary aggregates are estimated in the context of labour accounts (mainly through the confrontation of employees estimates of cost described in both systems). The labour accounts figures are then made consistent with national accounts definitions and boundaries.

4.6.5 Labour input by gender, education and household categories in the SAM

This section shows how the data on input of labour, in non-monetary terms, can be fully integrated in the SAM.
The following analysis is based on a numerical example. This is expressed in terms of units of labour consistent with monetary data used in Chapters 2 and 3 to exemplify NAMs and SAMs. The number of persons employed, jobs, full-time equivalent units, and the amount of hours worked can all be used in analyses, each one providing different information and measuring different indicators. Choice of the unit to be used in the SAM will be determined by the analysis to be undertaken. The value added matrix is usually shown in terms of hours worked or full-time equivalent units, and used to measure performance indicators on the amount of labour actually contributing to the production process. The net generated income matrix is generally shown in terms of jobs and

number of persons employed, and used to link the result of the production process (in terms of income) to those who benefit from the income produced. Input of labour is linked to the persons providing it, and the persons are linked to the household to which they belong. Jobs represent an intermediate step from full-time equivalent units or hours worked to persons employed.

National accounts estimates of the input of labour are traditionally analysed only by economic activity and institutional units employing labour. The analysis of labour in a SAM requires labour figures to be disaggregated and cross-classified also by socio-demographic criteria in the SAM sub-matrices. Furthermore in the SAM the labour factor can be looked at both from the person (i.e. supply of labour) and from the job (i.e. demand of labour) point of view. This is because the labour sub-matrices in a SAM analyse labour by characteristics of the employer (e.g. industry), the socio-economic characteristic of the person providing labour (such as gender or education), and the type of household to which the worker belongs. Most of the characteristics used in these sub-matrices are also used in the system of labour accounts.

Linking labour characteristics to the person and to the household provides a consistency check on statistics of labour and statistics of income from labour in national accounts. Input of labour included in the SAM is the same measure of the labour factor underlying both value added and income in the measurement of GDP [23] in the national accounts. Production factors (including labour) are remunerated through income for their input into the production process (value added, sub-matrix (3,2) of the SAM). This flow of income attributed to production factors is distributed to institutional sectors to which the production factors belong. The labour factor belongs to households, so wages and salaries, and mixed labour and capital incomes are distributed to households (net generated income, sub-matrix (4,3) of the SAM). In this way, the SAM analyses the input of labour not only according to the economic activity and institutional unit employing it, but also according to the institutional unit providing it.

In the SAM, value added is cross-classified by economic activities and kinds of primary inputs: compensation of employees and mixed income – gross operating surplus. Only compensation of employees and part of mixed income remunerate labour.

When a matrix is compiled for labour input, disaggregated by economic activity and labour categories, it is possible to measure the volume of work provided by each category of labour factor to each industry. The matrix can be directly linked to the value added sub-matrix showing the flow of value added produced by each industry and the labour category which has contributed to it. The labour matrix underlying the SAM value added sub-matrix (3,2) is shown in table 4.1 in columns 1 to 6. The input of labour in this part of the table is on the domestic concept. Labour provided by resident workers to non-resident production units is excluded, while labour provided by non-residents to resident production units are included (ESA95, 11.17-11.19). Column 7 is the rest of the world account, and shows labour provided by resident workers to non-resident production units. This is the labour underlying the monetary flow of wages and salaries from the rest of the world recorded in the SAM sub-matrix (3,10). Column 8 shows the total of domestic employment and labour provided abroad by resident persons.

In the net generated income sub-matrix, recording primary incomes (sub-matrix (4,3) of the SAM), the economic flow is cross-classified by kinds of primary input and groups of households. This sub-matrix describes the remuneration of labour received by households to which the labour factor belongs. This differs from the value added sub-matrix as it relates to the income received by resident households from resident and non-resident production units. It does not include the remuneration of non-resident labour working in resident production units (ESA95, 8.94). In the SAM, this latter flow is recorded in the rest of the world sub-matrix (10,3).
The labour matrix underlying the net generated income matrix is shown in table 4.2 in rows from 1 to 7. It shows what kind and how much of labour is provided by each group of households. The input of labour is on the national concept [24], applying the residence

criteria to the unit receiving income, and not to the production unit. This part of the table includes residents working in resident units and residents working abroad. Row 8 relates to non-residents working in resident units, and is equivalent to the rest of the world account sub-matrix (10,3) of the SAM.

Table 4.1 The labour matrix underlying the value added matrix and the R.o.W. vector (in units of labour volume)

Generation of income account	Production account						Total	R.o.W. Account	Total
	Industries								
	1	2	3	4	5	6		7	
Labour categories									
Employees									
Male									
1 Primary education	24,0	156,7	58,9	94,3	14,6	71,0	419,5	2,5	422,0
2 Secondary education	1,0	16,9	3,0	13,4	10,9	16,7	61,9	0,8	62,7
3 Tertiary education	0,8	10,0	1,4	5,7	9,2	31,9	59,0	0,5	59,4
Female									
4 Primary education	11,2	118,2	1,3	53,0	12,2	119,0	315,0	0,0	315,0
5 Secondary education	0,7	11,1	0,9	12,9	8,2	23,3	57,1	1,7	58,8
6 Tertiary education	1,0	5,1	0,6	6,2	5,4	69,7	87,9	0,9	88,8
Self-employed									
Male									
7 Primary education	32,1	111,9	37,8	66,8	24,1	10,3	283,1	0,0	283,1
8 Secondary education	1,9	15,9	1,7	11,7	24,2	3,2	58,5	0,0	58,5
9 Tertiary education	0,0	3,4	0,7	1,5	22,1	0,8	28,7	0,0	28,7
Female									
10 Primary education	30,2	69,1	0,1	38,7	10,8	17,1	166,1	0,0	166,1
11 Secondary education	0,3	7,8	0,0	7,8	7,7	5,2	28,9	0,0	28,9
12 Tertiary education	0,3	1,0	0,0	0,7	10,4	1,1	13,4	0,0	13,4
Total	103,5	527,1	106,4	312,7	159,8	369,4	1,578,8	6,4	1,585,2

Table 4.2 The labour matrix underlying the allocation of primary income matrix (in units of labour volume)

Allocation primary income	Generation of income												Total
	Labour categories												
	Employees						Self- Employed						
	Male			Female			Male			Female			
	Prim.	Sec.	Tert.	Prim.	Sec.	Tert.	Prim.	Sec.	Tert.	Prim.	Sec.	Tert.	
	1	2	3	4	5	6	7	8	9	10	11	12	
Institutional sectors													
1 Corporations													
2 General Government													
3 NPISH													
House-hold types*													
4 Employment (wages and salaries)	406,5	57,5	58,3	282,6	52,1	83,5	46,9	17,9	14,0	53,7	11,3	10,7	1 095,0
5 Self-employment (mixed income)	7,4	1,9	0,5	19,8	4,6	3,0	226,9	34,6	13,8	96,8	15,1	2,4	426,7
6 Income in connection with old age (retired)	3,8	1,1	0,2	6,4	1,3	1,9	5,6	4,1	0,5	11,3	1,9	0,3	38,4
7 Other transfer income	3,0	0,7	0,4	6,1	0,8	0,4	3,6	1,9	0,4	4,3	0,6	0,0	22,2
Total	420,6	61,2	59,4	315,0	58,8	88,8	283,1	58,5	28,7	166,1	28,9	13,4	1,582,2
R.o.W.													
8 Non residents working in resident units	1,4	1,5	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2,9
Total	422,0	62,7	59,4	315,0	58,8	88,8	283,1	58,5	28,7	166,1	28,9	13,4	1,585,2

* Household type is determined by the main source of income, shown in next column: wages and salaries, mixed income, pension, other income.

The structure of tables 4.1 and 4.2 can be used in the compilation of a SAM both where mixed income is split into remuneration of labour and capital, and where mixed income is not split [25]. Only in the first case can a proper per capita value for remuneration of labour be calculated. In the second case, the analysis of self-employed cannot be on per capita values, but is limited to a non-monetary analysis of the labour factor.

In tables 4.1 and 4.2, labour is recorded only in the households' row, because remuneration of labour (both of employees and of self-employed) is transferred to households through wages and salaries and mixed income (ESA95, 11.15). In ESA95, labour provided by self-employed can only be carried out from the households sector, i.e.

self-employed workers (both own-account workers and employers) can be classified only to the household sector as sole proprietors or in partnerships of unincorporated enterprises. As self-employed workers they receive a mixed income, which remunerates their labour as well as their capital. Classifying self-employed workers to the corporations sector is not consistent with ESA95. However, some countries may classify part of the self-employed workers to the corporations sector because the economic and fiscal systems allow the presence of the self-employed labour in corporations (see box 3.2 in chapter 3).
Tables 4.1 and 4.2 can be compiled using a top-down approach, a bottom-up approach or a combination of both. (These approaches are discussed in chapter 5).

Box 4.3: The Input of Labour

This box presents a brief description of the methodologies used by three countries to compile disaggregated tables on the input of labour according to the SAM classifications.
The implementation of the SAM classification is mainly through top-down methods, except in two cases - the Netherlands and Norway – where the estimation of the input of labour by gender is obtained using a bottom-up approach.
As far as the top-down approach is concerned, differences among countries are mainly related to the sources of information used to apply the classifications. In most of the cases, a single source of information provides the structure according to which national accounts estimates (representing a constrain) are distributed. The LFS is the main source. In Finland, income distribution statistics are used, allowing the same source of information to be used to split the input of labour by gender, education and groups of households.

The Input of Labour by industry, gender and education

Italy
The input of labour by industries is estimated by applying the technique described in box 4.2. First, the estimates are made for a benchmark year. Time series for each component of labour input are then extrapolated. The way the estimation of FTEU is carried out makes it impossible to relate each labour unit with those characteristics of the worker which have not been used as classification variables throughout the estimation process. To derive a classification of labour by gender, the benchmark process has to be replicated with gender as one of the classification variables from the beginning.
The national accounts estimates remain a constraint. The results of the re-benchmarking process are used as structures to split the published data on labour using a top-down approach. The re-benchmarking process is carried out using gender, three categories of employment, twenty regions, and sixteen economic activities. This makes it possible to get a structure by gender at this level of detail for each of the six components of labour estimated for the benchmark year (points 4a-4f of the Italian case in box 4.2). The main sources are the Census of Population, the LFS 1991, the Census of Manufacturing and Services Firms 1991 and the Census of Agriculture 1990. The LFS provides indicators to extrapolate figures by gender to 1996.

No information on education is available from sources on enterprises, so the benchmark process based on the comparison of these sources with those on households cannot be applied. The disaggregation of labour by education level is carried out by applying the structure by education level derived from the LFS on the total of labour broken down by gender and industries. This process is applied to employees and self employed separately.

Belgium
The labour volume tables are based on national accounts data and LFS data about employed persons. The employment figures in national accounts are derived from the estimate of the working population supplied by the Ministry of Labour on June 30 of each year. These estimates are mainly based on administrative data (social security data, VAT data, etc.). Because they give the best split by branch of industry, the national account totals by branch of industry act as constraints. The LFS is used to break down these estimates by gender and education. The RAS method is used to eliminate discrepancies, and provide a consistent table. Separate tables for employees and self employed persons are compiled.

National accounts estimates of employment do not include the estimate of labour volume of employees in terms of full-time equivalents (FTE) at present. The compilation of the table for wages and compensation of employees is based on the labour volume of employees in terms of FTE. This is necessary to get results consistent with other sources [26]. Because figures of FTEs are not yet published in Belgium, compilers have to estimate labour volume of employees in terms of full-time equivalents, using LFS results. Adjustments are made for part-time workers on the basis of their percentage of part-time work. Every second employee job is converted to FTE via the average number of hours worked. A full-time job (one FTE) is counted as 38 hours per week. The structure of the estimate of FTE in LFS is applied to the total number of employees in national accounts. In this way, estimates of labour volume in FTE by industry, gender and education level are coherent with national accounts figures. [27]

Netherlands
In the Dutch SAM, labour input is disaggregated into 14 types of labour. The information is derived from the labour accounts. Two important determinants for Dutch employment and wages are applied as discriminating criteria: gender and level of education attained. Seven categories of level of education are distinguished: (1) basic education, (2) lower and (3) higher general secondary education, (4) lower, (5) middle and (6) higher vocational education and (7) university training. The detailed information on the labour market in the Dutch SAM is derived from a combination of data from different micro-sources and meso data from the labour accounts and the national accounts. The Annual Survey on Employment and Earnings (ASEE) is used as the best source to describe employment (jobs), by branch of industry and gender. LFS is used for breaking down labour by education level. The LFS contains reliable employment data by educational levels. In compiling the detailed SAM labour matrix, LFS data are linked to labour account figures. The LFS records are clustered into 324 cells classified by industry, gender and labour hours. Then, each LFS cell is grossed up in such a way that the result equals the corresponding labour acccount figure. This re-weighted LFS database provides sub-matrices for both paid employment of employees and self-employed classified by gender, educational level and industry.

The Input of Labour by gender, education and groups of households

Netherlands
The SAM distinguishes labour input data classified by gender, educational level and household groups. In the Dutch case, 14 types of households classified by main source of income and household composition are distinguished. The SAM sub-sectoring of households is based on the Socio-economic Accounts (SEA). In the SEA, total wages and salaries received by type of household are compiled from micro tax data. The LFS collects data on personal characteristics, including position in the household (e.g. breadwinner, partner or child), and on household characteristics such as composition (single- or multi-person, with or without

children). To compile matrices with labour data classified by gender, educational level and household groups, LFS data are compared with SEA data. The re-weighted LFS database (described above), extended with imputed wage rates, is used again. LFS cells are grossed up so that (a) total wages and salaries by gender and educational level equal the previously compiled levels and (b) total wages and salaries per type of household equal the corresponding SEA figure.
The Dutch LFS does not contain any information on income levels. Therefore, in contrast to the SEA, the Dutch LFS cannot classify households by main source of income. On the other hand, the LFS contains information on the employment status (employee or self-employed) and the type of industry for each individual in the household who belongs to the labour force. In addition, the LFS asks whether a person receives social security benefits and whether he or she has reached the age of 65. Based on these data the main source of income of the breadwinner can be deduced. This is used as a proxy for the main source of income of the whole household. This method is not completely accurate with regarding to double-income households. The discrepancies between the SEA and LFS are concentrated in the category multi-person households without children.

Notes

9) Because some employed persons are self-employed, a person may have a job and a post with herself/himself as employer.
10) Variables included under this heading may play differnt roles. Distributive variables on the one side and independant measurement units on the other side. The latter role may lead to figures like the volume of hours and the total wage sum
11) See e.g. UN Statistics Division (1997) as well as Hoffmann & Mata Greenwood (1999) and Mata Greenwood (2000).
12) For more detail on Dutch labour accounts see Statistics Netherlands (1999) and Leunis (2000a).
13) A comprehensive description of concepts and methodologies to measure the non-observed economy can be found in OECD (2002).
14) For definition of employee labour input at constant compensation see ESA95, 11.36-11.37.
15) See e.g. Mata Greenwood (2000) and Leunis (2000b) for more detail about concepts and measurement of hours worked.
16) Chapter 6 is mainly devoted to the description of applications of the SAM and of the uses of the data it includes.
17) A filière is a group of economic activities describing the whole process through which a raw material is extracted, transformed into a finished product and sold on the market. The “filière” approach is based on the grouping of data from households survey (Census of the Population) in filières. Each macro-filière thus contains data classified by economic activity. The basic assumption is that economic activity classification errors resulting from information given by individual workers in the Census of the Population will, in all probability, remain within the same filière of production, thus nullifying the error. (Istat, 1993).
18) For more detail on Dutch labour accounts see Statistics Netherlands (1999) and Leunis (2000a).
19) In the case of value added and output, the methodology described is not applied in some specific industries (like agriculture, energy, construction, public administration, financial activities) where estimates are elaborated using different methodologies (like unitary prices multiplied by quantities) or using specific sources of information on these values
20) This procedure is described in chapter 5
21) This procedure is described in chapter 5
22) Surveys on households provide information on registered and part of non registered workers while surveys from establishment provide information on registered primary and multiple jobs; comparison of the statistics can therefore provide figures on registered main jobs (surveyed both by households and establishment), non registered jobs (surveyed only by households), and multiple registered jobs (surveyed only by establishment).
23) Labour is remunerated by part of GDP, the remaining part represents the remuneration of the capital factor and taxes.
24) The measure of the national employment is not defined in ESA95 but it can be derived from the definition of domestic employment (ESA95, 11.17-11.18).
25) See paragraph 3.1 in chapter 3.
26) Belgium found a larger wage differential than expected.
27) The method to calculate full time equivalents will change in the near future.

5 Compilation Procedures and Techniques

5.1 Introduction

SAMs and labour accounts bring together a variety of data. These include the integrated estimates from national accounts, basic statistics from central registers and censuses, and results from household surveys (labour force survey, household budget survey etc.), and establishment surveys (structure of earnings survey, labour cost survey, etc.). They are brought together, in a consistent way, using statistical integration procedures. This chapter looks at the principles underlying these procedures.

The process of building a labour-oriented SAM usually involves the following steps:

1. identification and preparation of appropriate data sources. This may include *matching* of several micro-data files to obtain the set of variables of interest for each individual, and the complex task of *harmonising* the variables with the national accounts concepts;
2. combination of data sets to enable decomposition of the traditional national accounts figures into more detailed socio-economic variables (e.g. gender and level of education). *Calibration* techniques for micro-data are often useful to reduce the impact of sampling variation and non-response bias etc. in surveys; and
3. *error detection* and *regularisation* or *balancing.* Inconsistencies between estimates obtained by aggregation of micro-data and the national accounts figures may still be present after step 1 and 2. For example, identity relations may not hold. These inconsistencies should be investigated to discover errors in the data etc., and corrections made. *Regularisation* or *balancing* techniques can then be used to obtain strict numerical consistency in the macro-data. (This process can also provide feedback to survey statisticians (and national accountants) to improve estimates from surveys or registers (or in national accounts)).

To integrate different sources, top-down or bottom-up approaches can be used. These are described in sections 5.3 and 5.4 respectively. Section 5.5 discusses the advantages of combining the two approaches. Section 5.6 gives examples of the adjustments needed to combine the various sources available in labour accounts and SAMs. The last section, 5.7, describes some specific techniques that can be used in the integration process.

5.2 Preparing the overall design of the SAM

Keuning and de Ruijter (1988) outline the compilation phases for a SAM. According to them, the first phase is to identify the design for the SAM to be compiled. There are a number of options available to a designer of a SAM, and the selection should be based on the ease of compilation weighed against the usefulness of the finished matrices. The options vary from country to country, according both to the availability of data and the structure of their economy. Selection of the particular accounts to be compiled should take place during the design phase (e.g. factor accounts, flow of fund accounts or subsidiary (non-monetary) accounts).

Once the structure of the SAM is established, the next step is to identify sources of data. The SAM framework is all about reconciling the results from as many sources of data as possible, comparing and cross-checking data to improve overall statistical quality. The usefulness of a potential data source can be assessed on its comparability with other sources. Sources should be comparable in two senses: they should be relevant to the year for which the SAM is being compiled, and they must have classifications that are consistent with the structure of the overall SAM.

Essentially, a SAM expands on the results of the national accounts. Some countries' systems of accounts already include some of the sub-matrices of the institutional sectors in their sector accounts and balance of payments. However, more generally, to compile

SAMs, countries need to expand their national accounts totals using social and, to a lesser extent, business surveys, and administrative data to fill individual SAM cells. Data sources differ across countries. Questionnaires vary in the questions asked. Coverage of surveys also varies. The three main sources used in most countries come under the following headings.

Household surveys. Household surveys generally collect a large number of variables. These can be crossanalysed, and used to fill in the detail of the rows and columns of the SAM sub-matrices. Household surveys usually collect information about areas of the economy where employer surveys are weak, e.g. the self-employed. They may also shed light on areas where administrative data are poor, e.g. the hidden economy.

Amongst EU member countries there is an increasing degree of comparability of survey types and designs. EU members are required by EU regulation to conduct, from 2003, a continuous Labour Force Survey, providing quarterly results. Two countries have derogations; one until 2004; the other until 2005. This asks an array of questions, providing background of the household, and details about its participation in the labour market. For SAMs, the LFS can be used to provide averages of hours worked (or some other measure of labour volume) and, for some countries, wages and salaries each broken down by gender, occupation, education, age etc. Surveys also ask about the branch of industry. Where an individual can be linked to an employer, the branch can be identified accurately. However, in countries where this linking is not possible, industry is self-reported, which may not correspond to the industry to which the employer is classified in national accounts (see, for example, Daffin, 2001, for the UK).

A second important household data source is the Household Expenditure Survey. Like the LFS, this provides a rich array of household characteristics, but also detailed information about household spending patterns. Earnings of individuals in the household, and other sources of household income are sometimes collected. In some countries, income data for sampled households are collected separately from fiscal sources.
Household surveys are, of course, subject to sampling (and non-sampling) error, and may not, in all instances, adequately cover all sub-groups of the population.

Business surveys. Business surveys collect information available to employers about the number, pay, hours of work, and job characteristics of their employees. To meet EU regulations, member states must collect data from businesses, and build a business register of key variables such as employment, output, and investment. Generally, financial and employment data are collected about the business and these are used in the compilation of the national accounts. Some information about employees is collected but this is usually limited to information that is available on the pay roll. The “structure of earnings” survey is compulsory in EU member states. This asks for detailed information about the work, hours, and pay for a sample of individuals employed by the firm. It provides valuable information on earnings distribution, and for minimum pay policy.

Administrative Data: There are a number of administrative data sets that are useful for the labour and income parts of a SAM. Much of the data is already used in national accounts. The detailed data on tax payments and social contributions by firms and households offer rich analytical potential. For example, administrative data on social contributions or personal tax can be linked to individuals’ characteristics, such as gender and age, and to details of income and wealth. In some countries, household surveys and administrative registers can be linked, enabling a large number of variables to be extracted and crossanalysed.
Macro-economic classifications are largely determined in international guidelines, such as SNA93 and ESA95 (and their forerunners). This has led to an increased coherence in definitions and classifications across countries. Classifications used in SAMs go beyond these. The following is a list of criteria that should be used for these further sub-divisions.

Homogeneity within a group, and heterogeneity among groups. To be meaningful in analysis, the grouping of units ideally requires that the units have a common behaviour.

For example, the variables used to define a type of household – income, wealth, and consumption – will vary considerably across households. However, within this heterogeneity, sub-groups defined according to particular variables do have identifiable patterns. For example, the elderly typically obtain the main part of their income from pensions and/or social benefits, and not from current employment. By aggregating actors according to characteristics that significantly influence behaviour of interest to researchers and policy makers, classification helps to simplify the description of the economy. Policy target groups should be separately identified, wherever possible. (There is often a trade-off between a tractable definitional structure and a reasonable representation of the complexity of the economy).

Stable and measurable set of defining characteristics. To the extent possible, classifications should be based on stable characteristics. Variables that are changeable, or impacted upon by policy, such as income, should be avoided. (Though it is sometimes necessary to use such variables to allow the SAM to be used in policy analysis.) Stable groupings allow the dynamics of economic changes to be modelled or tracked over time without having to control for changes in group membership.

Groups that the source data can identify. In deciding suitable group characteristics, the variables chosen should be generally available in the surveys (and other sources), and enumerated to a sufficiently reliable degree.

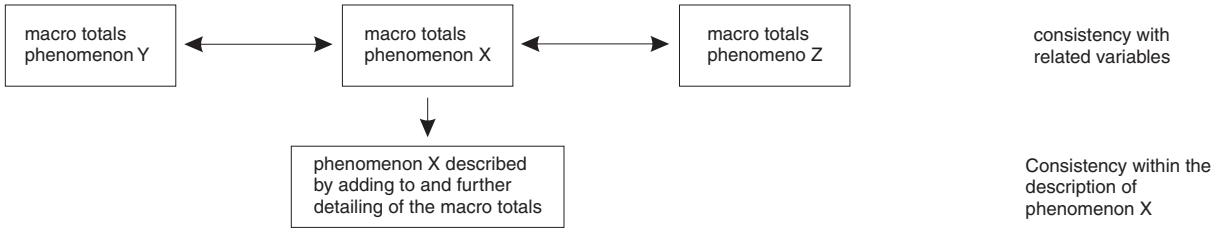
5.3 Completing the SAM: a top-down approach

The development of the pilot SAMs for the 8 countries in the Leadership Group is an example of a top-down approach. Labour volume and compensation of employees are subdivided for branch of industry, gender and education by using data from labour force survey, structure of earnings survey, and other sources. Macro-economic totals on income and consumption are subdivided into household categories by using data from household budget survey and income statistics.

In national accounts, the identity relationships between production, income, costs etc. are important quality checks on the figures. Full consistency between these variables is a necessity. Supply and use tables underlying these relationships tend to be integrated at a detailed level. Other parts of the system of national accounts, like the description of the production factor labour, tend to be compiled in much less detail. Systems, like SAMs, can be added to extend parts of national accounts. When an extension consists only of a further breakdown of certain transactions (e.g. income generation according to a more detailed classification of labour or a sub-sectoring of households) without adjusting the macro aggregates, the integration procedure is a top-down approach. This is shown in Figure 5.1. Having reached consistency at the macro/meso level, the results at that level are taken as given in further sub-dividing the variables.

So, in developing SAM sub-matrices, using a top-down approach, the compiler usually begins by filling the column totals, row totals or both, from sources such as national accounts. These totals remain fixed throughout the process. The next stage is to fill in the cells of the matrix from the various available sources. This may involve applying a distribution derived, for example, from a household survey to one of the row/column

Figure 5.1 Top-down approach



totals. Less reliably, if better data are not available, the compiler may use ratios from another comparable country, or the results of previous studies.

Having put together an initial sub-matrix in this way, data in the cells should be subject to *cleaning and error correcting*. Checks should be made with other sources; and ratios using data from within the sub-matrix should be checked for plausibility. For example, combining monetary and non-monetary data may show implausible wage rates or unrealistic spending patterns for various groups. What can be done at this stage to improve the data in the sub-matrix depends very much on the richness of data sources in the compiling country.

Once the cells of the sub-matrices have been filled in, and the plausibility of the individual cell estimates checked, overall *reconciliation or balancing* of the SAM should begin. This is usually done using mathematical techniques such as linear programming or RAS (described in section 5.7.3). Decisions have to be made as to which sub-totals in the matrix are to be treated as control totals, and therefore to remain unchanged in the reconciliation. For full consistency with national accounts, SAM breakdowns must add up to national accounts totals. National accountants should be made aware of some of the data inconsistencies revealed by the SAM, so that they can consider improvements in their procedures.

These two processes of *data cleaning* and *reconciliation* or *balancing* should proceed simultaneously – or iteratively. Once a new set of balanced figures has been produced, these should be subjected to a further round of cross-checks, cleaning and correction. The two processes together should ensure that account is taken of the relative reliability of the various sources. The expectation should be that the weakest figures are more prone to adjustment than those more firmly measured. After certain iterations, the compiler may want to reassess earlier decisions. For example, it may become obvious that the chosen classification system is too ambitious given the quality of the data. There may be intractable data shortages. Simplifications may have to be made.

5.4 Compilation of labour accounts or SAM modules with a bottom-up approach

There are two variants of the *bottom-up* approach:

a. *Derived estimates, benchmarking.* In consecutive steps, primary sources are the benchmark for further breakdowns and extensions.
b. The *accounting approach.* Inconsistencies between variables can, in principle, lead to research into and adjustment of all data, if necessary.

Variant (a) is presented in Figure 5.2. In most cases, a single source is identified as the most reliable (or primary source), and information from this source is not challenged. This might, for instance, be a census or a large structural survey. Other sources are only used to bring in further detail or to add an annual or quarterly pattern. There is no feedback to the primary source.

Variant (b) is shown in Figure 5.3. The term “accounting” is used because accounting identities determine the approach. The essential difference between variant (a) and variant (b) is that variant (b) uses all sources, and knowledge of their strong and weak points to improve the results. Even primary sources are subject to additional checks and possible adjustment.

The labour accounting system introduced by the ILO in the late 1980s (and described in chapter 4) is essentially a bottom up system. It is a framework for combining statistics from a variety of different statistical and administrative sources. It produces statistics that are of better quality than the original source data from which they are derived. It aims to use the strengths from the sources, and to eliminate the weaknesses through a process of confrontation and integration.

Figure 5.2 Bottom-up approach by derived statistics and benchmarking

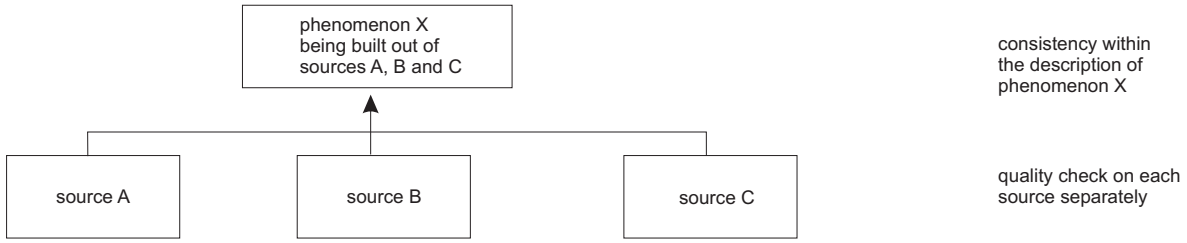
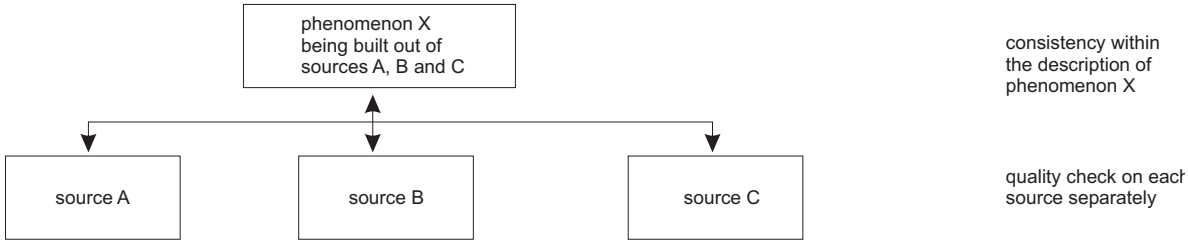


Figure 5.3 Bottom-up approach by accounting



This micro-meso approach for the development of labour accounts in the Netherlands is described in Statistics Netherlands (1999). An even more elaborate bottom-up approach than the one presented in figure 5.3 is micro-integration [28)].

Micro-integration creates a micro-database by combining individual records from different sources of micro data. Where it does not find a complete match it modifies records of one or more source. Its aim is to match and modify records so that statistical analyses and publications based on the data give acceptable results. Because the published results are aggregate data, it is not necessary for all errors to be removed. Small errors often cancel out when they are aggregated. Statistical data editing, using all available sources is more efficient than a "stovepipe" approach, where every data source is modified independently of others. This is particularly so when micro-integration of all sources can be performed by one institution – the statistical office.

Micro-integration is driven by consistency, and the desire to offer data users the opportunity to investigate, in detail, the relationships and the dynamics of changes in the indicators.

Recent developments in information and communication technology have created the opportunity to build integrated micro-databases which contain all the relevant information on persons, families, households, jobs, social security benefits and living quarters. These micro-databases are based on linked administrative and survey data using micro-integration. The production of integrated micro-data files as part of the redesigned production process of social statistics, will lead to a number of benefits over the traditional 'stovepipe' approach. For example,
– the statistical outcomes will show more consistency;
– the statistical outcomes will be more comparable over time, and between areas;
– better tools to identify quality problems in sources will be designed and made available;

– costs will be reduced by using more (cheaper) register data, and less (more expensive) survey data;
– there will be better opportunities to produce data on small population groups;
– there will be better opportunities for small area estimation; and
– there will be better opportunities to correct for the selectivity of non-response in household surveys.

A good example of where this development can be helpful is estimation of the gender wage gap. Interpretation of statements like “average wages of men are higher as those of women” requires more micro detail. Difference may be attributable to the payment of full-time jobs compared with part-time jobs, educational and occupational distribution, years’ experience, or other personal characteristics. Answers to these questions require wage statistics from the Structure of Earnings Survey to be combined with personal characteristics gathered in the Labour Force survey, for instance.

The extent to which micro-integration improves the accuracy of statistical output depends, among other things, on knowledge of invalid, inconsistent or missing data and experiences with statistical techniques (Holt, 1999).

5.5 Combining top-down and bottom-up approaches

Table 5.1 gives an overview of the advantages and disadvantages of the top-down and bottom-up approaches.

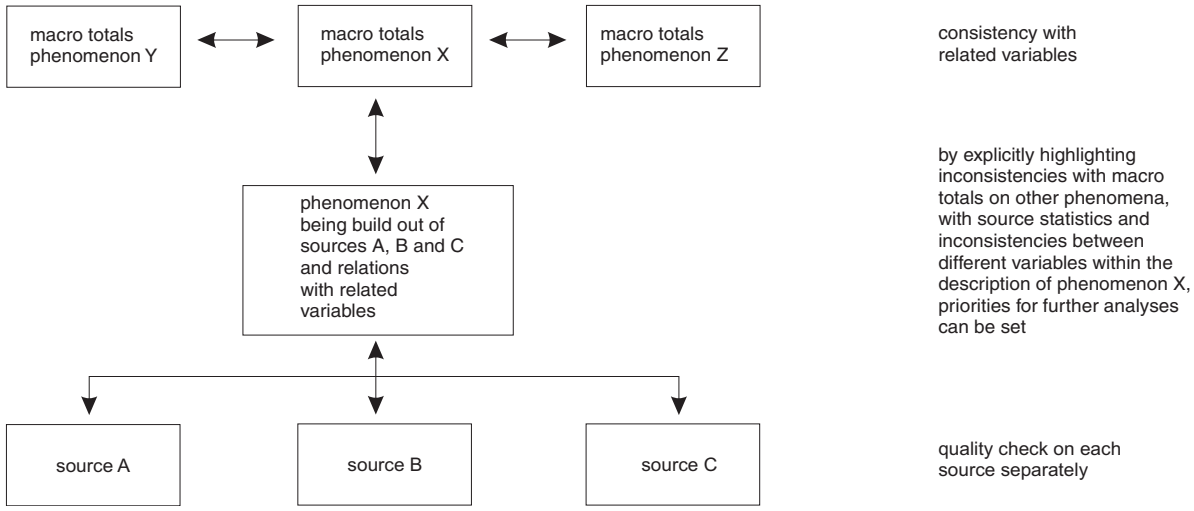
Table 5.1 Advantages and disadvantages of the top-down and bottom-up approach

Top-down approach		Bottom-up approach	
Advantages	Disadvantages	Advantages	Disadvantages
– rapid first results (controlled by parts of the macro system); – first concentrates on main aspects, details may follow later; – can be done with relatively little capacity.	– justification of final results is often a black box for the outside world; – discrepancies with more detailed figures are hidden; – analysis pinpoint to possible problems in the pre-set macro totals that cannot be corrected.	– link between source and final results can be well described andjustified; – more degrees of freedom in adjusting: no data are inviolate.	– time and capacity consuming (discrepancies cannot be assumed to be attributable to one or only a few sources; each source has to be analysed on the points where diverging results occur); – inconsistencies with other results may be hidden.

To some extent, the choice is between speed and quality. However, bottom-up approaches do not have to be slower once they have been set up. There are also issues about quality if a SAM derived from a bottom-up approach produces results that are inconsistent with national accounts, and these inconsistencies remain unresolved.
A combination of the two approaches (shown in figure 5.4) could minimise the disadvantages, and maximise the advantages of each method. It is a practical solution, and could well yield the best results most efficiently.

The strength of this combined approach is that there is feedback in both directions. Assumptions and figures are eligible for adjustment and improvement at both ends of the process. Decisions must be based on arguments; there is no prior decision to leave some assumptions and/or data inviolate.

Figure 5.4 Combining top-down and bottom-up approach



Leunis (2000b and 2000c) describes the combined approach that was used to produce labour accounts and national accounts in the Netherlands after the ESA95 revision. A full link between labour accounts and national accounts was achieved. However, the link with the micro data sources was not fully developed at the time.

Labour accounts are often built using a bottom-up approach, but some top-down inputs are usually necessary. SAMs tend to be built using a top-down approach, at least in the first place. These may show inconsistencies, which can be fed back to national accountants. Indeed, one of the objectives of producing SAMs should be to challenge the results produced by the national accounts system, and to prompt improvements in national accounts and in basic statistics, as well as SAMs.

5.6 Building a labour-oriented SAM with a bottom-up approach

This section describes the bottom-up approach of constructing a labour-oriented social accounting matrix. This consists of three main steps: harmonisation and completion; error detection and reduction; and balancing.

Harmonisation and completion. *Harmonisation* is the removal of differences in definitions, classifications, reference periods etc. *Completion* is the correction of differences in populations to achieve full coverage. In some sources, data are missing or incomplete. They can be completed using the data from other sources. When data are

Box 5.1: The integration process: harmonisation and completion

The following tables are a checklist of adjustments that might be needed for harmonisation and completion of different data sources to bring them into line with ESA95 definitions. (Country specific characteristics of data sources may, of course, require other adjustments.) Most compilers start with one source identified as the primary source. Other sources are used to complete the primary source, and to check the quality of sources against each other. Quality checks are usually made just for those parts of the population, which occur in both sources. Many of the adjustments shown are needed to meet EU obligations linking LFS employment and ESA employment.

completely missing, populations are completed by means of estimates based on explicit assumptions. Sometimes, it is not clear if a particular adjustment can be considered as an adjustment with respect to harmonisation or an adjustment with respect to completion. Therefore, harmonisation and completion are considered as one step in the integration process. Box 5.1 indicates the sorts of adjustments made in the two processes. Those actually made will depend on the sources available to the compiler.

Table 5.2 Employed persons/jobs: adjustments for harmonisation to ESA by data sources

	LFS	Business surveys	Administrative data
Adjustments for definition of coverage			
Employed persons who live in collective households	x		
Employed persons below/over age limits	x		
Armed forces and diplomatic staff working abroad	x	x	x
Cross-border workers (outgoing)	x		
Employees not observed in company records (e.g. domestic staff, clergy, outworkers[1])		x	x
Employment in firms registered as having no employment		x	
Employment in black economy	x	x	x
Adjustment for coverage			
Employment in economic activities not covered		x	x
Employment in enterprises below the size threshold for the data source		x	
Employment in jobs not subject to social security contributions or tax duties			x
Adjustments for definition of employment			
Employment in secondary job	x		
Employment for third and further jobs	x		
Employment in small and short term jobs		x	x
Employment in casual jobs		x	x
Lay-offs		x	x
Adjustments for reference period			
Conversion to annual average		x	x
Adjustments for classifications			
Status in employment (e.g. owners of incorporated enterprises)	x		x
NACE	x		
Adjustment for measurement problems			
Bias due to non response	x	x	x
Problem which may occur in all parts of the processing	x	x	x

[1] An outworker is a person who agrees to work for an enterprise or to supply a certain quantity of goods or services to an enterprise by prior arrangement or contract with that enterprise, but whose place of work is not within it.

Table 5.3 Hours worked: adjustments often needed for harmonisation to ESA by data source

	LFS	Business survey	Administrative data
Adjustments for the elements mentioned in table 1			
Additional adjustment elements:			
Adjustments for definitions of hours actually worked			
paid overtime		x	x
unpaid overtime		x	x
other hours worked but not paid		x	x
holiday leave	x	x	x
sick leave	x	x	x
maternity leave		x	x
pregnancy leave		x	x
short leave		x	x
days lost due to labour conflicts or technical reasons		x	x
short time work		x	
Adjustments for reference period			
Conversion to annual average		x	x

In this first step, the results of different sources are made comparable. The figures can be assessed against each other. Within an accounting system like national accounts, SAMs, or labour accounts, data must meet definitional identities (see box 4.2 in chapter 4 on labour accounts in the Netherlands, and SNA93, Chapter 2, Annex, B, table 2.4). When identities do not hold, it indicates that sampling and non-sampling errors still exist [29], and that these must be reduced [30].

Error detection and reduction consist of a range of checks to trace errors at the source, and to eliminate them wherever possible. An example is the comparison of sample

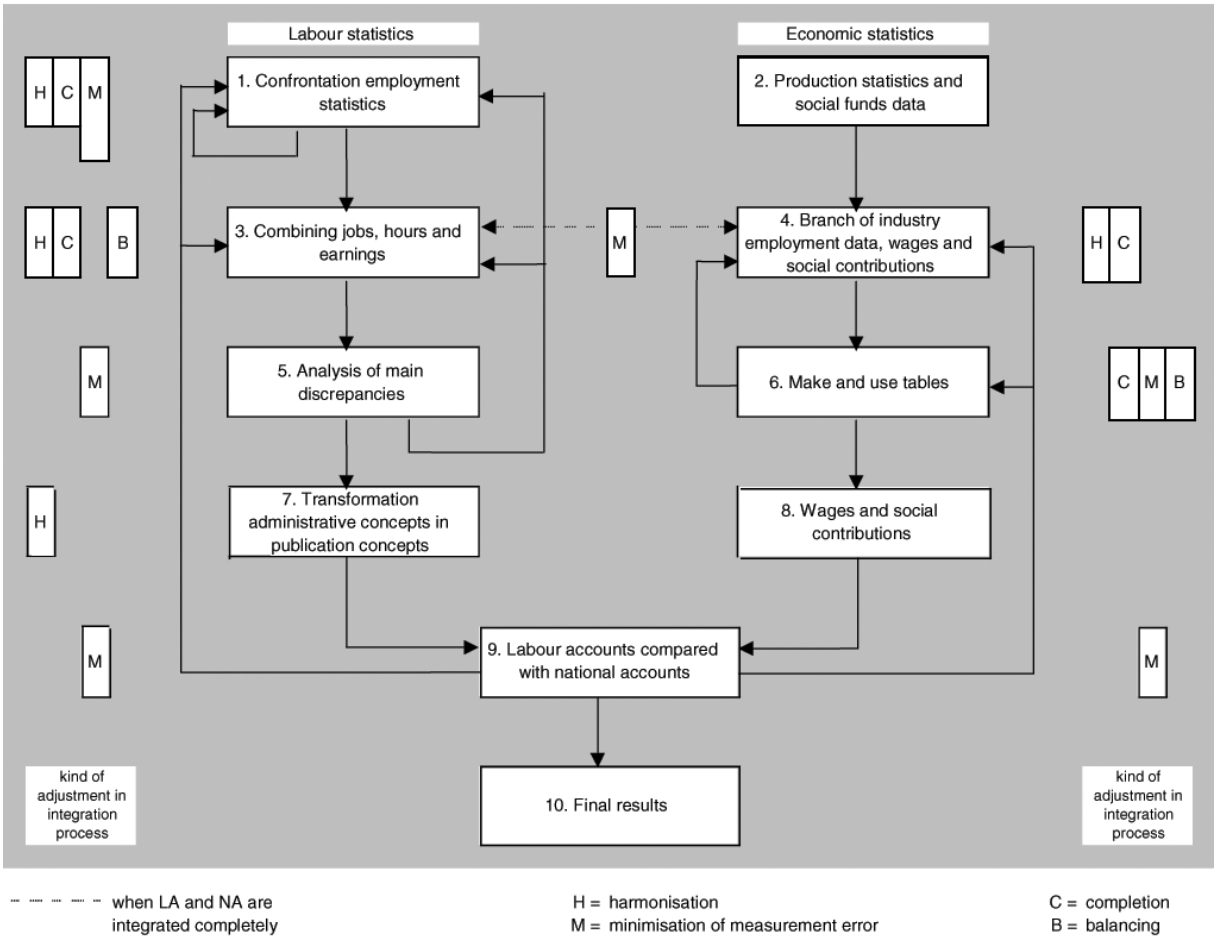
findings with integral data to gain insight into the extent of under- or over-estimation due to generalisation of the sample.

Table 5.4 Compensation: adjustments often needed for harmonisation to ESA by data source

Adjustments	LFS with wage data	Business surveys		Administrative data
		Labour cost	Structure of earnings	
Adjustments for the elements mentioned in table 1 and partly in 2	x	x	x	x
Adjustments for definition of compensation				
Wages and salaries in kind	x	x	x	x
Employers' actual social contributions	x		x	
Employers' imputed social contributions	x	x	x	x
Adjustments for reference period				
Conversion to annual averages		x	x	
Transition from week- or month-based to year-based concept	x	x	x	
Adjustment for compensation referring to previous year				x

After reducing sampling and non-sampling errors as much as possible, discrepancies in the data may still exist. If the discrepancies are small enough, they can be eliminated in the third step, *balancing*. In this step, the data are adjusted to achieve full numerical consistency. There are different methods of balancing. At the European level, each country can chose the method that best fits with the sources of data. In building the pilot-SAM, all countries use the RAS method (see 5.7.3). In building labour accounts, the Netherlands makes use of the Powell algorithm. At the micro level, use can be made of calibration techniques (see section 5.7.3).

Figure 5.5 Compilation of employee data by branch



Adjustments for harmonisation (H), completion (C), adjustments aimed at minimisation of sampling and non-sampling errors (M), and balancing (B) occur in different stages of the process. This is shown in table 5.5, which particularly reflects the Dutch approach.

It is impossible to perform all the steps at once. For labour accounts, the data can be harmonised and completed at the start. However, before combining employment, earnings and hours of work data in box 3 (figure 5.5), a decision has to be made on what employment figure to use. There are usually several good sources of employment available (LFS, establishment surveys, register data, etc.). Therefore, the **first stage** is the confrontation of these different employment statistics, and H, C and M adjustments made. This stage should be applied generally for all variables that are available from more than one source.

In the **second stage** (boxes 3 and 5 in figure 5.5), more quality checks can be applied, on earnings and hours, and employment levels. Analysis of any discrepancies should lead to additional adjustments to minimise measurement error, which may reflect on decisions made in an earlier stage. So, a loop back to the first stage may be needed. In principle, H and C adjustments should not be needed in this second stage. However, it is possible that the concepts of employment used in the first stage confrontation of the main sources differ from the concept used when it is combined with other labour variables. For example, the confrontation between different employment figures may use point of time data from establishment surveys and registers, whereas the link with earnings may use annual averages.

The **third stage** shows how, in the Netherlands, labour data have been linked to macro-economic statistics from national accounts (box 9). Figure 5.1 shows that in box 7, H (harmonisation) adjustments are needed to align concepts with national accounts, mainly on wages and hours worked. Variables in box 3 are from labour statistics, and are derived from wage administrations, and include gross earnings excluding employers' social contributions, and paid hours. Full-time equivalents are not part of confrontations in box 3, because it is not measured directly, but derived from other variables. As in the second stage, the analysis in the third stage may reflect on decisions made in previous stages. A new loop back may be needed.

In Dutch labour accounts, balancing has not been applied just at the final stage. As figure 5.5 shows, it could be applied first in box 3. There are two reasons for this. First stage 3 harmonises at least six linked variables at the same time. The link between labour accounts and national accounts is more straightforward, concentrating on only one variable - compensation of employees. Second, if the link with national accounts cannot be achieved, the process of building labour accounts ends at this stage.

Balancing in the middle of the process when the discrepancies are still quite large can lead to problems. For example, large adjustments to some variables could lead to unrealistic results; or convergence does not occur. In this case, it may be necessary to return to stage 1, and make a further adjustment.

Integrating different sources, and applying the various steps of harmonisation, completion, error reduction and balancing need not lead to the integrated statistics being less timely than the results of source statistics. Once the labour accounts or SAM framework is in place, and accounts produced on a regular basis, the different stages can be executed very quickly. Preliminary estimates based on provisional data may precede final results. Labour accounts can be kept up to date with modelling and interpolation. For example,

– preliminary estimates may incorporate structural trends, e.g. changing male and female employment rates. Trends may be assumed ahead of actual measurement by extrapolating structural changes in economic activity that influence male/female employment. Later comparisons indicate how valid the assumption was; and
– provisional annual data can be compiled a few months after the end of the year by extrapolating structural data using quarterly survey results.

This updating procedure allows a continuous inflow of new data over a specified period (e.g. 2 years), after which final results are published. These results remain valid until a full revision takes place, in which the entire time series is reassessed. Such overhauls typically occur only once every five or ten years.

Estimating a SAM for a recent year requires an efficient and cost-effective way to incorporate and reconcile information from a variety of sources, including data from prior years. The RAS approach (see 5.7.3) can be used if a consistent SAM is available for a past period, and new information comes available on row and column totals, even if no information is available on the flows within the SAM. A new matrix is generated from the old matrix by means of 'biproportional' row and column operations.

A generalisation of RAS is "cross entropy" (Robinson et al, 2001), which is based on information theory. When not all row and column totals and no consistent SAM are available, RAS cannot be used. Robinson et al (2001) shows that, if the analyst is concerned with column coefficients, cross entropy is superior to RAS. If the focus is on flows in the SAM, RAS performs better, but only slightly.

In the following box, the integration processes in the UK are shown.

Box 5.2: Quantifying the adjustments, the UK-case

The UK has recently done much work to reconcile labour market statistics. The following tables give an example of different steps to reconcile employment statistics. The two basic sources are the Labour Force Survey (LFS), and the Annual Employment Survey (AES), an employer survey. The surveys differ in their definitions of employment and in their coverage. The first table shows adjustments to the estimates of both sources to achieve harmonisation of definition and coverage.

Table 5.5 Comparison of LFS (Labour Force Survey) and AES (Annual Employment Survey) estimates of employee job after harmonisation of coverage and definition for Great Britain, autumn/September 1996.

	Jobs (000's)		Jobs (000's)
LFS employees	22,187	AES jobs	22,269
+ Employees in communal establishments	130	+ Jobs in private households	120
- Armed forces covered by LFS	117	+ Homeworkers on piece work rates	150
+ Second jobs	860	+ Jobs in non-UK organisations	
+ Third and fourth jobs	70		
= All civilian jobs	23,130	= All civilian jobs	22,539

After harmonisation of coverage and definitions, there is still a difference of around 600,000 jobs between the two estimates. The difference is a result of over- and under-counting in the two surveys and of sampling error.
After adjustments for respondent and classification error, the difference between the LFS and the employer surveys estimate of jobs narrows to –129,000 to 181,000 or –0.6 per cent to 0.8 per cent (table 5.6). This is within the limits that could arise from sampling errors.

Table 5.6 Comparison of LFS and AES estimates of employee job after adjustment for respondent and classification error, Great Britain, autumn/September 1996.

	Jobs (000's)		Jobs (000's)
LFS harmonised estimate of civilian jobs (from table 1)	23,130	AES harmonised estimate of civilian jobs (from table 1)	22,539
- Difference in reporting of employee/self employment status	100–200	+ Jobs excluded from employer returns (from table 2)	310–520
Revised estimate	22,930–23,030	Revised estimate	22,849– 23,059

5.7 Techniques for integrating surveys for labour accounts and SAMs

In this section, we review some of the techniques that can be used in building labour accounts and SAMs. The main aim is to create coherent data sets from a variety of different sources. There is a brief outline of matching and calibration techniques for micro-data and regularisation or balancing techniques for improving numerical consistency of macro-economic data. (More detailed technical details are available in the literature.)

5.7.1 Statistical matching for building an integrated data set

To create one micro-data file containing all variables of interest several sources are likely to have to be combined. Different types of matching techniques can be used to link a record in one source to a record in another source. Whenever it is possible, exact rather than statistical matching should be applied. *Statistical matching* is another possibility. In the simplest case of two sources, the basic principle of statistical matching is to establish a link between each record of one file and a 'similar' record of the other file, using information that is common to the two files. Statistical matching techniques always presume the existence of a common set of variables, through which the link is created, and a 'measure of similarity' is defined.

The key assumption of statistical matching is that the set of variables, *Y*, observed in the first file but not in the second, and the set of variables, *Z*, observed in the second file but not in the first, is independent conditionally on the set of common variables *X*. This *conditional independence* assumption is in general not satisfied. It may result in complete loss of the true relationship between *Y* and *Z* (Renssen, 1998 and Singh *et al,* 1993). Singh *et al* (1993) suggest using a third source, containing information on the joint distribution of (*X*, *Y*, *Z*) when the first source containing *Y* (and *X*) is to be completed by adding *Z* from the second source (also containing *X*).

5.7.2 Calibration of micro-data

Calibration (or weighting) is defined as modifying the sampling (or other initial) weights for the statistical units in a micro-data set in order to introduce numerical consistency between estimates for a specific set of *auxiliary* variables based on the calibrated micro-data, and on some *a priori* population information about the same set of auxiliary variables. Calibration is a general framework that allows the compiler to reduce sampling error, to reduce sampling bias, and to achieve numerical consistency. This manual focuses on the last of these.

Generalised calibration, as introduced by Deville and Särndal (1992), can be formulated as a (non-linear) constrained optimisation problem, which can be solved by an iterative procedure. The objective function in this optimisation problem follows from the choice of a distance function. Results of a calibration exercise therefore depend on the distance function that has been chosen (except for complete post-sratification where the choice of distance function has no effect on the results). A particular distance function is often chosen for practical reasons, such as getting only positive weights, or reducing the number of outlying weights. Details can be found in Deville and Särndal (1992), Deville *et al* (1993) and Vanderhoeft (2001).

The importance of the generalised calibration framework is that it generalises, and provides a theoretical foundation for several intuitive and well-known approaches for adjusting micro-data. For example, in a coherent system of accounts, the structure of earnings survey may be used to estimate the relative importance (or distribution) of sub-populations with respect to wages. This relative distribution is then used to disaggregate (or decompose) national accounts figures. This common practice fits into the generalised calibration framework.

Generalised calibration may involve many auxiliary variables, either qualitative or quantitative, or both. A well-know example is the case of *classical post-stratification*. Post-strata may be obtained by a complete cross tabulation of two or more variables,

such as gender, age, education, and sector of activity. The problem is to obtain an estimated population total for each post-stratum and to ensure that all post-strata in the sample are non-empty. If at least one of these conditions cannot be satisfied, integration of only marginal information in the weighting process is applied. This approach is called *calibration on margins*, which is a special (or extreme) case of *incomplete post-stratification*. A straightforward application in SAMs is the use of LFS data to produce the breakdown of employment by gender and education consistent with figures from national accounts. There are many variants of generalised calibration that lie between classical complete post-stratification and calibration on margins. So, it is possible, for example, to calibrate simultaneously on the joint population distribution of gender and age and on the marginal population distributions of education and sector of activity.

This paragraph considers in more detail one application of *calibration on margins* in compiling a SAM. The aim is to use the LFS to disaggregate the number of workers in branches of industry (from national accounts) by level of education. The two auxiliary variables are industry and level of education. These must be recorded for each worker in the survey. It is assumed that a sampling weight is available for each worker in the micro-data set obtained from the survey. The control totals by industry come from national accounts. A percentage distribution for level of education comes from the LFS, and is multiplied by the grand total from national accounts to give control totals by level of education. Calibration seeks to modify the workers' sampling weights so that, using the new weights, the estimated number of workers for each level of education and for each branch of industry is equal to the corresponding control total. The parameters of interest are the numbers of workers by level of education and by industry jointly, which can be estimated from the survey and the new, calibrated weights. In this example, the validity of the results depends on the equivalence of the industry breakdown used in the LFS and in national accounts. The industry of local kinds of activity units (KAU) is difficult to measure precisely in household surveys, and, for national accounts, it is often obtained directly from businesses. These differences can lead to unexpected (or even wrong) results when applying the calibration technique. By limiting the level of detail (e.g. by grouping industries), the differences can (probably) be ignored.

An interesting application of the calibration method is *repeated* (or consistent) *weighting*. When aggregate results have already been published for a long time, it is still possible to make new estimates based on micro-data that are consistent with the published results. The weights of the micro-data are calibrated to the results published earlier. Important literature on this topic is Kroese and Renssen (2000), Kroese *et al* (2000) and Renssen *et al* (2001).

Calibration techniques can be extended for use with a very large amount of auxiliary information from administrative registers. A major problem with administrative data is that the concepts are not usually fully harmonised with those of interest in the survey. There are often many different sources of administrative data which may be difficult to match, both with each other and with survey data. On the other hand, administrative data are of good quality in their own right. They are usually exhaustive, and population totals can accurately be determined from them. Calibration provides a powerful tool to integrate administrative information without disturbing variables in the survey. In this case, the variables of interest are the survey variables, and the auxiliary variables are from administrative sources. By calibrating different surveys on the same body of administrative information, a strong coherence between the results of the different surveys can be created. Administrative data can also provide a link between individual data and enterprise data, providing opportunities for integration of enterprise and household surveys.

Calibration assumes that the concept measured in the survey is completely equivalent to the concept in the population total; that coverage of the survey corresponds to the known totals; and that the totals are known precisely. The conditions, under which calibration is possible, are described in Skinner (1999). Such issues should be addressed in the

harmonisation, completion and error reduction phases, which should precede the (final) calibration phase.

Integrating various sources at micro level is common to calibration and statistical matching techniques. Consistency is introduced at the level of the individual either by matching equivalent records or by modifying the individual weights. Consequently these techniques can be implemented only when micro-data are available. If they are not, coherence can be achieved by using only aggregated data. The techniques designed to adjust macro-data are closely related to the techniques for calibration of micro-data (see section 5.7.3).

There are several software packages for weighting. This manual briefly considers three. CALMAR (Sautory, 1993), BASCULA 4.0 (Nieuwenbroek and Boonstra, 2002a and 2002b) and g-CALIB 1.0 (Vanderhoeft, 2002a and 2002b).(Some survey software packages include modules for weighting, but these are not discussed here).

CALMAR is essentially a macro that runs under SAS®. It was the first software to integrate fully the generalised calibration framework (Deville and Särndal, 1992, and Deville *et al,* 1993). It has virtually no restriction on the complexity of the calibration problem to be solved. It can handle any set of qualitative and/or quantitative calibration variables. Preparation of a micro-data file is left to the user, which can be quite difficult and time-consuming, depending on the calibration variables (and combinations of them) to be included in the calibration model. CALMAR does not have a user-friendly interface and therefore requires good knowledge of SAS®.

BASCULA 4.0 is a stand-alone package, with a Windows-like user interface. The software weights a micro-data file, and calculates variance estimates. It does not cover the generalised calibration methodology fully. Different algorithms are provided for four distinct situations. These are post-stratification, ratio estimation, linear weighting and multiplicative weighting. A drawback is that multiplicative weighting is not possible with quantitative calibration variables. A useful feature of BASCULA 4.0 is “consistent weighting” (available only when the linear weighting method is selected). This produces higher numerical consistency by using both individual calibration variables and household level auxiliary information.

g-CALIB 1.0 has been developed for SPSS® users. It consists of some SPSS® syntax modules, on top of which a Windows-like interface has been developed under Visual Basic. As in CALMAR, generalised calibration methodology is implemented fully in g-CALIB. g-CALIB is more user-friendly and flexible. Its interface enables the compiler to define constraints completely through the interface, based on a very elementary data file. So calibration variables do not have to be calculated explicitly beforehand. It also incorporates several techniques for using individual (or element) level auxiliary information and/or household (or cluster) level auxiliary information, either separately or simultaneously. g-CALIB offers more possibilities than BASCULA for producing highly numerically consistent estimates.

5.7.3 Regularisation or balancing of macro-data

Regularisation or *balancing* techniques are all about achieving consistency at the macro-level. For SAMs, a basic issue is adjusting the cell values in a contingency table so that marginal totals are equal to fixed control totals.

Let *i* be an index for the cells in the contingency table *P* (a single rather than a double index is used to simplify notation). Let $P(i)\ (i = 1,\ldots,I)$ be the initial cell values. The regularisation problem consists of finding new cell values $U(i)\ (i = 1,\ldots,I)$ that satisfy the set of consistency constraints. The new values $U(i)\ (i = 1,\ldots,I)$ have in some sense to be as close as possible to the initial values $P(i)\ (i = 1,\ldots,I)$. This is quantified by choosing an appropriate “distance” function $D(U,P)$. The regularisation problem is formulated as a constrained minimisation problem. (Note the similarity with the generalised calibration problem) The initial values in the table *P* may be observed or estimated in surveys. By

trying to find a solution to the constrained minimisation problem, as much as possible of the survey distribution should be retained in the new contingency table *U*.

With the above formulation of the problem, regularisation techniques differ with respect to the choice of the distance function *D.* A common choice is a (weighted) Euclidean distance:

$D(U,P)=\sum_{i=1}^{I} W(i)\left[\frac{U(i)-P(i)}{P(i)}\right]^2$, where $W(i)\,(i=1,\ldots,I)$ is an appropriate set of cell weights (Statistics Netherlands, 1999).

The solution to the constrained minimisation problem is found first by transforming the problem into an unconstrained minimisation problem; and, second, by applying a suitable algorithm - which is usually iterative - to minimise the new objective function. This new objective function is very often the Lagrangian function, and the algorithm used can be a general-purpose algorithm such as the Newton-Raphson (NR) algorithm. This algorithm is included, for example, in the generalised calibration software packages CALMAR, and g-CALIB 1.0. BASCULA 4.0 includes the iterative proportional fitting (IPF) algorithm for "multiplicative weighting".

The weighted Euclidean distance is also used in labour accounts, where (non-linear) identity relations for several variables have to be satisfied (Linder (1996), and Statistics Netherlands (1999)). These include, for example, contractual working hours, overtime hours, number of main jobs, annual regular earnings per job, bonuses, and allowances, etc. This particular constrained minimisation problem is often solved by substituting functions for some of the variables (in terms of a basic set of variables), which are derived from the identity relations, in the objective functio $D(U,P)$, and minimising the new objective function by Powell's algorithm.

The choice of method to solve a constrained minimisation problem depends very much on the nature of the constrained minimisation problem, i.e. on the distance function used and on the set of constraints. The solution (if it exists) should not depend on the method used [31]. Powell's algorithm is likely to converge much more slowly than the NR algorithm, which can be a significant drawback. It is unlikely to be practical to solve a calibration problem for micro-data by means of substitution and Powell's algorithm, because of the very large volume of variables to be optimised.

A well-known algorithm to solve the problem of adjusting cell values in a contingency table to satisfy constraints on its margins is *iterative proportional fitting* (IPF). The regularisation technique is termed the *raking ratio method*, or the *RAS method.* IPF is an alternating method, where, first, adjustments are calculated to satisfy the constraints corresponding to one of the classifying variables. These adjusted cell values are in turn adjusted according to the other classifying variable. New adjustments are based again on the first classifying variable (in case of a 2-way contingency table), and so on. This procedure continues until convergence, i.e. until successive updates of the cell values do not significantly change.
The work of Bacharach (1970), Thissen (1995) and several other authors (see alsoVanderhoeft, 2001) shows that the method perfectly fits into the generalised calibration framework, and demonstrates the implicit 'presence' of a distance function, namely the distance function corresponding to the *exponential* or *multiplicative method* in generalised calibration terminology [32]:

$D(U,P)=\sum_{i=1}^{I} P(i)\left[\frac{W(i)}{P(i)}\ln\left(\frac{W(i)}{P(i)}\right)-\frac{W(i)}{P(i)}+1\right]$ Given the theoretical foundation of calibration methodology, it provides a theoretical justification of the raking ratio or RAS technique.

If in the Euclidean distance the weights are set equal to the initial cell values of the table, i.e. $W(i) = P(i)\,(i = 1,\ldots,I)$, then the regularisation technique based on this distance also fits into the generalised calibration framework, i.e. as the so-called *linear method* (which is related to generalised regression or GREG estimation). The distance function can then be written as

$$D(U,P) = \sum_{i=1}^{I} P(i)\left[\frac{U(i)}{P(i)} - 1\right]^2 = \sum_{i=1}^{I} P(i)\left[g(i) - 1\right]^2$$

where $g(i) = U(i)/P(i)\ \ (i = 1,\ldots,I)$ are the correction factors (the g-weights in calibration methodology for micro-data).

In regularisation techniques for macro-data, if a distance measure is explicitly used, the weights can in principle be anything, while they are clearly defined in terms of the initial weights in the generalised calibration framework for micro-data. Incorporating an additional factor $1/Q(i)$ in the *i*-th term of the distance function further extends the generalised calibration problem, and captures any regularisation technique in the same powerful and theoretically founded framework. In a calibration context, these additional factors also bring *ratio estimation* into the general theory (see Deville and Särndal, 1992).

This shows that regularisation techniques for macro-data and calibration techniques for micro-data fit into a single unifying framework. There is not really a distinction between the two approaches. The practical importance of this is that a single software package could be developed and used to tackle all calibration and regularisation problems in the same way. g-CALIB 1.0 can be used to adjust contingency tables, because it offers an extremely flexible way to define the constraints. As an example, consider a 2-way table and suppose that, instead of fixing row and column totals, a corresponding row and column are constrained to have the same totals, but that the value of this total is not fixed. This is a problem where corresponding rows and columns are contrasted, and it implies the use of a special *contrast variable* as a calibration variable. A contrast variable takes the values 0, 1 and –1, and this can easily be used in g-CALIB, where calibration variables are constructed internally. A typical calibration variable in more standard problems (e.g. the traditional RAS problem) only takes the values 0 and 1. Of course, a package such as CALMAR too could be used for adjustment of tables, but the user would have to create a lot of calibration variables beforehand.

An example of regularising a 2-way frequency table of Belgian data is shown in box 5.3, using the RAS method in a MS-Excel workbook.

5.7.4 The balancing methodology by Stone, Champernowne and Meade [33)]

The Stone methodology may also be used to balance SAM sub-matrices. It is currently used in Italy to balance row and column totals of the input-output tables, and the annual estimates of national accounts. An iterative technique (based on the application of the general least squares method) enables the compiler to move from an initial set of non-balanced estimates to a balanced set. The balancing process adjusts the starting figures by redistributing accounting residuals. The degree of adjustment of starting figures depends on their reliability. The less reliable figures are adjusted more; the more reliable figures less. It does not adjust figures considered as constraints. The degree of reliability of the starting values is evaluated by the compiler on the basis of *a priori* information on the quality and exhaustiveness of statistical sources and on the accuracy of the calculation techniques. A system of constraints and a matrix of variances [34)] have to be built in order to redistribute accounting residuals on the basis of the “relative reliability” of the various aggregates included in the accounts. Aggregates with lower reliability should be given relatively higher variances; aggregates considered relatively more reliable should be given lower variances. The attribution of variances is, in large part, a subjective process. Discrepancies are redistributed changing to a greater extent those estimates considered as less reliable. It is certainly not a neutral process: different variance assumptions lead to different results.

The balancing algorithm is based on “coupled gradients” [35], and can therefore handle accounting structures with thousands of equations, simultaneously balancing all parts of an accounting system.
Table 5.7 shows the variance pattern of the 1992 Italian input-output table. Table 5.8 shows the impact of the balancing on the final estimates.

Table 5.7 Pattern of variance attributed to total market-price flows

Aggregates	Variance
Matrix of intermediate costs	0.0 to 1.0
Intermediate costs	0.1 to 0.5
Household consumption	0.1 to 0.5
Joint consumption of the PA	0.0
Joint consumption of NPISH	0.2
Gross fixed investments	0.1 to 0.2
Valuables	1.0
Change of inventories	1.0
Exports of goods	0.0
Exports of services	0.2
Total exports	0.0
Value added	0.1 to 0.4
Taxes on products	0.0
Contributions on products	0.1
Total contribution on products	0.0
Transfer of products	0.0
VAT	0.6
Total VAT	0.0
Imports of goods	0.0
Imports of services	0.2
lin0Total imports	0.0
Trade margins	0.6 to 0.8
Transport margins	0.3 to 0.7
Total trade margins	0.0
Total transport margins	0.0

Table 5.8 Percentage of change after balancing

Aggregates	Percentge variations
Gross domestic product	0.47
Value added	0.52
Net VAT and indirect taxes	0.00
Imports of goods and services	0.00
Total resources	**0.40**
Household consumption	-0.71
Joint consumption of the PA	0.00
Joint consumption of NPISH	0.01
Gross fixed investments	-0.38
Valuables	-9.01
Changes of inventories	-3.59
Exports of goods and services	0.00
Total final uses	**-0.44**
Intermediate costs/uses	-0.33

In SAMs, the main constraints are national accounts aggregates, and the equality of row totals with column totals of the sub-matrices. In this respect the set of equations to be built has to respect the column-row equality and the variances attributed to National Accounts estimates must be equal to zero.

Box 5.3: The RAS-procedure for adjusting the number of employees by branch of industry, gender and education in Belgium

The total number of employees is the national accounts total (3057.12 thousand). The marginal breakdown for industry is also derived from national accounts. The structure of the marginal breakdown by gender and education (in column headed ‘constraint’) is obtained from the LFS. There are column and row constraints (in bold). There are discrepancies between row totals and row constraints, which have to be removed.

	Branch of industry (000's of employees)								
Gender & education	A+B	C+D+E	F	G+H+I	J+K	Other	Total	Constraint	Ratio
Male									
Lower education	7.65	233.76	98.70	233.79	56.74	184.71	815.36	834.53	1.02
Middle education	5.41	165.95	54.21	119.29	24.20	79.59	448.65	464.75	1.04
Higher education	1.25	97.30	12.98	62.31	92.09	220.28	486.22	481.50	0.99
Female									
Lower education	3.16	80.07	4.71	135.73	64.90	245.38	533.95	526.70	0.99
Middle education	1.81	37.92	1.48	65.51	22.07	122.95	251.73	248.12	0.99
Higher education	0.20	40.09	3.19	48.31	59.06	370.36	521.22	501.52	0.96
Total	19.47	655.10	175.26	664.96	319.06	1 223.27	3 057.12	3 057.12	

To obtain a coherent table, every element of row i is multiplied by the ratio (constraint row i) / (total row i). The row totals equal the row constraints, but the column totals differ from the column constraints.

	Branch of industry (000's of employees)						
Gender & education	A+B	C+D+E	F	G+H+I	J+K	Other	Total
Male							
Lower education	7.83	239.26	101.02	239.29	58.08	189.05	834.53
Middle education	5.60	171.90	56.15	123.57	25.07	82.45	464.75
Higher education	1.23	96.36	12.85	61.71	91.20	218.14	481.50
Female							
Lower education	3.12	78.99	4.65	133.89	64.02	242.05	526.70
Middle education	1.78	37.38	1.46	64.57	21.75	121.18	248.12
Higher education	0.19	38.58	3.07	46.49	56.83	356.37	501.52
Total	19.76	662.46	179.19	669.52	316.94	1 209.25	3 057.12
Constraint	19.47	655.099	175.26	664.96	319.06	1 223.27	3 057.12
Ratio	0.99	0.99	0.98	0.99	1.01	1.01	

As in the first step, now every element of column j is multiplied by the ratio (constraint column j)/(total column j). To obtain the final table, this has to be repeated several times until the ratios become equal or very close to 1. The final, adjusted table is:

	Branch of industry (000's of employees)						
Gender & education	A+B	C+D+E	F	G+H+I	J+K	Other	Total
Male							
Lower education	7.74	237.40	98.87	238.68	58.92	192.93	834.53
Middle education	5.54	170.88	55.06	123.48	25.48	84.30	464.75
Higher education	1.21	94.71	12.46	60.97	91.65	220.51	481.50
Female							
Lower education	3.05	77.66	4.51	132.34	64.36	244.78	526.70
Middle education	1.75	36.75	1.41	63.82	21.86	122.54	248.12
Higher education	0.18	37.70	2.96	45.67	56.79	358.22	501.52
Total	19.47	655.10	175.26	664.96	319.06	1 223.27	3 057.12

Notes

[28] A more extended description of micro-integration can be found in Van der Laan (2000).

[29] Non-sampling errors are for instance errors originating in differences between the observed and the target population, observation errors, processing errors, etc..

[30] There exists a whole range of errors. These errors are described in the final report of the Task Force on accuracy assessment of national accounts statistics (June 2001).

[31] Strictly speaking this excludes heuristic optimisation algorithms. However, Powell's algorithm is essentially heuristic too.

[32] It is assumed here for simplicity that both all P(i)'s and all W(i)'s are strictly positive.

[33] Stone et al. (1942).

[34] The Stone methodology requires the computation of a variance-covariance matrix of the estimates to be balanced: i.e. the calculation of variances and covariances of each single estimate of the accounting framework. In such a matrix values are therefore standardised, i.e. variances vary between 0 and 1 and covariances vary between –1 and +1. The calculation of the variance and covariance matrix as required by the Stone methodology is actually difficult to be implemented. Usually the assumption is that estimates are independent (therefore covariances are zero) and variances are replaced by a priori values indicating the relative reliability of each single estimate with respect to all the other estimates included in the balancing process. These values vary between 0 and 1 and they represent the upper limit of the change rate which can be applied to the original estimate in the balancing process.

[35] Nicolardi (1998).

6 Applications of Social Accounting Matrices

6.1 Introduction

The area covered by SAMs is the link between two often distinct worlds of statistics: economic statistics and social statistics. The integration of these fields of statistics enables a wider range of policy issues to be monitored and analysed. Even linking labour market and income distribution issues to macro-economic policy objectives such as economic growth, low inflation, and government fiscal balance becomes a real possibility. Labour markets are covered only sketchily in national accounts. The lack of information, for example, on labour and pay by educational level and by sex is a serious omission. A SAM-framework increases the opportunities for a more complete analysis, either directly by inclusion of a breakdown by labour categories in the relevant accounts, or indirectly by presenting and quantifying the link with underlying micro and meso data.

Their usefulness to producers of statistics (compilers of basic statistics, and national accountants) is addressed in section 6.2, which looks at the advantages of more integration of basic data. Their usefulness to users is addressed in section 6.3, where SAMs as tools for policy analysis are discussed.

Although SAMs and labour accounts have been produced in a number of countries, their use in developed countries is still not widespread. One reason for this is that there is still no country where SAMs are being produced both regularly and speedily. Until recently, the timeliness of SAMs was not seen as a high priority, because there was greater emphasis on structural analysis

The types of analyses that are possible with SAMs are presented in sections 6.4 and 6.5. In 6.4, the SAM figures, for 1999, for the Netherlands are combined with similar figures for previous years. In section 6.5, the figures for the countries participating in the EU leadership group are used to compare the structure of their labour markets. A large part of SAM analysis uses modelling approaches, which are described in more detail in section 6.6.

6.2 More integration of basic data with SAMs and Labour accounts

6.2.1 General quality improvement

The SAM framework, described in this handbook, makes it possible to analyse the relationships between regular national accounts and data on different categories of labour. The extra value of a SAM or fully linked NAM or labour account is the consistent combination of national accounts data with more detailed data which, on their own, are of limited application. It is this consistency and quality improvement achieved through statistical integration and the SAM framework that adds value. In the absence of a SAM, users have to reconcile the data themselves, but they lack the comprehensive knowledge that statistical offices have.

Reliability of macro-figures, such as gross national income (GNI), can be improved by integration of data at a meso-level. In Europe, where GNI plays an important role as the main aggregate that determines the contribution of member states to the European Union budget, the reliability of member states' GNI-figures is of major importance. Supply and use (or input-output) tables are often used to compile a firmer estimate of GNI. Typically, these frameworks combine very detailed production and expenditure data, but incorporate only aggregate data on the income side. (Some countries, like the UK, are able to include detailed income data). The SAM-framework can improve reliability even further by applying checks at a more disaggregated level. For example, in the Dutch SAM, estimates of savings and dissavings of different household categories were

thought to be unrealistic. Analysis of these discrepancies can pinpoint weaknesses in the underlying sources. It can also lead to a further evaluation of the higher aggregates. Indeed, use of the detailed labour accounts in the Netherlands, since the late eighties, has led several times to improvements in higher aggregates. Speeding up the compilation of SAMs so that discrepancies can be spotted before final national account figures are compiled and published can be an invaluable contribution to the quality of national accounts.

SAMs can be even more valuable if they are combined with detailed labour accounts. Labour income and employment can be disaggregated by industry and type of labour, and also by type of labour and household group. Average wage rates by industry, and type of labour can then become part of regular national accounts compilation. This process should provide plausible average wage rates for all groups, give aggregate estimates for wages and salaries that are consistent with national accounts cost structure by industry, and aggregate employment estimates that are consistent with labour accounts. Without this confrontation between national accounts and labour accounts, inconsistencies between these sources might not be detected.

6.2.2 Extension of a SAM towards a SESAME [36)]

In section C of chapter 20 of SNA93, a system of economic and social accounting matrices and extensions (SESAME) is outlined. The starting-point for a SESAME is the SAM, where the economic information is complemented by other important aspects of human life. One area where such a system can be of value is sustainable development which focuses on the interaction between social and environmental issues and the economy.

The SESAME is a detailed statistical information system in matrix format. It extends the framework beyond conventional national accounts, which, despite their wealth of information, do not cover social and environmental aspects. The SESAME details accounts expressed in money values, particularly those for labour income, and links them to equivalent non-monetary information (Keuning and Timmerman, 1995a, describe a SESAME including environmental accounts). Relationships between monetary and non-monetary data are shown at a meso-level, allowing additional plausibility checks on the results. Also, non-monetary macro-indicators are based on meso-data that are consistent with the rest of the system.

SESAMEs are determined, to a large extent, by the kind of information required for monitoring and policy-making at the macro-level. It is impossible to capture socio-economic development in a single indicator, but it is clear that a prime task of national statistical offices is to condense the large amount of information they collect and compile a manageable, “executive summary”. These summaries typically include trends in main indicators : gross domestic product, population size, (un)employment, inflation, current account of the balance of payments, income inequality, environmental indicators, average income of the poorest subgroup, average number of years of schooling, and so on. Putting these statistics into a formal framework can aid analysis, particularly if the core macro-indicators are all derived from a single integrated information system such as a SESAME.

A meso-level information system like a SESAME can be flexibly designed in terms of which breakdowns and related non-monetary variables are included. Therefore, the derivation of a set of core economic, social and environmental macro-indicators can go hand in hand with designing such a system. This is a distinguishing feature of a SESAME.

Another application of SAMs is the introduction of a central role for time accounts, recently described by Carsten Stahmer (2001). Following Sir Richard Stone and his proposals for a System of Social and Demographic Statistics, Stahmer combines the dynamic approach of labour accounts (which, until now, has largely been confined to German speaking countries, “Arbeidskräfte Gesamtrechnung”) with developments in SAMs and SESAMEs.

6.2.3 The role of SAMs in building a consistent set of structural indicators

In the present European context, SAMs may be useful in analysing progress made in meeting the ambitions of the Lisbon summit: to transform the European Union into *"the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion".* To measure progress, the European Union has adopted a set of *Structural Indicators*. These cover employment, innovation, economic reform, social cohesion, and the environment. Their development is being carried forward in several fora. The indicators have to be produced annually for each EU member state and for the EU as a whole, and then compared with those of the USA and Japan.

The European Commission has said that "the indicators selected should not be seen in isolation but rather as different elements of the same picture". The Economic and Social Committee has been even more explicit: "The Committee would also stress that, in addition to the high standards of reliability, topicality and uniformity required for each of the proposed indicators, it will be necessary to interpret the indicator-based figures in order to assess progress made in economic, social and structural policy. This can be done with the help of an underlying statistical information system, so that in interpreting the data account is taken of e.g. the economic and demographic characteristics of a Member State".

The quality criteria specified in the Communication of the Commission (COM(2000) 594, §27) are that indicators must be (i) easy to understand, (ii) policy relevant, (iii) mutually consistent, (iv) timely and (v) comparable across countries. SAMs can be used to aid compliance with these criteria. They automatically produce indicators that are mutually consistent. By embedding them in a SAM framework, that follows the ESA95 and SNA93 guidelines, comparability across countries could be assured. SAMs could be a systematic framework and database, for the joint derivation of the monetary and non monetary indicators, and for subsequent policy analyses and simulations. (Of course, not all Structural Indicators can be derived from a single SAM.The appendix to chapter 6 classifies the present list of indicators in terms of the feasibility of integrating them in a SAM framework.)

The advantages of using a SAM are increased *relevance, reliability* and *efficiency.* The SAM increases the *relevance* of economic, social and environmental indicators by combining them in a single meso-level information system. Their inter-dependence, and interactions between socio-economic policies in various fields can be analysed. *Reliability* can be improved because the more data are confronted at a meso-level, the more logical identities can be checked: components must add to totals, accounts must balance, and price by quantity must equal value. For example, when labour statistics are confronted with the national accounts, gaps and inconsistencies in both data sets can be identified and adjusted. *Efficiency* is improved by using uniform units, classifications, and concepts throughout the system. This leads to easier matching of results from different surveys, which, in turn, leads to more reliable outcomes. Recently, progress has been made in harmonising EU-wide classifications in economic and social statistics, and this will aid comparability of the indicators between member states.

6.3 SAM as a tool for policy analysis

From an analytical point of view, the SAM offers various new perspectives, particularly regarding the relationship between the distribution of income and economic development (see, for example, Pyatt and Round, 1979). The accounting structure of SAMs can be used for all kinds of analyses. These include simple analyses of income level and distribution changes (e.g. Keuning, 1996: section IV.4), and 'Keynesian' multiplier analysis, 'fixed price' analysis with income and expenditure elasticities deviating from one, and comprehensive, price endogenous Computable General Equilibrium models (CGE-models). The latter type of model (see section 6.6), which is increasingly used for policy making, implicitly or explicitly uses a SAM framework to calibrate the base year position. Moreover, projections or simulations from these models can be put back into a SAM-framework.

For national accounts, SAM-extensions are conceptual improvements. A SAM enables analysts using national accounts data to introduce other, particularly labour market, aspects into their analysis. For data providers, e.g. in the field of social statistics, linking their data to national accounts provides new opportunities for their use.

6.3.1 The NAM describing from whom to whom transactions

Compared with standard t-accounts, a NAM also records which (sub-) sectors pay what to which other (sub-) sectors. This feature enables a more thorough analysis of transmission mechanisms in the economy. Detailed (from-whom-to-whom) flow of funds accounts already provide valuable information about financial flows, such as the financing of government debt, or the role of financial intermediaries. A NAM relates these transactions to the behaviour of the non-financial economy (SNA93, 11.104 – 111). For instance, having both non-financial and financial accounts in a NAM greatly facilitates an analysis of the impact of monetary policy on financial and non-financial assets and liabilities. It also enables a more thorough analysis of the impact on the real and financial economy of an external shock, like an oil price hike or government budget retrenchment.
Having the capital accounts as well shows which (sub-) sectors have invested in which industries of the domestic economy, and which (sub-) sectors have invested abroad. The links between financing and the real economy are made even clearer.

6.3.2 Experiences with SAMs

As the 1993 SNA (20.122) observes: “The abundance of data included in most SAMs may give the impression that it can only be constructed for countries with a wealth of statistical information. In practice, developing countries have taken the lead in compiling SAMs”.

Pyatt and Round (1985) provide a review of the early experience. Since those years, SAMs have been compiled for a multitude of (developing) countries, such as Bangladesh (Fontana and Wobst, 2001), China (e.g Pan, 2000), India (Sinha et al., 2000), Indonesia (Biro Pusat Statistik, 1982, 1986, 1991, 1995, 2000; Keuning and Kusmadi Saleh, 2001), Malaysia (Chander et al., 1980), Pakistan (EUR/NEI, 1985; Iqbal, Siddiqui, 1998), the Philippines (Vos, 1991), Thailand (Centre for World Food Studies, 1980), Vietnam (Nielsen, 2002), Botswana (Central Statistics Office, 1990), Cameroon (Gauthier and Kyle, 1991), Ethiopia (Shiferaw, Holden, 2000), Gambia (Jabara et al., 1992), Ghana (Powell and Round, 1996), Kenya (Lewis and Thorbecke, 1992; CBS Kenya, 1981), Madagascar (Dorosh, 1991), Mozambique (Arndt et al., 1997), South Africa (McDonalds, Punt, 2001; Malan, 2000; Statistics South Africa, 1993, 1995; McGrath, 1987; Khan, 1987; South African Central Economic Advisory Services, 1986), Tanzania (Wobst, 1998; Sarris, 1994; Rutayisire and Vos, 1991), Zambia (Nokkala, 2000; Hausner, 1999), Zimbabwe (Thomas, Bautista, 1999), Bolivia (Thiele, Piazola, 2002; Alarcon et al., 1997 and 2000), Brazil (Wagner, 1996), Ecuador (Barreiros, 1985), and for developed countries such as the United States (Reinert and Roland-Holst, 1992, 1994; Reinert et al., 1993, Roland-Holst and Sancho, 1992), Russia (Dondorov, 2000), Denmark (Madsen et al., 2001), Finland (Nokkala et al., 1999, 2000), Germany (Reich and Stäglin, 1990), Greece (Psaltopoulos et al., 2000),), Italy (Coli and Tartamella, 2000; Frederico and O’Rourke, 2000; Civardi, 1990; Lenti, 1990), the Netherlands (Den Bakker et al., 1994; Timmerman and Van de Ven, 1994; Statistics Netherlands, 2002), Poland (Roberts, 1995; Zolkievski, 1990 and 1993), Portugal (Santos, 1995), Spain (Rubio Sanz and Perdiz, 2000; Cardenete and Sancho, 2000; Uriel, 1990) Turkey (De Santis and Ozhan, 1997), United Kingdom (Stone et al., 1962).

The vast majority of these SAMs are the result of isolated research projects, with rather limited policy impact. The only countries that have institutionalised the compilation and use of SAMs are Indonesia (where they are compiled every five years, with intermediate updates), and the Netherlands (where they are compiled annually, but, so far, with a time lag of two and half years). South Africa is making serious efforts to produce regular SAMs.
The first application of the broader idea of a System of Economic and Social Accounting Matrices and Extensions (SESAME, see below) was for Indonesia (Keuning, 1996).

SNA93 (20.122) provides a possible explanation of why a developing country might have been the first: “Actually, it is in situations where basic information and other statistical resources are (very) scarce that it is all the more important to make the best possible use of whatever data are available. Integrating outcomes of all kinds of costly censuses and surveys into a consistent overall framework may increase both their relevance and their reliability. This applies in particular to household surveys and population censuses. Generally speaking, carefully acquired consistency at the meso-level leads to a higher degree of accuracy at the macro-level. Naturally, if there are too many holes in the basic data, the reliability of (parts of) the SAM remains dubious. In this way, building a SAM will also pinpoint gaps in the available data set and discrepancies in the survey concepts.”
Applications of SAMs in developed countries have been limited. This is largely because they are neither timely, nor available with a long time series. A reasonable length of time-series is available only in the Netherlands. timeliness is still a problem for all countries including the Netherlands. When statistical offices first start developing SAMs, they tend to compile them for years for which definitive national accounts are available. So they tend to be three to four years out of date. Only after some years of experience is it possible to reduce this delay, making them useful for policy analyses. (This, of course, is exactly what happened when the input-output framework was first introduced into national accounting systems).
The scepticism of some potential users may well be because statisticians have failed to explain fully what SAMs can do. Where SAMs are only partially developed users may be disappointed by the limits to their application. Statisticians may need to explain that complex systems like SAMs have to be built up step by step. Their development is an investment that may take some time to come to full fruition, but it will provide ever-increasing benefits as each step is completed. The call by policy makers for sustainable development indicators bringing together social , environmental, and economic statistics is an opportunity for statisticians to explain the value of SAMs and their strong integrating characteristics.

Another reason why SAMs have been slow to develop may be internal to statistics offices. They are traditionally structured with separate social and economic departments. Labour statistics are often brigaded with social statistics. Without strong user demand for cross-cutting analysis, the incentive to break down these “silos” has not been present. Political demand for these sorts of analyses to produce sustainable development indicators may provide the necessary impetus. Top management commitment to reorganisation, or to facilitating inter-departmental working will be essential.

Even without user demand for SAMs *per se*, SAMs can be a valuable tool to improve both quality and timeliness. They can complement short-term information on employment, labour costs, and volume of work. The regular production of a SAM enables more reliable estimation of more timely indicators, by combining the structure of the SAM for an earlier year with scattered pieces of information for recent periods (Leunis and Keuning, 1994). This is analogous to national accounts, where quarterly accounts and early estimates of annual accounts are often compiled by benchmarking short-term information to the more detailed, annual accounts of several years earlier (Algera and Janssen, 1991).

6.3.3 SAMs and productivity measurement

Human capital is increasingly seen as the most important factor of production. A SAM can be used to provide more reliable labour productivity measures, using more detailed data, particularly on labour input. The parts of a SAM that are central to productivity measurement are the value-added and generation of income sub-matrices, together with the underlying labour and capital sub-matrices. Section 6.4.2 shows, for the Netherlands, how these sub-matrices can be used to get a much better understanding of changes in labour productivity, by looking at more detailed breakdowns of output and labour inputs. To do this analysis effectively, consistent value added and labour data are needed. Until recently, published employment figures were derived from labour statistics that were not consistent with national accounts. The availability, in EU member states, of ESA employment figures produced alongside, and consistently with national accounts enables these more reliable estimates of labour productivity to be produced. The

advantages of a SAM for productivity measurement are increased *reliability* and *level of detail*. The increase in *reliability* is achieved by the availability of employment data from labour accounts that are fully integrated with the national accounts. Integration of national accounts and labour statistics ensures better consistency between the numerator (output, or value added) and the denominator (labour input) of labour productivity. This reliability can be further increased in SAMs and labour accounts where information on labour is more *disaggregated*. A SAM can provide labour inputs by industry, by gender, and by educational attainment. These can be used to decompose productivity estimates and understand them better. Educational attainment can be used to quality-adjust labour input. (Estimates of changes in labour productivity will become even more meaningful when labour inputs are measured in terms of hours worked). This analysis is illustrated in section 6.4.2.

6.4 Illustrations of the uses of SAMs

6.4.1 Introduction

This section gives two examples of how SAMs can be used. They both relate to the Netherlands, where work on SAMs has advanced considerably over the last twenty or so years. The first example (6.4.2) looks at the wages and salaries part of the generation of income account, and shows how this SAM sub-matrix can be used to analyse changes in wages, employment and productivity. The second (6.4.3) examines how the use of the different factors of production changed in the second half of the 1990s, in the Netherlands. The analysis uses SAM-type information to examine the contribution of knowledge based factors in the development of the Dutch economy.

6.4.2 The Dutch SAM 1995 to 1999

6.4.2.1 Introduction.

This section is an illustration of the sort of analysis that can be undertaken when SAMs are available. It is an examination of actual Dutch data in 1995 and 1999. It is an analysis of the wages and salaries part of the generation of income account in the Dutch SAM. It shows the trends in wages and salaries, employment, value added, and productivity, and variations by industry, gender and educational level.

6.4.2.2 Developments in employee costs (compensation of employees)

Table 6.1 shows that between 1995 and 1999, compensation of employees rose by almost 18%, or just over 4% per annum. Financial intermediation, real estate, renting and business activities (Nace J/K) had the fastest growth (over 40%). Mining, quarrying, manufacturing, electricity, gas and water supply (Nace C/D/E) had a relatively slow growth (6%).

(Compensation of employees consists of wages and salaries of employees and employers' social contributions. In the remainder of this section, the analysis is confined to wages and salaries).

Table 6.1 Compensation of employees by industry, 1995-1999 (mln eur)*)

	1995	1999	Value changes	Average annual growth rates (%)
Agriculture, hunting, forestry and fishing	1 943	2 225	1,14	3,4
Mining, quarrying, manufacturing, electricity, gas and water supply	33 583	35 538	1,06	1,4
Construction	11 560	13 316	1,15	3,6
Trade, repair, hotels and restaurants, transport, storage and communication	36 890	43 221	1,17	4,0
Financial intermediation, real estate, renting and business activities	29 265	41 255	1,41	9,0
Public administration, education, health, other community, social and personal services activities	49 267	56 193	1,14	3,3
Total	162 508	191 748	1,18	4,2

*) 1995: 1 euro = 2,09891 Dutch Guilder, 1999: 1 euro = 2,20371 Dutch Guilder

Table 6.2 Wages and salaries by industry, gender and education, average annual growth rates (%)

1995–1999	Total	Primary /lower secon-dary edu-cation	Upper or post secon-dary edu-cation	Tertiary edu-cation	Male	Primary /lower secon-dary edu-cation	Upper or post secon-dary edu-cation	Tertiary edu-cation	Female	Primary /lower secon-dary edu-cation	Upper or post secon-dary edu-cation	Tertiary edu-cation
Agriculture, hunting, forestry and fishing	3,7	2,3	2,8	"	3,4	1,3	4,1	"	5,2	"	"	"
Mining, quarrying, manufacturing, electricity, gas and water supply	1,7	0,2	1,3	4,8	1,7	0,4	1,4	4,3	1,6	–1,1	0,9	7,6
Construction	4,5	4,1	3,6	12,5	4,7	4,1	3,7	14,0	0,9	"	"	"
Trade, repair, hotels and restaurants, transport, storage and communication	4,3	3,0	3,7	9,2	4,4	3,4	3,6	9,0	4,3	1,9	4,3	10,0
Financial intermediation, real estate, renting and business activities	8,9	6,8	6,2	12,1	8,7	6,1	6,0	11,7	9,4	8,1	6,8	13,6
Public administration, education, health, other community, social and personal services activities	3,7	1,3	3,9	4,2	3,4	1,0	3,6	3,8	4,2	1,8	4,2	4,8
Total	4,5	2,7	3,7	7,2	4,4	2,6	3,4	7,1	5,0	2,8	4,3	7,3

" = not enough observations (less than 0,3% of labour volume).

Between 1995 and 1999, wages and salaries of employees grew about 19%, or 4½% per annum. Wages of male workers rose by 4.4%, and those of female workers by 5% per annum. Financial intermediation etc. showed the fastest growth, 8.9% per annum (8.7% for men, and 9.4% for women). Mining etc. had relatively slow growth of 1.7% per annum (1.7% for men, and 1.6% for women).

The growth rate was higher for workers with higher education qualifications: 2.7% for those with primary/lower secondary, 3.7% for those with upper/post secondary, and 7.2% for those with tertiary education. The highest growth rate was for workers with tertiary education in Construction (Nace F) (12.5%), Financial intermediation etc. (12.1%), and Trade, repair, hotels and restaurants, transport, storage and communication (NACE G/H/I) (9.2%). The lowest growth rate of wages and salaries of workers with the tertiary education was in Public administration, education, health, other community, social and personal services activities (NACE L/M/N/O/P) (4.2%). In Mining etc., despite their relatively slow growth (1.7% per annum), wages of employees with a tertiary education grew by an average of 4.8% per annum (men 4.3%, and women 7.6%). The fastest growth of wages of men was of those with tertiary education in Construction (14%); and, of women, those with tertiary education in Financial intermediation etc. (13.6%).

6.4.2.3 Wages and salaries of employees: volume changes and price changes.
The value changes of compensation of employees can be split into volume changes (changes in full time equivalents or ftes) and price changes (changes in wages per fte).

Table 6.3 Labour input of employees, in full-time equivalent jobs, average annual growth rates (%)

1995 - 1999	Total	Primary /lower secon-dary edu-cation	Upper or post secon-dary edu-cation	Tertiary edu-cation	Male	Primary /lower secon-dary edu-cation	Upper or post secon-dary edu-cation	Tertiary edu-cation	Female	Primary /lower secon-dary edu-cation	Upper or post secon-dary edu-cation	Tertiary edu-cation
Agriculture, hunting, forestry and fishing	1,5	0,4	0,5	"	0,2	–1,9	1,3	"	6,4	"	"	"
Mining, quarrying, manufacturing, electricity, gas and water supply	0,2	–1,2	0,2	3,8	–0,3	–1,4	–0,3	2,6	2,4	–0,2	2,3	9,1
Construction	2,2	1,7	1,8	9,5	2,3	1,6	1,7	11,2	1,9	"	"	"
Trade, repair, hotels and restaurants, transport, storage and communication	3,1	1,8	2,9	8,0	2,7	1,9	2,2	7,3	3,8	1,6	4,3	9,5
Financial intermediation, real estate, renting and business activities	7,7	6,5	5,6	11,0	7,9	6,4	5,9	10,8	7,3	6,7	5,2	11,5
Public administration, education, health, other community, social and personal services activities	2,2	–0,2	2,6	2,7	1,0	–1,3	1,1	1,6	3,5	1,0	3,7	4,1
Total	3,1	1,5	2,7	5,7	2,5	1,0	1,9	5,2	4,3	2,5	4,0	6,6

" = not enough observations (less than 0,3% of labour volume).

Volume changes

Between 1995 and 1999, employment of employees rose 3.1% per annum (2½% for men, and 4.3% for women). Employment grew fastest in Financial intermediation etc. (7.7%), Where, in contrast to other branches of industry, male employment grew a little faster than female employment. Within each of the industries shown in table 6.3, growth in employment was greatest for workers with the highest level of education. The slowest growth in employment was in Mining etc. (0.2%), where the number of male workers actually declined, especially amongst the lower educated. Falls in employment were also recorded for women with the lowest education, in Mining etc., and for men with the lowest education, in Agriculture etc. and Public administration etc.

Price changes

Table 6.4 Wages and salaries per fte, average annual growth rates (%)

1995 - 1999	Total	Primary /lower secon-dary edu-cation	Upper or post secon-dary edu-cation	Tertiary edu-cation	Male	Primary /lower secon-dary edu-cation	Upper or post secon-dary edu-cation	Tertiary edu-cation	Female	Primary /lower secon-dary edu-cation	Upper or post secon-dary edu-cation	Tertiary edu-cation
Agriculture, hunting, forestry and fishing	2,2	2,0	2,2	"	3,2	3,3	2,8	"	–1,2	"	"	"
Mining, quarrying, manufacturing, electricity, gas and water supply	1,5	1,5	1,1	1,0	1,9	1,9	1,6	1,7	–0,8	–0,9	–1,4	–1,3
Construction	2,2	2,3	1,8	2,7	2,4	2,4	1,9	2,6	–0,9	"	"	"
Trade, repair, hotels and restaurants, transport, storage and communication	1,2	1,2	0,8	1,1	1,6	1,5	1,3	1,6	0,5	0,3	0,0	0,4
Financial intermediation, real estate, renting and business activities	1,2	0,3	0,6	1,0	0,8	–0,3	0,1	0,8	2,0	1,4	1,5	1,9
Public administration, education, health, other community, social and personal services activities	1,5	1,5	1,3	1,4	2,4	2,3	2,5	2,2	0,7	0,8	0,5	0,7
Total	1,4	1,2	1,0	1,4	1,9	1,6	1,5	1,8	0,7	0,3	0,3	0,7

" = not enough observations (less than 0,3% of labour volume).

Between 1995 –and 1999, wages and salaries per fte grew by an average of 1.4% per annum (1.9% for men, and 0.7% for women). They grew by 2.2% in both Agriculture etc. (men 3.2%, and women –1.2%), and Construction (men 2.4%, and women –0.9%). Falls for female workers were also recorded in Mining etc., at all education levels. For men, the only fall was in Financial intermediation etc., for those with only primary/lower secondary education.

6.4.2.4 Relation with value added

Labour productivity is of key concern to policy makers, and to economists studying economic performance. To measure labour productivity, the analysis needs the same disaggregations of value added (the numerator in productivity measures) as for employment and wages. Because value added is not normally available separately for employees and for the self-employed, employment and wages data in the rest of this section cover both employed and self-employed.

Value added

Between 1995 and 1999, the economy grew by 15%, an average of 3.7% per annum. Trade etc. grew fastest, at about 6% per annum. Agriculture etc. and Mining etc. grew slowest, at 1.7% per annum.

Employed persons (Employees and self-employed together)

Table 6.6 shows the growth in employment (employees *plus* self-employed in ftes) over the period.

Table 6.5 Value added (gross, basic prices) by industry: at prices of 1995

mln eur	1995	1999	Value changes	Avarage annual growth rates (%)
Agriculture, hunting, forestry and fishing	10 436	11 161	1,07	1,7
Mining, quarrying, manufacturing, electricity, gas and water supply	66 314	71 013	1,07	1,7
Construction	15 975	17 619	1,10	2,5
Trade, repair, hotels and restaurants, transport, storage and communication	65 790	83 529	1,27	6,1
Financial intermediation, real estate, renting and business activities	68 116	83 599	1,23	5,3
Public administration, education, health, other community, social and personal services activities	68 885	74 515	1,08	2,0
Total	295 517	341 138	1,15	3,7

Table 6.6 Labour input of employed persons, in full-time equivalent jobs

fte x 1000	1995	1999	Volume changes	Avarage annual growth rates (%)
Agriculture, hunting, forestry and fishing	236,9	237,5	1,00	0,1
Mining, quarrying, manufacturing, electricity, gas and water supply	1 011,8	1 017,8	1,01	0,1
Construction	415,9	462,4	1,11	2,7
Trade, repair, hotels and restaurants, transport, storage and communication	1 451,8	1 592,3	1,10	2,3
Financial intermediation, real estate, renting and business activities	955,7	1 262,9	1,32	7,2
Public administration, education, health, other community, social and personal services activities	1 590,5	1 746,9	1,10	2,4
Total	5 662,6	6 319,8	1,12	2,8

Total employment grew by 12%, an average of almost 3% per annum. In Financial intermediation etc. it grew fastest with an average of over 7% per annum. In Agriculture etc. and Mining etc. it grew slowest, at 0.1% per annum.

Labour productivity

Table 6.7 shows labour productivity change, defined as the change in volume of value added (for the whole economy, i.e. GDP) per full-time equivalent job.

Between 1995 and 1999, labour productivity grew by almost 3½%, or 0.8% per annum. The fastest growth was 16% (3.7% per annum), in Trade etc. This coincides with a period of high growth (36%) in employment of workers with tertiary education, compared with 25% for all industries. This relationship between high productivity growth and high growth in employment of people with tertiary education does not hold in all industries. In Construction, productivity declined by 0.2% per annum, while the number of male workers with tertiary education grew by over 11% per annum, well above the all-industry average. [These two (deleted) sentences on wage rates shouldn't be in this section on productivity without some explanation].

Financial intermediation etc. saw the sharpest decline (1.8% per annum) in productivity. Both value added (5.3% per annum) and total employment (7.2 % per annum) grew well above average, with the number of employees with a tertiary education growing even faster at about 11% per annum.

In view of the increasing share of higher educated labour in Financial intermediation etc., the productivity decline is surprising, but can be explained. The growth of value added is almost 1½ times higher than that of GDP, while the growth of labour input is over 2½ times higher than the economy-wide growth of labour inputs. The growth in the number of employed persons with primary/lower secondary education is over 5 times higher than in the total economy, while the growth in the number of employed persons with tertiary

Table 6.7 Labour productivity (value added at prices of 1995)

1000 eur	1995	1999	Volume changes	Avarage annual growth rates (%)
Agriculture, hunting, forestry and fishing	44	47	1,07	1,6
Mining, quarrying, manufacturing, electricity, gas and water supply	66	70	1,06	1,6
Construction	38	38	0,99	–0,2
Trade, repair, hotels and restaurants, transport, storage and communication	45	52	1,16	3,7
Financial intermediation, real estate, renting and business activities	71	66	0,93	–1,8
Public administration, education, health, other community, social and personal services activities	43	43	0,98	–0,4
Total	52	54	1,03	0,8

education is only (about) twice as high as the overall growth. [You may want to reinstate "rate" in this paragraph, even though it is implicit].

So far, the calculations of labour productivity change have not taken account of the effect of changes in the composition of labour input. This means that an upgrade of labour input results in an increase in wage rates, and no change in the quantity of inputs. Of course, the quality of labour input has risen, and this should be recorded as a change in quantity. A correction for this can be made by weighting the volume change in labour input in each industry and in each education group in proportion to their share of compensation of labour:

$$LP = \frac{\%\Delta VA}{\sum (i) fc * \%\Delta L(i)}$$

LP= Labour productivity
VA= Value added (volume)
(i)= per industry, per education cluster
fc= fraction of total compensation
L= Labour inputs

The self-employed can be treated in two different ways. In the Dutch SAM, wages are not imputed for the self–employed. They can be assumed to behave in the same way as wages of employees (SAM 1). This means that only the upgrade of employees is used in calculating labour productivity. So, in SAM 1, the volume change of employees is weighted by their share of compensation of employees.

Table 6.8 Labour productivity 1999, volume indices, 1995 = 100

	SAM 1	SAM 2	Average annual growth rates SAM 1	Average annual growth rates SAM 2
Agriculture, hunting, forestry and fishing	0,96	1,02	–1,1	0,4
Mining, quarrying, manufacturing, electricity, gas and water supply	1,05	1,05	1,1	1,2
Construction	1,00	0,98	–0,1	–0,5
Trade, repair, hotels and restaurants, transport, storage and communication	1,11	1,14	2,5	3,4
Financial intermediation, real estate, renting and business activities	0,89	0,91	–2,9	–2,4
Public administration, education, health, other community, social and personal services activities	0,99	0,98	–0,4	–0,5
Total	1,01	1,02	0,2	0,5

If the compensation of the self-employed is imputed, it can be added to the compensation of employees to calculate the (correct) weights (SAM 2). Compensation of the self-employed can be imputed by multiplying the compensation of employees per fte by the number (ftes) of self employed persons. So, in SAM 2, the volume change of employed persons can be weighted by the share of compensation of employees *plus* the share of imputed compensation of self employed.

The labour productivity figures in table 6.7 are adjusted in this way to give the new estimates shown in table 6.8.

Between 1995 and 1999, SAM 1 measures labour productivity growth as almost 1%, or 0.2% per annum. SAM 2 measures it as almost 2%, or 0.5% per annum. In both cases, labour productivity growth is less than shown in table 6.7. This is because the upgrade in labour inputs is now (properly) treated as a rise in the quantity of labour input.

6.4.3 Trade revealed knowledge intensity [37)]

6.4.3.1 Introduction

A clear analytical use of a SAM, together with data on capital stock, is the understanding of the role of the factors of production, labour and capital, in an economy. An important development in the world economy, in recent years, has been increased economic

integration, reflected in increasing trade, and economic dependence between countries. The Dutch economy has traditionally been very open, and has long adapted to being largely dependent on other countries. A comparison of the total production factor requirements of net exports (exports minus imports) and of consumption reveals the extent to which this dependence has prompted the Netherlands to specialise. Cörvers and Reininga (1996) investigated the trade revealed comparative advantages of the Dutch economy with the help of SAMs [38]. Building on their analysis, this section looks again at the input of labour and capital into net exports and consumption. It does so by focusing on knowledge incorporated in these two factors of production. The increasing importance of knowledge and information technology in the growth of modern economies is widely acknowledged, and frequently addressed [39]. The analysis shows how SAMs can be used to measure the extent to which the Dutch economy has become more or less dependent on its own knowledge, or knowledge provided by other countries by importing goods and services with a high knowledge content.

6.4.3.2 Trade revealed comparative advantages

Table 6.9 shows which factors of production have played a dominant role in the way the Dutch economy has specialised. The ratios in this table have been constructed to enable the Heckscher-Ohlin-Vanek (HOV) theory of international trade to be tested. According to this theory, comparative advantage in the use of factors of production is reflected in relatively high intensities of these factors in net exports. It assumes that consumption is determined by consumer preferences that do not differ substantially between countries. It also assumes that goods and services are produced using the same production technology in all countries. Direct comparison of the factor input between countries, for example, with the aid of SAMs or SESAMEs, can help to confirm (or deny) the validity of this theory. It may also help in testing some of its rather exacting underlying assumptions [40].

For a series of production factors, the table compares the total factor use in the production of one Euro of net exports, with total factor use in the production of one Euro of domestic consumption. A ratio of greater than one indicates an above average factor input in net exports.

The ratios reflect differences in commodity composition, and the specific characteristics of the Dutch production structure [41]. Total factor use is calculated using a Leontief model, which measures both direct and indirect uses. Indirect uses are those attributed to final demand via intermediate consumption. Data for capital are the gross stock of capital goods compiled in national accounts, and used in estimating consumption of fixed capital [42]. The following capital goods are distinguished:

– Computers and software
– Civil and hydraulic engineering works, houses and buildings
– Machines, installations and other tangible assets
– Transport equipment
– Other intangible assets

Data on labour are based on SAMs [43] they relate to full-time equivalents of employees and the self-employed, by gender, and the following levels of education:

– primary education and first stage secondary education (low)
– second stage secondary education (intermediate)
– tertiary education (high)

The analysis also takes into account the use of energy from fossil fuels in the Dutch economy. The input of this natural resource in Dutch exports is high compared with its input into consumption [44]. This partly reflects the ample stocks of natural gas in the Netherlands, which have enabled the Netherlands to specialise in the production of energy-intensive goods and services.

The figures in table 6.9 largely correspond with the findings for 1991 of Cörvers and Reininga (1996) [45]. They established a relatively high input of low-educated labour in exports compared with domestic consumption, as is shown in table 6.9. This relatively

high ratio should be compared with the same ratios in Netherlands's trading partners. The major part of Dutch imports and exports is with other reasonably highly developed OECD countries. Further, non-tradable goods and services, such as government services, have a high input of highly educated labour, and this may influence the results in table 6.9.

The breakdown of capital in Table 6.9 shows that Dutch exports use a relatively large amount of transport equipment and energy compared with domestic consumption. Dutch exports are dominated by relatively energy-intensive products such as horticultural and chemical goods, and transport services. The predominance of the last of these reflects the role of the Netherlands as a distribution country, explained by its beneficial geographical location. The relative increase of transport services in exports compared with domestic consumption indicates that this role has become more important in recent years.

Table 6.9 Proportion of factors of production used in exports compared with domestic consuption in the Netherlands

	1995	1999	2000	1995–1999/2000
	ratios			% change
Capital				
Computers ans software	0,69		0,62	–10,8
Machines en installations	1,62		1,46	–10,1
Transport equipment	4,08		4,6	12,7
Houses, buildings and infrastructure	0,43		0,47	9,5
Fossill energy	3,04		3,2	5,4
Labour				
Educational level:				
low	1,08	1,18		9,1
intermediate	0,96	1,13		17,5
high	0,48	0,57		17,2

The extent to which these results really reflect the relative factor endowments of the Netherlands can only be checked by direct country comparisons" [46]. The validity of the assumptions underlying the HOV theory of trade can also be tested. The assumption of identical product technologies in different countries seems particularly open to criticism. It is conceivable, for example, that through the growth in advanced and knowledge-intensive production techniques, the Netherlands has specialised in high quality products on the more traditional markets. These differences become apparent in a comparison, between countries, of production methods, and the corresponding input of factors of production. Harmonisation of SAMs will make the analysis of differences in labour use between countries more reliable.

6.4.3.3 Knowledge-related production factors

Identifying knowledge contained in the factors of production, labour and capital, can help to distinguish knowledge as a separate factor. The present analysis identifies highly educated labour, and ICT capital (computer and software) as being knowledge intensive.

Table 6.9 shows that the input of ICT capital and highly educated labour is relatively low in exports compared with domestic consumption, and that the relative input of ICT capital fell in the late 1990s. This decrease is not the result of slower growth in ICT capital input, but more the consequence of an increasing dependence on other countries. The detailed data underlying this analysis show that there is a higher input of ICT capital in the Netherlands in electronics industry, business services and government services. The net exports of these goods and services from the Netherlands are negligible (government services), or even negative (electronics, business services). The reverse can be seen for highly educated labour where, between 1995 and 1999, the ratio decreased, reflecting a decrease in the dependence on other countries.

In spite of this, the use of these two factors that contain knowledge capital increased substantially in the Netherlands, in the late 1990s. This is shown in figures 6.1a and 6.1b.

In constant prices, gross ICT capital stock doubled between 1995 and 2000, and the input of highly educated labour increased by 24 percent between 1995 and 1999. If the input of factors of production is described as a function of final output of goods and services in a Leontief model, the growth in these factors can be broken down into a number of underlying factors with the aid of structural decomposition analysis.
The share of ICT capital in the total input of capital goods, and the share of highly educated labour in total labour input have both increased substantially. The domestic input of factors of production therefore shifted towards knowledge-intensive labour and capital in the late 1990s. The total input of capital and labour per unit of output, on the other hand, decreased. One reason may be that productivity increases are partly the result of higher shares of ICT capital and highly educated labour. In any case, these results confirm the importance of differentiating separate capital and labour categories in the measurement of productivity change. This can be done, consistently with the estimation of the aggregate of these inputs in national accounts, by means of SAMs.
The increase as a consequence of structural changes (3 in the figures above) is indicative of a shift of production and consumption to relatively knowledge-intensive goods and services. Agriculture, mineral extraction, and the food, oil, chemical and basic metal industries all experienced lower than average growth rates, while there was a relatively high growth for the electronics and transport equipment industry, the telecommunications sector, financial institutions, computer services and other business services. As might be expected, overall economic growth (4 in the figures) also had a substantial effect on the growth in ICT capital, and on the input of highly educated labour.

6.4.3.4 Conclusions

The comparative advantages of the Dutch economy clearly coincide with the geographical location of the Netherlands and its corresponding distribution function, and the ample supply of energy in the form of stocks of natural gas. With respect to knowledge, the results are less convincing (partly because the results depend so much on the validity of the assumptions underlying the HOV theory on trade). The ratios in table 6.9 can only reveal the specific characteristics of the Dutch economic structure. They conceal the fact that the competitive strength of the Netherlands on the more traditional markets may partly result from advanced product and production technology. Internationally harmonised systems of economic and labour accounts, including SAMs, are an important tool in the international comparison of labour requirements. This is especially the case when accounts include breakdowns of labour by level of education or occupation, and show differences in factor intensities between industries and countries. This is exactly what SAMs can do.

Figure 6.1a Development of ICT capital in the Netherlands, 1995–2000

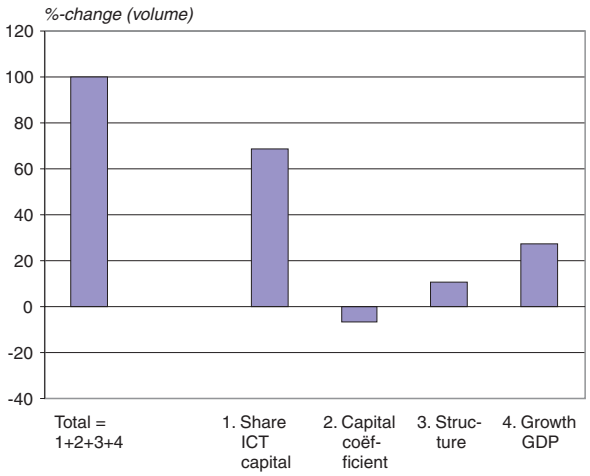
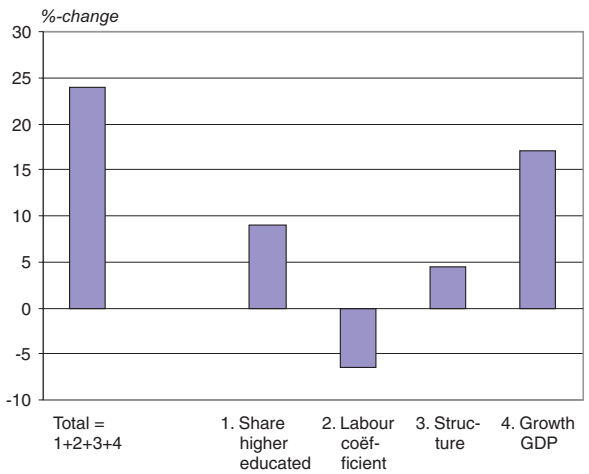


Figure 6.1b Development of FTEs of higher educated labour in the Netherlands, 1995–1999



6.5 Comparison of the structure of the labour markets in 8 European countries

6.5.1 Employment by branch and sex

Data on employment for Belgium, Greece, Italy, Netherlands, Portugal, Finland, United Kingdom and Norway have been compiled for the pilot SAM for 1997. Although these data are limited to employees, they show the potential of the SAM framework.

Analysis of gross value added shows the importance of the various branches of industry in the total economy. In the European Union, in 1997, financial services had the largest gross value added, while agriculture and fishing had the smallest amongst the six branches shown in Eurostat (1999, p. 99). Amongst the eight European countries in the pilot, financial services had the largest gross value added in Belgium, Italy and the Netherlands. Trade, transport and communication in Greece and Portugal, and manufacturing in Finland, United Kingdom and Norway were the largest branches in terms of gross value added.

Public services had the largest share of wage employment [47)] in the Union, and in each of the eight countries. In comparison with the EU average, wage employment was particularly high in manufacturing in Italy and Portugal, and in trade, transport and communication in the Netherlands and the United Kingdom. Wage employment in market services in general is relatively high in both these countries.

Table 6.10 Wage employment share (%) of an economic activity, 1997

	Agriculture NACE A/B	Mfg NACE C-E	Construction NACE F	Trade, transport NACE G-I	Financial NACE J/K	Public services NACE L-P	Total
							x 1000
EU-15	2	22	6	24	13	32	133,416
B	1	21	6	22	10	40	3,057
GR	4	22	8	20	8	37	2,019
I ('96)	4	27	5	21	10	33	15,654
NL	2	19	7	25	20	28	5,201
P ('95)	3	28	8	23	7	30	3,342
FIN	2	23	6	23	9	37	1,848
UK	1	18	4	29	18	29	24,422
N	1	18	5	27	9	40	2,029

Public services employ the largest proportion of female employees in each of the eight countries. Manufacturing employs the largest proportion of men in Belgium, Italy, Portugal and Finland, and trade, transport and communication the largest proportion in the Netherlands, United Kingdom and Norway.

Table 6.11 Wage employment share (%) of an economic activity by sex, 1997

	Agriculture	Mfg	Construction	Trade, transport	Financial	Public services	Total
women							x 1000
B	0.4	12	1	19	11	57	1 276,3
GR	3	19	0,4	19	10	48	78 203,9
I ('96)	3	20	1	19	10	47	6590,9
NL	1	10	1	25	22	4	1 762,3
P ('95)	2	27	1	20	7	43	1 505,8
FIN	1	14	1	22	9	53	911,7
UK	1	10	1	29	18	41	11 722
N	1	9	1	23	10	56	963
men							
B	1	28	9	24	10	28	1780,8
GR	5	24	13	21	6	30	1 240 309,1
I ('96)	4	32	9	22	10	23	9 063,6
NL	2	23	11	25	19	21	3 438,3
P ('95)	4	29	14	25	8	20	1 836,7
FIN	3	33	11	24	9	21	936,2
UK	2	26	7	29	18	19	12 700
N	2	25	9	30	9	26	1 067

6.5.2 Per capita wages

Except in the United Kingdom and the Netherlands (amongst the eight), financial services and business activities recorded the highest per capita wages [48) 49)]. At the other end of the scale, in many countries, wages in agriculture were only about half of the wages paid in the financial services industries. Wages were also low in construction, except in the United Kingdom and the Netherlands. In these two countries, the highest wages were paid in manufacturing.

Per capita wages (shown in the top half of the table above), unless calculated as full-time equivalents, can give a distorted picture of the distribution of the wages by economic activity if part-time employment is high. (A full-time equivalent adjustment has already been applied to the Dutch figures in the table). Part time employment represents 11% of all employment in Finland, 25% in the United Kingdom, and 27% in Norway. In terms of hourly wages, agriculture remains the sector with the lowest wages [50)]. Hourly wages in manufacturing in Finland exceeds those in financial services. In the United Kingdom, hourly wages in public services (and manufacturing) are considerably higher than those in financial services

Table 6.12 Per capita wages (fixed euro) by economic activity relative to financial services, 1997

	Agriculture	Mfg	Construction	Trade, transport	Financial	Public services
B	40	66	52	67	100	64
GR	42	83	61	83	100	99
I ('96)	47	78	62	76	100	79
NL	72	102	88	89	100	97
P ('95)	40	59	60	66	100	84
FIN	60	89	81	73	100	75
UK	57	141	104	82	100	101
N	75	99	96	80	100	70
Hourly wages (fixed euro) by economic activity relative to financial services, 1997						
NL	72	104	91	88	100	98
P ('95)						
FIN	57	102	85	76	100	91
UK	49	128	89	89	100	122
N	74	90	83	80	100	81

6.5.3 Gender wage differential

The overall gender wage differential [51)], (before taking account of differences due to economic activity or education), is relatively small in Norway and Greece, but large in Italy, the Netherlands, Portugal and Finland.

In financial services, there is a large gender wage differential. The gender differential is, in general, smallest in construction. Higher female wages in construction in Belgium, Portugal and Norway may be due to occupational differences. For example, clerical or administrative jobs mainly filled by women may be better paid than manual jobs filled by men with the same educational level. Another factor may be the continued receipt of wages and salaries during long absences such as maternity and parental leave. When women are not at work but continue to receive their wages, their hourly wages can be higher. In Norway, women employed in public services and agriculture earn more, too.

The effect on the gender wage differential of educational attainment appears to be country specific. For the total economy, the gender wage differential seems to narrow as the education level moves from primary to secondary in only three countries (Belgium, Italy and the United Kingdom), but only marginally. It narrows as the level moves from secondary to tertiary in only four countries (Greece, the Netherlands, the United Kingdom, and Norway).

6.5.4 Return for education in terms of increased earnings

Wage rates tend to increase as educational level increases. In Belgium, Greece, Netherlands and the United Kingdom, wage rates for both males and females with upper or post secondary education are 1.1–1.2 times the wage rates for those with lower secondary education, and around 1.5–1.9 times for those with tertiary education. In Italy

and Portugal, these factors are higher. For employees with upper or post secondary education, they are 1.4 - 1.8 times higher than for those with lower secondary education. In Portugal, the effect of tertiary education is particularly high. In Finland, and for females in Norway, there is practically no effect on earnings of secondary education. The impact of tertiary education over and above lower secondary in Finland and Norway tends to be slightly less than in other countries.

The impact of education on wages is fairly similar in the six industry groups, except in Italy and Portugal, where there is a considerable variation across economic activities. The highest return for women with tertiary education in Belgium and Norway is in manufacturing; in Greece, Finland and United Kingdom, in public services.

In terms of increased earnings, the benefit of education is similar for men and women, in Greece and the Netherlands. In the United Kingdom, it is higher for women than for men. In the other countries, the benefit of tertiary education is higher for men than for women [52)].

Table 6.13 Gender wage differential (female wage rate as % of male wage rate) by economic activity and educational level, 1997

	Agriculture	Mfg	Construction	Trade, transport	Financial	Public services	Total
Belgium							
total	78,0	74,8	106,0	85,2	73,2	76,3	81,2
primary/lower secondary (ISCED 1-2)	.	72,1	.	85,1	94,0	79,5	82,6
upper or post secondary (ISCED 3-4)	82,5	78,7	103,4	84,9	77,8	82,5	83,9
tertiary (ISCED 5-6)	.	65,8	61,4	71,5	69,6	69,0	66,5
Greece							
total	92,5	81,4	71,4	76,4	77,8	85,4	90,4
primary/lower secondary (ISCED 1-2)	94,0	80,4	.	72,1	82,2	75,7	84,9
upper or post secondary (ISCED 3-4)	85,2	85,2	.	77,8	78,8	80,7	84,6
tertiary (ISCED 5-6)	.	79,1	.	78,0	79,2	90,9	90,0
Italy							
total	74,2	75,4	99,5	76,9	63,1	70,1	75,7
primary/lower secondary (ISCED 1-2)	76,8	78,4	94,9	78,5	74,8	60,8	74,3
upper or post secondary (ISCED 3-4)	76,7	74,6	80,9	71,5	65,9	81,0	74,6
tertiary (ISCED 5-6)	.	57,0	.	77,7	65,6	61,2	60,0
Netherlands							
total	67,8	68,4	75,3	61,5	62,6	69,5	68,1
primary/lower secondary (ISCED 1-2)	67,9	69,3	72,2	60,3	73,8	70,5	66,8
upper or post secondary (ISCED 3-4)	67,4	68,0	72,5	61,7	64,7	69,2	66,6
tertiary (ISCED 5-6)	.	67,6	75,9	63,3	64,6	74,1	69,1
Portugal							
total	76,9	78,9	168,0	85,6	67,8	53,5	76,1
primary/lower secondary (ISCED 1-2)	73,1	88,4	65,7	83,5	65,5	77,1	83,8
upper or post secondary (ISCED 3-4)	.	74,5	151,1	70,9	81,5	60,9	69,5
tertiary (ISCED 5-6)	.	60,4	.	99,7	65,1	38,5	46,7
Finland							
total	81,3	76,2	85,6	73,6	73,7	86,5	78,6
primary/lower secondary (ISCED 1-2)	82,5	81,3	.	78,7	95,4	94,6	81,1
upper or post secondary (ISCED 3-4)	89,8	79,3	91,4	76,6	88,4	97,8	78,8
tertiary (ISCED 5-6)	74,4	66,3	72,6	62,1	70,4	81,3	72,1
United Kingdom							
total	100,6	76,7	90,0	74,6	72,2	79,5	80,4
primary/lower secondary (ISCED 1-2)	90,9	76,6	93,2	75,6	83,9	72,9	77,3
upper or post secondary (ISCED 3-4)	103,5	80,4	88,7	77,2	77,3	76,8	78,3
tertiary (ISCED 5-6)	102,5	80,7	86,1	70,2	75,4	83,7	82,9
Norway							
total	111,0	80,1	105,7	90,3	66,5	105,9	90,9
Primary/lower secondary (ISCED 1-2)	118,7	86,3	117,9	92,7	81,4	115,6	96,0
upper or post secondary (ISCED 3-4)	102,8	79,6	97,9	86,1	70,4	122,4	87,0
tertiary (ISCED 5-6)	.	75,9	.	105,6	65,5	102,5	89,5

Table 6.14 Relative increase in per capita (hourly) wages due to education by economic activity, 1997 (Lower secondary education = 100, in all countries, and both genders)

	Agriculture	Mfg	Construc-tion	Trade, transport	Financial	Public services	Total
Belgium							
Female							
upper or post secondary (ISCED 3-4)	.	121	.	118	103	120	120
tertiary (ISCED 5-6)	.	160	.	159	121	158	150
Male							
upper or post secondary (ISCED 3-4)	116	111	115	118	125	116	119
tertiary (ISCED 5-6)	.	176	195	189	164	182	187
Greece							
Female							
upper or post secondary (ISCED 3-4)	92	110	.	112	117	125	121
tertiary (ISCED 5-6)	.	133	.	127	134	169	165
Male							
upper or post secondary (ISCED 3-4)	102	104	111	104	122	117	122
tertiary (ISCED 5-6)	109	135	147	117	139	141	156
Italy							
Female							
upper or post secondary (ISCED 3-4)	149	123	118	114	129	155	136
tertiary (ISCED 5-6)	211	166	119	171	181	181	166
Male							
upper or post secondary (ISCED 3-4)	150	129	139	125	147	116	135
tertiary (ISCED 5-6)	.	229	.	173	206	180	206
Netherlands							
Female							
upper or post secondary (ISCED 3-4)	107	112	107	110	117	107	113
tertiary (ISCED 5-6)	.	146	137	153	160	143	156
Male							
upper or post secondary (ISCED 3-4)	108	114	106	108	133	109	113
tertiary (ISCED 5-6)	135	150	130	145	183	136	151
Portugal							
Female							
upper or post secondary (ISCED 3-4)	.	155	428	141	165	138	151
tertiary (ISCED 5-6)	.	325	.	352	221	215	235
Male							
upper or post secondary (ISCED 3-4)	.	184	186	166	133	175	182
tertiary (ISCED 5-6)	74	476	563	295	223	430	421
Finland							
Female							
upper or post secondary (ISCED 3-4)	99	96	136	95	95	112	101
tertiary (ISCED 5-6)	104	118	129	113	124	164	140
Male							
upper or post secondary (ISCED 3-4)	83	96	98	97	99	118	103
tertiary (ISCED 5-6)	132	130	131	141	159	207	151
United Kingdom							
Female							
upper or post secondary (ISCED 3-4)	111	120	109	117	115	124	118
tertiary (ISCED 5-6)	149	184	161	166	161	197	190
Male							
upper or post secondary (ISCED 3-4)	98	114	115	114	125	117	116
tertiary (ISCED 5-6)	133	174	175	178	179	172	177
Norway							
Female							
upper or post secondary (ISCED 3-4)	115	109	98	106	89	101	102
tertiary (ISCED 5-6)	.	162	.	136	119	134	135
Male							
upper or post secondary (ISCED 3-4)	119	114	103	95	113		
tertiary (ISCED 5-6)	184	160	119	148	151	145	

6.6 Modelling [53)]

6.6.1 Introduction

SAMs can be used as a conceptual framework to explore the impact of exogenous changes in variables such as exports, government expenditure, and investment on the socio-economic system. For example, they can look at the effect of shocks on the structure of production, and factor and household income distributions. In this way, SAMs can be the basis for simple multiplier analysis, and/or the building and calibration of a variety of applied general equilibrium models. The chosen structure and level of

disaggregation are determined by the questions that the SAM is expected to address. If it is used to explore income distribution, then the household account should be broken down into a number of relatively homogeneous household groups reflecting the socio-economic characteristics of the country. If its purpose is to analyse inter-sectoral links, then a relatively detailed sectoral disaggregation of production activities is needed. These should include characteristics of the goods and/or services produced, and the type of technology employed in production.

SAMs can be used in a range of modelling applications. The next few paragraphs review multiplier analysis and structural path analysis. They then analyse the structure and main features of general equilibrium models, and show how these models are built on the basis of a benchmark SAM.

6.6.2 Exogenous and endogenous accounts

The SAM is a snapshot of the economy, but it can also be seen as a represention of annual flows which can be explained by structural or behavioural relationships. Government, the rest of the world, and the capital accounts are usually treated as exogenous, and factors of production, institutional sector, and production accounts as endogenous. The SAM approach lends itself to deriving the income distribution and expenditure pattern by socio-economic groups following, for example, a change in the structure of production caused by government actions or a change in exports. These analyses need to distinguish between the determination of primary and secondary income distribution. A distinction therefore has to be drawn between claims on resources which arise directly from the production process of work and accumulation, and claims that result from their transfer.

6.6.3 Multiplier analysis [54)]

SAMs can be used in multiplier analysis if a number of conditions are met; in particular, if there are excess capacity and unemployed or underemployed labour resources. They can be used to estimate the effects on the system of exogenous changes, such as an increase in the demand for a given production activity, government expenditures, or exports.

As long as there is this excess capacity, an exogenous change in demand can be satisfied through an increase in output, without having an effect on prices. The impact on the endogenous variables of a change in an exogenous variable can be tracked through the SAM. The direct, indirect, and total effects on the outputs of the production activities, and on the incomes of the factors of production and socio-economic groups are estimated through the multiplier process in the SAM. For example, a public works program building a rural road from farm to market would require a significant amount of unskilled labour that is typically provided by the landless and small farmers' household categories. In turn, a significant part of the incremental incomes earned by these two socio-economic groups from their work on the road project would be spent on food. The subsequent increase in food production to satisfy that demand would lead to still further employment and increases in income for these groups, and so on, until the multiplier process is exhausted.

6.6.4 General equilibrium modelling

The preceding SAM multiplier analysis rests on the limiting assumptions that there is excess capacity. The static nature of the SAM multiplier analysis precludes estimating dynamic effects. For example, a SAM cannot measure the future effects of investment on productivity because it is only a one-year snapshot of the economy. (Of course, the intermediate inputs of labour and capital that meet the investment demand are included in the SAM).

In the real world, some sectors in the economy operate at full capacity, and some factors of production, such as skilled labour, are fully employed. In a Computable General Equilibrium (CGE) model, prices are endogenous, and, with other endogenous variables in the system, adjust to the "equilibrium" of the economy. When there is an exogenous shock, a new set of prices is set, which, in turn, determines production, consumption,

employment and incomes. CGEs add to the simple SAM framework by introducing the behaviour of the main actors in response to price changes.

The SAM provides the underlying structure of the CGE. Each account and sub-account of a SAM appears as a corresponding endogenous or exogenous variable in the CGE. A CGE take as its initial conditions the values appearing in the base-year SAM. The parameters and coefficients of the equations of the CGE are calibrated on the base-year SAM. A SAM provides the "navigation table" for a CGE. All the mechanisms and transformations inherent in the SAM are an intrinsic part of the CGE's architecture. The SAM structure predetermines the channels (i.e. the various transformations) through which influence is transmitted throughout the socio-economic system, and the CGE formalises the relationships underlying these channels through a set of behavioural and technical equations and equilibrium conditions.

Appendix

General Economic Background Indicators

Indicator		Micro-Macro oriented	SESAME
a1.	GDP per capita in PPS	Macro (all background indicators are meant to provide a macroeconomic overview)	GDP is derived from the NA. PPS data are derived from a different source.
a2.	Real GDP growth rate	Macro	Derived from the NA
b1.	Labour productivity	Micro and macro	GDP is derived from the NA; number of employed persons is derived from the Labour Accounts (LA). Clearly, the consistency of this indicator is enhanced when NA and LA are fully consistent (as accomplished in SESAME). PPS data are derived from a different source.
b2.	Labour productivity (per hour worked)	Micro and macro	GDP is derived from the NA; number of hours worked is derived from the Labour Accounts (LA). PPS data are derived from a different source.
c.	Employment growth	Micro and macro	Derived from the Labour Accounts (LA)
d.	Inflation rate	Macro	Not derived from SESAME. Harmonisation of HICP with national accounts (consumption) deflators will clearly increase mutual consistency between volume measures (GDP growth) and inflation figures.
e.	Unit labour cost growth	Macro	If this indicator can be interpreted as: Labour costs / GDP = Labour – income quotient, then the information can be derived from the NA.
f.	Public balance	Macro	Derived from the NA
g.	General Government debt	Macro	Derived from the NA

(I) Employment

Indicator		Micro-Macro oriented	SESAME
1.	Employment rate	This indicator is micro as well as macro oriented. Determinants of employment concern both the characteristics of the labour force as well as macro-economic conditions	This indicator can be derived from Socio-demographic module of SESAME
2.	Employment rate of older workers	This indicator is micro as well as macro oriented	Potentially, this indicator can be derived from Socio-demographic module of SESAME
3.	Gender pay gap	This indicator is micro as well as macro oriented.	Derived from the LA/SAM
4.	Tax rate on low wage earners	Micro and macro	Not derived from SESAME
5.	Life-long learning (adult participation in education and training)	Micro	Not derived from SESAME
6.	Quality of work (accidents at work)	This indicator seems micro as well as meso (industry branch) oriented	Not derived from SESAME
7.	Unemployment rate	This indicator is micro as well as macro oriented	This indicator can be derived Socio-demographic module of SESAME

(II) Innovation and research

Indicator		Micro-Macro oriented	SESAME
1.	Spending on Human Resources (Public expenditure on education)	Macro	The representation of such an indicator in a knowledge module is currently subject to research at Statistics Netherlands as part of the NESIS project
2.	R&D expenditure	Micro and macro	The representation of such an indicator in a knowledge module is currently subject to research at Statistics Netherlands as part of the NESIS project
3.1	Level of Internet access - household	Micro	Not derived from SESAME
3.2	Level of Internet access - enterprise	Micro	Not derived from SESAME
4.	Science and technology graduates	Micro and macro	The representation of such an indicator in a knowledge module is currently subject to research at Statistics Netherlands as part of the NESIS project
5.	Patents	Micro and macro	The representation of such an indicator in a knowledge module is currently subject to research at Statistics Netherlands as part of the NESIS project
6.	Venture Capital	Micro and macro	Not derived from SESAME
7.	ICT expenditure	Micro and macro	The representation of such an indicator in a knowledge module is currently subject to research at Statistics Netherlands as part of the NESIS project

(III) Economic Reform

Indicator		Micro-Macro oriented	SESAME
1.	Relative price levels and price convergence.	Macro	Not derived from SESAME
2.	Prices in the network industries	Meso	Not derived from SESAME
3.	Market Structure in the Network Industries	Meso	Not derived from SESAME
4.	Public procurement	Macro	Not derived from SESAME
5,	Sectoral and ad hoc State aid	Meso	Not derived from SESAME
6.	Capital raised on stock markets	Macro	Potentially derived from the NA financial balance sheets
7.	Business investments	Macro	Derived from the NA

(IV) Social Cohesion

Indicator		Micro-Macro oriented	SESAME
1.	Distribution of income (S80/S20 ratio)	Micro	Not derived from SESAME
2.	Risk of poverty	Micro	Not derived from SESAME
3.	Persistence of poverty	Micro	Not derived from SESAME
4.	Regional cohesion	Micro-Macro	Not derived from SESAME
5.	Early school-leavers not in further education or training	Micro	Not derived from SESAME
6.	Long-term unemployment rate	Micro-Macro	Currently, not derived from SESAME
7.	Population in jobless households	Micro-Macro	Potentially derived from a Socio-demographic module

(V) Environment (*)

Indicator		Micro-Macro oriented	SESAME
1.	Emissions of greenhouse gases	Macro – Meso	Derived from NAMEA. Emissions in NAMEA are based on the 'resident principle' which are consistent with the SNA but differ from IPCC guidelines. In NAMEA emissions from international transport are allocated to individual countries/economies. Current indicator is macro-oriented. Indicator gains relevance if information on industry-level is used (see also section 5).
2.	Energy intensity of the economy	Macro – Meso	For most countries derivable from NAMEA. Again definitions may differ regarding the recording of bunkering. However, only NA consistent definitions will lead to a consistent indicator. Current indicator is macro-oriented. Indicator gains relevance if information on industry-level is used (see also section 5).
3.	Volume of transport relative to GDP (freight and passengers)	Macro – Meso	Not derived from SESAME. Potentially, volume of freight or passenger transport could be included in NAMEA. The territorial demarcation of this indicator is not entirely clear. However, this is important in order to be consistent with GDP. Current indicator is macro-oriented. Indicator gains relevance if information on industry-level is used (see also section 5).
4.	Modal split of transport	Macro	Not derived from SESAME
5.	Urban air quality index	Macro (+ regional/geographical)	Not derived from SESAME
6.	Municipal waste collected, landfilled and incinerated	Macro	European NAMEAs are currently compiled for air emissions. The Dutch NAMEA includes municipal waste
7.	Share of renewables	Macro	Potentially derivable from NAMEA

Notes

[36] Based on SNA 1993 and Keuning (1996a; 1997a).

[37] Based on De Haan (2001), Hoe kennisintensief is Nederland

[38] Cörvers and Reininga, Analyzing relative factor inputs of Dutch exports. Occasional paper NA-069, CBS, 1996.

[39] A good example is the Lisbon summit in March 2000 where EU heads of government formulated a common strategy to strengthen employment, economic reform and social cohesion as part of a knowledge-based economy.

[40] n a comparison of true and trade revealed factor endowments, Cövers (1999) confirms the HOV theory.

[41] A more detailed explanation of this analysis is provided by de Haan (2002, forthcoming).

[42] Preferably, capital service inputs should be used instead of gross capital stock. To get a first impression it is assumed that changes in capitals service inputs are proportional to changes in the gross stock.

[43] The Social Accounting Matrix is illustrated in the National Accounts 2000, table X5.

[44] This is illustrated in de Haan, M., A structural decomposition analysis of pollution in the Netherlands, Economic System Research, pp 181-196, 2001.

[45] The ratios in table 1 are calculated with the following formula:

$$\frac{\sum_j f_j^k (e_j - m_j)}{\sum_j f_j^k (c_j)} \times \frac{\sum_j c_j}{\sum_j (e_j - m_j)}$$

The relative availability of production factor (*k*) is determined by the sum of net export (ej – mj), multiplied for each commodity (j) with its total factor content (f_j^k), divided by the sum of domestic consumption multiplied for each commodity with its total factor content. As such, the first expression in the formula compares the total factor requirements of net exports to the total factor requirements of consumption. In addition, this expression is scaled by the second expression: .

$$\frac{\sum_j c_j}{\sum_j (e_j - m_j)}$$

In this way the ratios adjusted for differences between net export and consumption in money terms.

[46] Different country comparisons seem to provide diverging evidence about the relative knowledge intensity of the Netherlands. See for example CPB (2002, chapter 2) De pijlers onder de kenniseconomie.

[47] The total employment structure may be different from wage employment taking into account the 14% share of self-employment in the Union, certainly in Greece with a 45% share of self-employment.

[48] Excluding employers' social contributions except for Greece; the wage share in the compensation of employees varies between 70% in Italy and 87% in the United Kingdom ('96 labour cost survey).

[49] Per employee in P, FIN, UK and Norway, full-time equivalents in B, GR, I and NL; the effect of a conversion of a head count into a full-time equivalents would be an increase of the per capita wages.

[50] Paid hours in the Netherlands but hours actually worked in Finland, United Kingdom and Norway.

[51] This measure including gross wages only and referring in Greece and Portugal to per capita wages instead of hourly earnings, is different from the structural indicator of the gender pay gap. This indicator is defined as the gross hourly earnings of women working 15 hours or more per week as a percentage of the gross hourly earnings of men.

[52] But other variables, seniority and occupation (supervisory responsibilities) may explain the differences.

[53] This section is a summary of Thorbecke (2000).

[54] The elementary principles underlying the multiplier analysis are being described in appendix 6.2.

Annex Pilot-SAM for Belgium

1 Background of the SAM in Belgium

The Belgian situation regarding national accounts is exceptional. National accounts are not drawn by the National Statistical Institute but by the Institute for National Accounts. The Institute for National Accounts is an umbrella organisation of three institutes: the National Statistical Institute, the National Bank and the Planning Bureau. In the Leadership Group on Social Accounting Matrices, Belgium was represented by a member of the National Bank and a member of the National Statistical Institute.

By the start of the Leadership Group on Social Accounting Matrices in October 1999, Belgium had no experience in producing labour accounts or SAMs. Moreover, there was almost no linkage at all between statistics. However, in spring 1999 the Institute of National Accounts created a coordination cell with the original aim to solve the problem of discrepancies between the different sources for employment and unemployment. Finally, a new methodology was developed to connect social statistics (information about employment, hours worked and compensation of employees) to national accounts in the framework of ESA 95. This could be seen as a first step towards the creation of labour accounts and SAMs. Because the work in the framework of ESA Employment was very closely linked to the work in the Leadership Group, Belgium decided – at the latest moment – to participate in the LEG and to make a pilot SAM for 1997.

On 15 and 16 June, NSI organised the third meeting of the LEG on SAMs. We also linked a workshop to this meeting because we wanted to inform the users of the possibilities of labour accounts and SAMs and of the current state of affairs. We also wanted to take into account the recommendations and priorities of the users in our future work.
The conclusions of the workshop can be summarised as follows: the Belgian users are in favour of integrated systems of labour accounts and SAMs. Priorities are: quick availability, coherence, flexibility, transparency and accessibility. There is also a need for regional information and internationally comparable data. The users stressed the importance of collaboration between the different institutes concerned with the integration process. Very interesting for the users are the calibration techniques which play a central role in the method developed by the NSI and where we want to combine administrative records and survey records at the individual level. They wanted to see the calibration techniques tested in the near future.

2 The labour market statistics in the context of the national accounts

For the time being, in the Belgian national accounts, the method used for the estimation of the active population, employment and the active population is provisional. On the other hand, the method of estimating the wages may be regarded as more or less final.

2.1 Employment and unemployment

2.1.1 The provisional solution

The solution adopted is a combination of employment according to the Federal Ministry of Employment and Labour (MEL) and unemployment according to the Labour Force Survey (LFS).

There are two reasons why the present solution has to be regarded as provisional. The first reason concerns the hybrid nature of the combination of employment and unemployment, estimated from totally different statistical systems and not permitting the

exclusion of any double counting or omissions. The second reason concerns the actual estimate of employment. The employment statistics produced by the MEL deviate in five crucial ways from the requirements of the national accounts: frequency, timing, date or recording, basic statistical unit and geographical breakdown.

2.1.2 Towards a new solution

On the basis of recent developments in the basic sources, possible solutions are emerging which would satisfy the European precepts.
NSSO recently developed and started operating a data base called LATG. This data base obtains its information from the employers' quarterly returns to NSSO. It contains data on some three million workers concerning such aspects as jobs, terms of employment and hours.

A second recent development observed in information sources is the fundamental review of the labour force survey: not only was the questionnaire adapted to the changes in the economic, social and political organisation of the working world and the methodological requirements of Eurostat, but above all, since the beginning of 1999 the survey has become continuous and therefore permits quarterly estimates of the trend in the variables connected with the labour market.

2.2 Compensation of employees

The method used can be regarded as virtually final. Since the administrative data gathered by NSSO are virtually exhaustive, they form the preferred basic source. These NSSO data are based on quarterly returns by employers. The information which they contain permits an initial estimate of compensation, broken down into gross wages and salaries, and actual and imputed social contributions by branch of activity.

3 Sources used for the pilot SAM

For the pilot SAM, use was made of a limited set of sources. The national accounts are the basic source. Employment figures in national accounts are mainly based on administrative sources, namely the estimate of the Ministry of Labour of the working population on June 30. Until now, only employed persons are estimated, neither full time equivalents nor hours worked are integrated. In the near future, the methodology to calculate employed persons in national accounts will change. Also a calculation of full time equivalents and hours worked will be made.
The basic source for earnings in national accounts is social security. The concept used is the concept of gross earnings, including all earning components subject to social security contributions.
The national accounts totals are seen as constraints. In order to breakdown the aggregate values from national accounts, use was made of the following sources:
The Belgian Labour Force Survey (household survey excluding collective households), which gives us information about employed (employees and self-employed), unemployed and inactive people according to the ILO-definitions. The survey also gives information not available in administrative files (educational level, profession…). From 1999 on, the Belgian LFS is continuous. Before 1999 the survey was held with a fixed reference period in spring.
The 1995 European survey on the structure of earnings, which supplies wages for enterprises with more than 10 employees in NACE C till K. This source was the only source for wages with a breakdown for educational level. From 1999 on, Belgium carries out this survey on a yearly basis.
The Household Budget Survey, which supplies the extent and composition of the incomes and expenditures of households.

4 Pilot SAM

Belgium made a pilot SAM for the year 1997. As already mentioned, use was made of a very limited set of sources. For the breakdowns, we made use of the minimum standard breakdowns agreed in the Leadership Group. Caused by a lack of time and resources, the pilot SAM could not be totally finished. Only a first estimation of (some aspects of) the labour demand, labour supply and a breakdown of consumption could be made. The results are very first estimates and can't be seen as final estimates. A lot of things can be improved and deepened. Although the SAM in Belgium gives only a limited number of detailed cells, the Belgian NAM is complete and gives a disaggregation of the products, the industries, the sectors and the input factors.

4.1 Detailed NAM

In the Belgian NAM, the accounts "Goods and Services" and "Gross Fixed Capital Formation" are broken down by 6 products (P6), the "Production" account is broken down by 6 industries (A6). In the accounts "Allocation of primary income", "Secondary distribution of income" and "Use of income", there is a breakdown of 5 institutional sectors (S11-Non-financial corporations; S12-Financial Corporations; S13-General government; S14-Households; S15-NPISH). Concerning the account "Capital", there is a breakdown of only 3 institutional sectors (Corporations; General Government; Households, including NPISHs). The breakdown of the "Generation of Income" account gives 4 types of incomes (Compensation of employees, Taxes less subsidies on production and imports, Net operating surplus & Mixed incomes, FISIM). The "Financial" account distinguishes 3 types of assets (Currency & deposit; Loans; Other financial assets).
The main source for the detailed NAM was the NA data. However, there was some difficulties to keep the consistency between all the accounts seeing that the version of some accounts are still provisional.

4.2 Demand side of labour, submatrix (3,2)

For the labour volume tables, we made use of national accounts data and LFS data about employed persons. The employment figures in national accounts are derived from the estimate of the working population supplied by the Ministry of Labour on June 30 of each year. These estimates are mainly based on administrative data (social security data, VAT data,…). Because they give the best split up by branch of industry, we took the national account totals by branch of industry as a constraint. However, the national accounts don't give a breakdown for sex and education. For this breakdown we made use of the LFS. We could eliminate the discrepancies and make a consistent table, using the RAS method. We made separate tables for employees and self employed persons based on the same methodology . At first we didn't calculate labour volume of employees in full-time equivalents (FTE). But in making the tables for wages and compensation of employees - where it was necessary to make use of the labour volume of employees table - and in comparing the results with other sources, we realised that we had to use FTE. Because in Belgium, we don't publish figures about FTE, we had to make an estimation of labour volume of employees in full-time equivalents. Therefore we used the LFS. We made adjustments for every part-time worker on the basis of their percentage of part-time work. We also converted every second employee job in FTE via the average number of hours. Here we counted 38 hours as 1 FTE. We applied the structure of the estimate of FTE in LFS to the total number of employees in national accounts. This way, we could estimate a labour volume in FTE coherent with the national accounts figures.

Because until now national accounts don't give any information about hours worked, we didn't calculate labour volume of employees in hours worked. We will work on this subject in the future. For wages and compensation of employees, the figures in national accounts give the best split up by branch of industry. The basic source for compensation in national

accounts is social security. Another source is the yearly account of enterprises. For the breakdown by sex and education, we used the 1995 European survey on the structure of earnings. This survey supplies wages by gender and educational level and branch of industry, but only for NACE C till K and enterprises with more 10 employees. There is no other source for wages with a breakdown for educational level. We estimated the lacking branches “A+B” and “Other” in the following way: the average wage rate per employee was given by the 1995 European survey on the structure of earnings. Next we computed relative wage rates (vis a vis the branch average) for each labour category in each branch. Since the relative wage rates for each labour category didn’t deviate too much by branch, we could apply the average relative wage rate per labour category for branches “A+B” and “Other”. Combined with the data by labour category on labour volume (in FTE), we could estimate the missing wages and compensation for the branches “A+B” and “Other”. Until now we didn’t make any adjustment for the threshold of 10 employees.

4.3 Supply side, submatrix (4,3)

The net added value of the cell (4,3) in the national accounting matrix can be broken down into its various components. Two of them, wages and mixed incomes, can be analysed separately from the labour supply point of view. The wages are the revenues of the employees and the mixed incomes are the revenues of the self-employed persons. In a SAM, theses two kind of persons and of revenues are classified by gender, educational level and household group. In Belgium, this kind of breakdown has been made on basis of the household budget survey. The main difficulty has been the determination of the household type. This last one is determined by the main type of revenue. If you take an household and you add all the revenues of each individuals by type, the type of revenue with the greatest amount indicate the household type.

4.4 Consumption

In the NAM, the consumption is broken down by 6 products (P6), according to the NACE nomenclature. In the SAM, by choosing the HBS as main source, it was not possible to keep this nomenclature, the products has been broken down by 9 types of products, according to the COICOP nomenclature. By using the HBS, it was possible to give a matrix which shows which type of household consume which type of product. The classification of households was based on the main source of income (Wages and salaries; Mixed income; Income in connection with old age; Other transfers income).

5 Perspectives for the future

During the SAM LEG Belgium tried to disaggregate certain cells of the NAM. We could only apply a minimum breakdown using a limited set of sources. The work was done with very limited staff and is very preliminary. More work has to be done, a more detailed breakdown is necessary and other sources and methods have to be taken into consideration. The work can be seen as a first exercise and a first step to integration.
Simultaneously with the work on the pilot SAM, integration work was done in the framework of the coordination cell of the Institute of National Accounts. The calibration techniques are tested. In a later stadium and under the condition that more resources are available, more work can be done to develop a complete SAM.

Notes

[55] LATG : "Loon- en Arbeids Tijd Gegevens".
[56] We found a larger wage differential than expected.
[57] The method to calculate full time equivalents will change in the near future.
[58] Figures on hours worked and full time equivalents will be integrated in national accounts in October 2002.

Annex Pilot-SAM for Finland

1 Background of the SAM in Finland

The compilation of Labour Accounts was topical at Statistics Finland in 1999. The reason was the need to compile supplementary employment data for National Accounts. Finland participated in the Eurostat's ESA employment Task Force in 1999–2000. There was also research interests on productivity studies and a demand for more detailed labour market data. But the compilation of a SAM was not yet an explicit goal. Statistic Finland organised a seminar in May 1999 to discuss the need of SAM and the problems and advantages of the development of the SAM; as a result it was decided to participate in the SAM Leadership Group. Later, in 2000, a project on the development of Labour Accounts (LA) was launched, and is still continuing. As the objectives, timing, and methods of the LA project are different, co-operation with the SAM has mainly been at conceptual level and in the development of new data sources.
Statistics Finland had no prior experience on SAM's. However, they were seen as a useful tool for the integration of available labour market data sources. The Leadership group gave an opportunity to learn from the experiences of other countries. In practise, the compilation of the SAM has been a co-operation of two departments: the department of National Accounts and the department of Social Statistics. Year 1997 was taken as the reference year for the SAM.

The Finnish pilot SAM uses the existing NA totals as such and it compiles and matches other labour market data to these. Basic sources are used for the distributions assuming that they are valid. This method is known as a 'top-down' procedure. On the other hand, the LA starts from the source statistics aiming at estimates, which together are incorporated and in harmony with other information in the NA. The procedure is known as the 'bottom-up' approach.

Users needs of SAM
User needs were identified in a Seminar in June 2001 in Helsinki. Users stressed that the compilation of a SAM would improve the quality of data as it reveals the inconsistencies and measurement problems in statistics. It may also contribute to the difficulty of compiling long time-series. A SAM will be useful in illustrating the relationship between different concepts and measurements; an example in Finland is the continuous discussion about the concept of unemployment. The relationships between population, labour force, active participation, hours worked and unemployment could be illustrated in a useful manner. An existing occasion, where demographic, labour market and economic data are used together, are labour market projections.

Differences in labour productivity by type of economic activity and by type of labour are important for labour market analysis. The measurement of productivity was seen problematic; an extensive project on this topic is in progress. Also, Statistics Finland and the Confederation of Finnish Employers work together for the development of a Labour Cost Index. In addition, concrete proposals stressed the need to include age groups, occupation and region in the analysis variables, to describe the structure of unemployment and the need to develop the classification of occupations in relation to education. Wages and salaries are currently not used in the econometric models of forecasting, but the SAM will make it possible.

The use of SAM's in labour market research was also discussed. The analytical uses include growth accounting and the contribution of production factors to growth. Gross flows between employment, unemployment and inactivity are also an important application. As more and more micro-econometric approach is used in labour market studies, it will be useful to study the relationships between different types of research strategies and the role of SAM in this context. In the future, ecological aspects of

economic growth, as well as the growth of knowledge and information, but also social aspects of human resources are important. The SAM was also seen as a tool for increasing the transparency of international comparisons. It may be seen as a historic successor of the discussions about a System of Socio-Demographic Statistics in the 1970's.

2 Finnish National Accounting Matrix - NAM

Implementation of ESA95 was carried out in 1998 [1]. In this phase the concepts, classifications and the accounting system on the whole, except supply and use tables, were revised according to the ESA regulation. The compilation of supply and use tables by product was transferred to the second phase of the revision. These tables will be integrated to the current NA and will be available by the end of 2002.

2.1 Aggregate NAM (problems and solutions)

When compiling the pilot NAM, the lack of supply and use tables was the main problem from the beginning. It is not possible in the pilot to present aggregates included in the account of goods and services by product; e.g. intermediate consumption, final consumption expenditure or gross fixed capital formation by product. Secondly, discrepancies, which in principle are not allowed but actually are included in the Finnish NA, have proved to be very difficult or in fact impossible to treat consistently in a NAM. Most of the differences should not exist after the integration of supply and use tables into the NA. However, a discrepancy between net lending aggregates from capital and financial accounts seems to exist even then.

In addition, there was no data for the estimation of interrelations between sectors inside sub-matrices "from whom to whom" or the data available was insufficient. For the basic obstacles mentioned and reasons above, we have in our pilot on SAM concentrated on the description of the LA's, i.e. labour cost/incomes and the corresponding labour input in the frames of the NA.

In the compilation of the NAM, the National Accounts data were used. The NA itself is an integrated framework compiled from various sources. They include administrative sources and registers, business register, structural business survey, household surveys, tax registers and so on. An important data source tax records for persons and businesses as well as administrative data on social security benefits. The main source for employment and working hours is the national monthly Labour Force Survey (LFS), but also data from the Business Register (BR) and the annual employment statistics RES (from Regional Employment Statistics) are used for detailed breakdowns by type of activity. The compilation of Labour Accounts has been launched at Statistics Finland, but results were not available for the pilot NAM. The priority of the LA project is to produce a first prototype of an information system utilising the most important data sources in a systematic and coherent way across all branches of industries. This information will be further developed and refined before a future integration into the NA.
The pilot NAM for 1997 is based on data published in 2000 (National Accounts, Tables. Series National Accounts 2000:25, Statistics Finland). Some of the data have revised in later publications.

2.2 Detailed NAM (problems and solutions)

(The description of the detailed NAM depends on the agreement on the solution of the ongoing discussion.)

[1] As to the methods, gross domestic income is described in detail in ESA95 GDI Inventory published by Eurostat in 2001.

3 Finnish pilot SAM for 1997

The compilation of the pilot SAM is the first effort done by Statistics Finland. Different data sources were available, but during the compilation process, several problems were discovered.
The degree of integration of different sources varies. Most commonly the harmonisation concerns concepts, definitions and classifications, but there are differences in methods, reference times and units. However, the most important reason for differences in data is, that they are compiled from different viewpoints and designed for different purposes. As they, from the viewpoint of a SAM, are basic data sources, they are also end products published separately. Thus the internal consistency of the data in each source is the most important quality criteria.

We have used the following sources:
– New (provisional) micro data of the LA for wages and salaries, submatrix (3,2)
– Regional Employment Statistics RES for mixed income, submatrix (3,2)
– Income Distribution Survey (IDS) for supply side, submatrix (4,3)
– LFS for labour input and hours worked, submatrix (3,2)
– Household Budget Survey 1998 and NA unpublished data for final consumption expenditure, submatrix (1,6).

In the estimation of monetary submatrices (at most 36 cells), it was found out that the sample size of the Income Distribution Survey was too small for some of the cells. Alternative sources had to be used instead. The problems concerned both wages and salaries and mixed income. The solution was to use several sources, even a provisional data of the LA. We also studied the possibility to use the Structure of Earnings Survey (SES) for the demand of labour (submatrix 3,2), but even the SES, which is mainly a total count, had too few cases in some categories.

3.1 Demand of labour, submatrix (3,2)

Labour demand submatrix includes tables of wages and salaries and the labour demand in persons and actual hours worked by industry (Nace A6), gender and education. Similar tables refer to mixed income and labour units of self-employed.

3.1.1 Methods and sources used, problems, solutions

In the Finnish pilot, the basic matrices were calibrated to the corresponding totals of the NA by industry. The RAS-method was used in the calibration. Concerning the demand side matrices, there are three starting matrices (labour volume in persons and in hours and the monetary matrix). The calibration was done at the final state of estimation. We also tested the impact of changing the order of calibration, but it had no significant impact on the estimates.

In sub matrix (3,2) wages and salaries by industry and type of labour were taken from a provisional data of the LA. As mentioned, other available sources had too few observations in some cells of the matrix. The LA data is derived by linking the registers of all insured jobs with the RES, Business Register and data from tax authorities. However, linking the data is not always successful. The registers of insured employees were not of very high quality, because they have not been processed and refined for the LA or SAM. Linking this data with other sources it is possible in the future to compile LA's that are more consistent and of better quality.

However, the LA data could not be used for mixed income. More work and analysis is needed to arrive at reasonable estimates of mixed income of persons. The IDS concept of entrepreneurial income differs from the NA mixed income concept. But the main problem is the sample size, which is too small to give reliable estimates by type of labour. Finally, tabulation from the RES was used. It is based on administrative data from taxation levy and is a total count. The problem of the RES is in the definitions; mixed

income as it is defined in the SAM, is not available. Also, the labour status (employed/self-employed) refers to December of the year and incomes to the tax year. For these reasons mixed income is not correctly derived and allocated when a person/household has several income sources during the reference year.

3.1.2 Extent of deviation from sources (and justification)

The source data used only as a basis for subdivisions by type of labour in each industry. The differences with the NA are due to different concepts. In 1997, the deviation of the IDS total wages and salaries was only -0.9 per cent compared with the NA estimate. However, the difference in entrepreneurial income was some -16 percent. The RES data is a total count. The total wages and salaries in 1997 were –3 per cent compared with the NA. For self-employed the IDS estimate was –14 per cent lower and the RES –32 per cent lower.

3.2 Supply of labour, submatrix (4,3)

Supply of labour includes a table on wages and salaries by household type and by type of labour, and a similar table on mixed income. Labour units by type of household are not available. The IDS does not measure labour input; employed persons include only those who worked at least 6 months during the year.

3.2.1 Methods and sources used, problems, solutions

Monetary source data is derived from the IDS. Labour volume is not available from existent sources. The Finnish LFS collects data on individuals, only. In the spring of years 1995-1998, household data was collected from a sub-sample of the monthly LFS. We analysed the 1997 Spring data, but the problem arises in the definition of household type

3.3 Final consumption expenditure, submatrix (1,6)

Final consumption expenditure by purpose in submatrix (1,16) was estimated for nine categories and for five household types.

3.3.1 Methods and sources used, problems, solutions

The basic source is the Household Budget Survey 1998 (the survey was not carried out in 1997). The HBS is the official source of private consumption expenditures and of the number of private households. Data are collected from a sample of household by interviews and bookkeeping. Background data are derived from administrative sources. The total consumption expenditures by purpose according to the NA were adjusted taking into account the consumption of foreigners in Finland and the consumption of Finnish residents in the Rest of the World. Consumption expenditures of collective households were subtracted from the NA totals before the calibration of the HBS data. Afterwards, the consumption expenditures of collective households were added to the category of ‘households with other transfer income’.

The calibration method was used to adjust the submatrix to the NA totals.

3.3.2 Extent of deviation from sources (and justification)

Total consumption in 1998 was according to the HBS –12 per cent less than the NA estimate. The NA uses other sources at aggregate level. The HBS data refer to 1998 and the SAM to 1997. According to the NA, the structure of consumption has changed between 1997 and 1998. However, it is supposed that there are no dramatic changes in the structure of household types. In any case, the HBS is not compiled annually, and the different reference times will exist except the years when the survey is carried out. The differences are also diminished as the NA uses the HBS as a basic source of consumption expenditures. There is a correlation between these two sources. The second problem is the underestimation of certain expenditure in the HBS, but which are

estimated from other sources in the NA. The underestimation of the expenditures on alcoholic beverages and tobacco in the HBS is adjusted to NA level by using calibration.

We would also like to rise up the problem of collective households. The NA estimates their consumption, but there is no information of the number of collective households, or the number of people actually living in collective households. As the population of Finland is rapidly ageing, there will be more people who permanently live in hospitals, are in long-term or permanent care or live in old people's homes. The structure of consumption expenditures of collective households is changing due to this development. Collective households are not included in surveys, and official administrative information is unable to fully capture these persons. We think, that in social statistics and social accounting the lack of information is unfortunate.

4 Future perspectives

In Finland, the future of the SAM does remain open. The most important issue concerns the organisation and resources needed to further development of social accounts. The pilot revealed that more capacity, time and co-operation is needed for the production of SAM's. It also suggested, that many basic sources are not designed for social accounting purposes. The combination of different data sources is difficult and capacity intensive. The most important requirement would be the development of regular and relevant data on labour income of individual persons and households. This data should be consistent with other data by industry and status in employment.

Social Statistics Department is working on an integrated income data register based on administrative sources, which is a total count of all persons living in the country. Income concepts are based on international recommendations (Canberra Group and Eurostat). This data set will be a useful and reliable basic source for the SAM.

Compilation of the pilot SAM has been a learning process to us and to Statistics Finland. The effort gave many new inspiring ideas and it was an important experience on the quality and suitability of basic data. It also illustrated in practise the analytical possibilities opened up by the SAM.

Annex Pilot-SAM for Greece

For the construction of a SAM two main sets of tables are required: a) the institutional sector accounts and b) the input-output tables. Very often these two sets of tables for various reasons are each other incompatible and a lot of adaptations are needed, in order to derive from them a SAM in general equilibrium. The aim of this paper is the description of the procedure, that have been followed to construct a SAM using observed data for Greece. The Greek national account system is based on the international recommendations given by the System of National Accounts 1993 (SNA 1993) and the European System of Accounts (ESA 1995). In this context a fully consistent set of input-output tables and sector accounts is provided in annual basis since 1988. For the construction of SAM we have used data for 1997. Methodologically in this paper the SAM is faced as a table consisted of four main divisions. These specific divisions represent the Intermediate Consumption, the Final Demand, the Revenues from Sectors and finally the Transfers between Sectors. For the compilation of the first three tables we have used the methodology of supply and use tables in which focuses the first part of this paper. For the derivation of the fourth table we have used the rules concerning the compilation of institutional sector accounts which are the object of the second part of this paper.

1 Supply and use tables and symmetric input-output tables

1.1 Supply and use tables for Greek economy

In the new European System of Accounts supply and use tables play an important role as one of main integration frameworks. In the Greece a system of supply and use tables has been applied since 1988.

The Supply and Use tables framework consist of four types of tables:
a) The Make Matrix
b) The balances of resources and uses
c) The matrix of intermediate Uses
d) The production accounts by branch

a) The Make Matrix
Make matrix table shows in detailed level the resource of goods and services produced by resident units in the economic territory. The table has a “commodity by industry structure”.
Each column of the table presents the commodity structure of total industry output and each row presents the industry share of total commodity output. So the main diagonal identifies the principal production activities of the branches and the secondary production is allocated outside of the main diagonal. The dimensions of Greek make matrix is “447 products X 125 Branches”. Using the classification proposed we have aggregated the make matrix for year 1997 to a table of dimension 6X6. This matrix is evaluated in basic prices.

b) The balances of resources and uses
The uses and resources balances are in fact a representation of the basic identity between the supply and demand for each one of the 447 products considered by the Greek system of national accounts. On the one side of the uses and resources balance appear the various sources of the supply of a product, namely domestic production and imports.
On the other side of the balance appear the various kinds of uses a product can has (Consumption, investments e.t.c). Provided supplies and uses are valued consistently

the total supply of a product must be equal to total uses of it. Valuation complicates the framework to a great extend: supply is regularly valued at basic prices and use at purchaser prices. The bridge between the valuation of both sides is achieved using the data for taxes, subsidies and trade margins which also presented in the balance of each one of the 447 products. Using the classification we have derived 6 aggregated balances for year 1997.

c) The matrix of intermediate Uses

Use matrix table shows the utilization of commodities in the production process of the industries. The table has "commodity by industry" structure and in the case of Greece consists of 447 rows and 125 columns. Each column in it presents the commodity structure of intermediate expenditures of each industry. We have aggregated the use matrix for year 1997 to a table of dimension 6X6. This matrix is evaluated in purchaser prices. In order to derive this matrix we have made two adaptation:

First we have allocated the amount of FISIM in the row which refers to banks. The allocation has been made assuming that the amount of FISIM that corresponds to each branch is proportional to its operating surplus. Second from each entry of use matrix have been eliminated the corresponding trade margins. The total amount of trade margins has been allocated in the row of "other market services".

d) The production accounts by branch

Production accounts have been drawn up for each one of the 125 branches of national classification. They present the data about the domestic actual production by branch at basic prices as well as the total intermediate uses of the branch at purchaser prices. The production account can be used to obtain one of the most important balancing items in the system –value added. Also they present the components of value added, namely compensations of employs and operating surplus. Using the proposed classification we have derived 6 aggregated production accounts for year 1997 .

1.2 Symmetric input-output tables

A symmetric input-output table is a product by product or industry by industry matrix describing the domestic production processes and the transactions in products of the national economy in great detail. A symmetric input-output table rearranges both supply and use in a single table. The IO tables which are published by Eurostat for the most of countries are not symmetric input-output tables. They are rather combined supply and uses tables. That is the reason for the presence of "Transfers" rows in the received IO tables. There is one major conceptual difference between a symmetric input-output table and a combined supply and use table: in the supply and use table the statistics relate products to industries, while in the symmetric input-output table the statistics relate product to product or industries to industries.

Most statistical information that can be obtained from producer units indicates what types of products they have produced/sold and, usually less detailed, what type of products they have sold/used. The format of the supply and use tables is designed to fit in with this type of statistical information (i.e. industry by product). By contrast, information of a product by product nature as required by the symmetric input output table is not often available. So the product by product input-output table can be compiled by converting the supply and use tables. This involves a change in format i.e. from two asymmetric tables to one symmetric table. The conversion can be divided in three steps.

a) allocation of secondary products in the make matrix to the industries of which they are the principal products;
b) rearrangement of the columns of the use matrix from inputs into industries to inputs into homogeneous branches;
c) aggregation of the detailed products of the new use table to the homogeneous branches shown in the columns Step b) is more complicated, as the basic data on inputs relate to industries and not to each individual product produced in each industry. The kind of conversion to be made here entails the transfer of inputs associated with secondary outputs from the industry in which that secondary output

has been produced to the industry they principally belong. In making this transfer two different approaches might be taken:

1) by means of supplementary statistical and technical information;
2) by means of assumptions.
   The assumptions used to transfer outputs and associated inputs hinge on two types of technology assumptions:

a) industry technology, assuming that all products in a product group produced in a branch are produced with the same input structure;
b) Product technology, assuming that all products in a product group have the same input structure, whichever industry produces them.

For the construction of the Greek symmetric IO tables we have followed the industry technology assumption.
Using the industry technology assumption also we converted the branch operating surplus and compensations of employees to operating surplus by product and compensation of employees by product. Combining the aforementioned two information with data taken from supply and use balances we have constructed the table “Revenues from Sectors” .

1.3 Investment matrix, Consumption matrix, Final demand table

The Greek national Account System provide in annual basis three types of tables

a) The matrix of final consumption of households and non profit Institutions. The table has a “commodity by purpose” structure;
b) The matrix of investment by branch. The table has a “commodity by branch” structure;
c) The matrix of investment by institutional sector. The table has a “commodity by institutional sector ” structure;

Applying the corresponding classifications to the aforementioned tables we have obtained the following tables:

1) the investment matrix for Greece
2) the consumption matrix for Greece
3) combining the information of investment by institutional sector with the information from the supply and use balances we have constructed the “final demand table”

2 The Institutional sector accounts - Transfers between sectors table

In order to build the table “transfers between sectors” we have used two sets of tables provided annually by the Greek national accounts system:

a) The overall economic table of year 1995 for Greece which presents the full sequence of accounts of all institutional sectors;
b) A matrix presentation of the most important transactions of the system.

A matrix presentation permits each transaction to be represented by a single entry and the nature of transaction to be inferred from its position. Each transaction between two institutional sectors is represented with a column and a row pair. The convention is followed that resources are shown in the rows and uses are shown in the columns. For instance taxes on income (D5) is payable by the Households and received by the government.

Annex Pilot-SAM for Italy

1 Background of the SAM in Italy

The Italian National Institute of statistics (ISTAT) has been carrying out studies on social accounting matrices since the publication of SNA93 and ESA95. Significant results have been reached, not last the ever growing interest on the subject. The academic research on SAMs has supplied important contributions. Nowadays, most of Italian economic statistics manuals have a chapter where social accounting matrices are described [59]. Two main trends of study can be distinguished: the former stresses the importance of the SAM as a data base where economic variables are analysed according to the social and/or demographic characteristics of the economic agents; the latter focuses mainly on the SAM as a data source for economic models. The most recent researches in the academic world are aimed at the compilation of regional SAMs.

In 1998 ISTAT has started a research project on the building of a SAM. As a first step a detailed NAM for the year 1990 was built. Further detailed analysis were provided only for the main NAM cells, namely value added, generated income and final consumption expenditure [60]. As a second step a full-fledged SAM has been built for the year 1990 with households grouped by regional area (North, Centre, South) [61].

These first exercises have pointed that available data are unfit for the building of consistent and reliable SAMs. In fact, data sources are not homogeneous in definitions, concepts and estimates so that a process of harmonisation and integration is necessary for the building of inner consistent SAMs. For the time being a set of integrated data on households' income and consumption has been built. The work is still in progress; as a second step, administrative data will be integrated. The ambition is the building of a data base as the Dutch SEA (Socio-economic Accounts).

2 National Accounting Matrix

The National Accounts Matrix offers a synthetic view on the macro-economic variables of a country and on their inter-relations.
The Italian aggregated NAM has been compiled using data from the I/O table and from the economic and financial accounts of institutional sectors. The sequence of accounts is the standard one, as described in chapter 2.
In the *detailed National Accounts Matrix*, each account is broken down according to the taxonomies of national accounts, namely *groups of products* for the Goods and services account, *industries* for the Production and the Gross fixed capital formation accounts, *value added categories* for the Generation of income account, *institutional sectors* from the Allocation of income account to the Capital account, *financial instruments* for the Financial account.
From a practical point of view not all the flows can be broken down. Here follow the main changes due to the lack of data:

- The Goods and services account is broken down by industries and not by products as expected. The classification by products will be possible as soon as supply and use tables are compiled.
- Since it is not possible to know exactly which industry invests in which product (an indirectly towards which industry), the Gross fixed capital formation account is left undivided.
- It is not feasible to break down taxes less subsidies on products simultaneously by product/industry and destination (General Government and the Rest of the world). The dummy account "taxes less subsidies on products" is then inserted.

– Rents, dividends as well as some types of current and capital transfers cannot be broken down simultaneously by paying and receiving units. Some dummy accounts are then introduced.
– The Households sector includes Non Profit Institution Serving Households (NPISH).

The Italian I/O table supplies most of the data necessary to fill in the cells intercepted by the Goods and services and the Production accounts. However, in a SAM, households' consumption expenditure is supposed to be on a resident basis and not on a domestic basis as in the I/O table. On this issue, the Italian NA supply the following data:

a) Households' domestic consumption by industry. (A)
b) Total residents' consumption abroad. (B)
c) Total non residents' consumption in Italy. (C)

By using available data sources on tourism, a structure of foreign tourists' consumption by industries has been estimated. Such structure has been applied both to the consumption of Italian tourists abroad (B') and to the consumption of foreign tourists in Italy (C').

Finally, households national consumption by industry (D) has been obtained as follows:

D = A-(B'-C')

The compilation of the cells describing the distribution of income process is a bit more complicated. From a conceptual point of view each matrix (vector) of the detailed NAM is the sum of equally dimensioned matrices (vectors) recording the single components of the NAM flow. For example the property income matrix is equal to the sum of five matrices recording respectively interests, dividends, withdrawal from the income of quasi-corporations, property income attributed to insurance policy holders, rents. Whenever possible, it is better to breakdown each single component instead of the economic aggregate as a whole. The final matrix (vector) is then obtained by sum.

T-accounts totals allow to fill in most of the row/column totals of each component-table. It is also possible to fill directly the inner part of the tables, provided there exists only one receiving sector or/and only one paying sector. In the Italian national accounts system this applies for the following categories:

– D423 Other distributed income of corporations [62)]
– D43 Reinvested earning on indirect foreign investment
– D422 Withdrawal from the income of quasi-corporations.
– Property income attributed to insurance policy holders to the R.o.W. (Financial corporation is the only paying sector)
– D6113 Social contributions by self and non-employed persons]
– D612 Imputed social contributions
– D71 Net non-life insurance premiums
– D72 Net non-life insurance claims
– D73 Current transfers within general government
– D74 Current international co-operation
– Current taxes on income and wealth from the R.o.W. (General government is the only receiving sector)
– Social benefits other than social benefits in kind form the R.o.W. (Households is the only receiving sector)
– Employers' and employees' social contributions to the R.o.W. (Households is the only paying sector).

The Italian NA produces interests (D41) in a matrix format.

Some of the remaining NA categories have been broken down on the basis of imputations. For example Current taxes on income and wealth to the R.o.W. have been imputed to the Households sector whereas Employers' actual social contributions from the R.o.W. are given to General Government.

Finally, dummy accounts have been introduced for Net indirect taxes on products, Dividends and Rents (the Other property income account) and for some kinds of current transfers (the Other current transfers account)..

3 Pilot SAM

The building of the SAM requires information not currently used in National Accounts. For this reason it is necessary to enlarge the database to not yet considered variables as the social, economic or demographic characteristics of individuals and households. In particular, the pilot SAM shows the analysis of compensation of employees by labour input categories (industry x gender x education) and households groups (main source of income of the household) and the breakdown of consumption expenditure by households groups.

For what concerns the analysis of compensation of employees detailed data on the input of labour and on earnings are required (sections 3.1.1 and 3.1.2 make a list of the main data sources employed).

For what concerns the analysis of consumption expenditure two sample surveys have been used: the ISTAT survey on households' consumption expenditure (HBS) and the Bank of Italy survey on households' income and wealth (SHIW). The former collects households' consumption expenditure by products but does not allow to classify households' expenditure according to the main source of income. The latter allows to breakdown households' consumption expenditure by groups of households (including the main source of income), but does not analyse consumption by products. Unfortunately, the simultaneous use of HBS and SHIW indicators lead to not inner consistent SAMs [63]. For this reason it is essential to build an integrated SHIW-HBS data set. For the time being an early archive has been built by applying statistical matching techniques [64].

3.1 The value added submatrix (3,2)

Our target is the estimation of the value added matrix where compensation of labour is analysed by industry, gender and education. In the standard value added matrix, compensation of labour is included both in compensation of employees and in mixed income. In order to construct a labour-oriented SAM, it is preferable, in our view, to separate self-employed labour compensation out from mixed income thus getting a value added matrix where compensation of labour remunerates both employees and self-employed. We compensate self-employed labour exactly as the labour supplied by employees, provided they work in the same kind of activity and in enterprises of similar dimension, taking into account the different (generally higher) number of hours worked by self-employed. That part of mixed income that remains when the imputed remuneration of self-employed labour is taken out (which may be negative) is included in the operating surplus. Italy applies a labour-based method in order to estimate compensation of employees, the variable being estimated by multiplying compensation of employee rates by full time equivalent labour units. National accounts analyse compensation of employees by industry (101 branches), class size (8 classes), and separating out workers employed in the underground economy (non-registered) from the others (registered). Our objective is instead to analyse compensation of employees/self-employed labour by industry, gender and education. The first step is the estimation of a labour matrix where both employee and self-employed labour [65] are analysed by gender and education. As a second step we estimate the per capita remuneration of labour, both for employees and self-employed. Such values are multiplied by the underlying labour units in order to get a first estimate of compensation of labour and the corresponding per capita values. Finally estimates have to be reconciled to the NA data on compensation of employees and mixed income by industry.

3.1.1 The labour matrix

ISTAT has a long tradition about the integration of labour statistics within the national accounts framework. Actually, national account estimates move from this integration which guarantees on the exhaustiveness of Italian GDP. Labour input estimates aim at measuring exhaustively both observed and non observed labour.

The labour input is estimated for the benchmark year [66] applying the technique described hereafter; for the following years, estimates are obtained updating benchmark estimates through a set of indicators. The estimation technique for the benchmark year is based on the collection of all the available sources of information and proceeding on the following steps [67]:

A harmonisation of the reference period and territory and conceptual harmonisation to national accounts definitions (with reference to "domestic employment" as a productive factor of GDP);

B1 estimation of labour demand through the integration of sources (for example *ad hoc* estimation of employment in some economic activities for which exhaustive data sources exist, like General Government; inclusion of administrative data on special categories of workers like own account workers);

B2 estimation of labour supply through the integration of sources and correction of main errors within the sources on the side of labour supply (for example classification of economic activity).

The objective of steps A and C, is to achieve the exhaustiveness of sources measuring in the households the number of primary jobs, both registered and non registered, and in the enterprises the number of registered jobs. These steps aim at filling statistical gaps due to non-response or lack of up-dated registers, or due to differences in the reference population of surveys.

C comparison of labour supply and labour demand to identify primary and multiple registered jobs and most of the non-registered primary jobs.

Comparison of data sources is made at a very detailed level. In particular estimates are made separately for three status in employment (employees, own-account workers/employers, family workers: I=1 [68], 2, 3; consistently with ESA95 definitions), economic activities (5 digit of ATECO91: J=1, …, 873) and regions (2 digit of NUTS: N=1, …, 20) [69]. The process is displayed in the box which follows:

A) $Ls_{nij} \cap Ld_{nij}$ = registered primary jobs

B) $|Ls_{nij} - Ld_{nij}| > 0$: B1) $Ls_{nij} > Ld_{nij} \rightarrow Ls_{nij} - Ld_{nij}$ = non registered primary jobs

B2) $Ls_{nij} > Ld_{nij} \rightarrow Ld_{nij} - Ls_{nij}$ = registered multiple jobs

D estimation of other components of the underground economy: non registered foreign workers (through indirect estimates based on administrative and other sources), non registered multiple jobs (indirectly estimated through monetary aggregates or other indicators), workers declaring themselves as non-employed (surveyed by the labour force survey -LFS), informal jobs (in the agriculture and construction sectors);

E transformation of jobs into full-time equivalent units through a coefficient resulting as the ratio between the average number of hours actually worked and the number of hours to be worked according to National Contracts.

This process is conceived in a way that makes impossible to associate to each labour unit the characteristics of the worker underneath it. Therefore in order to derive a classification of labour by gender and education level we had to replicate the benchmark process considering from the beginning gender as one of the classification variables. With respect to education, no information is available from the demand side sources so that the disaggregation of labour by education level is carried out applying to the whole amount of labour the coefficients derived from the supply side sources. The

re-benchmarking process has been carried out by gender, three status in employment, twenty regions, sixteen economic activities [70]. The already disseminated national accounts estimates represent a constraint.
The sources of information used in order to estimates the indicators to split national accounts estimates on the input of labour by gender and education are described in table 1.

Table 1 Main Sources of Information used for the purpose of the estimation of the input of labour

Sources	Typology of Information	Gender	Education
Households and Enterprises:			
Population Census	Resident employed persons by working place	X	X
Labour-Forces Survey	Resident employed persons	X	X
Manufacture, Services and Institution Census	Registered employment, main and multiple activities	X	
Agriculture Census	Agricultural sector, main and multiple activities	X	
Balance date of specific economic activities	Credit, insurance	X	X (credit only)
data on specific typologies of employees	Non-resident foreigners	X	
Institutions:			
State General Accounting Office, Ministries and other Bodies	Employees of the General Government	X	X

3.1.2 Compensation of labour by industry, gender and education

The monetary counterpart of the labour matrix is a matrix containing *compensation of labour per capita values* for each category of employment.
The main data sources used for the estimates are national accounts, sample surveys and administrative data sources.

National accounts
In particular we have used the following NA statistics:
– Wages and salaries (D.11) paid to registered employees, cross-classified by 101 industries and 8 size classes;
– Wages and salaries (D.11) paid to non-registered employees, cross-classified by 101 industries and 8 size classes;
– Employers' actual social contributions (D.121) cross-classified by 101 industries and 8 dimensional classes;
– Employers' imputed social contributions (D.122) cross-classified by 101 industries and 8 size classes
– Full time equivalence units of registered employee labour cross-classified by 101 industries and 8 size classes
– Full time equivalence units of non-registered employee labour cross-classified by 101 industries and 8 size classes

Sample surveys
In Italy, there are only few surveys which collect data on wages and salaries simultaneously by industry, gender and education. For this exercise, we have used the Bank of Italy survey on households' income and wealth (SHIW) for the year 1995 and the ISTAT survey on wages and salaries (ESES) for the year 1995.
The SHIW collects data on the net income earned by each component of the household, by pointing out each single source of income. The survey collect also demographic, social and economic characteristics of the earner. The surveyed unit is the household. The sample is about 8000 households and 25000 persons. The SHIW is carried out every two years.

The ESES collects data on the structure of wages and salaries by social and demographic characteristics of the employee and according to the industry where he/she is employed. According to the European statistical program the survey is carried out every four years. The survey focuses on local units with more than 10 workers and belonging to the manufacturing and service economic activities (namely, NACE rev.1 C-K). In 1995, the sample was 7500 local units and about 103000 employees.

Administrative data
We have used statistics on wages and salaries by professional level, collected by the Italian Bank Association on the employees of the credit and insurance sectors. Moreover we have used Government statistics on the wages and salaries of the public sector employees. Both the data sources provide only the professional level detail.
We estimate per capita values differently for each industry.
As a first common step, we calculate compensation of employees per capita values for each industry, separating registered employees from non-registered employees. The difference is equal to the employers' actual and imputed social contributions.
On the basis of available data sources we calculate wage differentials by gender and education for each industry.
For what concerns the agriculture sector, we can only use the SHIW data. Due to the very small size of the sample, some cells record only a few number of cases, especially for the less frequent typologies like high education. For this reason, first we differentiate wages by gender, and only as a second step we differentiate them by education. The assumption is that wage differences due to education are independent from the gender of the worker.

Another problem is connected with the use of the SHIW. As a matter of fact, the survey collects *net* incomes whereas we need a proxy variable of wages and salaries. A micro simulation model developed at ISTAT allows to estimate social contributions and taxes charging on each income. Differentials on wages and salaries are calculated using these "gross" values.

The differentials for Manufacturing, Construction, Trade and Financial sectors are calculated on the basis of the ESES. The population surveyed does not include enterprises with less than 11 workers. This fact may effect the results for the industries characterised by small enterprises, namely construction and trade. The assumption is that differentials by gender and education are not effected by the size of the enterprise.
Differentials for the Financial sector have been calculated also taking into account administrative data on wages and salaries by professional level.
Finally, for the sixth industry (Public administration etc) we have used mainly the SHIW and General Government administrative data on wages and salaries analysed by professional category.

We apply wage differentials to the compensation of employee per capita values of each industry, separating registered from non-registered employees. We assume that wage differentials do not change in the underground economy. We apply also the same differentials to the self-employed compensation of labour, thus getting *imputed wages and salaries rates*.

Per capita values of remuneration of labour are applied to the corresponding full time equivalent units. The result is a first estimate of compensation of labour by industry, gender and education. The final estimate is obtained with the reconciliation of compensation of employees to the NA distribution by industry. Discrepancies are distributed in proportion.

3.2 The generated income submatrix (4,3)

The generated income sub-matrix attributes remuneration of labour ,operating surplus and other taxes less subsidies on production to institutional sectors. In the Italian pilot SAM the remuneration of labour and the operating surplus are broken down among households groups classified by main source of income. As a first step we consider the remuneration of the labour input. Namely we consider the compensation of resident labour input paid in the economy. We move from a (1x12) vector where this aggregate is analysed by status, gender and education. Vector A is obtained as follows:
$A = (B+C)' - D$ [1]
where:

A (1x12): remuneration of resident labour input paid in the country analysed by status, gender, education

B (12x1): remuneration of domestic labour input analysed by status, gender, education. This vector reports the row totals of the Value Added matrix (NAM 3,2).C (12x1): wages and salaries from the Rest of the World (NAM vector 3,11) disaggregated by status, gender and education level groups. We computed an implicit amount of FTEUs by dividing the total amount of wages and salaries from the Rest of the World by the average per capita wage. Such amount of FTEUs has been distributed by status gender and education according to information from different sources on non resident workers. Disaggregated FTEUs have been multiplied by the corresponding average per capita remuneration resulting from the value added matrix. This vector is used as structure to split the national accounts constraint on wages and salaries from the Rest of the World.
D (1x12): wages and salaries to the Rest of the World (NAM vector 11,3) disaggregated by status, gender and education level groups. This vector is estimated by applying the same methodology used for vector C. In this case implicit FTEUs have been split by status, gender and education using data from the Census of the Population.

Once the vector A is estimated, it is necessary to disaggregate each cell of it by households group. We have used the SHIW since it allows to cross-classify remuneration of labour simultaneously by labour category and households group. In this case weights have been calibrated in order to get a distribution of labour and remuneration by industry, status, gender and education comparable with the corresponding distribution of the Value Added matrix and of its underlying labour matrix. Calibrated micro-data on labour remuneration are then aggregated by households group. The resulting structure is applied to vector A: we get a first estimate of the generated income matrix for what concerns the remuneration of labour. Values are then balanced in order to respect the National Accounts constraints.

The SHIW also provides data for the distribution of operating surplus by household group. We remind here that in the Italian SAM households' operating surplus is made of housing services (both actual and imputed) and the return to the capital input used by the self-employed in the production process.

Once the generated income matrix has been computed, the underlying labour matrix is estimated. Also in the case of labour input [1] is valid. In particular:
A (1x12) reports national labour input analysed by status, gender, education. It is obtained by dividing the monetary corresponding vector by the average per capita remuneration of labour resulting from the Value Added matrix.
B (12x1): domestic labour input analysed by status, gender, education. The vector is equal to the column totals of the labour matrix underneath the value added matrix.
D (1x12): non resident labour input employed in the domestic market analysed by status, gender, education. The vector is estimated starting from the monetary aggregate on wages and salaries to the Rest of the World (NAM vector 11,3) and dividing it by the average per capita compensation of labour underlying vector B, i.e. separately for each gender and education level groups.
C (12x1): resident labour input employed abroad analysed by status, gender, education. The vector is estimated as a balancing item, i.e. B-(A+D)' according to equation [1].

3.3 Final consumption expenditure submatrix (1,6)

In the Italian SAM households' consumption is analyzed simultaneously by industries and by households classified according to the family main source of income. In Italy the best data source on consumption is the ISTAT sample survey on households consumption expenditure (HBS). Unfortunately this survey does not collect reliable data on income. A matching of the SHIW and HBS is then necessary in order to analyze households consumption both by industry and households groups. The following are the main steps of the estimation process.

1. From the SHIW–HBS archive we get a structure of households' expenditure by consumption groups (COICOP headings) and households groups. This structure is then applied to the NA households consumption expenditure thus getting matrix A.
2. The row sum of matrix A will deviate from the NA distribution of consumption expenditure by COICOP headings. The reason why deviations occur is the use of sources other than the HBS, in the compilation of NA figures. By applying the RAS method deviations are eliminated.
3. Finally, COICOP categories are converted in industries by using a "bridge matrix".

Notes

[59] A. Giannone Sistemi di contabilità economica e sociale, Padova CEDAM, 1992. R. Guarini F. Tassinari Statistica economica - Il Mulino, 1996.

[60] Coli A. Cimino E. (1998).

[61] Coli A., Tartamella F. (2000-b).

[62] This category has been introduced by ISTAT in order to attribute self-employed income coming from corporations.

[63] For example if we subdivide national accounts disposable income and expenditure by households' groups according respectively to SHIW and HBS indicators, we get odd consumption propensities.

[64] Coli A., Tartamella F. (2000-a).

[65] The self-employed included in the labour matrix are those employed in the Production Households sector which is namely composed by unincorporated enterprises owned by households, with less than five workers. Actually, all data sources on employment in Italy record self-employed working in corporations and quasi-corporations who cannot be considered strictly neither employees nor capital earners. In the Italian NA these persons are remunerated through operating surplus in the generation of income account, and through capital income in the allocation of primary income account.

[66] The last benchmark refers to 1991, when the last available Population and Enterprises Census was performed.

[67] For more detailed information on methods and data sources see Calzaroni (2001).

[68] The first four digits of ATECO91 correspond directly to NACE Rev1.

[69] We build two matrices, one with the data integrated from the supply side and one from the demand side, each matrix of 20x3x873=52380 cells (regions x status x ATECO). Each cell identifies the number of workers of region N, status I and ATECO J.

[70] See Battellini, Coli, Tartamella (2001).

Annex Pilot-SAM for the Netherlands

1 Background of the SAM in the Netherlands

In the discussion that preceded the revision of the United Nations' System of National Accounts, a number of Dutch national accountants have proposed to introduce greater flexibility in the SNA. Furthermore, it was recognised that the 1968 system of national accounts did not sufficiently take account of social concerns such as (un-)employment and income inequality. This has led to the incorporation of a chapter on Social Accounting Matrices in the 1993 SNA.
In 1993 Statistics Netherlands started a research project on the compilation of two comparable SAMs for the Netherlands. As a starting point, 1988 and 1990 have been chosen as reference year. In 1994, the pilot-compilation of a SAM for the Netherlands was completed. Estimates were published for the years 1988 and 1990 (see Timmerman, Van de Ven, 1994). In subsequent years, consistent SAMs have been compiled for 1991 up to and including 1994.
From 1995 onwards Statistics Netherlands publish a SAM on a regular basis.
In the Netherlands, several partially integrated frameworks are available. For the compilation of the SAM, use is made of the Labour Accounts (LA) and the Socio-economic Accounts (SEA). The LA provide an overall picture of the Dutch labour market. As such they contain extensive information on employment and compensations of employees, broken down not only by industry but also by gender, by level of education and by part time/full time jobs. The SEA contain detailed information on the income distribution and consumption patterns of various household groups.

2 Sources available for the Dutch NAM and SAM

Besides the National Accounts (NA) two other (partially) integrated frameworks are used for the compilation of the NAM and the SAM in the Netherlands: the Labour accounts (LA) and the Socio-Economic Accounts (SEA). Although each of these frameworks are internally consistent and integrated, between them differences in definitions, classifications and estimates of figures exist.

– *The National Accounts (NA)*
  The NA give a detailed description of the economy, especially of the production process. The totals for the transactions in the SAM equal those of the NA. This means that the transaction-definitions and estimated transaction-totals used in the SAM are those of the NA.

– *The Labour Accounts (LA)*
  The LA is an integrated framework that presents a statistical review of the Dutch labour market. The sources directly used for the construction of Labour Accounts are:
  – *Household survey:* the Labour force survey (LFS) is a continuous survey (1% sample) of persons resident in the Netherlands, excluding those who live in institutions. The survey presents data on employment and unemployment by personal characteristics
  – *Establishment surveys* on employment, earnings and labour cost: quarterly surveys on (1) employment and pay-bill and (2) average hourly earnings and weekly hours of work, annual surveys on (3) employment and (4) average hourly and annual earnings and less regular surveys on (5) the structure of earnings and (6) the structure of labour cost. About fifteen years ago these were completely independent surveys. Gradually a merging of enterprise surveys on employment and earnings was realised and more and more use is made of a modular approach taking information from other surveys where available.

– In case of labour accounts, *data from social security institutions* is used on total earnings according to a concept of gross earnings, which includes all earning components submitted to the payment of social security contributions

  In addition to these sources directly underlying labour accounts, other sources used for the compilation of national accounts also play a role in the quality check of labour accounts.

  The national accounts are mainly based on establishment data, to be precise upon Production statistics. These statistics provide for each type of industry data on the structure and size of output, intermediate consumption and value added, including wages and salaries and employers' social contributions. In addition, most Production statistics supply data on the number of jobs. Other sources used for the compilation of compensation of employees are the Agricultural census in May, Cost and Finance statistics for the health sector and bank and insurance companies and government data for the public administration, defence and education.

  Statistics Netherlands receives separate (often integral) *data from social funds* on the receipts by Pension funds and Social security institutions of employers' contributions to these funds (premiums as well as lump sum payments). This gives separate data on total received premiums distinguished by destination (disability, unemployment, pension).

– *The Socio-economic Accounts (SEA)*
  The SEA give an overall picture of income and consumption patterns of various types (52 different types) of private households.
  The data for the SEA are derived from various micro sources and are made consistent within the SEA-framework. The most important of these micro sources are: the Statistics of Income Distribution and the Budget Survey.
  The Statistics of Income Distribution provides detailed information on the composition of income of private persons and households in the Netherlands. It is based on income-tax information.
  The Budget-survey is a household survey. It provides detailed information on the household consumption expenditure in the Netherlands.

3 National Accounting Matrix

Account 1 describes the supply and use of goods and services. The subdivision of goods and services into product groups should contain the most relevant details about the consumption expenditure on goods and services by households. In addition, the output structure of product groups by domestic industries should be taken into account. Another important criterion for the classification of goods and services in the Dutch NAM (and SAM) is the availability of data from the SEA about the consumption of various household groups. For the Netherlands 60 product groups have been selected.
In the production account (account 2), the classification of industries contain 49 industries, based on the economic activities in the supply, use and input-output tables.
In relation to the breakdown into institutional sectors, in first instance five institutional sectors have been distinguished in accounts 4, 5, 6 and 7 according to the ESA95.
The financial corporations sector in the NAM is subdivided into three sub-sectors: monetary financial institutions, insurance corporations and pension funds and other financial corporations.
The sector general government is subdivided into three sub-sectors: central government, local government and social security funds.

Special treatment of fixed capital formation

In order to provide a better understanding of the role of fixed capital in the economy, some separate accounts are introduced in the Dutch NAM, which differ in type of classification.

By the presentation of fixed capital formation in the NAM, three problems can be singled out. Firstly, although the current national accounts contain estimates of total fixed capital formation by sector and by industry, it is not clear which sector invests in which industry. Secondly, the distribution of fixed capital formation by destination is not available for the individual product groups. Finally, even though the destination of the newly produced and imported capital goods is known for each industry, this does not go for the existing capital goods, which are traded within the Netherlands. However, the destination of these goods is known by sector.

For these reasons, a so-called dummy account (account 8) has been introduced. Fixed capital formation is recorded by sector on the row of this account, according to the capital account of the sectors. The column shows in cell (1,8) the changes in inventories by product group and in cell (9,8) the fixed capital formation from production and imports (which are new for the Netherlands), specified by industry of destination. Cell (10,8) shows the sales of existing, but not yet fully written-off, capital goods, as far as they are exported or purchased by households for consumptive purposes.

Account 9 describes the destination of fixed capital formation. Fixed capital formation by industry is recorded in the row. In the column, fixed capital formation is shown by industry, broken down by type of asset.

In account 10, fixed capital formation is recorded by type of asset (buildings, means of transport, machinery and the like). A breakdown according to their industry can be found in the row. In the column these assets are distinguished according to the corresponding product groups.

Summarised, this presentation opens the possibility to show relations between the fixed capital formation by sector (as shown in the sector accounts) and product group as shown in the supply and use tables.

4 Pilot SAM

In the construction of the Dutch SAM, data from the National Accounts (NA), the Labour Accounts (LA) and the Socio-economic Accounts (SAE) are combined with source data from the Labour Force Survey (LFS), the Annual Earnings Survey (AES) and the Statistics of Employed Persons (SEP). As a result, detailed information on the distribution of income among household groups is presented in combination with elaborate labour market data (classified by gender and educational level) and national accounts data.

With respect to labour data, the SAM for the Netherlands contains two types of cross-tabulations.

The first, sub-matrix (3,2), records generation of income by various factors of production. The remuneration of the production factor labour (compensation of employees) consists of wages and salaries and employers social contributions. For each industry, wages and salaries are subdivided by gender and educational level into 14 types of employed persons (see section 4.1). In addition to the data on wages and salaries, corresponding data on the number of employees is compiled. Data on paid employment are measured in full-time equivalents (fte's); so, part-time jobs have been converted into fte's. Furthermore, data on the labour input of self-employed persons is compiled and also classified by type of employed person.

The second, sub-matrix (4,3), records the distribution of generated income among households and other resident sectors. Wages and salaries are cross-classified by 14 types of employed persons and 14 household groups (see below). In addition, an identically specified matrix on labour input (fte's) by households is compiled
In discussing micro-macro linkages on labour data in the SAM, the two types of cross-tabulations are consistently distinguished (see below the sections 4.1 and 4.2)

Accounts 4, 5 and 6 contain a more detailed household classification than in the NAM. The household sector is disaggregated into 14 socio-economic subgroups. The sub-sectoring of households is based on the SEA. This framework applies a classification to household groups based on differences in consumption behaviour and sources of income.

In the SAM, households are broken down by composition of the household (single- or multi-person, without or with children), main source of income (wages/salaries, property, mixed and transfer income) and household category (private versus institutional households). This results in 14 different household groups:

Households with wages and salaries:
1. Single-person households
2. Multi-person households without children
3. Multi-person households with children

Household with mixed income from:
4. Agriculture
5. Trade, hotels, restaurants, cafes and repair services
6. Business and personal services
7. Other activities

Households with transfer income in connection with old age
8. Single-person households with transfer income in connection with old age
9. Multi-person households with transfer income in connection with old age

Households with other transfer income
10. Single-person households with other transfer income
11. Multi-person households without children with other transfer income
12. Multi-person households with children with other transfer income
13. Persons in institutions (institutional households)

Households undivided
14. Households undivided

In discussing this classification of household groups with important users among which the Central Planning Bureau that compiles forecasts for the Dutch economy and estimates the impact of official government policy and political programs on future economic developments, it turned out that there is a high political need to have more detailed information on the development of income and expenditure of household groups depending on transfer income from government.

4.1 Demand side of labour, submatrix (3,2)

In sub matrices (3,2) and (3,14), wages and salaries (and the underlying number of employees) per industry are broken down by type of person employed. The same type of labour is also used for the household groups that supply the labour. This supply is shown in sub matrices (4,3) and (14, 3).

In the Dutch SAM, labour input is disaggregated into 14 types of labour. The necessary information is derived from the LA. Two important determinants for Dutch employment and wages have been applied as discriminating criteria: gender and level of education attained. The following seven categories of level of education are distinguished: (1) basic education, (2) lower and (3) higher general secondary education, (4) lower, (5) middle and (6) higher vocational education and (7) university training.
The detailed information on the labour market in the Dutch SAM could be derived from a combination of data from different micro-sources and meso data from the Labour

Accounts and the National Accounts. NA and LA are consistent for 49 industries. In the SAM this classification into 49 industries is applied in account 2.

In the LA, an explicit relationship exists between micro-data from, among others, the Labour Force Survey (LFS) and macro-data. The conceptual framework of the LA consists of a set of definitions (identities), both among macro-variables and between aggregates and the underlying micro-data. Some of these macro-variables are also included in the NA (total wages and salaries, total employment), which leads to additional identities which have to be fulfilled. In case of discrepancies between preliminary estimates of the macro-data, an analysis of the underlying source data leads to adjustments in micro- as well as meso data.

Within the LA, the various sources with data on labour are combined and, where necessary, reconciled to present an overall view of the labour market. The reconciliation process starts with choosing the "best" source for each variable to be included in the LA.
The adjustments made to compile the number of jobs of employees can be summarised in four stages: (1) harmonisation, (2) achievement of full coverage, (3) minimisation of measurement and (4) balancing. Establishment surveys are used as primary source to describe paid employment, because of their low variance of data on paid labour as compared with the LFS. For example, the Annual Survey on Employment and Earnings (ASEE) is used as the best source to describe employment (jobs), by branch of industry and gender.

In addition, the average annual contractual hours worked per type of job (classified by gender and type of industry) is compiled by using data from the Annual Earnings Survey. Multiplying total hours per job by the total number of jobs produces total hours worked per year. Next, dividing this figure by total contractual hours worked per full-time job can derive total full-time equivalents (fte's). At a macro-level the LA figure on total fte's corresponds with the NA figure, apart from some minor differences which can be specified.

The LFS contains reliable employment data by educational levels. In compiling the detailed SAM labour matrix, LFS data are linked to LA figures. Therefore, the LFS records are clustered into 324 cells classified by industry, gender and labour hours. Then, each LFS cell is grossed up in such a way that the result equals the corresponding LA figure. This re-weighted LFS database provides, in the first instance, the sub-matrix on paid employment of employees classifies by gender, educational level and industry, and secondly, an identically classified sub-matrix on the self-employed.

Next, the re-weighted LFS database is used to compile the detailed SAM sub-matrix on wages and salaries. Data on wages and salaries by educational level are only available to a limited extent. A household survey appears most suitable for a proper measurement of educational levels, for respondents themselves know best how well they are educated. Establishments often do not know the most recent educational attainment of their employees, so they systematically underestimate these levels. On the other hand, when the educational attainment is not known an overestimation can occur.
Household surveys, on the other hand, are less appropriate for obtaining data on wages and salaries. For that purpose, establishment surveys like the AES are more useful. For SAM purposes, data from this survey have to be combined with LFS-information. The following procedure has been applied:

1. By means of regression analysis, the following function has been estimated: Hourly wage rate = F (gender, age, hours worked, educational level).
2. The obtained coefficients were used to impute an hourly wage rate for each record (employee) in the LFS, based on the characteristics mentioned. In dealing with the underestimation of educational levels by AES, it was assumed that (a) the AES correctly estimated the wage ratios between educational levels, and (b) these wage ratios did not change over time.
3. Within each of the above LFS cells, total wages and salaries were computed as the product of the imputed hourly wage rate and hours of work.

4. The extended LFS records were aggregated to obtain the same level of detail as the integrated LA figures on total wages and salaries.
5. Imputed wages and salaries are compared with the corresponding LA figures. This results into correction factors for each LFS cell.
6. Using the correction factors and the imputed wage rates in 2, and making use of Iterative Proportional Fitting (IPF), integrated hourly wage rates could be obtained. Multiplying by the amount of full-time equivalents (hours of work) resulted in integrated data on wages and salaries per type of employee.

4.2 Supply side of labour, submatrix (4,3)

Here, the SAM distinguishes labour input data and data on wages and salaries classified by gender, educational level and household group. The SAM for the Netherlands distinguishes 14 types of households classified by main source of income and household composition (see above). The SAM sub-sectoring of households is based on the Socio-economic Accounts (SEA). In the SEA, total wages and salaries received per type of household are compiled based on micro tax data.

The LFS collects data on personal characteristics, including position in the household (e.g. breadwinner, partner or child). Household data such as its composition (single- or multi-person, with or without children) also belong to these characteristics. In order to compile matrices with labour data classified by gender, educational level and household group, LFS data have to be compared with SEA data. For this purpose the previously discussed re-weighted LFS database, extended with imputed wage rates, has been used again. But this time the LFS cells have been grossed up in such a way that (a) total wages and salaries by gender and educational level equal the previously compiled levels and (b) total wages and salaries per type of household equal the corresponding SEA figure.

It should be noted that the Dutch LFS does not contain any information on income levels. Hence, contrary to the SEA, the Dutch LFS cannot classify households by main source of income on the basis of the sum of the incomes of all persons in the household. On the other hand, the LFS does contain information on the employment status (employee or self-employed) and the type of industry for each individual in the household who belongs to the labour force. In addition, the LFS inquires whether a person receives social security benefits and whether he or she has reached the age of 65. Based on these data the main source of income of the breadwinner can be deducted. This has been used as a proxy for the main source of income of the whole household. Regarding double-income households this method is not completely accurate. The discrepancies between the SEA and LFS are concentrated in the category multi-person households without children.

Establishing the link between persons and household types

For the composition of SAM matrix (4,3) each individual of the population of the LFS is classified into one of the household groups mentioned above. Each individual is assigned to one of these household groups following the five steps described below (see also the annexed scheme):

– *Step 1: Determine the main source of income of each household*
The main source of income for each household is determined from the main source of income of the reference person of each household. The reference person is chosen from the core of the household. The core exists of one person (in case of a single person household) or two persons (all other households). Once the core of the household is identified the male member of the core is appointed as the reference person. In case the core exists of two members of the same gender, the first person interviewed by the polltaker is considered to be the reference person. After having chosen the reference person, the main source of income of this person is established: wages and salaries (i.e. employees who work more than 12 hours per week), mixed-income or transfer income.

Since the LFS does not contain any information on the level of wages or other types of income, use is made of an algorithm to determine the largest source of household income. In case the main source of income of the reference person is wages or mixed income this is by definition considered being also the main source of income of the whole household. In case the main income of the reference person is transfer income, and another person within the household receives wages, the household is characterised as a household with mainly wage income.

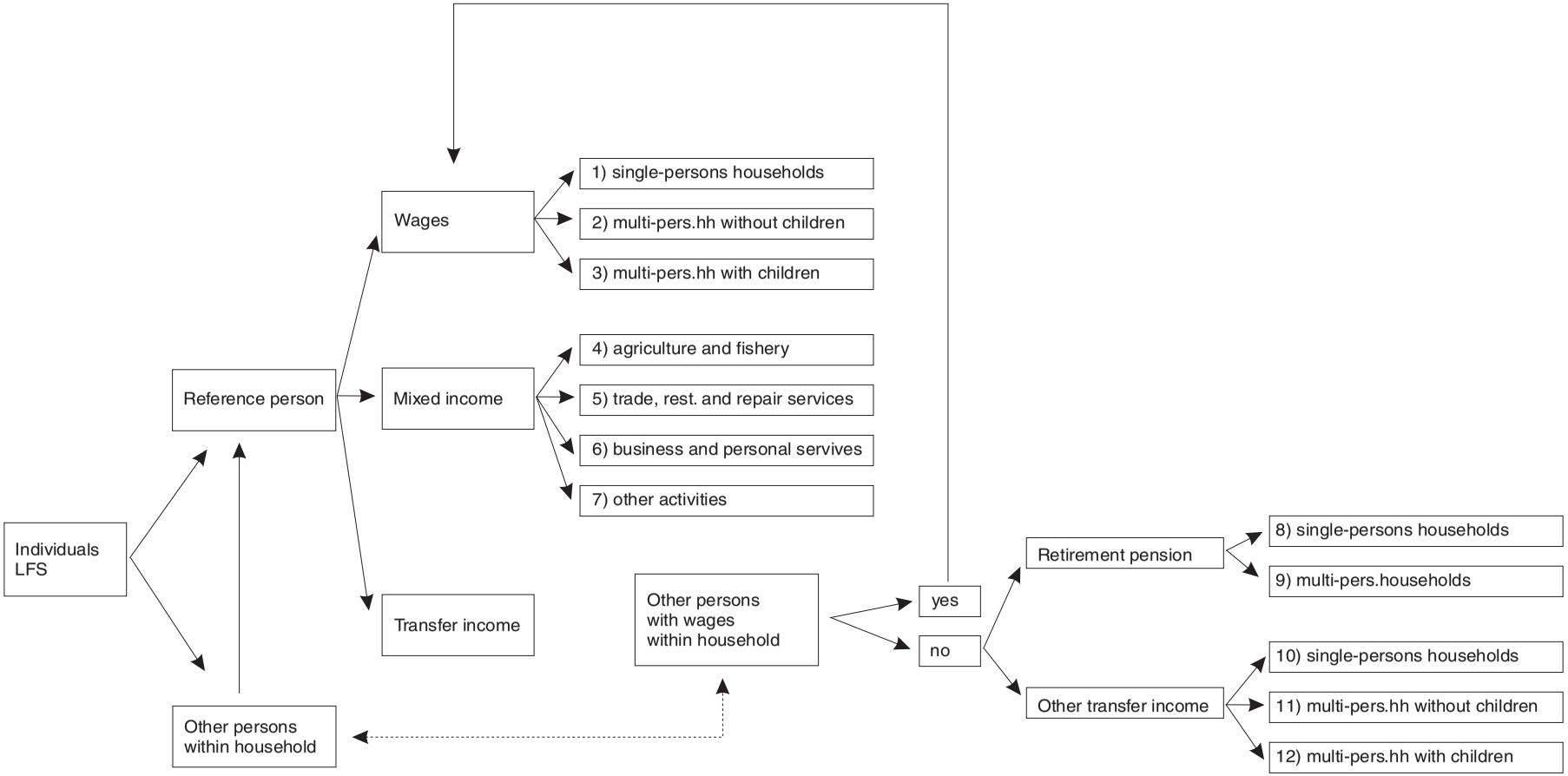
– *Step 2: Determine the branch of industry for own account workers*
  If a household is categorised as a household with mainly mixed income in step 1, a branch of industry is assigned to the household using the job description persons provide in the labour force survey. Four branches of industry are discerned: agriculture and fishery, trade, hotels, restaurants and repair services, business and personal services, and other activities. (for employees the branch of industry is also determined; this is not needed directly for matrix (4,3) but is used to calculate the wages received by households- see below).
– *Step 3: Determine the type of transfer income*
  When step 1 has led to the conclusion that the main source of income of the household is transfers income, it is then determined whether this is from a retirement pension or from other transfer income. The type of transfer income is determined from the information provided by the reference person, and the age of the reference person.
– *Step 4: Determine for each person the composition of the household*
  For households with mostly income from wages or transfers the composition of the household is determined (single- or multi-person household with or without children).
– *Step 5: Determine the level of education*
  The level of education for each working person (employee or own-account worker) is provided by the LFS.
– *Filling the matrix: labour volumes*
  After these five steps all individuals have been linked to one of the SAM household types. The next step is to fill the table with labour volume figures. This is in fact relatively easy, since the LFS contains information on hours worked by employees and own-account workers. In fact, in selecting the household types (step 1 to step 5) the information on labour volumes is already obtained. These labour volume figures still have to be raised to the level of the LA.
– *Filling the matrix: wages and salaries*
  The last step is to calculate the wages received by the households. Unlike the labour volume, this cannot be obtained from the LFS (information on the level of wages is not available in the LFS). We use the information from the LA to fill in the wages in matrix (4,3). The procedure is as follows:
  – The LA supplies wages by gender, education level and branch of industry (information used to fill matrix (3,2) - see I introduction).
  – From the five-step exercise performed above is known the labour volume of different types of labour supplied by each type of household.
  – Using the labour volume figures (for example the labour volume of high educated male employees in the business services) of each household as a distribution code, the total wage sum (of high educated male business services employees) can be divided over the 12 household types.

This procedure of splitting the wage sum over the household types uses the (reasonable) assumption that the type of household where the employee belongs to, does not influence the hourly rate of this employee.
See also the scheme on the next page.

4.3 Final consumption expenditure, submatrix (1,6)

The main data sources for the compilation of data on the income and expenditure of households, i.e. accounts 4 up to and including 6 in the SAM, are the Socio-economic Accounts (SEA). This partially integrated framework provides consistent information on income and expenditure for about 50 household groups. In addition to the household

Scheme: Assigning household types to persons using the LFS



groups included in the Dutch SAM, the SEA also contain a breakdown into level of income. The income data included in the SEA are based on the Income Statistics of Statistics Netherlands, while the data on final consumption expenditure are derived from the Budget Survey of Statistics Netherlands. Furthermore, the SEA have in principle been made consistent with the income data for the household sector, included in the system of national accounts. However, some differences, mainly of a conceptual nature, have not been eliminated.
In relation to final consumption expenditure, the SEA starts from the Budget Survey. The Budget Survey measures the net income and expenditure of households. The focus is on a description of the consumption patterns of private households.

Due to the small size of the sample, consumption data have not been calculated by applying a grossing-up procedure. Instead, the estimation of consumption patterns by household group has been based on a regression analysis, using a separate equation for each of the product groups distinguished. In doing so, the value of the consumption of the relevant product group has been used as dependent variable, while the main source of income, in combination with age, number of persons in the household, and income class constitute the independent variables. The resulting data have been adjusted for differences in population.

Furthermore, additional estimates have been included. In relation to the former adjustments, the (personal) expenditure of persons in institutions should be mentioned. Examples of additional estimates are the (imputed) service charges of banking and insurance, and expenditures for the replacement and repair of goods that are covered by non-life insurance claims. The imputed rents of owner-occupied dwellings are another example.

The adjusted data of the Budget Survey lie below the corresponding levels in the SEA. The remaining statistical discrepancies are about 4% in terms of total final consumption expenditure. Not surprisingly, the largest discrepancies are found with expenditures on tobacco, and beverages. These statistical discrepancies have been allocated proportionally to household groups.
To deal with some discrepancies between the sum of transactions by household group in the SEA and the corresponding figure in the NA, a fictive household group, called households undivided, is introduced in the breakdown of the household sector.

4.4 Other accounts

Types of taxes and social contributions
There are various types of taxes, social contributions and subsidies in the Netherlands. They are charged on various types of transactions: transactions in goods and services, transactions in relation to production activities, income transactions, etc. To show this relationship explicitly, a tax account has been introduced in the Dutch SAM. By doing so, it is possible to examine more closely the effects of government policy on e.g. the distribution of income among various household groups.
A subdivision of taxes and subsidies into different categories can be based on the following two criteria: the purpose and the base on which it is levied. The taxes are classified by the base on which they are levied and the social contributions are classified by the purpose of the 'tax'. As a consequence, the taxes, social contributions and subsidies have been subdivided into the following broad categories:
1. VAT
2. Excise duties
3. Environmental levies
4. Import duties
5. Other taxes on production and imports
6. Subsidies
7. Current taxes on income
8. Other taxes on income and wealth

9. Legal social security contributions
10. Other private social security contributions
11. Imputed social contributions
12. Contributions to pension schemes

Account 13 of the Dutch SAM is the tax account. In the row of this account, the relationship between each tax and the transition on which the tax is levied is shown: taxes less subsidies on products in the goods and services account (cell 13,1), other (not product-related) taxes less subsidies on production in the production account (cell 13,2), taxes and social contributions levied on the income and wealth of resident sectors in the distribution of secondary income account (cell 13,5), and finally, taxes levied on foreign income and wealth in the current account of the rest of the world (cell 13,14). In the column, the receipts of taxes and social contributions are specified in cells (3,13), (4,13), (5,13) and (14,13).

5 Perspectives

The Dutch SAM presents both data on production and labour markets and data on the distribution and use of income by household group. In the extension of the SAM towards a System of Economic and Social Accounting Matrices and Extensions (SESAME), the economic information in the SAM is completed by other important aspects of human life (see Keuning 1996a and 1997b). A strong argument for such a system is the increasing global awareness of the interaction between social and environmental issues and the economic process.
In the end, the development of SESAME will yield an integrated description of economic, social and ecological phenomena. The usefulness of such a statistical information system is the possibility of deriving a whole range of economic and social summary indicators

Annex Pilot-SAM for Portugal

1 Background of the SAM in Portugal

The data sources

In Portugal, National Accounts (NA) are the only statistical system that integrates and reconciles different data sources on labour market and households' expenditure or income. There is not a framework of satellite accounts like Labour Accounts and Social-Economic Accounts. NA's values are then the most reliable and so, in the compilation of the Portuguese SAM, they are taken as constrains, which means that a top-down approach is adopted. However, in order to breakdown the aggregate values from NA some specific data sources are used. Their totals may not be as reliable as those from NA but usually their structure is closer to the phenomenon in scope. For instance, the Household Budget Survey structures were used to breakdown compensations by type of household.

Besides **NA,** which is the fundamental source, the relevant sources (with a sufficient degree of quality) to built the pilot-SAM and its limitations are:
Labour Force Survey (**LFS**) - for 1995 the data quality is acceptable but for 1996 and 1997 this data has some drawbacks, which could create some limitations to its utilisation for 1996 and 1997.

Household Budget Survey (**HBS**) has two main drawbacks. The first is the reluctance people have to answer questions concerning their level of income and the second is that NA underused this source to estimate the levels of consumption of each product, which could imply significant discrepancies between the structures of the two sources.

Administrative Data "Quadros de Pessoal" - this source is used to estimate the wage rates although it is not representative of the very small enterprises; wage incomes are then, in some activities, overestimated. Besides, some activity branches are not well covered, especially those where public services weigh more, such as health and education. Income tax and Social Security files (**IT** and **SSF**) - the fiscal source would only enable the breakdown of the households in three groups of income type, in addition all households with a level of income below a limit in which there is an exemption in taxation are excluded. Finally, there is fiscal evasion and that is a problem difficult to deal with. Also, the SSF do not allow the linkage between the individual files and the type of household.

The motivations to built the pilot-SAM

When compiling the pilot-SAM some techniques of data integration and reconciliation are applied. Since their main purpose is to take the best of each source and come out with better figures one can expect that SAM has better figures than the individual data sources. SAM also shows the entire economic cycle (production, income generation, income distribution, consumption and saving) allowing, therefore, the simulation of politics' interventions in a macro or in a mesoeconomic level. Both previous arguments explain why since the decade of 80 there has been some tradition in the study of the methodological aspects of the SAM. They also explain the importance given by INE to the project of the pilot-SAM. Notice that INE is the unique producer of several statistical data in Portugal, for instance the Household Budget Survey, the Labour Force Survey and also the NA, all of them used in the SAM. There is the conviction that the confrontation of those statistical data sources through the SAM compilation can improve the quality of those same data sources. SAM can even show the need for the development of new data sources like the Labour Accounts.

2 National Accounting Matrix

2.1 Aggregate NAM

The aggregate National Accounting Matrix (NAM) is the matrix presentation (rows x columns) of the full sequence of accounts for the economy and its aggregates. Its compilation did not raise any problems since these values and tables had already been compiled for NA.

2.2 Detailed NAM

Portugal considered the minimum breakdown of 6 products (P6) and 6 Industries (A6), according to the NACE and as agreed in the LEG-SAM for the pilot-SAM. The LEG also set a minimum breakdown of 4 institutional sectors, however Portugal considered 5, according to ESA95 (S11-Non-Financial corporations; S12-Financial Corporations; S13-General Government; S14-Households; S15-NPISH (Non-Profit Institutions Serving Households)).
The Goods and Services Account (including Exports and Imports) was broken down by Products. The Production Account was broken down by Industries. The Generation of income account was broken down by primary input categories. The Allocation of primary income, the Secondary distribution of income account, the Use of disposable income account (uses) and the Capital account were broken down by institutional sectors. The Gross Fixed Capital Formation account was broken down by industries. As previously mentioned for the aggregate NAM, the detailed NAM did not raise specific problems since the statistical data needed to compile it was already available for the NA data. This was also the case of the tables sector by sector. Nevertheless its importance in the Portuguese case should be stressed. These tables are compiled for the institutional sectors and the Rest of the World for each type of property income (D.4), current transfers (D.5, D.6, D.7) and capital transfers (D.9). They are very useful because they already show “who pays to whom” and “who receives from whom”. Its reconciled statistical data comes from many data sources (tax sources, administrative sources, business and households’ surveys, Balance of Payments, the accounts of the respective institutional sectors). After being compiled and aggregated, those tables constitute themselves cells (4,4), (5,5) and (7,7) of the detailed NAM which are respectively the Property income, the Currents transfers and the Capital transfers.

3 Pilot SAM

3.1 Demand side of labour, submatrix (3,2)

This cell shows the allocation of income generated by industries (A6) to the different primary input categories (labour, capital). The labour force was broken-down in six types of labour (according to the gender and three education levels - G1, G2 and G3, respectively, level 1&2, level 3, and levels 4&5 of ISCED-97).

Compensations

The first step to estimate compensations by industry (i) and type of labour (j) was to determine average hourly earnings (w_{ij}) by the ratio of total earnings and hours worked, both from “Quadros de Pessoal” (QP). The total earnings (W_{ij}) were adjusted in order to incorporate the employers’ actual and imputed social contributions (it was assumed that they have the same rate in each branch); these earnings, and the hours worked (H_{ij}) were also adjusted to an annual scale.

The second step consisted in determining the relevant matrix of hours-worked (H_{ij}^{w}), using the data from LFS. Actually, three matrices were calculated, one for "wage-employment" (H_{ij}^{w}), another for "total employment" (H_{ij}^{t}) and the last one for the "other employment" (H_{ij}^{o}).
Finally, compensations were obtained from the product of each wij by the correspondent H_{ij}^{w}.
The first estimates were reconciled with NA data through the RAS method, which consists in an interactive process where two constrains were taken. The strongest was the NA's figures of compensations by branch; the other was the weight of each kind of labour in the total compensation obtained from the first estimates of compensations. The totals from NA and the structure of type of labour from the first estimates were the respected restrictions.

Mixed Income

The method for imputation was similar to the one described for compensations. The matrix of average annual earnings was calculated with administrative data assuming that the value of a certain labour unit was the same regardless the status of the provider (employee/self-employed). The number of self-employed (with and without employed people) by type of labour and branch was supplied by LFS and submitted to the NA's totals. It was then considered the product of the number of self-employed by annual earnings. The result is the matrix of self-employeds' compensations. The correspondent values of NA were available only by branch. The RAS procedure was then applied and the NA's constrain was considered the stronger one.

Gross Operating Surplus and Other Taxes less Subsidies on Production

The Gross Operating Surplus (GOS) and Other Taxes less Subsidies on Production items remained broken-down only by activity branch (A6) as they are in the detailed NAM.

3.2 Supply side of labour, matrix (4,3)

This cell describes the generated income in the economy and its allocation to resident institutional sectors. It describes their retributions for having participated in the economic process. The breakdown of "Households" deeps the social side of the pilot-SAM.
Initially the breakdown had two criteria: main source of income and household dimension. The income categories are: 1- compensations; 2- mixed income - income of self-employed with employed people and without employed people plus the estimated income from output produced for own final use without housing services; 3- gross operating surplus, property income, rentals of buildings and dwellings, housing services; 4- ageing pensions; 5- other current transfers. Households whose main source of income is compensations were also broken-down by 4 levels of dimension (households with 1 member, 2 members, 3 members and more than 3 members). Households whose main source of income is "Ageing pensions" were also broken down but only by 3 levels of dimension (households with 1 member, 2 members, more than 3 members). At the end 11 household categories were obtained. Nevertheless, at the stage of conciliation of data only four types of household were considered. The considered aggregated groups are: 1- compensations; 2- mixed income, gross operating surplus and property income; 3 - pensions; 4- other transfers.

Matrix R

	Activity branches	A/B				C/D/E		(...)	L/M/N/O/P/Q		
	Labour/branch	G1-M	G1-F	(...)	G3-F	G1-M ...	G3-F	(...)	G1-M ...	G3-F	Total
Households' sub-sectors	1		r_{12}								
	2										
	3					r_{ij}		(...)			$R_{i.}$
	4										
	Total	$R_{.1}$				$R_{.j}$		(...)			

Compensations

Compensations were broken down by 6 types of labour and by 4 types of households. The first step was to take from the HBS the matrix of values of compensations by type of household crossed with the level of education, the gender and the productive branch. It was called **matrix R.**

r_{ij} = compensation of household i from the (branch x type of labour) j
$R_{.j}$ = compensations of all households by type of labour
$R_{i.}$ = compensations of a certain household of all types of labour

Notice the formal identity between the elements from the last row of the above table - row $R_{.j}$ - and the correspondents of the matrix of cell (3a, 2). **Matrix C** as it was called, has the generic element $\mathbf{C_{ij}}$ of compensations broken down by 6 types of labour and 6 productive branches.

This matrix has already been reconciled with National Accounts data and it will be considered as constrain for matrix R.

Matrix C

Activity branch / Type labour	A/B	C/D/E	F	G/H/I	J/K	L/M/N/O/P/Q	TOTAL
	1	2	3	4	5	6	
G1-M G1-F G2-M G2-F G3-M G3-F	C_{21}	C_{22}	C_{ij}				$C_{2.}$
TOTAL		$C_{.2}$	$C_{.j}$				

The second step consisted in taking from matrix R the share of compensations by type of household for a certain branch and type of labour. Matrix **Rw** was obtained with the relative weights of each cell of R in the total of the respective column. Therefore, the sum of each column of matrix Rw is 1. The generic element is $\mathbf{rw_{ij} = r_{ij} / R_{.j}}$.

The third step consisted in allocating each value of matrix C through the structure of households of matrix Rw. The result was a matrix R1 with dimension 4x36 compatible with NA. The sum of the elements of each column of R1 is now identical to the correspondent element of the matrix C. Actually, the HBS supplies the breakdown of compensation by gender, three levels of education and only three major branches of activity, primary, secondary and tertiary sectors. Matrix R has a dimension of (4 x 18). In order to reconcile both matrices, C matrix was aggregated to the dimension (6 x 3), 6 types of labour and 3 major sectors.

The objective was to come up with a matrix of compensations by type of labour and type of household. So, the fourth step consisted in the aggregation of the values of the different branches according to each type of labour and household. The final matrix - matrix **C* -** has dimension 4x 6.

Matrix C*

	labour	G1-M	G1-F	G2-M	G2-F	G3-M	G3-F	Total
Households	1							
	2		c^*_{ij}					$C^*_{i.}$
	3							
	4							
	Total		$C^*_{.j}$					

c*$_{ij}$ = compensations by household "i" and type of labour "j" in the economy.
C*$_{.j}$ =compensations / type of labour / all types of households in the economy.
C*$_{i.}$ = compensations / type of household / all types of labour in the economy.
compensations The final C* is consistent with the domestic concept of compensations but the value of compensations in cell (4d, 3a) is a national concept. Matrix **C**** was built with relative weights by row of matrix C*, the weights of each type of labour within a type of household. The generic element of matrix C** is **c**$_{ij}$ = c*$_{ij}$ / C*$_{i.}$** The value of national compensations was previously broken down by household by applying a structure of compensations from HBS; the result was a vector with dimension 4x1. Finally, the structure by row of matrix C** was applied to this vector in order to unfold it by the different types of labour.

Mixed Income

The method and the statistical sources used for breaking down the Mixed Income Imputed to Labour are the same as for the compensations' breakdown.

Gross Operating Surplus

This amount refers to "housing services" and it was broken down by type of household with a structure of "housing services" from HBS.

3.3 Final Consumption expenditure, matrix (1,6)

The HBS supplied a matrix, with dimension (6x11), of consumption expenditure broken down by 11 types of households and 6 types of products; the NA supplied the total consumption expenditure by activity branch. The RAS procedure ran until the 6x11 matrix of consumption respected the totals from NA and the households' structure from HBS. Nevertheless, for a question of representativeness, it was considered an aggregation of 4 types of households (just like the breakdown of cell (4,3)).
Some adjustments were made to HBS's data, namely, in what refers to the insurance services. The HBS considers the total amount of payable premium as final consumption of financial services when only the amount of service charge, which is a part of the payable premium, should be considered and allocated to the fifth activity branch. The remaining amount should be allocated either to the fourth branch, in the case of non-life insurance premiums, or to the sixth branch, in the case of workmen's compensations.

3.4 Property Income, matrix (4,4)

In order to breakdown the Property income the RAS method was applied to both matrices: type of Property income (resources) (row) by type of households (column) and type of Property income (uses) (row) by type of households (column). Both matrices were filled in with data from HBS. The respected constrains were the structure (by type of household) from HBS and the totals (by type of Property income) from NA. Each row of the resulting matrices concerns one type of property income (received or paid by households) and it was considered that the structure of that vector remains the same no matter what is the institutional sector that receives/pays it to the households.

The Property Income attributed to insurance policyholders was broken-down by applying a direct structure of premiums, paid by households, after deducting the service charge.
The rents paid by the R.o.W. were broken-down with the structure of received rents from resident institutional sectors.
Finally, the values of different type of Property income were aggregated according to the institutional sectors, in order to fill in the SAM.

3.5 Current Transfers, matrix (5,5)

The totals of Current transfers, given by NA, were broken down according to simple structures, from HBS, and not by an iterative process, as the Primary Income was.
Concerning households' resources, the Social Benefits other than social transfers in kind (D62) were broken down with the structure of "Pensions", the Miscellaneous current transfers (D75) and Non-life insurance claims (D72) were respectively broken down by "Miscellaneous incomes" and "Insurance claims".
In what refers to households' uses, the Current taxes on income and wealth (D5) were broken down with a weighed structure of the Income Tax (IT) and the Real estate tax (RET), both of which in Portugal represent 98% of taxes' receipts. Concerning IT, it was previously taken into account the proportion of the amount of tax paid by some representative taxpayers: employees, self-employed, pensions, property income and lotteries. The proportion of each of these categories was crossed with the structure by type of household. Concerning RET, it was used a weighed structure of the urban and rural RET.
Actual social contributions (D611) also had some adjustments: from NA it was taken the relative weight of contributions of employees, employers and self-employed on the total amount of actual social contributions. As social contributions are proportional to the compensations, a weighed structure of monetary and in kind compensations was applied to the amount of contributions paid by employees and employers. To the amount paid by self-employed, a weighed structure of compensations of self-employed with and without employed people was applied. Then, the proportion received for each institutional sector was calculated and assumed that all the receiving institutional sectors had the same households' structure.
Concerning Imputed Social Contributions (D612), it was applied the structure of Pensions. To the Miscellaneous Current Transfers (D75) it was applied the structure taken from the Miscellaneous Expenses and to the Net Non-Life Insurance Premiums (D71), the structure of non-life insurance premiums. For all these transactions the proportion paid to each institutional sector was calculated and it was assumed the same household structure for all them.

4 Perspectives for the future

Through the development of the pilot-SAM it has been shown that the Statistical Portuguese System lacks some statistical sources, under uses others, and in general does not reconcile data of the different sub-systems. The major perspective is to continue the process of reconciliation of data through the development of a SAM on a regular basis. This means to produce a SAM for each year of NA changing basis. The production of a SAM year by year will depend on the development of new sources, namely on the existence of an annual survey on household expenditure.

Annex Pilot-SAM for the United Kingdom

1 Background of the SAM in the UK

The UK Office for National Statistics (ONS) produces annually comprehensive supply-use tables and sector accounts. The ONS does not regularly produce a Social Accounting Matrix (SAM), though an official UK NAM was produced for 1993 by David Hughes (ONS, 1993). As this did not include the household breakdown done in this exercise, this pilot SAM for 1996 is the first UK SAM to be produced according to ESA 95 principles. To construct the SAM, we have in places had to make assumptions. The SAM consists, in part, of published readily available data, and, in part, of data that we have had to estimate. This means that this SAM should be viewed as a pilot that is open to revisions over and above the usual revisions made as part of the annual publication of National accounts. This also means that where we suggest ways of dealing with missing data, these methods should not be taken as prescriptive.

The UK has a long history of Social Accounting Matrices. Several SAMs have been produced by academics, including Richard Stone (Nobel Prize winner in economics for his contribution to national accounting) in the 1960's.
Although SAMs are one of the more comprehensive ways of integrating different sources with national accounts, it is not the only work of this type done in the UK. Work has been done on reconciling the Labour Force Survey to the Workforce Jobs series- the latter currently provide the employment data for National accounts. Similar work has been done on reconciling earnings data from different surveys.

The next sections will cover the sources used in the construction of the SAM, split into the sources used for the National Accounting Matrix part of the SAM, and the breakdown specific to the SAM. Then there will be a section covering the structure of the SAM, and following on from this a section on the filling in of the individual cells, with special attention paid to those cells where numbers are not directly taken from the annual publications of national accounts.

2 Sources

The SAM consists of two parts; one is a matrix representation of national accounts (NAM) and a further disaggregation of certain cells, which turns the NAM into a SAM

2.1 Sources for the NAM

The main source for the NAM is the annual publication of the UK National Accounts consisting of 3 volumes. These are:
1) United Kingdom National Accounts The Blue Book (hereafter Blue Book or BB)
2) UK Economic Accounts (EA)
3) United Kingdom Input-Output Supply and Use Balance (IO)

For this exercise the Blue Book chosen is the 2001 edition.
The data on capital consumption comes from Economic Trends March 1999, The capital stock of the United Kingdom – some new developments in coverage and methodology. This article gives capital consumption by industry. These numbers were not re-published to fit any later Blue Book.
Underlying the UK national accounts are also a range of data organised in classification tables, which allows the user to disaggregate the Blue Book totals into its component series. These are used particularly in the redistribution cells, as the disaggregated series have, for the large part, a use sector and a counterpart recipient sector.

The Dividends and Interest Matrix provide information on interest flows.
The Perpetual Inventories Model provides data on net capital formation.

Where data do not exist.
Although totals can be obtained from the national accounts, and a breakdown either by industry or sector is sometimes available, the joint breakdown by both categories is only occasionally available. At the same time, sometimes the total uses and resources for each sector are available, but not the specific flows from one to another. When this is the case other methods have to be used, and this is explained in detail in the section covering the individual cells.

2.2 Sources for the SAM

The main data sources used to provide the further breakdown of individuals who supply labour and their households, which is needed for the SAM, are the Labour Force Survey (LFS) and the Family Expenditure Survey (FES). The LFS provides information about the age, educational qualifications, industry and hours worked of all in employment and the earnings of employees. The FES, which is the UK household budget survey, provides information about other forms of market income, transfers and expenditure.

3 Constructing the NAM

In this section the process of filling the individual cells of the SAM is detailed. In moving from the T-accounts to a matrix representation, it is not always obvious at first glance how to transfer the numbers. The table below indicates how each cell is filled in for those cells where data are directly available or need only a minimal amount of explanation. Those cells, which required more work to fill, are covered in detail in the full text section below.
In addition to filling out the usual cells, the UK had to introduce an extra column to deal with statistical discrepancies between the net lending/borrowing position implied by the capital account and the financial accounts.

Table 1 Cell description

Cell	Description
1.1	All data come from BB 2.1
1.2	All data come from BB 2.1 Use Table
1.6	All data come from BB 2.1 Use Table
1.7	Changes in inventories and acquisition less disposals of valuables. (including transfer costs)
	Only sector and industry totals are available. Industry totals come from BB 2.1 whereas sector totals come from BB 1.7 P.52 and P.53. Due to a complete lack of data to fill in the individual cells, this cell has been left empty apart from the totals.
1.8	All data come from IO Table 6. Dwellings, transfer costs, adjustment for sales by final demand and valuables are given its own column, as these are not allocated to industries. The columns do not contain sales by final demand, and are therefore total consumption at purchaser prices rather than total inputs.
1.10	All data come from BB 2.1 Use Table
2.1	Column totals come from BB 2.1 Supply table, Row totals come from 2.1 Use table.
	Diagonals are filled in using information from IO Table 1. This gives gross output for all 123 industries and principal product as a percentage of total industry gross output. These are multiplied together. Off-diagonals have been left blank due to their potential disclosive nature.
	There are two cases where the diagonal entry would have been larger than the product total. In both cases the differences are small enough to be attributable to the percentages being rounded to the nearest whole number. Also in both cases the numbers are restricted to the product total. This is consistent with numbers from the IO table 1, which state that for these groups 100% of total gross output of products are principal products.
3.2	See below
3.10	Data are from BB table 1.7 D.1 (CDID KTMN)
4.1	The industry breakdown of taxes paid is from BB 2.1 Supply table and table 1.7 D21-31 confirms that this amount goes to government There is a sum of money that goes through General Government to external sources. These are consequently paid by general government to the rest of the world in (10,4) except for VAT to the EU. ESA95 stipulates that, although VAT is organised by the general government, it is a direct transfer to the rest of the world. As there is no product breakdown of this tax a dummy account is introduced which subtracts the amount of the VAT. It is subsequently reintroduced in 10-1 through a dummy account where this tax is added in.

4.3	Data are from BB table x.1.3 B.2n B.3n D.1 D.2 and D.3. See below for complete explanation.
4.4	See below
4.10	Mainly results from 4.4 except that, in addition, this cell includes total taxes less subsidies on production and imports paid to the rest of the world. This is paid by general government. The sum paid is the difference between government resources in the allocation of primary income account from these taxes less subsidies (NVCC-NMYF) and the taxes and subsidies received by general government in 1.7 D.21 – D.31
5.4	Data are from BB 1.7 B.5g net of K.1. The numbers are entered into the matrix on the diagonal.
5.5	Data are from x.1.4 D5 D6 D7 D6 and D7 are split into subgroups D.61 D.62 D.71 D.72 D.73 D.74and D.75. Using the classification tables, each of these series can be disaggregated and the from-whom-to-whom relationships become apparent through this exercise.
5.10	Results from 5.5
6.5	Data are from BB x.1.4 B.6n (The numbers can also be taken from 1.7 B.6g and net it with K.1.) Data are entered on the diagonal
6.6	Data are from BB 1.7 D.8 This cell only involves households and the financial sector.
6.10	Data are from BB 1.7 D.8 Uses
7.6	Data are from BB 1.7 B.8g, net of K.1. Data are entered on the diagonal
7.7	Data are from BB x.1.7 D.91 D.92 D.99 and K.2. Using the classification tables, each of these series can be disaggregated and the from-whom-to-whom relationships become apparent through this exercise. Acquisitions less disposals of non-produced, non-financial assets are such that the negative number from government is equal to the sum of the other numbers and is entered as government payments.
7.9	Data are from BB 1.7 F.2 to F.7 Resources
7.10	Results from 7.7
8.2	The data are derived by taking proportions from ET March 1999 (this table gives capital consumption by industry, but is not consistent with the 1999 Blue Book) and applying these proportions to Blue Book total (BB 1.7 K.1). This only gives industry totals, and not by product and industry, so the entries have been made on the diagonal. Dwellings and transfer costs are given a separate column and row as they are not allocated to industries consistent with (1,8)
8.7	Data on the structure of the cell are supplied from the Perpetual Inventories Model, and then fitted to the national accounts totals using the RAS technique.
9.7	Data are from BB 1.7 F.2 to F.7 uses (cell 7a by 9g is the sum of other accounts receivable and statistical discrepancy)
9.11	Data are from BB 1.7 F.2 to F.7 Uses minus Resources
10.1	Data are from BB 2.1 Supply table
10.3	All data are from BB table 1.7 D.1 (CDID KTMO)
10.4	Results from 4.4
10.5	Results from 5.5
10.6	Data are from BB1.7 D.8 Resources
11.7	Results from 7.7
11.10	This is a balancing item in the spreadsheet worked out from other cells. The amount 600 equals the amount in BB 1.7 B.12.

Cell 3.2

Data on gross operating surplus, compensation of employees and other taxes on production come from BB 2.1 Use table. The capital consumption total comes from BB table 1.6.2 –K.1 For the industry breakdown of capital consumption. see the note for cell 8,2. The gross mixed income total and net mixed income totals come from BB table 1.6.2. Gross mixed income by industry is an unpublished series, but we are allowed to use them as an input series.

To calculate the capital consumption components of gross mixed income, first the ratio of gross mixed income to gross operating surplus is calculated to get a proxy for the size of mixed income in the industry. Then this ratio is applied to the capital consumption data. This gives a range for the relative weight of capital consumption from mixed income activity by industry. However the total is about twice the size of the economy total (This arises from this method not taking into account that a part of net mixed income is compensation of labour, and so it overestimates capital consumption). The capital consumption numbers derived from the previous exercise are then scaled to sum to the UK total (from Blue Book).

Cell 4,3

The data for 4.3 are filled in using the sector accounts, which are T-accounts in the UK. The table below is shows the CDIDs (the series identifiers used in the UK national accounts) so that it can be easily reproduced. For example, FAIR is the series identifier for non-financial corporation's net operating surplus. This can be found in the Blue Book in table 3.1.2 uses (the gross numbers are from the 3.1.3 resources).

Ideally the data should come from the resources part of the allocation of primary income account. However the codes for net operating surplus come from the uses of the generation of income account, because the numbers in the primary income account are only presented in gross form and the gross operating surplus numbers which are present in both accounts are identical.

Table 2 Identifiers for cell 4,3

	Compensation of employees	Net mixed income	Net operating surplus	Other taxes less subsidies
Non-financial corporations			FAIR	
Financial corporations			NHDA	
General government			NMXW	NMYD-NMCC
Household+NPISH	QWLY	QWLV	QWLU	
Unallocated			Unallocated	
Total	NVCK	EAWX	NQAR	NMYD -NMCC

Property Income Cells (4,4), (4,10) and (10,4)
These three cells are combined in such a way that the data give the uses and resources for 5 different categories of property income to and from the institutional sectors including the rest of the world. This gives a 5 by 5 matrix, which is filled, where possible, using the information contained in the categories and is known about the different sectors. Once the 5 by 5 matrix has been completed, it can be split into cells 4-4, 4-10 and 10-4 where 4-10 and 10-4 correspond respectively to the receipts and uses of the Rest of the World. (A similar process works for current transfers; 5-5 5-10 and 10-5 and capital transfers; 7-7, 7-11 and 11-7) Column and row totals are from table x.1.3 D.4 split into subcategories of (D41, D42, D43, D44 and D45)

Starting from the classification tables, the subcategories D.43 (Reinvested earnings on foreign direct investment), D.44 (Property income attributed to insurance policy holders) and D.45 (Rent on land and sub-soil assets) can be filled in.

D.41 Interest
The Dividends and Interest Matrix provides detailed information on interest received and paid according to the instrument earning the interest.

At this level of detail, for the vast majority of the instruments, there is either only one recipient sector or only one sector making the payments. This allows us to determine the flows directly. For the remaining instruments (covering payments and receipts of less than 5 per cent of the total amount), there are more than one receiving and paying sector. Here we divide out the payments according to the relative sizes of the receipts.

D.42 Distributed income of corporations
There are two main groups here, one is dividends, and the other is withdrawals from quasi-corporations. The withdrawals from quasi-corporations were filled in without problem. However, due to lack of information on the dividends structure, it is not possible to fill out this cell and the total is entered into a dummy account.

4 NPISH

In the UK national accounts NPISH transactions are combined with those of the household sector for publication, with only a few exceptions. Where transactions are known to exist estimates of the flows are made for the accounts, but they are considered to be of insufficient quality to enable them to be published separately. For this exercise, it is imperative to exclude the NPISH flows so they have been separated out. But, given the quality of the data, the resulting estimates should be treated with caution.

5 From NAM to SAM

The SAM goes beyond the Blue Book specifically by disaggregating the household sector by a range of characteristics. This necessarily requires information not contained in the system of national accounts. This section deals with the part of the SAM that has been disaggregated past national accounts levels.

The two main sources used to provide the more detailed breakdown needed in the SAM are the Labour Force Survey (LFS) and the Family Expenditure Survey (FES), which is a household budget survey. As the LFS collects data on a wide range of labour market indicators, including earnings for employees, it is used to provide detail about the demand of labour in cell (3,2). The FES collects information on income, transfers and expenditure. It is the main source used to breakdown all of the cells from supply of labour (4,3) to final consumption expenditure (1,6). The production of the pilot SAM has helped to disclose inconsistencies between the national accounts and the household survey data. In particular, the relative earnings of the different industry groups implied by cell (3,2) do not make sense. They arise as a consequence of a lack of coherence between data sources. Until this incoherence can be resolved the results shown in the pilot SAM should be treated with caution.

5.1 Classifying individuals and households

The SAM aims primarily to show the role of people in the economy by expanded certain cells of the NAM to show in more detail the transactions that involve individuals and households. This can be done in a number of ways according to the characteristics of the individuals and households that are of interest. In this particular case, individuals are categorised according to their sex and their educational attainment. Households are categorised according to their main income source: wages and salaries; mixed income (including property income); income in relation to old age; and other transfer income.

The classification of individuals is needed for the demand of labour in cell (3,2). Labour input is disaggregated by industry group and the characteristics of the labour input. Labour input is split into 6 groups based on sex and educational attainment. The three different levels of education are lower (corresponding to ISCED levels 1 and 2), middle (ISCED 3 and 4) and higher (ISCED 5 and 6). The LFS collects all the information about employment status, industry, education level and earnings for employees necessary to provide this disaggregation.

In the pilot SAM, households are classified into 4 groups according to their main of income – wages and salaries; mixed income (including property income); income in connection with old age; and other transfer income. This disaggregation can be provided by the FES as it collects details about income from a range of sources for each adult household member. It is not possible to produce this disaggregation directly from the LFS as the only income data collected is wages and salaries for employees. However, it is possible to use the Dutch approach (see Netherlands Annex 4,2) to produce an approximate disaggregation by using the employment status of the household members as a proxy of income. Cell (4,3) shows the flow of wages and salaries (and mixed income) from the type of labour to the type of households. This cell brings together classifications based on the LFS and the FES. The two surveys cannot be fully reconciled but the disaggregations based on the two surveys produce comparable estimates for the number of households in each class.

5.2 Demand side of labour, cell (3,2)

In the sub-matrices (3,2) and (3,10) wages and salaries (and the underlying volume of labour) per industry is broken down by the type of person employed. The same type of labour is also used for the household groups that supply the labour. This supply is shown in sub-matrices (4,3) and (4,10).

Table 3

		National accounts			Redistribution of income	
Type of income	**Cell**	**Code**	**Description**	**Percent of cell total**	**Description**	**Notes**
Generated income						
	(4,3)	D11	Wages and salaries in cash and kind	74.4%	Wages + salaries	
		D12	Employers' social contributions	11.3%	Employees' National Insurance contributions+ Contributions to Pension Funds	
		B2	Net operating surplus	8.9%	Imputed rent	Variable specially created for SAM.
		B 3	Net mixed income (self-employment income for sole traders)	5.4%	Income from self-employment	ROI variable corresponds to B3 + D422
Property income						
Resources	(4,4)	D41	Interest (on gov't securities, national savings, banks, building societies) (from UK)	20.5%	Investment income	ROI investment income is only two thirds of D41 + D421
	(4,10)	D41	Interest (from ROW)	1.5%		
	(4,4)	D421	Dividends on shares etc.(from UK)	13.2%		
	(4,4)	D422	Income withdrawals from quasi-corporations	18.7%	Income from self-employment	ROI variable corresponds to B3 + D422
	(4,4)	D44	Property income attributed to insurance policy holders	46.0%	Expenditure on life and non-life insurance	ROI variable is current expenditure. NA is based on stock.
	(4,4)	D45	Rents on land and sub-soil assets	0.1%	Income from self-employment	Insignificant amount with counterpart in uses
Uses	*(4,4)*	*D41*	*Interest (payments for loans for house purchases and other lending) (to UK)*	*98.2%*	*Mortgage interest payments (MIPs)*	*ROI figure less than half NA. Possibly due to under-recording of MIPs but also assuming that other interest is propotionate to MIPs.*
	(10,4)	*D41*	*Interest (to ROW)*	*1.2%*		
	(4,4)	*D45*	*Rents on land and sub-soil assets*	*0.6%*	*Income from self-employment*	*Insignificant amount with counterpart in resources*
Transfer income						
Resources	(5,5)	D61	Social contributions	0.2%	Pro-rated by number of households	Insignificant amount
	(5,5)	D621	Social security benefits	23.3%	Income from contributory benefits	
	(5,5)	D622 + D623	Private funded and unfunded employee social benefits (from UK)	31.4%	Income from occupational pensions	
	(5,5)	D624	Social assistance benefits from central government	23.8%	Income from non-contributory benefits	
	(5,5)	D624	Social assistance benefits from local government	7.5%	Housing benefit and council tax rebates	
	(5,5)	D72	Non-life insurance claims (from UK)	10.5%	Expenditure on non-life insurance	Counterpart in uses
	(5,5)	D75	Miscellaneous current transfers (from UK)	2.0%	Pro-rated by number of households	
	(5,10)	D75	Miscellaneous current transfers (from ROW)	1.3%		

The Labour Force Survey is used to construct a matrix showing wages and salaries for the six industry sectors and the six types of labour. At the same time, similar matrices are construct to show the volume of labour by jobs, full-time equivalents, and by hours worked. In order to produce a matrix that is consistent with the rest of the NAM, this LFS-based matrix has to be adjusted to conform with national accounts control totals for compensation of employees by industry by raking and scaling (RAS). As the LFS only collects information about wages and salaries, this process is dependent on the assumption that the non-wages components of compensation of employees are proportional to wages and salaries. A similar process can be used to produce a labour volume matrix that is consistent with the national accounts estimates of jobs. There is no national accounts' estimate of hours worked but a matrix of hours worked can be created by multiplying the number of jobs in each cell by the LFS average number of hours.
It is possible to find the average hourly compensation of employees by type of labour and industry by dividing the cells of the matrix for compensation of employees by the corresponding cells of the matrix of hours worked. In the UK case, the resulting matrix shows credible results by education level and sex, with hourly compensation higher for the more educated and higher for men than women. But the results by industry appear unlikely as they show compensation to be lower for industry group J/K (financial intermediation; real estate, renting and other business activity) than it is for industry groups C/D/E (manufacturing; etc.) and L to P (which is mainly the public sector). Results from the New Earnings Survey and the LFS give the opposite view and are consistent with each other. This suggests that there may be a problem with the quality of the industry breakdown in the national accounts figures.

5.3 The supply side of labour, cell (4,3), and distribution of income, cells (4,4), (5,4), and (5,5).

The disaggregation of the household sector for these cells in the SAM is based on data from the Family Expenditure Survey. An analysis of the redistribution of income (ROI) through taxes and benefits based on the FES is carried out annually in the UK. The variables created for this analysis are used in the SAM. Table 3 shows the national accounts aggregates (identified by ESA95 codes), the proportion of that each aggregate contributes to the total for the household sector for the cell, the ROI variable used in the disaggregation and a note of any difficulties with the disaggregation.

5.4 Final consumption expenditure, cell (1,6)

The Family Expenditure Survey is also used to provide the breakdown of final consumption expenditure by household type. The FES provides information on the proportion of expenditure on 16 different groups of goods and services attributable to each of the different household types. These proportions are then applied to the national accounts estimates for household expenditure for the same groups. The final stage is then to split these household expenditure estimates by industry using the allocations provided by the supply-use tables.

6 Summary

The UK pilot SAM needs to be treated with some caution as it has been necessary to make a number of assumptions in order to complete it. However, the process of construction it has been a valuable one. It has demonstrated a number of areas where the data are not sufficiently detailed to allow for the from-whom-to-whom relationship to be fully articulated. This is particularly the case for some cells where it is not possible to distinguish fully between the household sector and NPISH. It has also exposed areas where he macro data used in national accounts are not consistent with the micro data from surveys. This is particularly true of the breakdown of wages and salaries by industry

where national accounts estimates are significantly different from those shown by the Labour Force Survey and the New Earnings Survey, the UK annual survey of the structure of earnings. Even given these caveats, the SAM does yield some interesting findings and provides, as a diagnostic plausible savings estimates for the different household types. Cell (7,6) shows that the average household saved £1,393 in 1996, with wages and salaries households and mixed income households having savings of £2,265 and £3,470 per year, and households mainly dependent on income related to old age and those mainly dependent on transfer income having dis-savings of £229 and £85 per year respectively.

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