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A new method for compiling time series of national accounts data

Gert P. den Bakker and Robert A.M. van Rooijen

Recently, Statistics Netherlands has changed the method for compiling time series data after revisions of the national accounts. Instead of an annual backward calculation, the benchmark years/interpolation method is applied. After a short description of both methods the new approach is presented.

Introduction

One of the strong points of the System of National Accounts (SNA 1993) is that it creates a basis not only for detailed snapshots but especially for comparisons over time. Time series of national accounting data give a detailed account of the economic development of a country over time.
As such, they are of great importance for many users of the national accounts, often serving as a statistical basis for econometric studies, for instance.
The Netherlands Bureau for Economic Policy Analysis (CPB) uses time series of national accounting data as a basis for econometric modelling of the Dutch economy and the preparation of the annual 'Central Economic Plan' (the official economic forecasts for the Netherlands). Time series of national accounting data are also used by quantitative economic historians to analyse the economic development in the long run. Economic figures for periods in the past are used by politicians 'to learn from the past' and to prepare economic policy.

The SNA says nothing about the method of compiling time series. Although revisions of international guidelines are one of the important motives to revise national accounts and to make time series which are consistent with the revised data for the revision year, the ins and outs of revisions and time series are not discussed.

In the Netherlands, official national accounting data are available from 1900 onwards. In the course of time, national accounts have been revised repeatedly, followed by a backward calculation (Den Bakker, De Gijt and Van Rooijen, 1996). The time series were compiled with different methods, each method has its pros and cons. The next sections present a review of methods for the compilation of time series and a summary description of the method introduced in the Netherlands recently.

Methods for compiling time series

In the methods for compiling time series of national accounting data two archetypes can be distinguished:
- Annual backward calculation;
- Benchmark years and interpolation.

In both methods several variants are possible and a combination of (variants of) both methods is also conceivable. In the Netherlands a number of variants of the first method have been used in the past (Den Bakker and Van Rooijen, 1998). The benchmark years/interpolation method was used only recently in the backward calculation of the classification revision 1993, although benchmark years were also applied in the revision of the national accounting data for the interwar period.

Annual backward calculation

The first basic method for backward calculation of national accounting data boils down to the compilation of time series data year by year back in time. This can be done in different ways.

Method I.1

Method I.1 is a very drastic one. The figures for all years of the time series are compiled in the same way as the ones for the revision year. This means that the figures are compiled from scratch, starting with the (new) source material and using new classifications and definitions. The integration process is carried out all over again. It goes without saying that this method is very time consuming and requires a large staff input.

Method I.2

The figures for all years of the time series are determined by superposing corrections on the integrated figures before revision. The starting point is the consistent data set of national accounting data compiled in the past. The corrections resulting from the revision are superposed on this set. Because the old integrated figures are the starting point, the integration decisions taken in the past, are upheld.

Method I.3

This method starts out from the revised integrated set of national accounts data for the revision year. Subsequently, time series data are compiled by extrapolation using annual growth rates calculated before revision (if revised growth rates for a certain variable are available, then these are used). This method is applied for each variable on the chosen level of detail. The resulting data are inconsistent, mainly due to rebasing problems. As a consequence, the figures have to integrated again.

Method I.4

The starting point for this method are the old integrated figures before revision for all years. Firstly, corrections are made for revised definitions and classifications. The figures before revision thus reconstructed are the basis for the annual growth rates; these changes are subsequently used to extrapolate backwards.

Benchmark years and interpolation

The second basic method for backward calculation of national accounting data is basically the compilation of detailed estimates for one or more benchmark years in the past. The figures for the other years are determined by interpolation. This method can be applied in different ways.

Method II.1

The figures for the benchmark years are estimated from scratch, using new definitions, classifications and sources. The starting point is the (new) basic material; the figures are integrated all over again.

The figures for the years between the benchmark years are determined with the help of interpolation. In doing so the chosen level of detail is used, starting from the new integrated data set for the benchmark years. In the interpolation process annual changes before revision are taken into account.

Method II.2

The figures for the benchmark years can also be determined by using the original, integrated data set as a starting point. Corrections resulting from a revision are superposed on this set. These corrections are integrated before they are superposed on the original data set. As a consequence, strata of correction matrices become available (one for each revision) for all benchmark years. The figures for the years between the benchmark years are determined by interpolating the correction matrices.

A new approach: benchmark years and interpolation

Recently, Statistics Netherlands changed the method for compiling time series data of national accounts. The new method is variant II.2 of the benchmark years/interpolation method as described above.
In this method revision corrections are determined for all years in the period to be revised. However, the benchmark years are treated differently from the other years: the figures for the benchmark years are estimated with the help of detailed information, while figures for the other years are estimated more roughly, by interpolation. This, of course, does not mean that the figures for the other years are not judged on their merits.
In the benchmark years/interpolation method the supply and use table or input-output table is the integrating framework. These tables are compiled for both the benchmark and the intervening years.
The new method has a number of advantages:

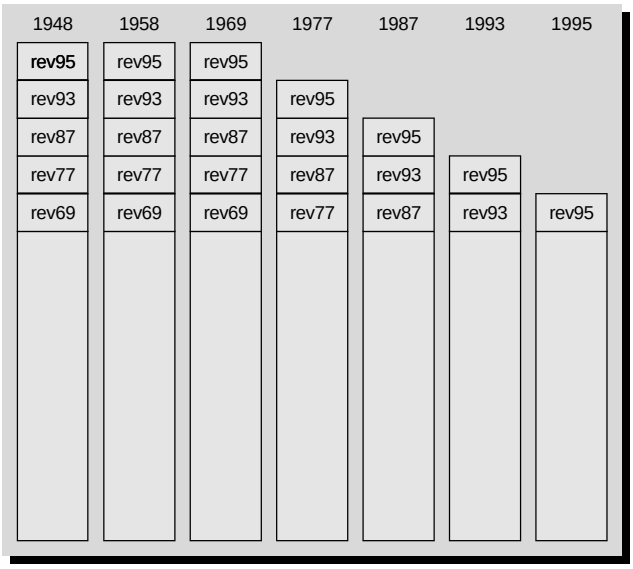
- it is transparent and relatively fast;
- the revision corrections are determined explicitly;
- decisions taken in the past on the integration of the data are upheld;
- in the case of a new revision, 'only' the revision corrections for the benchmark years have to be determined.

The benchmark years

Compilation of new time series data is necessary after a revision of national accounts has taken place. Such a revision is carried out for the so-called revision year. The new figures for that year are determined at a very detailed level. In fact, the revision year is the outstanding example of a benchmark year: it is the starting point for the backward calculation of the data.
The corrections which are carried out for the revision year have to be determined for the other benchmark years as well. This is done as much as possible with the help of the basic sources. However, the necessary information will not always be available. In that case the corrections have to be estimated with the help of all kinds of indirect information. For instance, corrections can be calculated back in time with the help of annual changes of a relevant variable.
The corrections for the benchmark years should preferably be determined in such a way that an integrated consistent set of revision corrections is obtained. For this purpose, the supply and use table is used in the Netherlands. However, these tables are only available from 1987 onwards. For earlier years the input-output table is the integrating framework. Clearly, not every single cell of the matrix will be judged on its merits.

In addition other data sets which have to be consistent with the figures in the integration framework are used in the compilation of time series data, e.g. data on fixed capital formation. These are used to estimate consumption of fixed capital and capital stock. Other examples are final consumption expenditure by purpose and employment.
In due course, once a number of revisions has been carried out, for all benchmark years strata of correction matrices become available (one for each revision). Figure 1 gives a schematic representation of the benchmark years/interpolation method; it shows clearly how the time series data are compiled by adding the strata of adjustment matrices to the original, integrated set of national accounts data (represented in the scheme by the white box).

Figure 1. Schematic representation of the benchmark years/interpolation method



In the benchmark years/interpolation method the choice of the benchmark years is very important, as they are the cornerstones for the time series. Obviously, years for which relatively much information is available should be chosen as benchmarks. Usually such years are revision years, for which much and sometimes new material is collected and analysed. Other examples of benchmark years are years in which population, occupational or industrial censuses are taken. The economic situation is also important for the choice of the benchmark year.
In the Dutch situation the present benchmark years are 1993, 1987, 1977, 1969, 1958 and 1948. The first three years are revision years. In the reporting year 1969 the 1968 SNA was implemented. In addition to that, a reclassification of enterprises was carried out and the value added tax was introduced. The year 1958 was chosen because in the past extra attention was given to that year in the compilation of the national accounts. Lastly, 1948 is the first year for which the international guidelines of the 1953 SNA were implemented. In addition, 1948 is the first 'normal' year after the Second World War, i.e. the most extreme influences of the war were no longer visible.

Interpolation

After the revision corrections for the benchmark years have been determined, the corrections for the intermediate years have to be estimated. They are determined with the help of an interpolation procedure especially developed for this purpose. The system for the interpolation is very flexible. For instance, it is possible to use direct information about a certain variable for one or more years.
In the interpolation procedure, each correction is determined separately within the framework of the input-output table (or supply and use table). To start with, the corrections for the benchmark years are expressed as a percentage of the original data. If we take a column of the input-output table as an example, this means that a

correction percentage is determined for each cell of the column. Subsequently, these percentages are interpolated between the benchmark years, assuming a linear pattern. In doing so, the structure as well as the development of the variables before revision is taken into account.

In general, the sum of the corrections for each cell will not be equal to the independently determined total of the column. To obtain balanced columns, it is assumed that certain cells in the column are more reliable than others. For instance, total output, intermediate consumption, value added and compensation of employees are relatively solid figures. The figures in the other cells are adapted to provide consistent columns.

The same method is used for the rows of the input-output table. Obviously, a number of constraints have to be taken into consideration. For instance, the total of a column of the table has to equal the total of the row. The corrections are determined in such a way that for all non-benchmark years integrated sets of revision corrections are obtained, with the same structure and level of detail as those for the benchmark years.

Estimation of growth rates and deflators

In the Netherlands the deflation method for national accounts data boils down to the use of the Laspeyres formula for volume changes and the Paasche formula for price changes. The crux of the method is that the weighting schemes are based on the most recent information: the weights for the volume changes are taken from the previous year and those for the price development from the reporting year. Longer series of volume and price developments are compiled by 'chaining' annual changes. The data in current prices, the growth rates and the deflators are estimated simultaneously and consistent with each other. In this way better current price data as well as better growth rates and deflators are obtained.
In the compilation of time series data, the same method will be applied. In general, however, revisions of national accounts data have a nominal character, and price indices of individual goods and services have seldom been adjusted. Obviously, growth rates and deflators of aggregates can also change as a result of changed weighting schemes. A detailed estimation of volume changes is only possible if input-output tables in constant prices are available. In the Netherlands this is the case from 1981 onwards. For the years before 1981, figures in constant prices are far less detailed. As a consequence, a rougher method has to be used.

Concluding remarks

Different methods of backward calculation may yield different results for the time series of national accounting data. As often, a compromise has to be reached between detailed methods on the one hand and rather rough methods on the other. The former requires much staff capacity and is very time consuming. A rough method boils down to a 'mechanism', which yields results in a relatively short period. It goes without saying that also in the case of a quick method certain quality requirements have to be maintained.
The fact that the international guidelines do not discuss revisions and backward calculations of national accounting data is probably one of the reasons that different methods are used for compiling time series data. Differences in methods between countries in compiling time series obscure international comparisons. For instance, time series can be compiled by applying annual changes as estimated before revision, starting with the revised (in many cases higher) level estimates for the revision year. After a number of successive revisions, a country using this procedure may become 'richer' in retrospect.
For the sake of the international comparability of time series of national accounting data, a standardisation of the methods for backward calculation of national accounts data at the international level might be considered.

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Behavioural gender segregation: Differences in time use between women and men

Ko Oudhof and Jeroen Pannekoek

Introduction

The employment structure has become an important domain in the combat against inequalities between women and men in the labour market. One of the objects of growing attention in the last decade has been the occupational gender segregation which concerns the clustering of women and men in different occupations. Several techniques of measuring segregation have grown out of the efforts to deal with this subject.

Although separate daily activities have a totally different time dimension from occupations, they can also be described as a set of units having differential distributions of female and male participation. In this article various measures of occupational gender segregation will be applied to data on daily activities, as collected in time use surveys.

This article examines the relationship between occupational segregation and segregation in daily activities, and the measurement of segregation, focusing on a procedure to compute segregation indices proposed by Blackburn et al. (1995). It also looks at the introduction of the time use surveys that were the sources for our data precedes and presents the results of the application of segregation measures on the time use data. The article concludes with a synopsis of the findings and a discussion on their implications and on future perspectives. Gender oriented segregation in the domain of time use

The concept of segregation generally refers to various types of inequalities, especially with respect to differential distribution of social groups to organisational units of a social system (e.g. James and Taeuber, 1985). The concept is mostly associated with the unequal access of geographical entities (neighbourhoods) or social entities (schools, enterprises, occupations etc.). Gender-specific inequalities in the access to industrial branches and occupations have long been the subject of sociological and economic labour market research, because occupational gender segregation was considered as one of the sources of wage differences between women and men (Blackburn et al. 1995).

Time use is another research topic which has traditionally enjoyed much attention from the gender perspective, especially because of the measurement of unpaid female production (household activities etc.). Micro-economic theoretical approaches and analyses are common to the research of labour market processes as well as to studies of unpaid labour, making it even more surprising that the analytical approaches of gender segregation have not been applied to gender specific inequalities in time use.

The central question in occupational segregation research can be summarised as follows: why are women represented disproportionately in various occupations. The same type of question might be formulated in a gender-oriented segregational approach of time use: *to what degree are some activities disproportionately performed by either women or men and why?* The activities are artefactual entities which are defined by a very specific measuring instrument (time use registration). Their true nature is that they are instances of individual behaviour which is the reason why it is adequate to refer to this type of segregation as *behavioural segregation*.

There are also some important differences between the entities that figure as objects of analysis of occupational and behavioural segregation. These need to be considered before we can take the next step in the analysis of time use.

Firstly, there is a difference in the relationship between individual persons and those entities. People generally have only one occupation, but they perform many different activities. Will this make a difference? No, but only on the condition that we keep our eye fixed on the starting question, especially with regard to the concept *disproportionately*. An occupation might be qualified as female because in comparison with the general distribution of 'allocated occupational entities' a larger proportion of women is employed in this occupation. In the same way it might be possible to qualify an activity as female when it is performed by a larger number of women than would be expected from the general marginal distribution. In the following section the exact measurement of segregation will be considered more closely.
In the second place occupations are rather long lasting characteristics of persons, while activities are almost transient events. Does this matter? Hardly, because the objective is not to consider individual attributes, but distributions of events: the assumed durability of the distribution is relevant, not the temporariness of the described entities themselves.

The third difference seems to be the fact that it is possible to consider not only the participation of people in activities, but also the time they spend on them, as will be done in this article. In reality, this is hardly a difference. One might also consider the time spent on an activity as a weight of that activity. Analogously one might consider the distribution of the time spent on activities as a weighted variant of the participation distribution. In the same way one might conceive weighted variants of occupational distributions, in which the working time is used as the weight. Conclusions from analyses on thus weighted occupational segregation would generally not differ very much from unweighted segregation, except presumably in the Netherlands and maybe also in Great Britain because of the large proportion of part time jobs.

Apart from the similarities between occupations and activities as possible entities in segregational analysis or between weighted and unweighted variants, it also remains very relevant to take into account the fact that each approach gives an answer to a slightly different question. Some questions on the gendered nature of the distributions and the answers on the segregational nature of the inequalities might be considered as more important from an emancipatory view. For example, one might consider the weighting by working time irrelevant compared with the primacy of the equal accessibility of occupations. But a totally different point of view might be taken if part time work appears to be strongly related to career opportunities in those occupations.

Measures of segregation

The index of Dissimilarity (ID)

The data from which segregation indices are computed can be arranged as in Table 1. For the application in this paper, this table pertains to the participation in activities *k*, during some period of time, for men and women. The number of men and women

participating in activity k are denoted by f_{1k} and f_{2k}, respectively. For the study of occupational segregation a similar table can be constructed were the activities are replaced by occupations and f_{1k} and f_{2k} denote the number of men and women in occupation k.

The row proportions of this table, denoted by $p_{k|1} = f_{1k}/n_{1.}$ and $p_{k|2} = f_{2k}/n_{2.}$, express the participation frequency by men (women) in activity k as a proportion of the overall participation frequency by men (women). Similarly, the column proportions, denoted by $p_{1|k} = f_{1k}/f_{.k}$ and $p_{2|k} = f_{2k}/f_{.k}$, express the participation frequency by men (women) in activity k as a proportion of the total participation frequency in activity k.

Table 1 Participation by Gender an Activity

Gender	Activity					Total
	1	...	k	...	K	
Men	f_{11}	...	f_{1k}	...	f_{1K}	$n_{1.}$
Women	f_{21}	...	f_{2k}	...	f_{2K}	$n_{2.}$
Total	$f_{.1}$	...	$f_{.k}$	...	$f_{.K}$	n

There is no segregation if the column proportions for men $p_{1|k}$ and women $p_{2|k}$ are the same (equal to $n_{1.}/n$ and $n_{2.}/n$, respectively) in all activities. In this situation, there are no typically *female* activities with an overrepresentation of women or *male* activities with an overrepresentation of men. Moreover, since the conditional distribution of gender is the same within each activity, there is independence between the variables gender and activity. Independence between gender and activity also implies that the row proportions are the same for both gender categories, i.e. $p_{k|1} = p_{k|2} = f_{.k}/n$
The other extreme, *complete segregation*, occurs if there are activities performed exclusively by men, activities performed exclusively by women and no activities performed by both men and women. In this case for some activities (male activities) the proportion of women, $p_{2|k}$, equals 0 and the proportion men $p_{1|k}$ equals 1 while for the other activities (female activities) the reverse is true.

The most popular measure of segregation is the 'index of dissimilarity' (*ID*), which is usually defined as (Inman and Bradley, 1991, Blackburn et al.,1995)

$$ID = \tfrac{1}{2}\sum_k \left| \frac{f_{2k}}{n_{2.}} - \frac{f_{1k}}{n_{1.}} \right| = \tfrac{1}{2}\sum_k \left| p_{k|2} - p_{k|1} \right| \qquad (3.1)$$

The *ID* is a summary measure of the distance between the participation distributions for women and men over the activities. Its minimum value is 0 and is attained when these distributions are equal (no segregation); its maximum value of 1 is attained if, for each activity, either f_{2k} or f_{1k} equals 0 (complete segregation).

The *ID* is independent of the row margins $n_{1.}$ and $n_{2.}$. That is, if one or both of the rows of table 1 are multiplied by a constant, the row proportions (and the *ID*) remain the same. In the literature on segregation indices this property is called *sex composition* invariance and it has contributed much to the popularity of the *ID*. It is especially important if indices are compared for different (sub)populations or different points in time. For instance, in the context of occupational segregation, it means that if the proportion of women in the labour market has increased between two time points and if in all occupations it has increased to the same degree, the segregation measure remains unchanged. For activities it means: if all women perform several activities and the increase is the same for all activities, the measure of segregation is unaffected.

Blackburn et al. (1995) gave another representation of the *ID*. For this representation the activities are div*ID*ed into male and female ones. Male activities are those for which the proportion of women is less than the proportion of women for all activities, $p_{2|k} < n_{2.}/n$, and the other activities are female. Thus, after ordering all K activities by the increasing proportion of female participants, the first c activities are male activities and the activities c+1 to K are female activities, where c is chosen such that $p_{2|c}$ is the largest proportion of women smaller than $n_{2.}/n$.

With this new variable, activity type, the 2xK-table (Table 1) can be condensed into a 2x2-table (Table 2).

Table 2 Participation by Gender and Activity type

Gender	Activity type		Total
	Male	Female	
Men	n_{11}	n_{12}	$n_{1.}$
Women	n_{21}	n_{22}	$n_{2.}$
Total	$n_{.1}$	$n_{.2}$	n

In terms of the participation figures in Table 2, the *ID* can be expressed as (see Appendix A)

$$ID = \frac{n_{11}}{n_{1.}} - \frac{n_{21}}{n_{2.}} = p_{m|1} - p_{m|2} \qquad \text{or as} \qquad (3.2a)$$

$$ID = 1 - p_{f|1} - (1 - p_{f|2}) = p_{f|2} - p_{f|1}, \qquad (3.2b)$$

with $p_{m|1}$ and $p_{f|1}$ the row proportions for men, and $p_{m|2}$ and $p_{f|2}$ the row proportions for women in the 2x2-table. This representation shows that the *ID* can be interpreted as the difference in the row proportions of the condensed table: the difference between the proportion of activities performed by men that are male activities and the proportion of activities performed by women that are male activities, or similarly for female activities.

The representation in a 2x2-table also shows how the *ID* summarises the difference between the row distributions of Table 1. The activity categories are first collapsed into just two categories: male activities (performed more by men than would be expected from the marginal distribution) and female activities (performed relatively more by women). Then, for this collapsed variable, the difference between the row distributions can be expressed as a single number: the *ID*. Since Table 2 was obtained by summation over the male and female activities, the *ID* is to a certain extent independent of the classification of activities: changes in the classification within the category male activities or the category female activities have no effect on this index.
If there is no segregation, there are no male or female activities (all proportions $p_{2|c}$ are equal) and the 2x2-table cannot be formed;

however, since in this case any division of the activities into just two categories will lead to a 2x2-table with equal row and column distributions, we may say that absence of segregation corresponds with independence in the 2x2-table.

Association in the 2x2 table and marginal matching

Another approach to measuring segregation is to concentrate on the 2x2-table and describe segregation as departure from independence, or as association, in this table. The *ID* measures depart from independence by the difference between row distributions but another possibility is to use the difference between column distributions. This leads to the so called Sex Ratio index, given by

$$SR = \frac{n_{11}}{n_{.1}} - \frac{n_{12}}{n_{.2}} = p_{1|m} - p_{1|f} = p_{2|f} - p_{2|m} \qquad (3.3)$$

with $p_{1|m}$ and $p_{2|m}$ the column proportions for male activities, and $p_{1|f}$ and $p_{2|f}$ the column proportions female activities. The *SR* is the difference between the proportion of men (women) performing male (female) activities and the proportion of men (women) performing female (male) activities. So it measures the extent to which activities by men are male activities and activities by women are female activities which has a clear interpretation in terms of segregation.

A choice between *ID* and *SR* is essentially a choice between comparing the row distributions or the column distributions of the 2x2-tabel and this will in general not lead to the same conclusions. For instance, if one or both of the columns of Table 2 are multiplied by a constant, the column proportions (and the *SR*) remain the same but the row proportions (and the *ID*) will change. Similarly if one or both of the rows of Table 2 are multiplied by a constant, the row proportions (and the *ID*) remains the same but the column proportions (and the *SR*) will change.

A difficulty with both statistics is that the maximum value depends on the margins. Both measures attain their maximum value of 1 in the case of complete segregation: all activities by women are female activities and all activities by men are male activities, but this maximum can only be attained if $n_{12} = n_{21} = 0$, and consequently $n_{1.} = n_{.1}$ and $n_{2.} = n_{.2.}$. So, in general, for given margins, the attainable maximum will be less than 1. For example, if the number of male activities ($n_{.1}$) is half the number of activities by men ($n_{1.}$) thus, $n_{.1} = \frac{1}{2} n_{1.}$, than the maximum value of the *ID* would occur if all $\frac{1}{2} n_{1.}$ male activities are performed by men in which case $n_{11} = 0$, $n_{21} = 0$ and *ID* = $\frac{1}{2}$.

In response to this problem Blackburn et al. proposed that the construction of the 2x2 table be adapted by following a procedure they call 'marginal matching'. After creating the ordered 2xK table, as explained before, a dividing point between female and male occupations is chosen in such a way that the total number of female activities ($n_{.2}$) equals the total number of activities performed by women ($n_{2.}$) and as a consequence $n_{.1}$ equals $n_{1.}$ and $n_{1.2}$ equals n_{21}. The segregation table has now become a symmetrical table. For this symmetrical table we have that

$$ID = \frac{n_{11}}{n_{1.}} - \frac{n_{21}}{n_{2.}} = \frac{n_{11}}{n_{.1}} - \frac{n_{12}}{n_{.2}} = SR \qquad (3.4)$$

So, the *ID* and *SR* are equal (to MM, 'Matched Margins', say) and either statistic is both the difference between the column proportions and the difference between the row proportions. Furthermore, the size of the category 'male activity' is chosen such that it could contain all activities by men and the size of the category 'female activity' is chosen such that it could contain all activities by women so that given the margins of the matched table complete segregation is possible.

The statistic MM, resulting from the matching procedure, can be interpreted as a measure for the extent to which female activities are performed by women and the extent to which activities by women are female activities. The *SR* has only the first of these interpretations and the *ID* only the second. Furthermore, the measure *MM* makes it easier to compare segregation across tables because, contrary to *ID* and *SR*, this statistic can attain the maximum value of 1 for given margins. Of course, the dividing point between male and female activities changes as the number of activities by men or women changes, but this is a consequence of constructing the measure such that it is not bounded by the size of the female (or male) category.

An additional interpretation of the statistic *MM* is obtained by viewing Gender and Activity type as two dichotomous variables taking values zero for men and male and one for women and female. It can then be shown that the correlation coefficient between these two variables equals the statistic *MM* and that this correlation coefficient can vary between 0 and 1 corresponding to no segregation (independence in the 2x2 table) and complete segregation.

Two typed of data on activities from the Time Use Surveys were used, as published by the SCP (Van de Broek, Knulst & Niggebrugge, 1997). Firstly, data on the participation of women and men in activities. For each of the 178 analysed activities the proportions were computed for women and men performing the activity at least once in the observation period of seven days. For the participation data a 2*178 table was constructed. For all activities in this table the row proportions of the female cells in relation to the row marginals were computed and were used to order the rows from high to low. Following the Blackburn procedure the 2*2-segregation table was produced by choosing the dividing point between female and male activities in such a way that the aggregation of the participation figures of both women and men in the female activities was equal to the sum of all participation figures of women. From this table the sex ratio index and the index of dissimilarity were computed.

The second type of data were the mean numbers of minutes that were spent in seven days on each of the activities by women and men respectively. For these time use figures exactly the same procedure was followed.

Overall behavioural segregation

The resulting outcomes of the computation of the measures of behavioural segregation are shown in Table 3. From the participation indices one might conclude that in the Netherlands the behavioural gender segregation declined clearly and consistently during the period 1975-1995.

Although the segregation indices are very useful indicators for overall trends, they will not show which activities contribute very strongly to the change in behavioural segregation. Table 5 (Appendix B) lists the activities that showed the largest decrease in the differences in participation by women compared with men, and thus contributed most to the descending segregation. The same was done for time use. The resulting summary in Table 5 shows that the decrease of segregation might for a large part be ascribed to smaller differences between female and male participation in

Table 3 Overall behavioural segregation indices (after marginal matching)

	1975	1980	1985	1990	1995
Participayion	0.194	0.186	0.182	0.177	0.161
Time use	0.184	0.172	0.168	0.159	0.154

household chores. The impression from the changed differences in time use is almost the same, but a few dissimilarities deserve attention: several activities (e.g. paid work and watching television) appear to be present in the top 20 of the time use summary, that were missing in the participation based list. This discrepancy can be understood as a consequence of the fact that many women and many men spent time on these activities in both years. The changes took place especially with regard to the amount of time and the differences therein spent on these activities.

Productive activities

If the measures of behavioural segregation are used to monitor gender inequalities, careful reflection should be given to the exact question which this measure would answer. If zero segregation were ever to be declared a policy end in the long term, the idea would surely not be that gender differences would be unacceptable for all activities. One might suppose that the objections would be directed against an unequal distribution of specifically burdensome activities being carried out by one sex, but if carried out by the other sex would lead to the same outcome. Gender segregation of leisure time activities might be considered completely acceptable: gender differences between watching television, reading a book or playing computer games are presumably without any objection from an emancipatory view. For this reason it might be preferable to take only those activities into account which could be characterised as follows: someone else might do it and produce the same result. Following Hawrylyshyn (1977) these activities are called productive. Without discussing the topic further here, participation in education is also considered as belonging to the set of productive activities.
The measures for productive behavioural segregation can be computed for this smaller set of activities in the same way as outlined for the complete list of time use activities.

The values of the segregation indices for productive activities are presented in Table 4.

The following lessons can be learned from the presented outcomes of the computations.

- Productive behavioural segregation is clearly higher when the behaviour is weighted by the time spent on activities.

Table 4 Productive behavioural segregation indices (after marginal matching)

	1975	1980	1985	1990	1995
Participayion	0.297	0.275	0.266	0.245	0.225
Time use	0.459	0.441	0.409	0.381	0.358

- Time use based productive behavioural segregation is diminishing somewhat faster than participation based productive behavioural segregation.
- Productive behavioural segregation is higher than overall behavioural segregation, as can be seen from comparison with the values presented in Table 3. The productive segregation indices show stronger downwards trends than the overall segregation indices. These trends can easily be understood by looking at Table 5 (Appendix B): the productive activities are represented much more strongly among the activities that show large decreases of differences between women and men. Moreover, the top five activities which show increasing differences, consist almost completely of non-productive activities.

Conclusions

Occupational segregation refers to the unequal distribution of women and men in occupations. Considering inequalities between the sexes in the participation in daily activities as a behavioural equivalent of occupational segregation has proven to be useful. The analyses of female and male participation in activities and the time spent on them resulted in perfectly interpretable and interesting outcomes.

In order to summarise the differences between the participation by men and by women in activities, the activities were classified into two classes: male activities (performed more often by men) and female activities (performed more often by women), following a procedure suggested by Blackburn et al. (1995). This 'marginal matching' procedure results in a 2x2 table, formed by classifying the activities by Gender and type of activity (male, female), with row margins that are equal to the column margins. For this matched table two widespread measures of segregation coincide: the *ID* (Index of Dissimilarity) and the *SR* (Sex Ratio index) and are named *MM* in this article.
The statistic *MM* can be interpreted as a measure for the extent to which female activities are performed by women and the extent to which activities by women are female activities, and similarly for men. Furthermore, the measure *MM* can attain the maximum value of 1 for given margins, which is not generally so for *ID* and *SR*, and can also be interpreted as the correlation coefficient between the two dichotomous variables Gender and Activity type.

The main conclusion from the analyses of the time use data appeared to be that behavioural gender segregation diminished clearly in the Netherlands in the period 1975–1995. Main causes of these changes are smaller differences in participation in household chores between women and men as well as diminishing discrepancies in the time spent on paid work and school. It would be interesting to explore somewhat further the application of the concept of behavioural segregation on these time use data. It would for example be very attractive to take the analyses one step further by applying the same approach to the separate age groups. In that way it will be possible to investigate whether, for instance, behavioural gender segregation is changing faster in younger age groups.

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Appendix A

The equality between expressions (3.1) and (3.2) can be shown as follows:

$$ID = \tfrac{1}{2}\sum_k \left| \frac{f_{2k}}{n_{2.}} - \frac{f_{1k}}{n_{1.}} \right|$$

$$= \tfrac{1}{2}\sum_{k=1}^{c} \left(\frac{f_{1k}}{n_{1.}} - \frac{f_{2k}}{n_{2.}} \right) + \tfrac{1}{2}\sum_{k=c+1}^{K} \left(\frac{f_{2k}}{n_{2.}} - \frac{f_{1k}}{n_{1.}} \right)$$

$$= \tfrac{1}{2}\left(\frac{n_{11}}{n_{1.}} - \frac{n_{21}}{n_{2.}} \right) + \tfrac{1}{2}\left(\frac{n_{22}}{n_{2.}} - \frac{n_{12}}{n_{1.}} \right)$$

$$= \tfrac{1}{2}\left(\frac{n_{11}}{n_{1.}} - \frac{n_{21}}{n_{2.}} \right) + \tfrac{1}{2}\left(\frac{n_{2.} - n_{21}}{n_{2.}} - \frac{n_{1.} - n_{11}}{n_{1.}} \right)$$

$$= \frac{n_{11}}{n_{1.}} - \frac{n_{21}}{n_{2.}} \qquad (3.2a)$$

where activities $k = 1 \cdots c$ are male activities and activities $k = c+1 \cdots K$ are female activities as defined in section 3.1.

To show the equality of the statistic *MM* and the correlation coefficient, we first define two dichotomous variables: Gender (G) with values 0 and 1 for men and women and Activity type (A) with values 0 and 1 for male and female activities. If we denote the cell proportions of Table 2 by $p_{ij} = n_{ij}/n$, the row marginal proportions by $p_{i.}$ and the column marginal proportions by $p_{.j}$, for $i = 1 \cdots 2$ and $j = 1 \cdots 2$, then the means of A and B (μ_G, μ_A) are :

$$\mu_G = \frac{1}{n}\sum_{t=1}^{n} G_t = \frac{n_{2.}}{n} = p_{2.} \quad \text{and} \quad \mu_A = p_{.2} \quad ,$$

their variances (σ_G^2, σ_B^2)are:

$$\sigma_G^2 = \frac{1}{n}\left(\sum_{t=1}^{n} G_t^2 - \sum_{t=1}^{n} \mu_G^2\right) = \mu_G - \mu_G^2 = \mu_G(1-\mu_G) \text{ and }, \ \sigma_B^2 = \mu_B(1-\mu_B)$$

and the covariance of A and B is:

$$\sigma_{GB} = \frac{1}{n}\sum_{t=1}^{n}(G_t B_t - \mu_G \mu_B) = p_{22} - p_{2.}p_{.2}$$

The correlation between A and B can now be expressed as

$$\rho = \frac{\sigma_{GB}}{\sqrt{\sigma_G^2 \sigma_B^2}} = \frac{p_{22} - p_{2.}p_{.2}}{\sqrt{p_{.2}p_{.1}p_{2.}p_{1.}}} = \frac{p_{22} - (p_{21}+p_{22})(p_{12}+p_{22})}{\sqrt{p_{.2}p_{.1}p_{2.}p_{1.}}} = \frac{p_{22}p_{11} - p_{21}p_{12}}{\sqrt{p_{.2}p_{.1}p_{2.}p_{1.}}}$$

For a table with matched margins we have $p_{.2} = p_{2.} = p_2$ and $p_{.1} = p_{1.} = p_1$, and so:

$$\rho = \frac{p_{22}p_{11} - p_{12}p_{12}}{p_1 p_2} = \frac{p_{11}(p_{2.} - p_{12}) - p_{12}(p_{1.} - p_{11})}{p_1 p_2} = \frac{p_{11}}{p_1} - \frac{p_{12}}{p_2} = ID$$

Appendix B

Table 5 below lists the activities that showed the largest change in the differences in participation by women compared with men, and thus contributed most to the declining segregation. The same has been done for time use. The activities preceded by F have higher participation figures or time use by women in 1995; similarly M denotes higher values for men. The underlined activities are regarded as productive activities

Table 5 Activities which contribute most to changes in segregation in participation and time use, 1975–1995

Top 20 largest decreases of differences in participation	Top 20 largest decreases of differences in time use
1. F: repairing clothes, polishing shoes	1. F: washing dishes, laying table etc
2. F: washing dishes, laying table etc.	2. M: paid work outside the home
3. F: preparing meals	3. F: preparing meals
4. F: vacuuming, dusting, swabbing	4. F: watching television
5. F: cleaning windows and doors	5. F: vacuuming, dusting, swabbing
6. F: making beds	6. F: embroidery, tinkering
7. F: shopping large grocery store	7. F: making beds
8. F: laundry	8. M: doing school homework
9. F: caring for other household members	9. F: repairing clothes, polishing shoes
10. M: listening to the radio	10. M: paid work inside the home
11. F: caring for houseplants	11. F: caring for houseplants
12. F: embroidery, tinkering	12. M: listening to the radio
13. F: shopping grocery store	13. F: cleaning windows and doors
14. M: gardening	14. M: playing records, tapes, CD
15. M: waiting during work (non-paid)	15. F: laundry
16. M: paid work outside the home	16. M: sleeping during daytime
17. M: coffee break at work	17: M: travel home-work by public transport
18. F: taking care of other children (not baby)	18. F: resting, taking a nap
19. M: travel home-work by car/motor	19. F: taking care of other children (not baby
20. F: walking or cycling for activities in organisations etc.	20. M: attending school, college, university

Table 5. Activities which contribute most to changes in segregation in participation and time use, 1975–1995

top 5 largest increases in differences in participation	top 5 largest increases in differences in time use
1. F: private use of telephone	1. M: using computer
2. M: car maintenance	2. F: sleeping at night
3. M: using computer	3. F: private use of telephone
4. F: crosswords	4. M: active sports participation
5. F: visits from family or friends	5. F: eating or drinking at home

International comparison of health care data in six countries , Phase II: extramural health care, prevention, medical goods and other services

Cor J.P.M. van Mosseveld and Peter van Son

Introduction

Each nation has built up its own structure for organising and financing health care based on historical conditions and national concepts of social solidarity and justice. Nowadays these national concepts receive significant impulses from international panels like the new *Health for All* programme of the World Health Organisation and other international organisations like the OECD and the European Union.
Meanwhile countries are confronted with the short term need to reform their national health care systems under the increasing pressure of rising costs, while at the same time trying to prevent cost containment policies from affecting accessibility, quality and solidarity.
In 1994 the Dutch Ministry of Health, Welfare and Sports requested – and financially supported - Statistics Netherlands to set up a project to compare Dutch health care data with those of a selected number of countries: Denmark, Germany, Switzerland, France and Belgium. Experts from these countries as well as representatives from WHO/EUR, OECD and EUROSTAT were invited to participate in a network to exchange information and consult with each other.
The project aimed to improve the comparability of a package of selected variables. It did not strive to develop a set of definitions on common concepts and procedures. Leaving national definitions intact, country profiles were drawn up to give a general insight into the national health care systems involved, including a set of descriptions of provisions in operational terms.

The first phase of the project concentrated on intramural care in the six countries, and was reported on in Netherlands Official Statistics vol. 12 no. 2 In contrast to the relative uniformity of the activities described in Phase I, the field described in Phase II is characterised by an enormous diversity of activities and heterogeneity of functions. This article examines Phase II of the project, and includes an update of the Phase I data.

Process

Description of the method and model

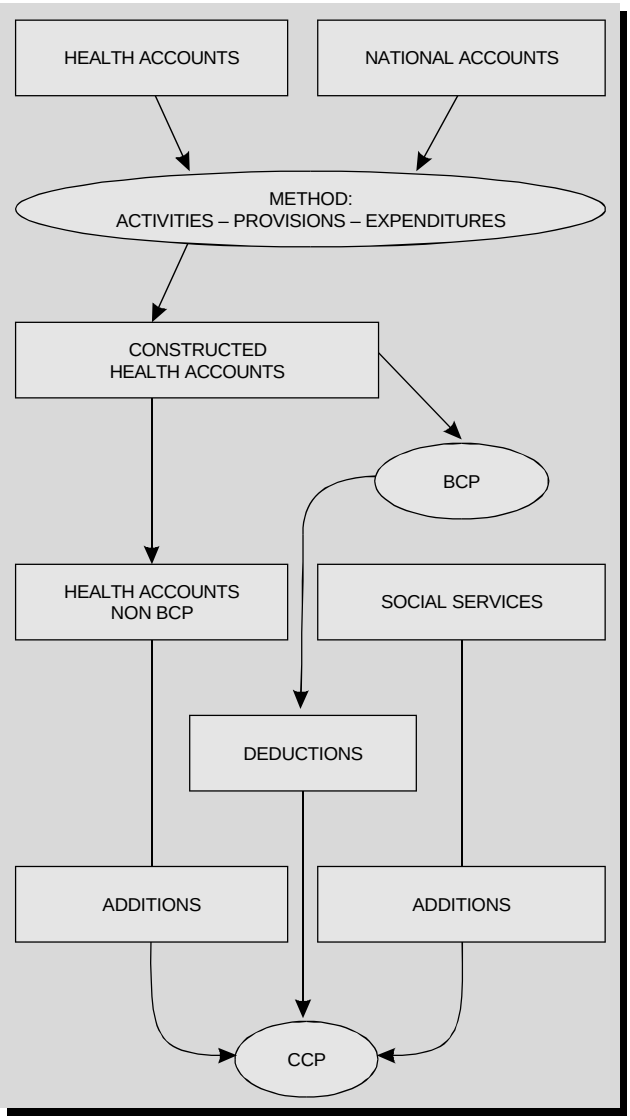
The project *International comparison of health care data* advocates a pragmatic approach to comparing the organisation and financing of the health care [1)] systems in the participating countries. The starting point for this approach is the description of health care [1)] used by Statistics Netherlands.
In the knowledge that comparability can only be achieved by eliminating differences, and differences can only be eliminated when their is enough information about them, it was imperative for the project to obtain detailed descriptive information on the health care systems of the participating countries, resulting in the country profiles.
But knowledge of the national systems alone is not enough to enable comparison. The separate activities are supplied in different combinations in each country. And as knowledge of the combinations of activities and providers is essential, an extensive list of activities was created. However, it is not the activities, but the providers that supply the data.
Next, information on providers and corresponding expenditures was needed. The country-specific sets of provisions with amounts of expenditure or costs were returned to us. This resulted in the following method:

Activities ➨	Providers ➨	Expenditures

The core theme of the project was the notion that expenditure can only be obtained at the level of the provider in the health care system; although these providers are different in various countries, many activities in the health care field are the same whatever system is used.
At least one step between the information at hand and the creation of multilateral comparable packages was necessary. Because the goal of this exercise was comparability, the idea was launched to limit every comparison to just two countries. Because the project was initiated in the Netherlands and we knew its system best, the Dutch health care system is the key country in every comparison. This first part of the process resulted in five bilateral comparisons.
Comparing the systems of two countries, using all the data at hand, but especially the data on the activities provided the possibility to separate each health account into three parts: one on a set of provisions (containing a comparable cluster of activities) in both countries, and two other sets of provisions one set not available in the Netherlands and one set not available in the other country (the so-called non-bilateral packages).
The set of providers in both countries is the so-called bilateral comparable package (BCP). If for any reason a comparison of just two countries is needed, this BCP-approach is the solution.
Having six countries in the project and selecting one country to be the key country, resulted in five distinct bilateral packages. Although each pair of results was comparable, the five bilateral packages were not. The package of the key country was different in every bilateral comparison. A multilateral comparable package was needed, in which all the bilateral packages were transformed to one multilateral comparable package, the so-called common comparable package (CCP).
One way to solve this problem is to create multilateral comparison by excluding every provision or an element of it not present in every country. The consequence of this approach would have been that each inclusion of a new country would limit the contents, ultimately resulting in a very meagre comparable package.
Another approach is to include every provision of all the constructed bilateral packages. This could lead to the opposite; a continually expanding comparable set.

So a different approach was taken: all provisions listed either in the bilateral packages or in the non-bilateral packages are included, as long as the activities of these provisions can be fitted into the general notion of health care. As a consequence some additions and deductions were necessary, but only in a limited number of cases. Another effect was that we were able to construct a reasonably stable package, that we would not need to change when a country is included or excluded.
The general notion of being an element of the health accounts had one problem, namely that some provisions had to be added that were not included in the health accounts in a certain country, but were part of the social sector.

Figure 1. Method & Completed model



The last problem to be solved concerned calculations of parts of provisions or sets of activities for which, although carried out in a certain country, no separate data could be supplied. Sometimes we had to reshuffle expenditure from one sector to another sector inside the health accounts; in other cases the amount of expenditure had to be calculated as an addition to the CCP. Of course in creating a common comparable package some provisions are eliminated from the bilateral comparisons because they do not provide health activities, in spite of the fact that some countries include them in the health accounts.

This figure illustrating the method and model of the CCP presents the complete picture. Starting with the health or national accounts, using the method to create a bilateral package, using all the bilateral packages, adding and deducting some provisions or elements, ultimately leads to a common comparable package.

Construction of the common comparable package of health care

This section presents the results of the common comparable package (CCP). The basic data supplied by the participants and the procedures and processes leading to the bilateral comparable packages (BCP) are bypassed in the present article. For more information on these blocks see Van Mosselveld and Van Son, 1999.

The project distinguishes the following blocks of health care:

– Block I consists of provisions and activities in the *intramural* health care sector, largely identical to the *inpatient* or *stationary* care sector.
– Block II represents the *extramural* health care sector, identical to the *out-patient* or *non-stationary* care sector (excluding prevention).
– Block III includes all *preventive* activities.
– Block IV represents the *medical goods*, consisting of pharmaceuticals and therapeutic appliances.
– Lastly, Block V contains the *other services* (research and development, education and training, and administration).

Our aim is to present the total CCP of health care in the participating countries, consisting of the CCPs for each of the five blocks.
First we examine the results of the process of the BCPs.

Results based on the data available

The General framework

Having set the *gross domestic* product (GDP) per capita of all six participating countries side by side, the Netherlands turned out to have the lowest per capita GDP of the six (US $ 21,896 in 1994 and US $ 25,476 in 1995). Switzerland performed best with a GDP per capita of US $ 36,607 in 1994 and US $ 42,811 in 1995.
Comparing the GDP data in terms of US dollars and of *purchasing power parities* (PPP) showed that only for Switzerland and Denmark was it relevant in which terms the data are expressed. In Denmark the difference between GDP per capita expressed in US dollars and that in PPP was 54 per cent; in Switzerland it was 53 per cent in 1994 and 75 per cent in 1995. The difference between the two measures was much smaller in the other countries, ranging from 12 per cent in Belgium, 17 per cent in the Netherlands and 28 per cent in Germany in 1994, to 28 per cent for Denmark, 29 per cent for the Netherlands, 33 per cent for France in 1995.
However large these differences are within one individual country, in the bilateral comparisons it is the relative difference between the two countries that is relevant. So the measure in which GDP is expressed is only really relevant for Denmark and Switzerland.
According to the OECD Health data bank, Denmark devoted 6.4 per cent of GDP to health care, Germany 10.3 per cent, a difference in spending of 3.9 percentage points for two highly developed countries in western Europe. These differences were also large when expressed in US dollars per capita: in 1994 they ranged from $ 1,858 in Belgium to $ 3,578 in Switzerland; that is almost twice as much (92 per cent more to be exact). This meant that serious doubts about the comparability of the contents of the health packages were certainly valid.

Bilateral comparisons

Belgium spent about the same amount per capita as the Netherlands on Blocks II and III (Belgium just 1 per cent more in 1994 and 5 per cent more in 1995). For all other countries the differences were much larger. France spent 68 per cent more per capita, and Germany almost twice as much (92 per cent more) as the Netherlands. Switzerland spent as much as 131 per cent more per capita than the Netherlands in 1994 In the BCP on Medical goods, Block IV, Denmark spent 7 per cent less than the Netherlands. All other participants spent more per capita, ranging from 39 per cent in Belgium (1994) to 61 per cent in France (1995).
The attempted comparisons on Block V: Other services were also presented. Other services comprise expenditure on research and development, education and training and administration. Although R&D expenditure should in theory be comparable for some

Table 1 Expenditures on the total CCP of health care, 1994, 1995 (US $)

	1994			
	Netherlands	Germany	Switzerland	Belgium
CCP Block I	15 688	92 286	12 126	8 617
CCP Block II	4 718	60 749	6 543	3 884
CCP Block III	850	6 926	420	327
CCP Block IV	3 991	35 246	2 751	3 642
CCP Administration	1 277	4 420	14 64	658
CCP Health care	26 523	206 713	23 303	16 627

	1995				
	Netherlands	Denmark	France	Switzerland	Belgium
CCP Block I	18 454	8 209	81 241	14 446	10 318
CCP Block II	5 373	2 097	36 916	7 976	4 119
CCP Block III	1 044	499	3 198	539	380
CCP Block IV	4 954	1 533	29 413	3 410	4 371
CCP Administration	1 489	124	9 245	1 880	740
CCP Health care	31 214	12 481	160 012	28 251	19 928

countries (the Netherlands - Germany to a certain extent, and the Netherlands - France), the data turned out to be hardly comparable at all. The same was true for expenditure on education and training (comparable in theory, but not comparable in actual data). So in the end only spending on administration was included in the comparison.

The input supplied by the participants on health care and related activities was compared with the results of the bilateral comparisons. Only for the bilateral comparison between the Netherlands and Switzerland was 100 per cent used for both countries. Belgium was the only country for which more than 100 per cent of the input was used in the bilateral comparison, caused by the additional payments (included in the BCP but not part of the input file on health care). In the other three comparisons less than 100 per cent of the input was used, ranging from 79 per cent in the case of France and 95 per cent for Germany.

The CCP of Health care

Additions

In Block I the additions ranged from $ 404 million in Belgium in 1994 (4.9 per cent of the BCP) to $ 15,313 million in France in 1995 (23 per cent of the BCP). No additions were needed in the construction of the CCP of Block I for the BCP of the Netherlands and Germany (1994). The additions in Block II - extramural health care - ranged from $ 8 million in Belgium in 1994 (0.2 per cent of the BCP) to $ 244 million for the Netherlands (3.4 per cent) in the BCP with Switzerland in 1995. No additions in Block II were necessary in France, Denmark (both 1995) and Germany (1994).
In Block III (Prevention) additions were limited to $ 5 million (0.6 per cent) in the BCP with Belgium in 1994. For Belgium the additions amounted to $ 17 million (5.1 per cent of the BCP) in the same year. The other countries needed no additional corrections.
Deductions

In Block I the deductions ranged from $ 29 million for the Netherlands (0.2 per cent) in the BCP with Belgium in 1994 to $2,200 million for the Netherlands (11 per cent) in the BCP with Switzerland in 1995. No deductions in Block I were necessary for Denmark (1995), Germany (1994) and Belgium (1994 and 1995).
In Block II deductions were necessary for all countries, ranging from $ 552 million for the Netherlands (9.3 per cent) in the BCP with France in 1995 to $ 6,602 million for Germany in 1994 (9.8 per cent of the BCP).
In Block III only Switzerland required no deductions. In the other countries the deductions ranged from $ 18 million in Belgium (4.8 per cent of the BCP) in 1995, to $ 485 million in Germany (6.5 per cent) in 1994.
No additions or deductions were necessary in Block IV (medical goods), which means that the results presented in the BCP on Block IV were equal to the results of the CCP on that block. For Switzerland the amount added to Block IV (partially transferred from Block II) had already been introduced in the construction of the BCP for Switzerland. The first preliminary CCP results are presented in Table 1.
The results of the CCP on Block I showed that Belgium still spent less per capita on intramural care than the Netherlands. In 1994 Belgium spent 16 per cent less per capita, in 1995 15 per cent less. In the BCP the difference was 18 per cent for 1994 and 16 per cent for 1995. All the other countries spent more. Germany spent 9 per cent more (in the BCP the difference was also 9 per cent), Switzerland spent 68 per cent per capita more than the Netherlands in both years (in the BCP Switzerland spent 69 per cent more). Only for Denmark were the differences with the BCP results more pronounced. In the CCP Denmark spent 30 per cent per capita more on Block I than the Netherlands; in the BCP Denmark spent only 13 per cent more.
In the CCP per capita on Blocks II and III the differences with the bilateral comparisons were not large. Belgium spent 1 per cent more than the Netherlands on the CCP per capita in 1994 and 7 per cent more in 1995. In the BCP of these two Blocks combined, Belgium spent 1 per cent more in 1994 and only 5 per cent more in 1995 than

the Netherlands. Denmark spent 27 per cent per capita more on the CCP on Blocks II and III combined in 1995 (the difference in the BCP was 17 per cent). Germany spent 127 per cent more in the CCP and 92 per cent more in the BCP. In France the difference with the Netherlands was 67 per cent per capita (in the BCP: 68 per cent). The largest difference was still recorded in Switzerland, which spent 173 per cent more on the CCP in these Blocks (in 1994) than the Netherlands (BCP 1994: 131 per cent).
As already mentioned no additions or deductions were necessary in the construction of the CCP on Block IV. So the BCP equalled the CCP on this Block. The differences ranged from 7 per cent less in Denmark to 67 per cent more per capita in Germany.

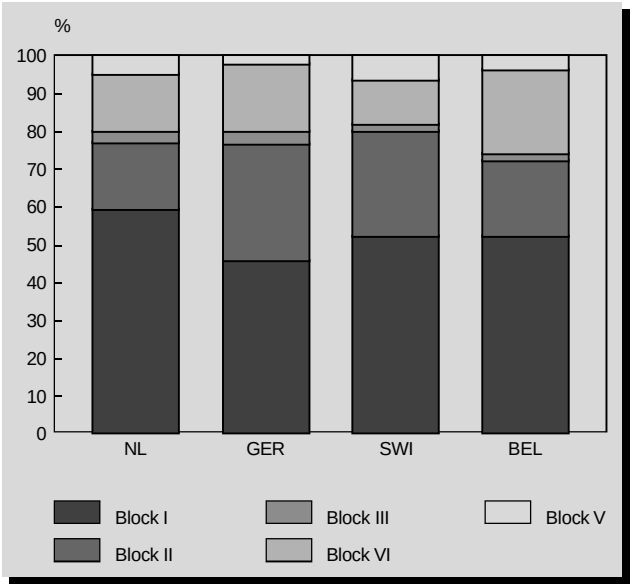
The data as supplied in the table above have a limited comparative significance. Therefore graphs 1 and 2 present the data on the CCP Blocks as shares in the total of health care.

In all countries Block I accounts for a very significant part of the total of health care (between 50 and 60 per cent). In Denmark Block I represents 66 per cent of the total CCP, in Germany on the other hand only 46 per cent. Block II is very important in Germany (30 per cent) followed by Switzerland (28 per cent) . In all other countries it is about 17 per cent of the total of CCP. Block III (prevention) - in all countries politically very important - only accounts for between 2 and 4 per cent of total CCP expenditures. Block IV (medical goods) ranges between 12 (Switzerland) and 19 per cent (Belgium) of total CCP.

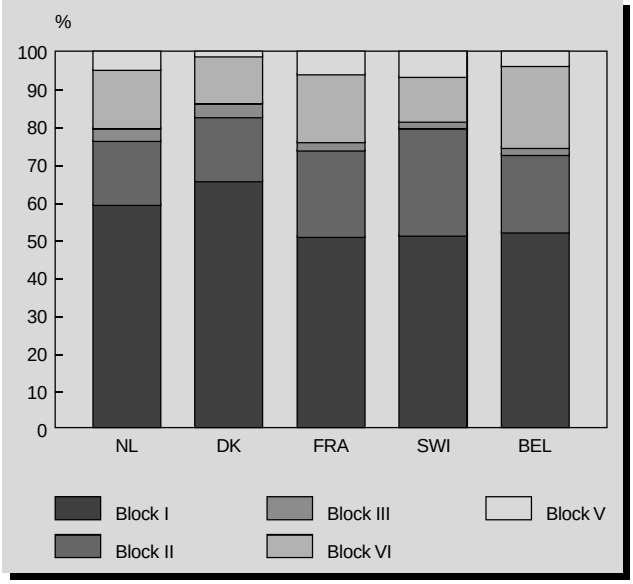
In table 2 the expenditures on the total CCP are expressed in US dollars and in ECU per capita.

If we compare the amounts spent on health (CCP) in the participating countries, the differences do not seem large. In the Netherlands around $ 2,000 per capita is included in the CCP on health ($ 1,724 in 1994 and $ 2,016 in 1995), in Germany and France $ 2,539 and $ 2,754 respectively. The differences in percentages compared with the Netherlands reveal that France and in Germany spent 37 per cent and 47 per cent more per capita, than the Netherlands. In Switzerland considerably more is spent on the CCP on health: $ 3,304 in 1994 (94 per cent per capita more than in the Netherlands) and $ 3,886 in 1995 (93 per cent more than in the Netherlands). In Belgium $ 1,644 per capita was spent on health in 1994 and $ 1,968 in 1995 (about 70 per cent less than in the Netherlands).

Graph 1. Percentages shares of Blocks I-IV & Administration in total CCP, 1994



Graph 2. Percentages shares of Blocks I-IV & Administration in total CCP, 1995



A comparison of two years is possible for the Netherlands, Switzerland and Belgium. Because the ECU is less volatile than the dollar, it is more suitable for a comparison of two years. In the Netherlands the expenditures per capita grew by 6.3 per cent from 1994 to 1995. In Switzerland the growth per capita (expressed in ECU) was only 5.9 per cent, in Belgium 8.5 per cent; considerably more than in the Netherlands.

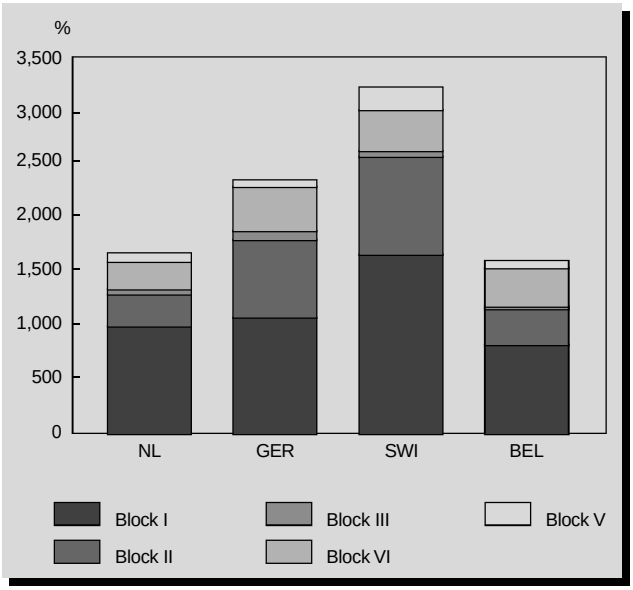
Graphs 3 and 4 illustrate the relative importance of the various blocks per capita (in US $) for 1994 and 1995.

Expressed in percentages of GDP the Netherlands spent 7.9 per cent on the CCP on health (1994 and 1995). Germany (1994) spent 1.7 percentage points more, France (1995) 3.0 percentage points

Table 2 CCP on total health care, 1994, 1995 (US $ & ECU per capita)

	Year	Expenditures per capita	
		US$	ECU
Netherlands	1995	2016	1546
Denmark		2340	1825
Netherlands	1994	1724	1453
Germany		2426	2047
Netherlands	1995	2016	1546
France		2754	2104
Netherlands	1994	1724	1453
Switzerland		3312	2800
Netherlands	1995	2016	1546
Switzerland		3942	3001
Netherlands	1994	1724	1453
Belgium		1664	1387
Netherlands	1995	2016	1546
Belgium		1968	1504

Graph 3. Expenditures per capita of Blocks I-IV & Administration, 1994



Graph 4. Expenditures per capita of Blocks I-IV & Administration, 1995

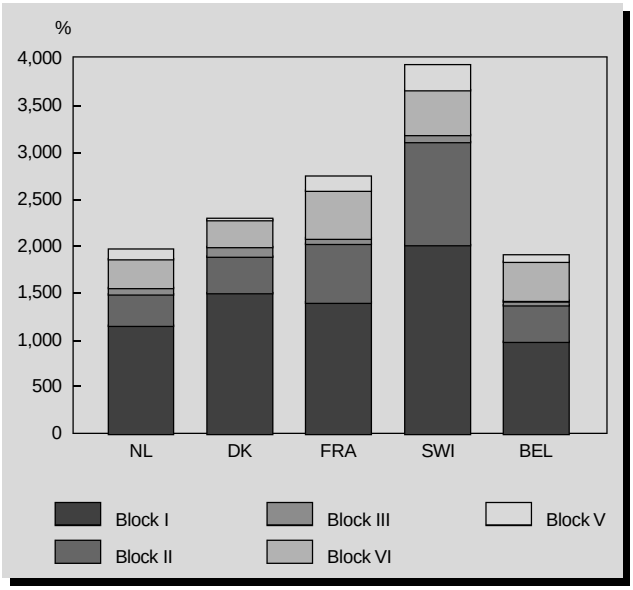


Table 3 Total health care expenditures: OECD and total CCP compared, 1994, 1995 (% of GDP)

	Year	OECD Total Health care		CCP Total	
			Difference [1]		Difference [1]
Netherlands	1995	8.8		7.9	
Denmark		6.4	–2.4	7.2	–0.7
Netherlands	1994	8.8		7.9	
Germany		10.3	1.5	9.8	1.8
Netherlands	1995	8.8		7.9	
France		9.9	1.1	10.4	2.5
Netherlands	1994	8.8		7.9	
Switzerland		9.6	0.8	9.1	1.2
Netherlands	1995	8.8		7.9	
Switzerland		9.8	1.0	9.2	1.3
Netherlands	1994	8.8		7.9	
Belgium		8.1	–0.7	7.3	–0.6
Netherlands	1995	8.8		7.9	
Belgium		8.0	–0,8	7.4	–0,5

[1] Difference in percentage points compared with Netherlands

more, Switzerland 1.1 percentage point more in 1994 and 1.2 in 1995. Denmark and Belgium spent less than the Netherlands (0.5 and 0.7 percentage points respectively in 1995). The difference between France and the other participants can to a certain extent be explained by the allocation of nursing home care and administration. The calculation of nursing home care and the additionally supplied data on administration in France led to an addition of 0.6 per cent of GDP to the expenditures, resulting in 10.4 per cent of GDP devoted to health care in the CCP of France.

This becomes clear when the CCP results are compared with the data presented in the OECD health data bank. According to the latter France spent 9.9 per cent of its GDP on health, compared with 8.8 per cent for the Netherlands. The difference between France and the Netherlands is 1.1 percentage point (OECD data), but this is much less than the difference in the CCP on health between the two countries (2.5 percentage points).

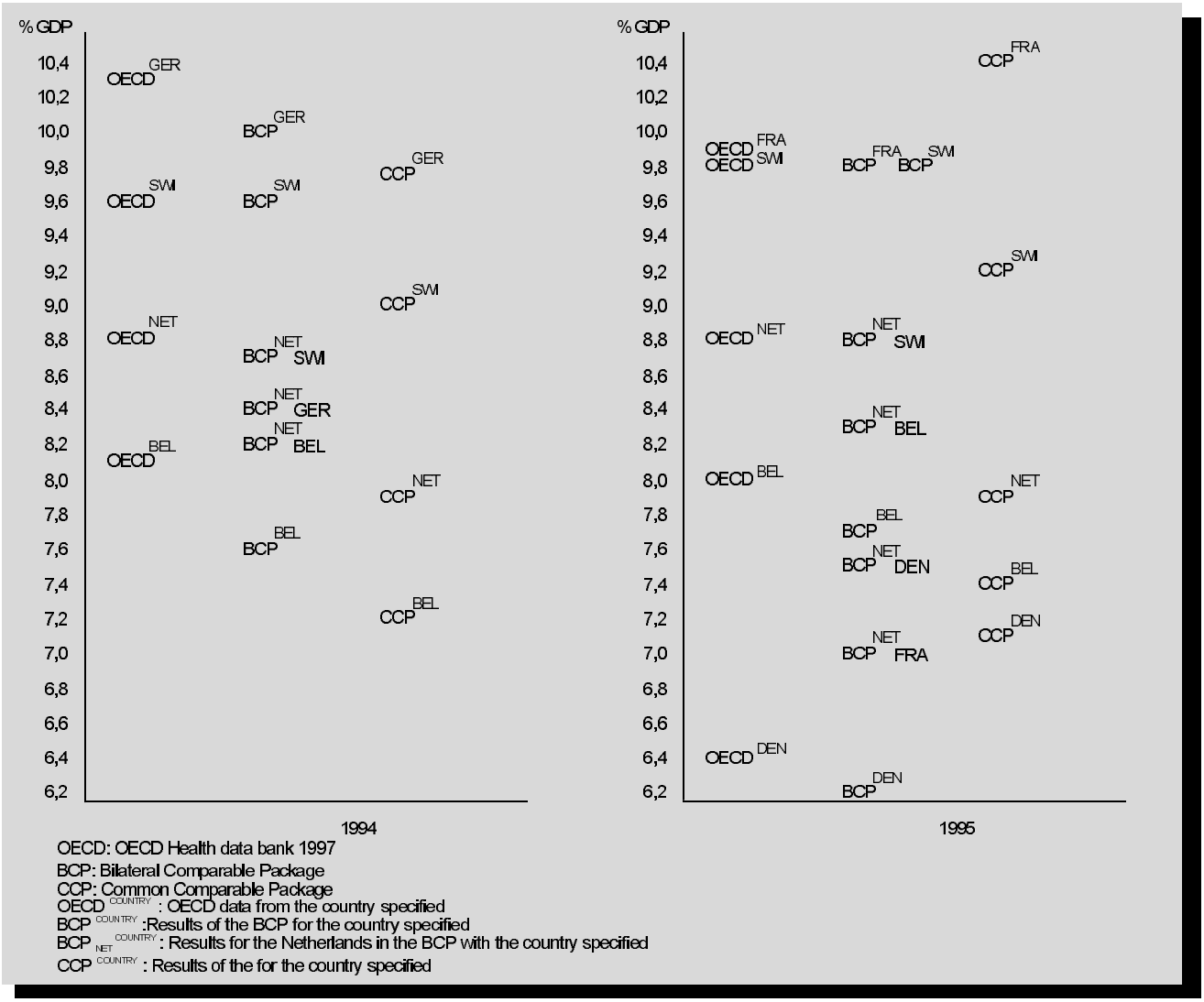
For five participants (Netherlands, Germany, Denmark, Switzerland and Belgium) the share devoted to health is smaller in the CCP approach than in the data supplied in the OECD health data bank. For the other two countries (Denmark and France) the results in the CCP approach are higher than the OECD results.
For Belgium the difference between OECD data and the CCP is 0.8 for 1994 and 0.6 percentage points for 1995; for Switzerland 0.6 percentage points for 1994 and 0.7 for 1995. For Germany the difference is 0.7 percentage point, the same as for Denmark. For the Netherlands the difference is 0.8 percentage points. For France the difference (in expenditures as a percentage of GDP) between the OECD and the CCP is 1 percentage point.

Comparing the results in the CCP approach (as percentages of GDP) the packages are more uniform, ranging from 7.2% for Denmark to 10.4 % for the France. Leaving out the highest and the lowest (France and Denmark), the range is limited from 7.4 per cent in Belgium to 9.6 per cent in Germany.

Lastly in graph5 the relative positions of the OECD data and the CCP data are presented for the participating countries.

It appears from the construction of the CCP of total health care that, as might be expected, the differences recorded in the various blocks of the CCP were still present but less pronounced. So the difference in one block of health care was compensated by a smaller difference in another block.
Belgium spent less per capita in the total CCP of health care than the Netherlands (4 per cent in 1994 and 2 per cent in 1995). Denmark spent 18 per cent more per capita, and Switzerland 95 per cent more (in 1995) on health than the Netherlands.

Graph 5 Expenditures on health care: OECD, BCP and CCP compared, 1994, 1995 (% of GDP)



Evaluation

Below, the main results of the project International comparison of health care data are reviewed briefly. The starting point for the evaluation of this phase of the project is the aims and objectives. First however the results of the comparisons are evaluated briefly.

Results of the CCP

In all countries Block I was very important, ranging from 46 per cent in Germany (1994) to 66 per cent in Denmark (1995). In the Netherlands the importance of Block I was 59 per cent in the total CCP; in Belgium and Switzerland 52 per cent in 1994. In Germany Blocks II and III combined were responsible for 35 per cent of the expenditures, in Switzerland for 30 per cent and in France 25 per cent. In Belgium and the Netherlands these two blocks accounted for 23 per cent and 20 per cent respectively in 1995. Medical goods (Block IV) were accountable for 12 per cent in Switzerland (1994), 18 per cent in Germany (1994) and France (1995) and 22 per cent in Belgium (in both years). In the Netherlands Block IV took up 15 per cent (1994) and 16 per cent (1995). Administration expenditures, the last item in the CCP, accounted for 4 per cent in Belgium (1994 and 1995), 5 per cent in the Netherlands (1994) and 6 per cent in Switzerland (1994) and in France (1995). In Germany administration took up 2 per cent of total expenditures of the CCP which is low, but not as low as in Denmark where it accounted for only 1 per cent, very low compared with the highest share recorded in Switzerland and France (6 per cent) .

General conclusions of the project

- Unlike the construction of the bilateral comparable packages in Phase I, calculations were necessary in the Phase on extramural health care, prevention and medical goods, even in the construction of the bilateral comparable packages. To a large extent this is caused by the complexity of the field and the large heterogeneity of activities and providers.
- The approach of the CCP method supplies more uniform, comparable results, even in such heterogeneous sectors as extramural health care, prevention and medical goods.
- The great importance of intramural health care is not always accompanied by an opposite or minor importance of the non-intramural health care sectors. Only in Germany is a relatively small intramural sector compensated by a large non-intramural sector. In France on the other hand a large intramural sector is accompanied by a large non-intramural sector.

Evaluation of aims and objectives

- Determination of the boundaries of health care

  The country profiles were used extensively to determine the boundaries of health care. They supplied an overview of the health care system in all its national aspects. More detailed information was acquired through the matrices in which participants indicated whether or not care provisions existed and whether or not they belonged to the health care systems. The results provide a clear overview of the boundaries of health care of the participating countries.

- Development of the methodology and model for international comparison

  The most important feature of the development of the methodology is the notion that activities are the basic starting point. Based on these activities it was possible to describe provisions and the production factors (expenditures) connected with them. The bilateral comparisons were carried out at the level of health care provisions. In principle this method can be used successfully in all sectors of health care and for non-financial variables as well.

- Comparison of the health care systems of the participating countries by means of a reference model

  A common comparable package (CCP) was constructed on the basis of the bilateral comparisons. The CCP consists of provisions selected from the lists of provisions used in the bilateral comparisons. These selected provisions are counted as part of the common health care systems of the participating countries.
  Our conclusion is that the CCP approach can be used as a reference: a common concept to be used in international comparisons.

Some final remarks:

- The intention of the pragmatic approach by Statistics Netherlands was to leave intact definitions at national level and not to impose uniform definitions, as is common practice in international data collection. The possibilities for comparison were enlarged by annotations and comments facilitating better understanding of the data.
- The project offered the opportunity to benefit from the value of interaction, especially within the network of experts and to establish increasing consensus and, as a consequence, a better understanding of the meaning of data. However, not all problems were solved. It was too difficult to compare research and development and education and training, for example. In the field of patient transport, the availability and quality of data made comparison difficult (see the report Transport of patients).
- The participating countries were encouraged to compare their own data with those from other countries, using the same methods; by discussing the results together the effects of so-called ethnocentric judgements might be eliminated and more experience in improving the methods will be acquired.
- Not only the participating countries expressed an interest in the topic of international comparison of health care data and the methods applied. Other countries as well as international organisations have taken further steps in this field. This justifies the expectation that although this project - financed by the Dutch Ministry of Health, Welfare and Sports – has been concluded, the process of improving international comparison of health care data will be continued more or less along the same lines.

note

[1)] See Netherlands Official Statistics vol. 12 no.2.

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Disablement benefits: combining survey data with register records

Berna Schaafsma-Harteveld

Introduction

For a number of years now Dutch statistics on social security benefits have been based on register records. In the case of the disablement benefits this means that once a year Statistics Netherlands receives a anonymised set of administrative records from the social security institutions on the persons receiving disablement benefits.

Using registers as a data source for official statistics has advantages and disadvantages. The register data on disabled persons are comprehensive and extraction from the register is relatively cheap. On the other hand the source data may be 'polluted' and only concepts and definitions as used in the register can be provided. For example, data on the educational attainment and the labour market position of people with social security benefits are not included in the register, because such information does not correspond with its the primary administrative aim.

In order to enrich the source data and obtain more adequate information from a statistical point of view an approach is required which combines the register data with survey information. Therefore since 1996 Statistics Netherlands has been extending the register records it receives with the full data on individuals receiving disablement benefits, including identifying information such as date of birth and address. This has made it possible to micro-match the register data on persons with disablement benefits with survey data collected by means of the labour force survey (Kartopawiro and Ploeger, 1998).

Why micro level integration of register records and survey data ?

Users of social security statistics need adequate contextual information on the people receiving disablement benefits. Information on their sex, age and region is directly available from the register records, but these contain no information on the educational attainment, labour market position, household position, etc. Before micro level integration had become an accepted procedure at Statistics Netherlands much effort went into trying to surface similar information from Labour Force Survey data .The primary focus of the Dutch Labour Force Survey (LFS), however, is to provide in-depth information on the labour force and the labour market position of the non-institutional population. Although the survey includes items which trace social security benefits, it yields too few reliable data on persons receiving disablement benefits to pattern the prevalence of these benefits.

Statistical integration of available register records and survey data was a logical next step. By applying the subsequent stages of the integration process, harmonisation, completion and minimisation of measurement errors (Van Bochove,1991) it was possible to trace differences between the number of persons receiving disablement benefits according to the register records and according to the survey data and identify their cause. It turned out that some disabled persons are not included in the survey population because they live in institutions or abroad. After general corrections for differences in definitions and populations, it was possible to identify categories of respondents covered in the LFS who, judged by circumstantial survey evidence, were probably receiving disablement benefits. Still, the confrontation of records and adjusted and corrected survey response data opened our eyes to the fact that the LFS underestimated the number of recipients of disablement benefits by ten percent (Van den Elshout and Van der Hulst, 1993). This fact greatly hampered our intention to provide information on the educational attainment, labour market position, etc., of all persons receiving these benefits. In seeking a solution the central issue appeared to be the cause of the differences. Was the survey response selective or did the design of the survey items fail to make respondents report on their social security benefits? Micro level comparisons were needed to answer these questions and to provide for the background information on persons receiving disablement benefits.

The process of micro-matching

After careful consideration of all legal aspects concerning privacy protection it has recently become possible for the social security institutions to provide Statistics Netherlands with individual records from the disablement benefits register [1)], including identifying variables such as the identification number (social-fiscal number), date of birth and address. Since the LFS does not establish the social-fiscal identification number of the respondent, the micro-matching procedure relied on a small set of identifying variables: postcode, house number, date of birth and sex. Some minor variations in the particulars of the key variables were allowed in order to reduce the effect of erroneous non-matching caused by errors in the matching key.

The micro-match resulted in a data file which contained all persons interviewed in the LFS 1995 who were registered as receiving a disablement benefit. Estimates suggest a matching rate of about 90 per cent.

This file did not include people who were not yet receiving or no longer received a benefit on the date of the survey interview. Post-stratification to the register totals was used to weight the matched sample. The matched sample was not necessarily representative of the total population of persons receiving disablement benefits, because of selective non-response in the LFS or selective errors in the matching key. Stratification variables were sex, age, duration of the benefit, level of disablement and region [2)].

Results

On the whole, people receiving disablement benefits are older and less well educated than the active labour force in the Netherlands. One in three recipients had attained primary education as the highest level of education.

About one quarter of the disablement recipients in 1995 were active in the labour force. Most of them worked in industry and construction. Seven out of ten recipients did not belong to the labour force. Many were 80 to 100 per cent [3)] disabled or did not want to take on job for more than twelve hours a week.

How claimants of disablement benefits perceive their position in society depends on their sex and the degree of disability. There is a remarkable difference between men, who more often see

themselves as paid workers or disabled, and women who see themselves more often as housewives. Men who are completely unable to work see themselves primarily as disabled. Men with a less than 80 per cent disability see themselves primarily as gainfully employed.

Finding the explanation for the difference between the number of persons receiving disablement benefits according to the register and according to the LFS was complicated by the exclusion of former civil servants with disablement pensions in the matched sample. However, under different assumptions estimates were made on the causes of the difference between the two sources. After correction for differences in population, the failure of the LFS to report disablement benefits accurately or even at all was found to cause between half and three quarters of the difference between the survey and the register. The remainder, a quarter of the difference, is caused by selective non-response.

Future use of register data

Micro-level matching of register records on disablement benefits with data from the LFS provides new dimensions in the statistical information on people receiving disablement benefits. In the Dutch context it is impossible to derive such information directly from the Labour Force Survey data. This survey severely underestimates the prevalence of social security benefits, partly because respondents do not report receiving this benefit and to a lesser extent because of selective non-response. In the future, because complementary individual register records have become available, survey items designed to trace the number of social security benefits can be left out of the LFS, thus reducing the response burden.

Statistics Netherlands plans to carry out this micro-level integration of data on disablement benefit claimants on a yearly basis. Matching the survey data with register records will be facilitated by using national identification numbers, since from 1997 onwards the population register available to Statistics Netherlands contain the social-fiscal number. In the years to come it will therefore become feasible to include former civil servants receiving disablement pensions in this matching procedure. Furthermore, in 1998 Statistics Netherlands started implementing a similar micro-level integration project on persons receiving unemployment benefits .

The fact that identification numbers and the individual records from the social security registers have become available as a source for micro-matching will play an important role in the near future in upgrading the social security statistics towards a better coverage of the dynamics in this area (Imbens, 1996). In addition to micro-matching with survey data, exhaustive and reliable data sources such as administrative registers are also suitable for data matching with other registers.

Notes

[1] In the Dutch situation the national institute for social security (Lisv) is responsible for carrying out several social security arrangements. They commission four administrative bodies to carry out the actual allocation of the benefits. The register data Statistics Netherlands receives from these administrative bodies concern the Disablement Benefits Act (WAO) and the General Disablement Pensions Act (AAW; excluding benefits to former civil servants).

[2] The ' indication WSW' was also used for stratification, identifying a special group with disablement benefits.

[3] This percentage is used by social security institutions to record the degree of disablement: 80-100 per cent disabled means someone is not able to work at all.

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Atlas of plant communities in the Netherlands

Lodewijk van Duuren, Joop Schaminée [1] and Eddy Weeda [1]

Introduction

Mapping of the occurrence of species is a well-established way for understanding the 'behaviour' of these species, and many national and European atlases of plant and animal species have been published. In the Netherlands maps on species levels are published for vascular plants, mosses, stoneworts, mushrooms, mammals, birds, fish, reptiles, amphibians, ground beetles, butterflies and some smaller insect groups.

However, national atlases or maps on a national scale on plant community level (e.g. salt marshes, dry calcareous grasslands, wet heaths) are seldom seen, although their value for scientific interest or environmental policy is undeniably high (Van Duuren, 1996).
Maps with the distribution of plant communities can be used to establish gaps in data used for classification of vegetation, to protect plant communities, for spatial and environmental planning, for a better understanding of the relationship between vegetation and abiotic factors such as soil types and groundwater regime and as a framework for related flora and fauna data.

In 1995 a project was started in the Netherlands to publish an atlas with distribution maps of all plant communities of the Netherlands. The executive work was mainly done by IBN-DLO, while Statistics Netherlands shares responsibility for the supervision and organisation. Several other institutes give financial support. This article gives some information about this atlas project.

Method

As far as possible a complete distribution pattern of each plant community is presented on a grid map. For each grid cell of 5x5 km the presence or absence of a plant community is indicated. Each plant community is illustrated by a map of the 'recent' distribution - in the period since 1975 - and a map of its 'historical' distribution - the period before 1975. The map is based on data from three different sources, which are described further below; these sources can also be distinguished on the map (see figure 1). The computer program VEGATLAS (S.M. Hennekens, IBN-DLO) was used to store and map the data.

Vegetation data in the form of relevés

The main source for the atlas is the database of the project on the new classification of the plant communities in the Netherlands (Mucina et al., 1993). In order to classify the plant communities in the Netherlands more than 200,000 relevés have been collected and stored in a database (TURBO(VEG) S.M. Hennekens, IBN-DLO, Wageningen). A relevé is a sample in the field measuring mostly 1, 4 or 100 square metres. For each sample all the occurring plant and moss species are recorded and for each species a measure for the quantity (numbers or coverage; see example in Table 1). The relevés are partly derived from publications, for a large part also from unpublished sources such as notes in note-books. For the benefit of the 'atlas of plant communities' project additional relevés were collected and stored in the same system. Because the criteria for suitability for the atlas project are less precise than for the classification, more relevés can be used than are selected for making the classification of the vegetation types. For instance, relevés of which the mosses are not determined can often not be used for the classification, but usually are suitable for the atlas.

Table 1 Example of a relevé

Vegetation with Common polypody and Crowberry in the dunes of Terschelling

size: 10 x 10 m		coverage herb layer: 100%
author: V. Westhoff		coverage moss layer: 100%
date: 1–8–1939		location: G5.61.43
Herb layer:		
Polypodium vulgare	2	r = rare, coverage < 5%
Empetrum nigrum	4	+ = few, coverage < 5%
Hieracium umbellatum	1	1 = abundant, coverage < 5%
Festuca rubra subsp. dumetorum		2 = very abundant, coverage < 5% or coverage 5–25%
Hypochaeris radicata		3 = coverage 25–50%
Calamagrostis epigejos		4 = coverage 50–75%
Jasione montana		5 = coverage 75–100%
Carex arenaria	1	
Ammophila arenaria	2	
Salix repens		
Viola canina subsp. dunensis	r	
Moss layer:		
Hypnum cupressiforme	3	
Pleurozium schreberi	3	
Dicranum scoparium		

Other vegetation data

In addition to the basic data in the form of relevés, all other data about the occurrence of plant communities can be used for the atlas. However, it is impossible to check these data for a correct classification as they will already have been classified. Such data include description of occurrence of certain types in literature, vegetation maps and verbal contributions. Because of their different character, these data are marked with a different symbol on the map.

Flora data

Because the above-mentioned data are not collected systematically, certainly not all occurrences are covered by the dots on the map. To gain an insight into the 'completeness' of the maps a method was developed based on the distribution of so-called diagnostic species (see also Rodwell et al. 1993). The idea underlying this method is that the occurrence of a characteristic species of a certain plant community also to a certain degree predicts the occurrence of the plant community itself. Because the distribution of plant communities is not completely comparable with the distribution of such species, the latter data can only be used to give an insight into the possible distribution. The source of the flora data is the flora atlas of the Netherlands and a database with recent data about the distribution of plant species in the Netherlands (Florbase of FLORON, Leiden).

This possible distribution is partly derived from the flora data on the basis of expert judgement. First the characteristic or diagnostic species are selected. Secondly each selected species is assigned a weighting factor. The higher the value of the weighting factor, the more characteristic the species. If the sum of the values of the selected species that occur in a certain grid square (5x5 km) exceeds a threshold value, a grey square is indicated on the map. The selection, weighting factors and threshold values are determined for each plant community by the author of the map (see example in the framework)

Weighting factors for the plant community Isoetum-Lobelietum

Species	Weighting factor
Isoetes echinospora	2
Isoetes lacustris	2
Lobelia dortmanna	2
Littorella uniflora	1
Eleocharis multicaulis	0.5
Juncus bulbosus	0.5
Elatine hexandra	0.33
Luronium natans	0.33

Threshold value for each grid cell (above this value the grid cell is indicated): 2.8
E.g. Isoetes lacustris + Littorella uniflora = 3: indication: grey cell on map
Isoetes lacustris + Eleocharis multicaulis = 2.5: no indication: blank cell on map
Isoetes lacustris + Eleocharis multicaulis + Elatine hexandra = 2.83: indication: grey cell on map

Abiotic data

Abiotic data are of minor importance and only used for a small number of plant communities, which are strongly and clearly related to one abiotic factor. For the occurrence of Spergula-Corynephoretum the presence of drift sands is essential. This means that the distribution map of drift sands determines the potential area of this community. The distribution of the abiotic data can be combined with a map of the plant community in the program VEGATLAS in order to see the relation between the two and to give an insight into the completeness of the vegetation data.

Results

The results are initially published in a series of four volumes, according to the division of the classification of the plant communities in the Netherlands.

Contents of the four volumes of the atlas of plant communities

Volume 1: Communities of open water, marshes and wet heathlands
Volume 2: Communities of grassland, dry heathland and fringe communities
Volume 3: Communities of pioneer habitats, salt marshes and tall forb communities
Volume 4: Communities of scrubs, woodlands and clearings

The first volume is planned for 1999. Together the four volumes contain 300 maps of the plant communities of the Netherlands. Each map is accompanied by an introductory text, with at least the following parts: ecological explanation, distribution and changes in distribution, completeness of the map and the area in Europe. Each volume and each vegetation class has a more general introduction, which is also intended for readers with less specialised knowledge. The basic data, which are often more detailed than the published data, can be used in different ways for different projects.
A more dynamic view of the project Atlas of Plant Communities in the Netherlands is available on Statistics Netherlands' website: www.cbs.nl.

Maps on a European level

Mapping plant communities in the Netherlands is an important project for several reasons. However, in some aspects mapping these communities on a European level would be even more important, as this often covers the whole distribution area of the community. In our view the main aspects are:
– establishing gaps or overlaps between the national data;
– protection of plant communities;
– relation to abiotic data: ecological significance of the plant community;
– framework for related flora and fauna data.

If one or more classes of the European vegetation classification are published, it will be of great value to use the collected basic data (relevés) with the method described in this article to make maps of the distribution of plant communities on a European level. If the grid system of the Atlas of the Flora Europaea is used, 'potential actual' maps based on characteristic species can also be made. A first example of such an approach was presented by Zuidhoff et al. (1995), covering the distribution of eutrophic grazed grasslands of the Cynosurion cristati.

Note

[1)] Institute for Forestry and Nature Research, Wageningen (IBN-DLO)

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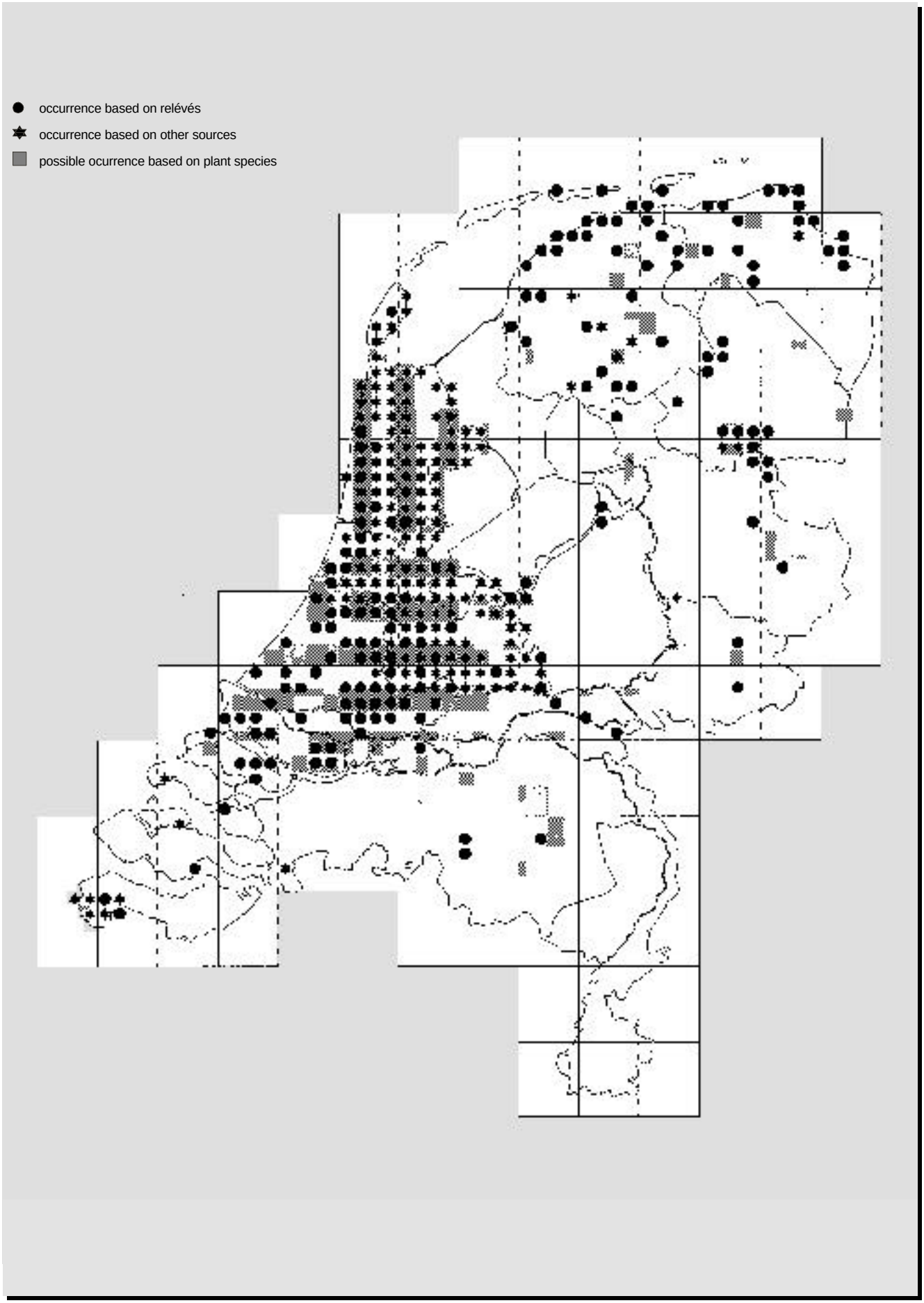
Figure 1. Wolffio-Lemnetum gibbae since 1975



Economic accounts for agriculture

Peter Pauli

This article gives a number of reasons to draw up separate satellite accounts for agriculture (economic accounts for agriculture), supplementing the standard national accounts framework. A major function of the satellite accounts is to form the basis for the calculation of income indicators, which are used for agricultural policy reasons in the European Union.

Introduction

This article gives an overview of the changes from the current Economic Accounts for Agriculture (EAA) to the new EAA97. The differences between the new European System of National and Regional Accounts (ESA95) and the EEA97 as well as the main features of the new EAA are discussed.

The purpose of the ESA95 "…is an internationally compatible accounting framework for a systematic and detailed description of a total economy (that is a region, country or group of countries), its components and its relations with other total economies."[1)] The ESA95 replaced the ESA78 and is fully consistent with the revised world-wide guidelines on national accounting, the System of National Accounts (SNA93). However, the ESA95 focuses more on the circumstances in the European Union.

The ESA95 framework consists of two main sets of tables:
- the sector accounts: production, generation of income, distribution and redistribution of income, use of income, financial and non-financial accumulation and balance sheets;
- the input-output framework: supply and use tables and symmetric input-output tables.

In this respect it is important to understand that there is a strong relationship between the supply and use tables on the one hand, and the production account and the generation of income account on the other. In fact, main economic indicators like output, intermediate consumption and value added (GDP) are estimated within the input-output framework; they are transferred to the sector accounts with the aid of a link table.

Satellites

The ESA95 (par. 1.18-23) clearly states that in some cases it could be useful to draw up a set of satellite accounts, mainly for the purpose of analysing a special situation or phenomenon. Such satellites are free, to a certain extent, to define their own set of rules to cover the particular requirements in the light of (a) their specific objectives, (b) the availability of data sources, and (c) the specific nature of units and their economic activities. The way of presenting the information could also be changed, and last but not least it is even possible to change the basic concept.
Immediately the question arises: are there valid reasons to create such a satellite accounting system for the agricultural industry?

The aggregate production accounts for the agricultural industry [2)] have at least the following uses within the policy context:
- to monitor the contribution that agriculture, as a significant component of the national economy, makes to that economy, as measured in the system of national accounts;
- to monitor developments in agriculture as a means of informing policies directed at or involving agriculture;
- to enable international comparisons of the economic situations in agriculture;
- as the basis of calculating income indicators for the persons engaged in agriculture;
- as a source of data that can be incorporated in models of the agricultural industry and its links with other sectors (such as input-output analysis).

It follows that, for the first purpose, the accounts for agriculture must use the same bases as those for other sectors of the economy. However, the conventions used in the context of national accounts may not be entirely appropriate for the second purpose, which is more directed at the needs of agricultural policy. Consequently, accounts that are constructed specifically for the production activity of this agricultural industry sometimes use conventions that differ from those used for the agriculture component in national accounts; for example, the coverage of wine or olive oil production that occurs on agricultural holdings may be treated as part of agriculture but in national accounts be excluded from this sector and included in food production. [3)]
We can thus conclude that there is a need for a specialised accounting system for agriculture: the EAA97, a satellite of the national accounts. Because a satellite by definition cannot be a fully integrated system, to stay in touch with the mainframe of the national accounts all deviations will be listed in so-called bridge tables to reconcile the national account and satellite account approaches. Apart from that it should be emphasised that the main features of the ESA95 stand firm in the EAA97.

Changes flowing from the SNA93 and ESA95

The SNA93 introduced changes and improvements that have been adopted by both the Food and Agriculture Organization (FAO) in its 1996 *A System of Economic Accounts for Food and Agriculture* and by the European Union in its *ESA95.* [4)] The adjustments needed to revise the methodology of the EAA to conform with the new framework have been finalised. Some points like constant price calculations, however, are still open. Because the EAA97 is a flexible system it is possible to introduce or revise items in a later stage.

Some of the revisions to the EAA are largely to do with presentation. The EAA97 is to be subdivided into three current accounts (Production Account, Generation of income account and Entrepreneurial income account) shown in simplified form in figure 1.

More significantly, some changes in fundamental concepts are involved. These changes concern:
- the basic *statistical unit* for describing the production process;
- the *valuation* of output, and its various components, at *basic prices*;
- determining the *time* at which output is recorded;
- the valuation, content and registration of *intermediate consumption*;
- *transactions* of the generation of income account;
- *other distributive transactions*;
- the content and valuation of *gross fixed capital formation* and *consumption of fixed capital*;
- other items: *transport* costs, *concept of value added* at factor cost;
- *market/non-market* division, measuring the volume of *labour* etc..

Here attention will focus on the more practical implications of the major changes involving the first four. The SNA/ESA revisions also have a knock-on effect for the indicators of income that the statistical office of the European Union (Eurostat) has developed from the EAA and which are used in the context of agricultural policy.

The basic unit

Under the revised EAA the basic unit is to be changed from the *unit of homogeneous production* (UHP). While UHPs remain within the conceptual framework of national accounts and are still seen to have a role within input-output analysis, it is clear that the revised ESA gives pre-eminence to a different concept - the *local kind-of-activity unit* (LKAU). The equivalent term in the SNA1993 and FAO 1996 is the *establishment*. The LKAU is itself a grouping, in a distinct unit, of the production activities of an institutional unit which falls into the same class of the revised NACE. In addition to the main activity, the LKAU is deemed also to include secondary activities belonging to other NACE classes which are connected with the main activity, but which cannot be separately identified from available information.
The agricultural LKAU will not necessarily correspond to an agricultural holding, since a holding could have both an agriculture LKAU and a LKAU belonging to some other NACE rev. 1 category (or several LKAUs belonging to different categories). In distinguishing between LKAUs within the same holding, much depends on the ability to separate the agricultural from the other activities in the data source.
For the purpose of the EAA97, it is assumed that agricultural activity will *always* be separable from other activities - that is, agricultural activity will *never* be a secondary activity. Thus the output of the branch agriculture in future within the EAA97 will thus result from two types of activity: (i) the agricultural activity of LKAUs, and (ii) the non-agricultural secondary activities of agricultural LKAUs, which cannot be separately identified (currently excluded from the 'pure' branch that consists of UHPs). It should be noted that, in this approach, all LKAUs with identifiable agricultural activity are included in the branch, and that this ensures that the potential coverage of agricultural production is the same as under the present UHP 'pure' branch. If, however, it were conceded that, in practice, there are situations where agriculture is a secondary activity, this element of agricultural production would be lost to some other, non-agricultural branch.

Agricultural industry

By grouping all LKAUs engaged in the same type of activity, it is possible to establish an 'industry', making it possible to break down the economy by 'industry'. The classification of these 'industries' depends on the principal activity of the units thus grouped together. At the most detailed level of classification, an 'industry' includes all LKAUs in the same class (4-digit level) of NACE rev.1 and therefore engaged in the same activity as that defined in NACE rev.1. Since an 'industry' comprises a group of *units* which carry out the same or similar types of *activity*, the definition of the agricultural 'industry' in the EAA97 depends on the identification of the characteristic activities and units in that 'industry'. The resultant selection of characteristic agricultural activities and units may lead to some differences between the EAA97 agricultural 'industry' accounts and the national accounts.

Eurostat proposes that, for the purpose of the EAA97, LKAUs should not include units whose sole purpose of production is for own-consumption. In effect, this will exclude family gardens and allotments; the boundary between such units and agricultural holdings is to be determined (as a default) by reference to the threshold for inclusion in each member state's farm structure survey. It should be noted that, under the present UHP branch concept, output from these is included, so this change represents a small narrowing of coverage. In this respect the problem of non-harmonised thresholds in farm structure surveys between member states could lead to incomparability. In the middle and eastern European countries in particular, agricultural production in allotments can be quite significant.

Measuring output

Valuation of output at basic prices

The current methodology of the EAA is based on valuing output at the 'ex-farm' price. However, under the revised SNA/ESA all output, whether intended for sale, or stored for later sale or for any other use, is valued at its basic price.

Value of output at basic price is taken as:
– Value of taxes on products (other than VAT)
+ Value of subsidies on products

Thus, valuing output at basic prices requires the explicit treatment of taxes on products and subsidies on products. Taxes and subsidies represent the amounts due (rather than actually paid) in respect to output for the year. This is in line with the general principle of the ESA95 that all recording should be on an accrual basis.

The main issue here is how subsidies are treated, and in particular what constitutes a subsidy on a product and what is an 'other' subsidy on production. It should be noted that while this partition makes a difference to the calculation of value added at basic prices (the difference between output at basic prices and intermediate consumption at purchaser's prices, excluding VAT and deductible assimilated taxes - which is the balancing item in the production account), it makes no difference to the calculation of operating surplus (or mixed income) of the agriculture branch. This is because the 'other' subsidies on production are added in the Generation of Income Account, of which operating surplus (mixed income) is the balancing item ('other' taxes on products and compensation of employees are also deducted in reaching operating surplus/mixed income).
This proves why the inclusion of these accounts in the EAA97 is so important. The EAA97 gives a complete overview of subsidies/taxes on products and production.

Final production and total production.

The EAA97 change in the way in which the value of production is measured. At present the value of *final production of agriculture* is calculated as the value of products that leave the branch (the concept of the national farm). Under the EAA97 an alternative measure of output*, total agricultural production*, is proposed; this represents the total value of all agricultural products and includes production which is then used by another agricultural unit (or the same unit in case of cereals and fodder plants used for animal feed) in a further agricultural process. The adoption of *total agricultural production* as the output measure does not, of course, have an implication for value added, because of the off-setting change in the level of intermediate consumption.

Total agricultural production is in theory a more comparable measure of value of agricultural output across national boundaries. Among other advantages it permits a more meaningful comparison between countries that import different proportions of their animal feed, and provides more valid technical coefficients by which the

Figure 1. Proposed scheme of aggregate 'income' indicators

Production account	Generation of income account	Entrepreneurial income account
Output	Net value added	Net operating surplus*
– intermediate consumption	– compensation of employees	(mixed income)**
– consumption of fixed capital	– other taxes on production	– interest paid
	+ other subsidies on production	– rent paid
– Net value added	– Net operating surplus* (Mixed income)**	= Net entrepreneurial income

*corporations; **households.

performance of agricultural can be viewed against that of other industries (e.g. output per person). However, it does involve some theoretical issues and substantial practical difficulties in measuring and valuing the intra-branch production.

In the revised SNA/ESA the output of a branch is measured as the sum of all the outputs of all the units of the branch (in the case of agriculture, all agricultural LKAUs), excluding the output used as intermediate consumption *within the same unit* (LKAU) and within the same accounting year. Sales of agricultural products between holdings (or agricultural production used by other LKAUs within the same holding) would be measured (unlike the present situation).

However, Eurostat has proposed that for the EAA97 an approach be adopted in which, in addition, some of the intra-LKAU intermediate consumption is measured *where this output concerns two different basic activities* (the major example is products used for animal feed). The arguments for this departure from the strict conditions of the SNA/ESA are among other things:

- this form of production for intermediate consumption within the same LKAU is particularly significant in agriculture;
- the LKAU could cover a very heterogeneous collection of different forms of production, though all agricultural;
- adopting the SNA/ESA rule strictly would not adequately meet the aims for dropping the concept of the national farm, since much output is used within LKAUs rather than sold between agricultural holdings;
- it would enable consistency with other statistics, such as those of the FADN.

The value of intermediate consumption within the same unit would only be calculated when all the following criteria apply:

- the two activities being carried out relate to different four-digit levels of NACE rev. 1. This criterion would, for example, exclude the valuation of milk used as foodstuff;
- the output represents a significant value for a significant number of farmers - a rule to be applied independently by individual countries;
- data on price and quantity can be known without too many difficulties.

This last point, valuing output, can be particularly troublesome where the output is not normally marketed, or the amounts marketed are small and unrepresentative. Grass and grass products are a prime example. Details of how output used as intermediate consumption within the same LKAU can be identified and valued are still under discussion. However, it appears that only hay, silage and other animal feed products (like fodder beet) that are traded (at least in some countries) will be valued as part of total output.

Work in progress.

The production boundary in ESA95 has been enlarged to include the growth of cultivated assets not yet harvested as work in progress (ESA95 3.119). This is production which is not quite finished. For the EAA97, it includes wine, livestock for slaughter, all chickens and other poultry (including breeding poultry) and other animals except those regarded as fixed capital. It should be noted that growing crops and standing timber (in a regular development of inventories) are not regarded as work in progress inventories in the annual economic accounts.

Work in progress, like other inventories of finished products, constitute part of output. In this respect EAA97 pays special attention to the problem of changes in inventories of seasonal products for which the quantitative method (recommended by ESA95) is not an accurate approximation of the perpetual inventory in view of the irregular change in prices and quantities. It could also lead to the inclusion of nominal holding gains or losses in the measurement of the change in inventories.

To solve the problem of evaluating inventories of seasonal products the EAA97 recommends the reference method. This consists in determining the change in inventories as the difference between the value of output for the year and the value of sales (and other uses) for the same year.[5)] It is founded on the assumption that there are no inventories left over at the end of the marketing year (the end of the first half of the following calendar year). It involves directly evaluating total production harvested during year *n* using the weighted average price for the marketing year (*n*/*n*+1) and deducting from this the value of all sales (and other uses) made during calendar year *n* corresponding to the year of harvest at the prices applicable at the time of sale (or other uses).

This method treats the storage activity as a factor for raising the prices of goods during storage. It thus makes a distinction between the storage activity and its effects on product prices. The increase in value resulting from the time in storage is ‘anticipated’ since it is allocated to the production of year *n* (i.e. the year of harvest, even though the sales are spread over two calendar years), it being possible to anticipate price trends without too much uncertainty because they result from fairly regular and predictable changes.

The application of this method makes it possible to minimise the inclusion of holding gains or losses in the measurement of output. It ensures consistency between the calculations of output in value and quantity and avoids the recording of output on the basis of work in progress (requiring data on the level of inventories at the start and end of the calendar year, with corresponding prices). It also facilitates the elaboration of accounts in constant prices.

Figure 2. Calculation of Eurostat's 'income' indicators

Net Value Added 'at factor cost' (i.e. adjusted for taxes on products and subsidies on products)		Deflated, expressed per unit of total labour input, and in index form = Indicator 1
minus	Rents paid	
minus	Interest payments paid (inc. loans for land purchase	
equals	Net Income from agricultural activity of total labour input	Deflated, expressed per unit of total labour input, and in index form = Indicator 2
minus	Wages and salaries paid (hired labour)	
equals	Net income from agricultural activity of family labour input (the holder and his/her family, more property termed non-hired labour)	Deflated, expressed per unit of unpaid labour input, and in index form = Indicator 3

A second method is recommended in the specific case of products whose prices are difficult to predict (such as fruit, vegetables, potatoes and olive oil) and whose storage on agricultural holdings reaches economically significant levels. This method is less strict than the reference method in excluding holding gains and losses from the measurement of output; it considers the storage activity to be an extension of the production process in time. The inclusion of the increase in prices of stored goods is delayed and allocated to the year in which the storage took place. By this second method, seasonal output is calculated directly as the sum of sales, other uses and changes in inventories. Stock changes are estimated by valuing the stocks at the end and start of the accounting period on the basis of their current prices.

It should be noted that these two methods differ in how they measure the change in inventories but not in the recording of sales (which are valued at the basic prices applicable on withdrawal from inventories, thus allowing consistency to be ensured between the flows recorded in the customer branches of agriculture).

Valuation at constant prices

In the sequence of accounts of the EAA97 provision is made for the valuation at constant prices of final output, intermediate consumption, value added (as a result of the double deflation method) and gross fixed capital formation. The purpose of this valuation is to value the corresponding magnitudes of the current period as if the prices of the base year had not altered in the meantime. Price influences which have taken effect between the base period and the current period are thus eliminated (the values obtained as a result of this price adjustment being volumes).

For the purposes of economic analysis, it is useful to distinguish between those value trends which reflect volume changes and those caused by changes in prices.
The ESA95 defines price and volume: "Price is defined as the value of one unit of a product, for which the quantities are perfectly homogeneous not only in a physical sense but also in respect of a number of other characteristics." (ESA 95 10.13). The characteristics which have to be held invariant for the definition of price are those characteristics which constitute differences in quality. These definitions imply that all differences in quality are part of the 'changes in volume'.

To calculate year to year changes in price and volume, the ESA95 recommends the use of a Fisher index. As this type of index is difficult to apply, however, the Laspeyres and Paasche indices are acceptable alternatives for volumes and prices, respectively. For changes in volume over longer periods the ESA95 states that chaining, i.e. cumulating year to year changes, is the preferred method: despite non-additivity of the series this method, giving a 'chained Laspeyres volume series', is transparent to users, and therefore preferred. The calculation of the 'chained Laspeyres volume series' is achieved by calculating directly the volume ratio between each pair of years. These ratios are then chained along from the base year to give either an index (by starting with 100 in the base year) or a constant price series (starting with the value at current prices) in the base year.
Chain linked volume series are the best possible estimates of growth rates. In this respect non-additivity is not an argument to reject this method and stick to the system currently used in the EAA of a fixed base year. Harmonisation between member states is another argument in favour of the use of one method. However, clearly for a specific purpose like price analysis it could be useful to maintain a second method.

Income indicators

A major function of the aggregate economic accounts for agriculture has been to form the basis of the calculation of a range of indicators of what can be loosely described as 'income' from agricultural production. Figure 2 illustrates the definitions of the three indicators within the European Union.

It should be noted that the three income indicators are expressed per unit of labour input. Thus movements in the indicator will reflect both changes in the economic aggregate and in labour input; the importance of obtaining reliable income statistics will be covered later.

Indicator 1 is the longest established, originating in the early 1970s, and the one that receives the greatest attention in official publications of the European Union. [6)] However, there is a case for present Indicator 3 (introduced in 1987) being preferred as a proxy for the rewards remaining to farmers and their families for their productive activities in agriculture (though not representing the overall flow of resources to them, which would also encompass income from non-agricultural activities, from employment, from property, from transfers and so on).

In addition to the *production account* and *generation of income account*, the revised international guidelines contain an *entrepreneurial income account*, the balancing item of which is entrepreneurial income (see figure 1). Strictly speaking, this account relates to institutions (such as households or incorporated businesses) although, with some assumptions about the nature of the property income involved, it can be assumed to apply to the agriculture branch.

Entrepreneurial income is calculated after adding to the operating surplus (mixed income in the case of agricultural households) the property income receivable and deducting any income and rents payable *which are related to the productive activity.* Thus, for households, an explicit distinction must be made between the assets and liabilities linked to the unincorporated enterprise's

activity and those related to the household's non-productive activities.

Only the former are covered. This separation may be difficult in practice. For incorporated enterprises, the deduction of property income does not include payments to owners in the form of dividends or 'income to owners of quasi-corporations'.

There is therefore a difference between entrepreneurial income relating to corporations and that relating to unincorporated enterprises. For the former, the entrepreneurial income is 'pure'. For the latter entrepreneurial income includes income from self-employed (independent) work that cannot be separated from 'pure' entrepreneurial income.

In essence, entrepreneurial income corresponds with what the EAA currently labels 'net income from agricultural activity of family labour input'. But it is clear that this current term is inappropriate at the branch level, as it is a mix of reward relating to both households and incorporated businesses. Thus '(net) entrepreneurial income' is a better label.

The second, and more fundamental concern with the present array of income indicators relates to their use not as aggregates but when expressed per unit of labour input.
There are theoretical objections and practical problems associated with doing this even for the present Indicator 1, but they are brought to a head with attempts to express entrepreneurial income per unit of 'family' labour. A major difficulty is that the entrepreneurial income of incorporated business does not have any associated units of family labour input.
While under the former system, such problems could be dismissed as not affecting the overall figures greatly (although this was perhaps not the case for the United Kingdom and the Netherlands), this is no longer acceptable for the enlarged Germany, where the output from enterprises that are not close to the family farm model is significant.
Consequently, the European Union proposes to revise its indicators along the following lines:

- **Indicator A: Index of the real income of factors in agriculture per annual work unit**

  This yardstick corresponds to the real net value added at factor cost of agriculture per total annual work unit.[7)]

- **Indicator B: Index of real net agricultural entrepreneurial income, per unpaid annual work unit**

  This indicator presents the changes in net entrepreneurial income over time, per unpaid annual work unit. Converted into the form of an index for each member state, it provides information on trends rather than on income levels. It is most useful in those countries where agriculture is organised in the form of sole proprietorships. On the other hand, in view of the existence of 'conventional' companies which generate entrepreneurial income exclusively with paid labour, Indicator B is overestimated in comparison with a notion of individual income. This drawback may prevent a comparison of income levels between member states if the proportions of 'conventional' companies differ very much.

- **Indicator C: Net entrepreneurial income of agriculture**

  This income aggregate is presented as an absolute value [8)] (or in the form of an index in real terms). It allows comparability over time of the income of the agricultural 'industry' between member states.

Notes

1) Eurostat, 1996, European System of Accounts - ESA 1995.
2) This article will only discuss agriculture (NACE-code 01) but the methodology is basically the same for forestry (NACE-code 02).
3) Similar differences exist within the EU's EAA and national accounts with regards to vegetable materials for plaiting, Christmas trees, some forms of animal husbandry services, farming of horses etc.
4) The theoretical consequences of the ESA revision on the EAA are considered in detail in a working document for Eurostat's Working Party on the Economic Accounts for Agriculture, Doc. F/LG/277, Nov. 1994).
5) Use is made of the breakdown of output into sales (and other users) and changes in inventories.
6) Results for Indicator 1 have been calculated since 1976 and cover years from 1973 onwards for all EU member states except Austria, Portugal, Finland and Sweden, where 1980 is the earliest year. Aggregate economic accounts have been published within the European Union since 1964, and from 1969 onwards the six original member states adopted the common definitions and procedures of the EAA.
7) In order to take into account part-time and seasonal work, agricultural employment or changes therein are measured in annual work units (AWU's). One AWU corresponds to the input, measured in working time, of one person who is engaged in agricultural activities in an agricultural unit on a full-time basis over an entire year. A distinction is drawn between unpaid and paid AWU's, which together make up total AWU's.
8) This measure of income corresponds to the former measure "net income from family agriculture activity" for sole proprietorships.