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Dutch historical statistics: 19th century population censuses

Cees A. Oomens and Gert P. den Bakker

1. Introduction

For some time now, there has been a mounting interest in historical statistics. In reaction to this, Statistics Netherlands has compiled and revised a number of long, consistent time-series, concerning, for instance, population and labour force data based on census results. Even a superficial examination of the results of the nineteenth century censuses shows how difficult it is to compare them. This paper touches on these censuses against the background of the development of Dutch statistics.

2. A bird's eye view of the development of Dutch statistics

Three phases can be distinguished in the development of the present Dutch system of economic and social statistics. In the first, the period before 1795, governments had no great need for statistical information. Data were occasionally gathered for tax levying purposes, for example. Besides, statistical data came available as by-products of government activities. However, the government did not publish the figures and sometimes even treated them as official secrets. In some cases historians were able to find such material in archives which resulted in surprising conclusions (Estienne, 1802). However, for the period before 1795, there is no system of statistics and the statistics are not complete.

The second phase in the development of the Dutch statistics started in 1795. The French revolution of 1789 had major consequences for the enfeebled Republic of the Seven United Provinces. A French invasion acted in favour of the Patriots in the internal struggles, and a period of bloodless revolutions followed with a steadily increasing French influence. In this period, many things changed in the Netherlands. The decentralised public authorities were partly replaced by one central authority which introduced a general obligation of registration of births and deaths. Of great importance

for the development of the statistics hereabouts was the French interest in statistics. In France reports on the departments were made with both qualitative and statistical information. Such a report was made on the Batavian Republic as well: *Statistique de la Batavie* (Estienne, 1802).

Far more extensive is the report *Aperçu sur la Hollande* (Statistics Netherlands, 1900) which was written for, but probably never sent to the French authorities. It remained concealed in the archives until 1899 when it was published by the newly founded Central Bureau of Statistics. The statistical data in the report were by-products of the activities of the ministries.

In the Netherlands the interest for statistics grew. The Patriots shared the ideals of the French revolution: to give the people more influence on the government. In 1795, this resulted in a population census in aid of creating equal electoral districts. The outcomes of this census were fully published.

In 1798, an *Executive Administration* was established, assisted by eight *agents*, the aim being to replace regional policies by a national one. Johannes Goldberg became the agent for the national economy (Zappey, 1967). He was involved in politics and he had published a report on the finances of Holland in the years 1788–94. He wanted reliable statistics, and although he made several failed attempts to gather data, he did not give up and set himself the goal of making a complete statistical description of the country within ten years. He set out on a five-month journey around the country, to see the situation for himself, and distributed many questionnaires. However, too little preparation prevented Goldberg from achieving his goal: he had insufficient instructions on how to answer the questions, some people refused to answer, and the municipalities did nor have enough capacity to collect the questionnaires.

In 1815 the government of the new Kingdom of the Netherlands used the Goldberg method to obtain information about industrial activities. Again, a final report was never completed. However, Brugmans found and published data from this survey in a number of municipal archives (Brugmans, 1958).

Following the French occupation the government of the Kingdom was prepared to publish the statistical data in the possession of the ministries. It started by founding a *Commission for Statistics* which was made responsible for the sampling and publication of the data back to about 1803. A number of ministries published their ’own’ figures, and a section of the Ministry of Home Affairs was put in charge of the compilation of statistical yearbooks which gave a selection of available data. However, in 1878, this section was disbanded. Although the developments resulted in the availability of a considerable amount of information, it related only to government activities or by-products of these activities. Both researchers and the business world wanted figures on other issues as well.

A group of people around the lawyer J. de Bosch Kemper were very active in this field. In 1849, he published the first *Staatkundig en Staathuishoudkundig Jaarboekje* (Abstract on Politics and Economics). This initiated the founding of the *Vereeniging voor de Statistiek* (Association for Statistics) (Mooij, 1994). The Association asked the government for more statistics. It tried to gather statistical information itself as well, but failed as a result of lack of capacity, lack of financial possibilities and because it was not possible to make response compulsory.

As far as statistics are concerned, the rest of the nineteenth century was a sequence of unsuccessful efforts to sample, process and publish reliable statistics. Statistical commissions were founded and dissolved again. It took until 1899, when a former president of the Association for Statistics became a cabinet minister, that parliament accepted his proposal to found both a Central Commission for Statistics and a Central Bureau of Statistics.

Looking at the development of statistics in the nineteenth century it becomes clear that no experience was acquired for the very first step in making statistics: the sampling of data, due largely to the fact that the figures were mainly by-products of government activities. Also the population censuses, which were not by-products, only rendered that experience at the end of the century, probably because the censuses were held only every ten years.

A consequence of this lack of experience was that the publications seldom gave information about the definitions of the variables estimated. Also, continuity was often absent, even in the case of statistics (the by-products) which came available on the basis of laws which remained unchanged for years. For instance, a proposal to change a tax law was made to adapt the law to the deviation between the rules of the law and the rules in practice.

The complete description pursued by Goldberg remained unattainable until far into the twentieth century. On the one hand because economic theory could not yet provide the necessary basis, and on the other because the government clung rigorously to the linking of the statistical information to its own policy.

In the third phase of the development of Dutch statistics the breakthrough to the present system of statistics was effected. The majority of statistics became part of the description of economic and social processes. Two facts influenced these developments in the Netherlands: the centralisation of the statistical information and the economic, social and political situation in the 1930s.

The first fact is formulated in the Royal Decree of 9 January 1899 which established a central statistical office: *The Central Bureau of Statistics gathers, processes and publishes, as far as the available resources permit, the statistical information which the*

director-general considers useful for practice and science. And next: *The Bureau shall not undertake new statistical research or outlays, or terminate existing statistics, without permission from the Central Commission for Statistics.*

The first activity of the Central Bureau of Statistics was to take over the statistics which were compiled by the ministries. It also set up new statistics. During World War I, the Allies asked for information about the Dutch imports in relation to the stringent Dutch needs. Therefore, statistics on production and use for a great number of industries were set up. After the war, when the original need for these statistics no longer existed, the Bureau succeeded in saving the financing of them. The phrase *as far as the available resources permit* in the Royal Decree endured the influence of the government via the Bureau's budget.

The centralisation of statistics expanded experience with all aspects of making statistics. The less strict attitude of the government resulted in a modest extension of the scope of the statistics.

The second course of action has to do with both the economic decline and its consequences and the threat of war in the 1930s, which forced the government to take measures. One result was the development of the system of national accounts which was used for economic policies. In the Netherlands, Jan Tinbergen played a decisive role in this area. In 1936, he presented his famous macro-economic model for the Dutch economy which led to the elaboration of the national income estimates and to the development of the input-output tables which were used to optimise the utilisation of scarce raw materials. After World War II, the newly established Central Planning Bureau required new national accounting data. This led eventually to a major expansion of the Central Bureau of Statistics.

Traditionally, the Bureau did not want to make estimates, as opposed to counting. This already became clear in the publication of the 1899 Population Census which presents a detailed explanation and comparison with other statistics. However, differences between figures were only indicated, they did not result in improvements of the data. The results of the calculation of the national income, which was based, of course, on many estimates, could only be published with the remark in the accompanying text that making estimates was not a task for the government but should be done by independent researchers. However, as the estimates were used more and more by policy makers, the objections gradually disappeared.

3. The Censuses

Introduction

In the Netherlands, official censuses had been taken every ten years since 1829. The census scheduled for 1940 was cancelled because of the outbreak of World War II. The last census was taken in 1971. After that year opposition to the census had become so great and widespread that the government decided to abolish the population census.

A number of population counts had been carried out before 1829. The first general one was in 1795 [1)] at the instigation of the newly formed Batavian Republic. In the period between 1795 and 1815 the various governments repeatedly asked the provincial governors for information on the size of the population. This was given on the basis of the population accounting, sometimes completed on the basis of local enumerations.

In 1795, the purpose of the enumeration was to create a basis for the organisation of elections. In 1815, the government of the new Kingdom of the Netherlands held an enumeration of the population for the formation of military districts.

When defining their concepts, researchers preparing new statistics should consider the wishes of potential users of their findings. They should also take into account the restrictions imposed by the process of sampling and compiling the data. This relative freedom does not exist in the case of reworking existing statistical sources: the concepts have already been chosen. However, this does not mean – especially in the case of the nineteenth century statistics – that they are always clearly described. Historical research has therefore to find out which concepts were used in the original statistics. Only then does comparison become possible with the method currently in vogue, and can the 'old' data be transformed into 'new' ones. 'Bridging' definitions may have to be used to make data comparable in order to arrive at meaningful historical time series.

The Population in the Netherlands 1795–1899

Historians describing social and economic developments in the Netherlands in the nineteenth century are rather hesitant when it comes to explaining population movements during that period. The results of population censuses and the statistics on births and deaths are considered to be trustworthy, but the statistics on migration are generally rejected. Starting out from this assessment Hofstee (1978) used census figures and the statistics of births and deaths for the period 1815–1850 to estimate net migration. His result was a net migration of 143,000 people (including the province of Limburg for 1815–1830). Stokvis (1985), however, estimated the number of Dutchmen living abroad in 1850 at 68,000 and the number of foreigners living in the Netherlands in the same year at 71,000, concluding that it seemed difficult to accept Hofstee's estimates. Since this conclusion creates uncertainty about the accuracy of all nineteenth century

population statistics, it seemed appropriate for Statistics Netherlands to re-investigate this problem (Oomens, 1989).

Oomens' study analyses Dutch population data, statistics on Dutch immigrants in other countries and comments on these figures, resulting in substantial corrections on the original census data, for the following reasons:
- border changes;
- the change from actual to resident population (1849 and 1869);
- different census dates;
- most of the navy personnel on ships that were not in home waters on the census date were not included in the censuses;
- skippers inland vessels and their families (up to and including 1849).

A comment on the births and deaths statistics in the *Statistisch Jaarboekje van 1839* (Statistical Abstract of 1839) (Lobatto, 1839) turned out to be significant. It necessitated a correction for the number of births as published in the period before 1837, as in many provinces the number of births did not include stillbirths, while the number of deaths did. This affected approximately 174,000 births in the period 1796–1837.

Direct information on nineteenth century immigration hardly exists in other countries. There are immigration statistics for the United States, but these are considered to be incomplete (Swierenga, 1981). German (Prussian) statistics provide figures, but these are limited to immigrants who opted for the German (Prussian) nationality. For many countries information can be obtained from censuses (usually for 1850 and later years) and refers to the number of residents by country of birth and/or by nationality. Estimates on immigration or emigration for a number of countries can be based on these figures. If the information refers to the country of birth, a method described quite elegantly by Kuznets and Rubin (1954) can be used.

Table 1 presents a summary of the estimates concerning the state of the population and population movements for the period 1796–1899. The differences between the (corrected) census figures and the estimates from the (corrected) data of the population accounting are surprisingly small. The conclusion is that the new estimates present a reliable picture of nineteenth century population.

Table 1. Summary of the estimates, 1796–1899

	1796–1849	1850–1859	1860–1869	1870–1879	1880–1889	1890–1899
	x 1,000					
Population at the beginning of the period [a)]	2,093.0	3,084.1	3,312.0	3,595.2	4,016.4	4,515.5
Live births	4,776.1	1,133.3	1,279.9	1,448.0	1,552.1	1,644.3
Deaths	3,768.7	871.3	934.2	998.2	986.6	969.3
Immigration	91.7	9.3	14.7	28.9	25.3	22.0
Emigration	121.1	50.8	66.9	57.4	89.7	111.0
Population at the end of the period (computed)	3,071.0	3,304.6	3,605.5	4,016.5	4,517.5	5,101.5
Population at the end of the period (censuses) [a)]	3,084.1	3,312.0	3,595.2	4,016.4	4,515.5	5,107.3
Difference between computed and census figures	+13.1	+7.4	–10.3	–0.2	–2.0	+5.8

[a)] Corrected census data according to Oomens (1989).

The labour force in the Netherlands 1849–1899

In the Netherlands, occupational censuses were taken as a component of the population censuses in 1849, 1859, 1889, 1899, 1909, 1920, 1930, 1947, 1960 and 1971. Since 1971, data are derived from labour force surveys and the labour accounts. It is very difficult to compare the occupational censuses, a view shared by the census commissioners themselves. Von Baumhauer, who played a leading role in developing professional statistics in the Netherlands and was in charge of the 1859 occupational census wrote: *It is completely impracticable to make a comparative observation of the statements of the population concerning their occupation for both censuses (1849 and 1859)* (Baumhauer, 1873). The introduction to the occupational census of 1889 quotes this statement and comments: *However, to nearly the same extent this also holds for a comparison of the results of the first two censuses with that of 1889* (cf. Uitkomsten, 1889). Comments on the censuses held after 1889 are less negative, but research has shown that then, too, differences still existed which made it difficult to obtain a clear overall picture. So, tracing the differences is a first step towards coherence. The next step is to implement the corrections in order to make the censuses comparable (Oomens and Den Bakker, 1994).

To study the nineteenth century population it was possible to use the relevant supplements, comments and studies which have been produced through the years. This is not the case with regard to the occupational censuses: those of 1849 and 1859 were unsuccessful according to the Association for Statistics, and no further substantial comments on the occupational censuses are available.

The following method was used in the project (see also above):
– analyzing the scheme, implementation and results of the occupational censuses;
– comparison of the census figures with data from other sources;
– analyzing differences between successive censuses which seem unrealistic.

The comparison of census data with those from other sources did not yield many useful results, on the one hand because only a few other sources exist, and on the other because of differences in concepts used. In fact, only tax data concerning domestic servants were useful. The detailed analysis of the censuses was useful in the respect that it brought to improvements that had been made to avoid errors made in previous census. Many corrections on the original census data were made on the basis of detailed comparisons of successive censuses.

Many forms of part-time work have been introduced in the more recent past, but the nineteenth century, too, the labour force comprised many part-timers, for instance in agriculture (wives and children) and in brickyards. The questionnaires for the occupational censuses did not take account of part-time work. The population was divided into people with and people without occupation and the interpretation was left to the poll taker. It goes without saying that this resulted in great differences between successive censuses. Although these differences were corrected for, it was not possible the determine the norm used to classify a person in the category with or without occupation.

Another problem has to do with the census date (December 31) and the definition of the population. People who worked in the Netherlands but did not live in the Netherlands at the end of the year were not counted (peat cutters and coal miners, for example).

Further remarks on the study:

– At the time of the first occupational censuses questionnaires did not yet differentiate between kind of enterprise and occupation. The censuses of 1849, 1859 and 1889 asked only for occupations: all workers with the same occupation were added together, regardless of the type of enterprise they were employed by. The 1899 census provides both an industrial and an occupational classification which were used to make industrial classifications for the previous censuses.

  Apart from this distinction, the classifications used in subsequent censuses were not identical. In order to arrive at comparable data we need to choose one – and only one – classification. The next step is then to adjust the data of all censuses according to the classification of our choice.

  In earlier attempts to compile comparable data on the labour force it was more or less automatically assumed that they should be based on the most recent classification. However, even the most recent classification will have to be altered in due course which means that work on time series will have to be done all over again.

  Since reclassifying older censuses will require by far the most energy, it seemed better to choose a classification that was close to the nineteenth century structure. We chose the classification of the 1920 census as a benchmark, since this was the first census with a reasonably workable industrial activity index.

– The criticism of contemporaries on the censuses of 1849 and 1859 concerned mainly the fact that many people were classified as 'workers' without further comment. In 1889 the same occurred, but the poll takers were obliged to give a further description (233,654 questionnaires were affected).
– In the nineteenth century, people who employed domestic servants had to pay tax for them. For tax purposes, domestic servants included people who work for their employer's company and live in his house. The latter were erroneously classified as domestic servants in the censuses of 1849 and 1859.
– After implementation of the above-mentioned corrections for the regions (17 towns and 11 provinces, excl. these towns), a time series analysis was carried out. It appeared that great differences occurred for people without occupation, due to mistakes in the processing of the questionnaires.
– At the request of the Ministry of Defence, from 1889 to 1930 conscripts were classified under their previous occupation. After 1930 they were classified as soldiers.
– The poll takers of the 1899 census had great difficulties classifying women who belonged to a religious order and worked as nurses. The time series of women employed in religious organisations and in nursing reveal that the same problem evidently occurred in previous censuses.
– In 1899 the number of porters was much lower than in previous censuses, presumably because of a change in the terminology for which corrections had to be made.

4. The 19th century population censuses and what we have learnt from them

Two general conclusions from the Dutch nineteenth century censuses are:
– The government decided on the purpose of the censuses. They were focused on information needed for government activities. Social issues seldom played a role in the censuses.
– There was insufficient attention for the comparability of the censuses.

Broadly speaking, population censuses were taken because society demanded certain information. However, in the nineteenth century only one small part of society determined what had to be counted in the Dutch censuses: the government. No other segments of society had any influence in this respect.

In the course of the nineteenth century both the scientific and the business community put forward proposals on the kinds of data to be gathered. However, the government was very reluctant to meet these wishes: only data which were needed for government activities were compiled. Of course, in a way these government activities reflected the issues in society. Although external discussions did take place about the variables to be measured in the censuses, these debates were mainly held by professional statisticians who were sometimes closely associated with the authorities. The authorities disliked

such debate, and around 1880 the small group of statisticians employed at the Ministry of Home Affairs were dismissed.

Social issues did sometimes play a role in censuses. The 1795 population census was taken with the aim of forming electoral districts. Here the social context is clear: realisation of an important ideal of the French revolution, viz. influence of the people on the government. [2)]
An important aim of the 1815 census was the one that already played a role in ancient censuses: how many soldiers could be recruited from the population. The government also often wavered in its idea of what should be asked. On several occasions blind people and deaf-mutes were counted to estimate the costs of their education; in 1909 the physically handicapped were counted. Also sometimes questions were asked about living conditions.

In the Netherlands, censuses were taken to control the system of population accounting. After every census it appeared that the outcomes did not match the data derived from the previous census and the data from the population registrations. However, the results of the last census were kept. The explanation for this statistical discrepancy was found in the incompleteness of the figures on immigration and emigration.

From 1849 onwards, occupational censuses were taken together with the population census (with a number of exceptions). In the preparation of the 1889 census there was a debate on the question of whether an occupational census was necessary, in view of the technical and financial objections. The advocates of an occupational census argued that it was necessary to judge the social situation of the population. The composition of the labour force and the nature of the enterprises affect, for example, the concentration of the population in cities, which could, among other things, give rise to unemployment and social unrest, lead to public health problems and result in a drop in moral standards. The government was still of the opinion that the only data that were needed were those which were significant for government activities. However, it was more widely felt that as the government was responsible for the social health of the population, an occupational census was necessary. And thus the discussion of the role of the government was reflected in the questionnaires of the censuses.

A more recent example of the influence of social phenomena on population censuses is the housing census taken in 1947 to obtain information about the housing situation after World War II. This information was needed for the planning of housing construction as so many homes had been destroyed in the war.

One statistical lesson from nineteenth century censuses is the need for comparability. Censuses were taken to obtain information on the population of a country at specific moment in time. They were taken regularly, which should enable comparisons in time. However, for that purpose definitions and classifications should remain unchanged, or at

least should be able to be linked to each other. The lack of comparability in the nineteenth century Dutch censuses meant that a huge effort was subsequently required to achieve comparability, and even then numerous assumptions had to be made.

Looking at the successive censuses it appears that *learning by experience* hardly applies to the 19th century censuses. Some examples to illustrate this are:

– A remark by the official in charge of the 1859 occupational census about the lack of comparability between the 1849 and 1859 censuses did not improve the comparability of those censuses with the next one, on the contrary (see section 3.3).
– In 1849, as a result of obscure instructions, many people were classified as 'labourers, day labourers', without further description. In 1859, the same occurred with a dramatic result: about 19% of the labour force were classified in that category. In 1889, the same happened, but the poll-takers were obliged to give a further description.
– It took until 1859 before inland shippers and their families were included in the population censuses.

Perhaps the period of ten years between two successive censuses was too long to take advantage of the lessons from previous censuses. The centralisation of statistics in 1899 probably had a positive effect in this respect.

Notes

[1] Before 1795, from the Middle Ages to the French Revolution only local or provincial censuses were held.

[2] A report of the 1795 Census Commission for Holland started with the famous words 'Liberty, equality, fraternity' of the French revolution and the date was: 6 January 1796, the second year of the Batavian Freedom.

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Accessibility of business microdata

Andrea Groot and Cor A.W. Citteur [1)]

This article presents an overview of the policy of various national statistical bureaus with respect to the confidentiality of business microdata.

1. Introduction

At present the release of business microdata is under discussion, not only in the Netherlands, but in other countries too. For the sake of efficiency there is increasing pressure for more accessibility, so that optimal use can be made of the available microdata. Moreover, if researchers are allowed to use an existing data set instead of having to conduct their own separate survey, this might help to reduce the response burden.

On the one hand statistical offices are confronted with the challenge of satisfying these demands. On the other hand, however, they have to safeguard the often confidential character of the data. The data must remain 'secret', i.e. people examining them should not be able to infer information about individual subjects. In practice measures are taken to make it impossible to identify the respondent on the basis of the information contained in the data.

Up to now released microdata have largely consisted of data on persons and households. In 1991 a survey was held among various national statistical offices on the availability of these microdata for outside users (see Citteur and Willenborg, 1993). It revealed great differences between statistical bureaus in their behaviour with regard to the release of microdata for public use. Naturally, unrestricted access necessitates several precautionary measures, which often reduce the detailed information content of the data. Since the needs of external users are at variance with such reductions, other ways of releasing microdata are sometimes considered. If such an opportunity is granted, it will always be in relation to a well-specified user.

[1)] Regretfully, Cor Citteur died in June 1997. The authors wish to thank Bert Balk and Joris Nobel for their helpful suggestions and continuous interest.

Except for one case in the USA, none of the countries in the 1991 survey made microdata on enterprises publicly accessible. Making business microdata available is more difficult, as enterprises are much more recognisable on the basis of their characteristics than persons. But much has changed since the survey of 1991 and the pressure of the research world for access to business microdata has increased. In this light Statistics Netherlands was curious to know how this situation was being dealt with in other countries.

At the national level, the Dutch system of official statistics is completely centralised. Nearly all central government activities in the field of compiling information are concentrated at Statistics Netherlands. The principle of centralisation is laid down in a Royal Decree of 1899, which describes the position of the Central Commission of Statistics (CCS). Since 1 July 1996 there is a new law, which lives up to the Royal Decree of 1899.

There is no general law obliging persons, households, enterprises or institutions to supply information to Statistics Netherlands. There are, however, several acts containing provisions for obtaining data, while taking into consideration the confidentiality of data collected for statistical purposes. One important piece of legislation implemented specifically for statistical purposes is the Act of 28 December 1936, providing for measures to obtain correct economic statistics. It enables Statistics Netherlands, with authorisation by and under supervision of the Minister of Economic Affairs, after consultation with the CCS, to obtain directly or via officials and experts, the information necessary to compile accurate economic statistics. Data collected under the Act of 1936 may not be published in such a way that information about an individual person, enterprise or institution may be disclosed. Disclosure is only allowed by authorisation of the person, the head of the enterprise or the board of the institution concerned. It is forbidden to use data for other than statistical purposes, and data should never be used to make decisions affecting individual interests.

In the absence of a general law for the obligation to supply information (and even if such a law existed!), Statistics Netherlands works along the lines of persuasion to obtain the data it requires. It stresses the importance of the participation of a respondent in a given survey. In exchange, it guarantees the immunity of the individual information supplied from any non-statistical use; that information will be used only to build ’anonymous’ statistics.

We already knew before starting this survey that Spain, Greece and Italy do not have a specific law dealing with the protection of data, but fall back on the law on statistics which, in the case of Spain, includes special provisions. In Denmark, Finland, the Netherlands, Sweden and the United Kingdom laws exist which allow exceptions in the release of microdata. And lastly, authorities in France, Germany and Luxembourg supervise the management of statistics (see Als, 1993).

In aid of the survey we approached fifteen foreign statistical bureaus and asked them to cooperate in a survey on the accessibility of business microdata. We decided on two main questions, which we hope to be able to answer on the basis of the conclusions of the survey:

– how do statistical bureaus cope with the pressure for release? Which policy do they adhere to?

– is there any legal support of countries for users and reporters of microdata and how far do statistical bureaus go in releasing their business microdata?

2. The Survey

The survey is divided into two parts, the first part covering the access of microdata on enterprises. We listed various ways in which microdata might be presented, ranging from completely free use (Public Use Files) to use under strict conditions and allowed only to researchers who have signed a sworn confidentiality statement. Release to the general public requires different measures from those for the release to a restricted circle of users (Microdata For Research). The measures for ensuring confidentiality for the Public Use Files have to be severe, thereby making the data unsuitable for specialised statistical research. A positive side of releasing data to a small number of researchers is that it entails personal contact with the users and hence the possibility of taking special requirements about the features of the files into account.

Ways of presenting microdata are: public use files, microdata for research, synthetic datafiles, on-line and on-site.

Public use files are released to the general public, without any restrictions on their use. Hence, measures for guaranteeing that confidential information is not disclosed at all have to be strict in the technical sense. Many details of the original data are left out, thereby rendering the data unsuitable for specialised statistical research.

Microdata for research are envisaged for use by well-specified researchers who have to sign a contract which stipulates a proper use of the data, excluding e.g. linkage to other files or transferral to other persons. This is necessary in view of the fact that such data have a higher risk of disclosure, due to their richer content of information, than Public Use Files.

Synthetic datafiles are files in which part of the information contained in the records is not based on actual facts, but formed ’synthetically’. This might have taken place on the basis of a model, for example, or by data swapping.

On-line access means that the user submits – on-line – the set-up of his analysis to the data's owner, who then runs this analysis on the data and in turn delivers – on-line – the results to the researcher. The latter does not provide insight into the microdata themselves. A well-known example is the Luxembourg Income Study.

On-site stands for a facility in which a researcher is allowed to perform an analysis on the original microdata, but on the actual premises of the institute which holds the data. Since the user has access to the data in their original form, he or she has to sign the same declaration of proper conduct as the employees of the institute itself.

We also looked at ways of presenting identifiable data, other than Public Use Files (see column *release of identifiable data* in Table 1).

The second part of the survey consisted of questions on the legislation concerning company data. All the national statistical offices we approached have their own rules or laws on the accessibility of their microdata. The following bureaus cooperated in our study: Australian Bureau of Statistics, Statistics Canada, Danmarks Statistik, Statistics Finland, Institut National de la Statistique et des Etudes Economiques (France), Statistisches Bundesamt (Germany), National Statistical Service of Greece, Central Bureau of Statistics (Israel), Instituto Nazionale di Statistica (Italy), Management and Coordination Agency (Japan), Statistics New Zealand, Instituto Nacional de Estadística (Spain), Statistics Sweden, Office for National Statistics (United Kingdom), Bureau of the Census (USA).

3. Findings

In this section we present the various national policies regarding accessibility of business microdata, in alphabetical order.

Australian Bureau of Statistics (ABS)

Files containing confidential unit records from business surveys are rarely released. Most disclosures of business microdata take place by a consent arrangement, whereby the respondent consents to the limited release of specific data to nominated government users for clearly defined purposes, and the recipient signs an undertaking regarding the use and custody of the file. It is possible for the respondent to consent to the publication of specific data. In addition there is the possibility of release to the other party in a joint arrangement, where that party is under equivalent legal obligation not to disclose information. On-site release to an outside researcher is possible, but rarely practised. It is employed only when of direct benefit to the ABS, and the researcher can be bound by stringent secrecy provisions.

Recently the ABS has been considering the release of Public Use Files of business surveys if it can be ascertained that this would be unlikely to result in the release of identifiable data. On-line access will probably be established as a route for release; making synthetic data is also being considered. It is not very likely that there will be any change in regard to the conditions associated with release under contract or release on site to authorised researchers.

The user of the microfiles has to pay a fee which covers the dissemination costs. The level of the fee depends on the file and the expected number of users but minimum threshold charges have been established.

Special tabulations may be produced on request, the cost varying depending on the complexity of the request. The ABS also provides a consultancy service, undertaking requested analyses of a more sophisticated nature.

The penalty for ABS officers convicted of breaking confidentiality rules is a fine of up to 5,000 dollars or an imprisonment for a period of up to two years, or both. The penalty for a breach of undertaking by an external user is identical. All disclosures of statistics collected by the ABS under its legislation are subject to the same confidentiality provisions.

Companies are obliged to provide information in relation to prescribed matters. Failure to comply with a requirement to provide such information renders the non-respondent liable to a maximum fine of 100 US dollars for each day the offence continues.

Statistics Canada

Access to business microdata is granted only to people in the employ of Statistics Canada and who have taken the oath of secrecy. They must be performing a service for Statistics Canada. No costs are involved. Otherwise, release of business microdata is possible only with the written consent of the respondent and at the discretion of the Chief Statistician or in accordance with section 12 of the Statistics Act. This section allows for the joint collection of information with government departments and agencies and municipal or other corporations. However, respondents must be given the right to object to the sharing of their data with the other party.

Special tabulations for users may be produced on request, on a cost-recovery basis. Only data which do not identify an individual respondent may be released.

Statistics Canada co-operates with external users on particular projects, mostly with groups and consortia in joint publication and analysis ventures. These users are not granted special access.

Employees of Statistics Canada found guilty of breaching confidentiality regulations are liable to a maximum fine of one thousand dollars or imprisonment for a term of maximum six months, or both, and may also face dismissal.

All surveys are mandatory unless specifically authorised as voluntary. Respondents must answer within the specified time. If they refuse or forget to answer or give false information, they are liable to a fine of up to five hundred dollars or to imprisonment for up to three months, or both.

Danmarks Statistik

Public use files are available, taken from the administrative business register. The information these contain includes name, address, telephone number, activity (detailed NACE) and size class (according to employment), but no information on turnover. On-line and on-site files are available from the statistical business register. Although Denmark's statistical registers are often drawn from public sources, they are all confidential. Synthetic datafiles will be released before the year 2000.

No further analysis is made on special request. Danmarks Statistik cooperates with external users on particular projects: the cooperation with the Ministry of Transport, for example, which resulted in a special publication on transport.

Fees are charged for the access to data from the administrative register, the price depending on whether the customer wants information about one unit or about a range of units. The office also charges a price for special tasks.

The sanctions for internal users breaking confidentiality regulations is dismissal. External users will be excluded from the privileges of using microdata.

Respondents are obliged by law to answer the questionnaires. No authorisation exists for the dissemination of individual information. There are no users with special privileges with respect to access.

Statistics Finland

Public use files are released from the business register maintained by Statistics Finland. Data on the industry (activity class), location of activities, establishments, main commodities, personnel and turnover size, and engagement in foreign trade activities of enterprises, corporations and self-employed persons are public. No microdata for research is released outside Statistics Finland, but the microdata (without identification numbers of units and with highly aggregated activity classifications) can be used by external researchers who have signed a special contract and also pay a fee, on the

premises and under control of Statistics Finland. Data collected from the public registers remain confidential. It is possible to divulge data to a third party.

In order to enhance the accessibility of business microdata for external users, the identification numbers are obligatorily removed and classifications (mainly activity classification) are aggregated, using rates and shares instead of absolute figures. External users may be given access to strictly defined data; a user has to make a written application, in which the purpose of the microdata analysis is specified. The main rules for releasing the data are given to users in written form; contacts are responsible for training the users.

The present costs involved with the accessibility depend on the way of access. They comprise costs of labour, rent, management and control, computer network, etc.

Special tabulations may be produced on request, before publication they pass a disclosure review process. Statistics Finland cooperates with external users on particular projects concerned with developing existing statistics and other research. The outsiders in these particular projects do not have access to the microdata themselves or to the computers.

The sanctions for internal users breaking confidentiality rules could consist of a fine or an imprisonment of up to two years. External users may be sentenced to a fine or to a prison sentence of up to one year.

Government authorities, enterprises, employers, self-employed persons, municipalities, non-profit institutions and pensions institutions are obliged to provide Statistics Finland with data. This obligation covers data on the type, location, ownership, financing and products of their activities, as well as data on the resources, and the uses of the resources for their activities. An enterprise which fails to provide the data or provides false data may be sentenced to a fine. There are no users with special privileges with respect to access.

Institut National de la Statistique et des Etudes Economiques (INSEE, France)

France has a general professional code of confidentiality which applies to everyone who needs confidential material to practise their profession, like notaries and doctors. People who do not adhere to this code risk a fine (100,000 francs) or a prison sentence of up to one year. For statisticians, administrative measures such as dismissal will also certainly be taken.

The protection of confidential data (and the sanctions of breaking confidentiality) extend to data which the INSEE did not receive through its own observations, but from external sources, and also to data obtained from public registers.

However, there is also a public register, SIRENE, which is controlled by the INSEE. For individual enterprises or establishments, this register contains the name, address, legal form, main activity, and employee information. Government institutions are obliged to use this data in the implementation of their programmes. Within the INSEE, SIRENE serves as a sample frame of enterprises and as a starting point for the coordination of sample frames of other institutions. Moreover, there is a second set of data which may also be released in some cases. This data consists of additional activities, a global indication of the personnel, turnover class, the share of exports in the turnover and an indicator for research and development.

Decisions concerning access to individual microdata about enterprises are taken by the *Comité du secret statistique concernant les entreprises*, which is examines various problems concerning the confidentiality of business data. In the period from 1984 (year of establishment) to 1994, the *Comité* has handled 360 requests about the accessibility of individual business data, of which 324 requests were granted (90%).

Statistisches Bundesamt (Germany)

There is no dissemination of business microdata at all, but data about persons and households is released, provided that they are not identifiable. This is not possible in the case of business microdata.

National Statistical Service of Greece

There is no dissemination of data on enterprises, even those from administrative sources. Information on the identity data of enterprises, like name and surname/title, postal address and branch of economic activity is provided, however.

Enterprises are obliged to supply data to the Statistical Service. The fines for not doing so may vary from 1 to 3 million drachmas.

Central Bureau of Statistics (Israel)

No public use data are available. In some cases on-site files are available as the only means of access, on several conditions, including inspection of all analysis results before dissemination. There are no users with special access privileges.

Very small fees are charged for access to the on-site files. At the request of a user, the Central Bureau of Statistics may perform an analysis which will lead to results that can be made public. The Bureau cooperates with external users on particular projects, for example, preparing panels, economic research, production functions, productivity analysis and other subjects.

A respondent may authorise the Central Bureau of Statistics to divulge confidential information about himself to a well-specified third party. From the moment information enters the Central Bureau of Statistics, it is deemed confidential. Internal users who break this confidentiality are liable to a fine or an imprisonment for up to three years, or even dismissal. External users who publish or communicate confidential information which has been communicated to them to a third party are also liable to imprisonment for up to three years.

Respondents are obliged to answer to the best of their knowledge and belief. Non-respondents are liable to imprisonment for three months, although this sanction is hardly enforced.

Instituto Nazionale di Statistica (ISTAT, Italy)

No business microdata are available as several studies showed that the risk of linkage in the case of business data is too high. ISTAT releases only sample collections of microdata, without any identifying data linking them to individual natural or legal persons. At the moment only individual and household microdata are released. To obtain access to these data, users must sign a contract in which they undertake to use them only for research purposes and not to consent access to third parties. Two techniques are used to protect data, the suppression of geographical codes and the aggregation of variable categories. Special tabulations on request are not available.

All public authorities, agencies and bodies are obliged to supply any data and information that is requested from them for the surveys. If they fail to do so or knowingly provide inaccurate or incomplete information, they shall be liable to an administrative fines of between one and ten million lire.

Management and Coordination Agency (Japan)

The modes of access are via microdata for research and on-site files. The access to Microdata takes place under several limiting conditions, for example legal arrangements, where the user has to sign a declaration of proper conduct, and user screening. No release of public data exists.

External users may use these microdata free of charge or at cost price.

Government authorities have privileges with respect to the access to business microdata. There is no cooperation with external users on particular projects.

The sanctions for breaking confidentiality rules are penal servitude for up to one year or a maximum fine of 100,000 yen.

Respondents are obliged to answer within the specified time; if they refuse or forget to answer or provide false information, they are liable to a fine of up to 100,000 yen or imprisonment for up to six months.

Statistics New Zealand

Public use files are available from Statistics New Zealand. Microdata for research are also available, but for government agencies only and for researchers working for such agencies. If a researcher is working on a project of interest to Statistics New Zealand, and if Statistics New Zealand expects some relevant output of the project, the researcher could be engaged as a contractor and would then have access to microdata, provided he makes the required declaration of secrecy. Information on the identity of enterprises, like name and address, is removed. Customised data is also provided to users, on request. Statistics New Zealand may perform analyses at a user's request, and the results of these analyses may made public, if confidentiality is maintained. Other, more confidential, results may be supplied to government departments, where they may only be used in aid of further analysis.

All information collected under the Statistics Act 1975 is to be kept confidential and is not to be published or otherwise disclosed.

Fees are based on the amount of information provided and the time taken for any additional programming work or technical advice required.

Respondents have an obligation to answer survey questions to the best of their knowledge and belief.

Non-respondents are liable to a fine of up to 500 dollars; enterprises up to 2,000 dollars.

Instituto Nacional de Estadística (Spain)

No business microdata are available to the public in Spain, although there is a procedure for industrial surveys which consists in an off-line demand by the user, and a very fast supply of the data through a process prepared and executed by the survey specialist. Once entered into the statistical system, all data are equally protected irrespective of their source. No plans exist for enhancing the accessibility of business microdata for external users; however, the off-line procedure will probably be extended to other surveys.

No fees are charged to the user of data if he supplied the data himself, other users are charged. Analyses may be performed on request; results are only delivered if they are anonymous.

Government statistical authorities and regional statistical agencies have privileges with respect to the access to business microdata. There is no cooperation with other institutions. The fines for internal users breaking confidentiality rules will be penalised according to an internal disciplinary system; for external users the fine is between 500,000 and 5,000,000 pesetas.

Statistics for which it is compulsory to supply information are laid down by law. Sanctions for non-responding enterprises are economic, the enterprise is charged with an amount between 10,000 and 5,000,000 pesetas, although up to the present the highest fine imposed was 100,000 pesetas.

Statistics Sweden

Access to microdata is subject to strict rules, only microdata for research are available at the moment. These are made available in such a way that individual enterprises or establishments cannot be identified; moreover, under to Swedish law it is illegal to try to identify individual subjects.

Fees are charged to external users of microdata.

No users have special access privileges. At the special request of the user Statistics Sweden may perform an analysis whose results may be made public. Statistics Sweden may cooperate with external users on particular projects.

As a rule Statistics Sweden never publishes figures that can divulge information about a specific respondent. This holds for data from public registers as well. The sanctions for breaking confidentiality consist of a fine or an imprisonment for two years at the most.

It is possible for Statistics Sweden to take legal action to impose a fine for non-respondents, but this is hardly ever used.

Office for National Statistics (United Kingdom)

External users are obliged to work on-site to gain access to business microdata. There have only been very few cases, all at the premises of the Office for National Statistics. An analysis service is also offered, providing analyses on behalf of the users. No particulars about an individual company will be revealed without the company's written consent. There are outside users who have privileges with respect to the access to business microdata: by law government institutions are allowed access to information provided they use it for statistical purposes and academic researchers are allowed occasional access as part of the office's policy to support research. This access may become more formalised in the future and the service will then be given more prominence in the academic community.

The present costs involved with the accessibility are low, because the service provided to users has not yet been developed or marketed extensively. Users are charged the cost of performing an analysis but in the few cases of users being given direct access to data, charges have not generally been made to date.

The Office for National Statistics cooperates only very infrequently with external users on particular projects.

Disclosing confidential information is a criminal offence under the Statistics of Trade Act with a maximum penalty of an unlimited fine and/or two years in prison.

People failing to furnish the estimates or returns as required, he shall, unless he proves that he had a reasonable excuse for the failure, be liable to a fine of up to 2,500 pounds.

Bureau of the Census (Unites States)

There are no public use files in the USA. The economic censuses are mandatory and only surveys that are annual or less frequent may be mandatory. Other surveys are voluntary. Where applicable, the mandatory requirement is authorised according to an Act of Congress (Title 13), where the law requires mandatory response and ensures confidentiality of response. However, by special request, a very limited number of releases are permitted. Selected researchers can attain the *special sworn status* and conduct their research at confidentiality-secured sites only, currently Washington, DC and Boston. It should be noted that the special sworn status is conveyed only when the Bureau determines that the proposed research project benefits the authorised Census Bureau program. Microdata for research, synthetic datafiles, on-line and on-site access may possibly be realised before the year 2000, the latter within the *statistical enclave*. At the moment, access for external users takes place under several limiting conditions, including physical barriers, legal contracts, personal screening, requiring inspection of any result of the analysis before dissemination and training.

For those with Bureau approval for access to data, there is a standard fee of 4,000 dollars per full time equivalent per month. Special tabulations may be provided if a user makes and compensates for a special request. Such tabulations must also pass the disclosure review process.

The Census Bureau's Center for Economic Studies (CES) cooperates with external users on many projects, all carried out at secure CES facilities. These projects are concerned with important economic questions in many areas, and the common theme is that they are best approached with economic (plant and firm level) microdata. Most of the time this is in cooperation with other government institutions. The data of the Census Bureau will occasionally be combined with external data.

No respondent may authorise the Bureau of the Census to divulge confidential information about himself to a well-specified third party (informed consent), although the newly proposed data sharing legislation would seem to permit informed consent by the respondent.

Employees breaking confidentiality could face a fine of up to 5,000 dollars or imprisonment of up to five years or both. Data from public registers are not covered by statistical confidentiality rules.

Respondents have an obligation to cooperate in the surveys. If they fail to answer questions in a census or in a survey where participation is deemed mandatory, respondents are liable to a fine of up to 100 dollars. For willfully giving a false answer a respondent can be fined up to 500 dollars. No penalties for non-responding are permitted for surveys taken more frequently than annually.

4. Conclusion

There is much diversity between the various national statistical bureaus in how they present their microdata. No public use files are available in some countries: Australia, Canada, Denmark, France, Germany, Greece, Israel, Italy, Japan, the Netherlands, Spain, Sweden, the United Kingdom and the United States of America, while in Canada and Sweden microdata for research is the only way to get access to business microdata.

As a protection against unauthorised use of individual data in which a smaller or larger risk of disclosure is always present, users are obliged to sign a contract. In most of the participating countries access for the external users takes place under limiting conditions: physical ones (in terms of computer security), legal contracts, user screening, requiring inspection of analysis results before dissemination in any form whichever, and user training.

Identity data of enterprises, for example name, postal address and economic sector are not provided by most of the participating bureaus, with the exception of those in Denmark, Finland, France and Greece.

On-line files are currently available in Denmark and Spain, and are envisaged before the year 2000 in Finland and the United States. Half of the participating statistical bureaus present on-site files under the appropriate limiting conditions, for example a declaration of secrecy.

Synthetic datafiles are not provided in any of the countries considered here, but Denmark hopes to be able to provide synthetic datafiles before the year 2000.

In most of the countries considered the businesses selected in the sample have to respond accurately; if they fail, they are liable to a fine and/or a prison sentence.

Table 1 sums up how the national statistical bureaus present their microdata, including, in the last column, their future plans in this area. The column *release of identifiable data* concerns the release by the national statistical bureaus of information about name, address, telephone number, activity, number of employees and turnover.

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Table 1. Availability of business microdata

Country	Public use files	Microdata for research	On-line	On-site	Release of identifiable data	Remarks
Australia	No	Yes	No	Yes	No	Considering the release of Public Use Files of business surveys.
Canada	No	Yes	No	No	No	Developing a remote access system for individual and household microdata.
Denmark	No	No	Yes	Yes	Yes, except information on turnover.	Synthetic datafiles before 2000.
Finland	Yes	Yes	No	No	Yes	Panel microdata of R&D statistics may be used by external users. On-line and on-site microdata will be available before 2000.
France	No	Yes	No	No	Yes	Access to individual microdata on enterprises is possible, to be decided by the Comité du secret statistique concernant les enterprises.
Germany	No	No	No	No	No	No dissemination of business microdata, but data about persons and households are released.
Greece	No	No	No	No	Yes	Information on the identity data of enterprises is provided.
Israel	No	No	No	Yes	No	Access available to on-site files under several conditions.
Italy	No	No	No	No	No	
Japan	No	Yes	No	Yes	No	
Netherlands	No	No	No	Yes	No	
New Zealand	Yes	Yes	No	No	No	
Spain	No	No	Yes	No	No	No plans exist for enhancing the accessibility of business microdata for external users.
Sweden	No	Yes	No	No	No	
UK	No	Yes	No	Yes	No	
USA	No	No	No	Yes	No	Selected researchers attain special sworn status and conduct their research at confidentiality secured sites only.

Large groups of enterprises

Robert V. Goedegebuure

1. Introduction

A growing need for statistics on large groups of enterprises has manifested itself in recent years, as illustrated by the popularity of rankings in economics magazines like Fortune. Naturally, what generates most interest is the performance of these large groups of enterprises in terms of size, growth and profitability. This interest in the economic performance of large groups of enterprises is stimulated by the realisation that they tend to grow at a faster rate than the economy as a whole, implying that their economic and political power is increasing. There are plenty of examples of the increasing power of large groups of enterprises. Trade missions are joint efforts by politicians and captains of industry, the share of large groups of enterprises in investments in research and development is very high, and so on. Some months ago there was a discussion in the Netherlands about a fiscal arrangement, the so-called *technolease* construction, which was clearly beneficial to the multinational companies involved; it was not clear whether this arrangement was open for smaller companies.

In its own right, the mounting influence of large groups of enterprises is sufficient reason for statistical offices to monitor their performance. Traditionally, most statistical offices are not concerned with groups of enterprises, since their main aim is to measure *production*, which takes place within separate enterprises. Whether or not the enterprise belongs to a group seems of little relevance. Large groups of enterprises have been surveyed in the Netherlands since the early seventies, with the aim of measuring how they are *financed*. Generally speaking it is more appropriate to measure production at enterprise level, and financial aspects at group level. For a long time the two sets of statistics, enterprise statistics on production on the one hand, and group of enterprise statistics on financing on the other, have led more or less separate lives, even though they had some variables in common. The rising demand for data on large groups of enterprises and the latent added value of combined information made Statistics Netherlands decide to start a project to integrate these and other statistical sources. In this article we shall discuss the objectives of the project, some methodological aspects and the first results.

2. Objectives of the project

The need to integrate enterprise statistics on production and groups of enterprises statistics on financing is not new. The first plans to publish results on the hundred largest groups dates back to the early eighties. The realisation of these plans, however, has always been hindered by the multiplicity of the objectives involved:

– input objectives: the need to coordinate various data sources and thereby improve the quality of statistics. These activities are directed at micro level;
– internal output objectives: the use of integrated data for the national accounts;
– external output objectives: the need to obtain meaningful data from the database. Output objectives require a statistical and an economic approach.

Clearly, the micro level approach for input and the statistical or economic approach for output do not mix well. At the same time the efforts, dependent as they were on the availability of various basic statistics throughout the office, always lagged behind. As a consequence, external output objectives were never realised.

One could say that there is an organisational problem in this respect: because of the multiple objectives, it is not easy to pick the best location in the organisation for the project. Although the project started out in an input oriented department, at the beginning of 1997 it was decided to relocate the project management to a statistical, i.e. output oriented, department. In its new form the project will be a coproduction of input and output departments. The project is supervised by a steering committee with representatives from the national accounts department, and from departments responsible for input, and integration and output.

3. Terminology

Several types of statistical units are used in the project:

truncated groups of enterprises

Clearly national statistical institutes are mainly concerned with the statistical units operating in the national territory. From an international (or rather: global) point of view this approach becomes less and less satisfying, however, since the globalisation of groups of enterprises implies that their activities are scattered throughout the world, and some multinationals even view themselves as global companies without a homeland. So the global demand in this respect is for information is on multinationals, but this information cannot – yet – be obtained by just adding up national parts. The current practice of delimiting the national parts from multinationals leads to so-called truncated groups of enterprises. These truncated groups provide useful information for national purposes, but insufficient information for European or global purposes. Reversely,

financial information on multinationals, which is openly available from annual reports, would provide useful information for national purposes.

Within our national boundaries groups of enterprises are formed using the criterion of control. In most cases this coincides with more than 50% ownership of shares, but this is not necessarily the case due to, for instance, preferential shares.

fiscal units

Fiscal units are gaining importance as the use of fiscal data is intensifying as a secondary source, either to complement or to replace primary data sources. Moreover, fiscal units are used to obtain data on international trade in goods.

enterprises and legal units

For statistics on production, enterprises are used as statistical units. Enterprises can be described as homogeneous units with regard to production processes. For smaller firms there is usually a one-to-one link between enterprises and legal units, but this is often not the case for larger firms, which use complex legal structures for their operations.

One of the main problems in the project is to merge statistical sources which are based on various statistical units. Figure 1 shows that it is especially hard to link fiscal units with enterprises or groups of enterprises, because the relationships might be one-to-one, several-to-one or one-to-several.

Figure 1. Relations between statistical units

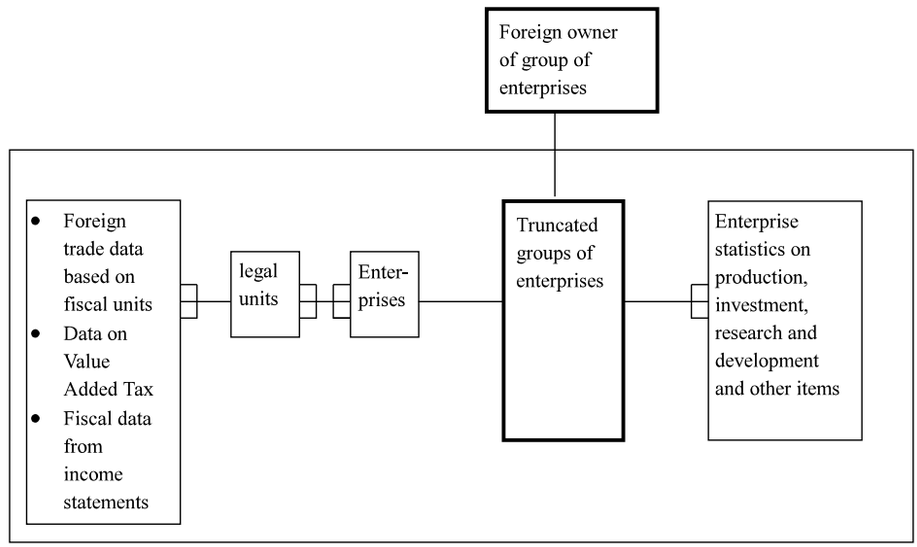


Figure 1 is actually a simplification, since there is also a dynamic element in the relationship between enterprises and groups of enterprises. It turns out that the ownership of approximately 0.5 to 1% of all enterprises changes during a given year. Monitoring ownership, however, is very labour intensive.

4. Result: the database of large groups of enterprises

The main result of the project is a database which combines information from various sources:
– data on stuctures of groups of enterprises;
– data on the financial strength of enterprises and groups of enterprises;
– data on production and investment;
– data on international relations: foreign control, foreign trade.

This database can help to achieve the various input and output goals.

4.1 Input goals

Reducing the administrative burden

Some variables are measured more than once. Data on employment stem from enterprise statistics, statistics on the financing of large enterprises and from secondary sources. Likewise, various sources contain information on foreign trade: value added tax files, data from the Intrastat system, some enterprise statistics and the statistics on the financing of large enterprises; moreover the Dutch central bank also compiles foreign trade figures. Although there are usually valid historical arguments for duplication (or triplication, or even worse), clearly current statistical and administrative systems provide ample opportunities for reducing the administrative burden on firms. One of the goals of the project is to accelerate this process.

Quality enhancement

At present, we have a large quantity of data at our disposal from which we can learn a lot about the quality of statistics. For instance, we can compare data from enterprise production statistics with fiscal income statements. Or we can match the very detailed monthly Intrastat data with aggregate annual data stemming from the statistics on the financing of enterprises. Such comparisons may enable us to evaluate the quality of the response or the accuracy of methods used. The combination of information might also be used to identify slow respondents, so that appropriate action can be taken in an early stage.

Theoretically, some economic variables measured at enterprise level should add up to the total of the truncated group: employment, value added, foreign trade. Other variables do not necessarily add up due to intracompany flows which cancel out at group level, like turnover and investments.

Furthermore, there is the problem of non-response. Normally, non- response is adjusted for by imputation based on data from the previous year and/or data from comparable units in terms of size and industry code. It is thought that information from additional data sources may help to refine adjustment procedures, thus improving statistical figures.

4.2 Output goals

Partial integration

As they are a combination of data from various sources, the results of the project might serve as an important tool in national accounts. The main type of analysis is checking the consistency of economic variables at enterprise level and group level.

Performance of large groups of enterprises

A group of enterprises is defined as *large* if the value of its assets exceeds 25 million guilders. Some 2,400 groups of enterprises met this criterion in 1995, and they have been growing at a rate of 7% a year for the last five years. As this is well above the growth rate of the economy as a whole (approximately 2%), they are increasing their share in the Dutch economy. The combined total assets of these groups amounted to 745 billion guilders in 1995, more than the Dutch gross domestic product. People employed by these groups accounted for approximately 30% of total employment in the Netherlands.

The performance of large groups of enterprises can also be measured in terms of their contribution to the innovation of our economy. It turns out that in 1995 as much as 46% of all investment in research and development was accounted for by only five multinationals. This underscores the concentration of economic activities within a limited number of groups of enterprises in the Dutch economy. It was also found that 50% of employment within large groups of enterprises was concentrated in the 5% largest groups.

International relations

An interesting feature of the statistics on the financing of large truncated groups of enterprises is that they contain information on the relationship with the international group of enterprises to which the truncated group belongs. The statistics record whether

or not the truncated group controls foreign subsidiaries, and whether or not it is controlled itself by a parent company abroad. This element is gaining importance, since the new European Union regulation on structural business statistics holds that for service industries *'... Member States will provide the Commission with a report relating to the availability of the necessary data for the breakdown of results according to the existence [..] of a majority control by non-resident enterprises'*. The increasing attention for ownership and control, especially with regard to service industries, has been inspired by the GATT negotiations. It has been noted that roughly speaking foreign markets can be accessed in two ways. First of all, by exporting domestically produced goods and services. And secondly, by setting up shop abroad.

At the same time the economic world seems to be globalising more rapidly than ever before, leading to a worldwide need for relevant statistical indicators. Some important questions are: what is the relationship between foreign investments on the one hand and the worldwide organisation of production and international trade flows on the other hand? What percentage of world trade takes place within networks of affiliated companies? It is recognized that these needs cannot be satisfied by current national statistical systems. Perhaps global statistics require a Global Statistical System.

For national purposes, the database of large groups of enterprises turns out to be very efficient for measuring international activities and developments therein. As economic activities in general are heavily concentrated within large groups of enterprises, this is especially so for international economic activities. Table 1 shows that 39% of the largest enterprises have foreign subsidiaries and that the ownership of these subsidiaries rapidly increases with size: 62% among the largest groups of enterprises compared with only 28% for smaller groups. The same observation, although less pronounced, can be made with regard to foreign parent companies.

Large groups of enterprises used to be assigned a two-digit industrial code based on their main activities. Because of the heterogeneity of the group's activities, this coding system is usually not very informative. The combination of statistical information on groups and detailed information on enterprises has enabled us to provide much more information on the activities of the groups. It is clear that large groups of enterprises are relatively more engaged in the manufacturing industry and far less in business and other services.

Feedback of information to enterprise statistics

The previous section illustrated how the information from enterprise statistics (production, research and development) was used to enrich statistics on groups. But the reverse may also be true: enterprise statistics can benefit from information on groups. First of all, information on financial strength (to be measured at group level) can be linked to performance in sectors of the economy. Since grouping of enterprises makes separate enterprises less vulnerable, financial information can be related to the level of

Table 1. Percentage of groups of enterprises with foreign subsidiaries and parent companies

Size class	Foreign subsidiaries	Foreign parent
	%	
25% largest groups (over 300 employees)	62	37
middle 25% (135 to 300 employees)	42	31
lowest 50% (fewer than 135 employees)	28	26
Total	39	30

Table 2. Activities of large groups of enterprises compared to the economy as a whole

Sector of the economy	Large groups of enterprises	National income (excluding banking, insurance and government)
	%	
Manufacturing industry	52	24
Repairs and trade	16	22
Construction services	10	8
Transport, communication	8	11
Business services	7	29
Other	7	6
Total	100	100

investment or the competitive power of sectors. Secondly, several studies have revealed the relationship between foreign investments and performance: 'foreign' affiliates tend to perform better (higher profits, faster growth) than local firms. And lastly, the information on groupings is relevant in describing the demography, i.e. births, growth and deaths, of enterprises.

5. The costs of the project?

Everything has a price tag, and this project is no exception. It was foreseen that the internal collection of all the required information would cost time, and that the additional work to load all the data into one database would prove to be a tedious task. However, the cooperation and support from all the statistical departments involved was very good, even though they knew they would hardly benefit from their contribution until later on in the project. The main methodological problems concerned the

definitions of variables used, and the linking of the various units used. For the time being, the project aims at providing reliable results, by focusing on 95% of regular cases and irregular but large cases. It would cost a disproportionate amount of time to achieve better, let alone perfect, results. For example: linkages between fiscal units to enterprises, or enterprises to groups may remain imperfect, and discrepancies between group results with enterprise results may remain unsolved, but these imperfections will not affect the outcomes.

The technical problems are hardly worth mentioning. Although the volume of information is overwhelming, modern hardware and software make it easy to load large files stemming from various software packages and in different formats (SPSS, Paradox, ASCII) into a database. Since one of the goals is data analysis, the database will make use of SPSS formats. As most variables follow (international) definitions, the additional work (recomputations) remains limited.

The first edition of the project, 1994, was conducted as a pilot in less than five months (January–May 1997), its main aim to gain experience and obtain test results. The second edition, 1995, to be completed in February 1998, will focus on all goals: partial and entire integration and output. The third edition will be directed towards turning the project into a regular process, producing relevant output for internal and external customers.

The use of chain indices in the Netherlands

Sake de Boer, Jan van Dalen and Piet Verbiest

A brief history of deflation practice in the Netherlands

For the period since 1948, Statistics Netherlands has published annual estimates of values in constant prices and volume indices of national accounts variables. In addition, annual volume growth rates of the national product are available for the period 1900 to 1920, and in 1987 new macro economic data for the period 1921 to 1939 were published. Recently, new volume changes and deflators for this period have been published as well.

The years since the second world war are divided into two periods with respect to the estimation methods used: 1948 to 1980 and 1981 to the present.

1948 to 1980

For this period data have been published for GDP, imports, exports, domestic final demand categories and value added of industry groups. The level of aggregation was high.

In the 1970s a need arose for more coherence between statistics of values, volumes and prices, to be coordinated in input-output tables. From the start the idea was a system of fixed weight price indices.

In the discussions the most important user of national accounts data, the Netherlands Bureau for Economic Policy Analysis (CPB), played a very important role. The CPB always (with one exception) constructed models based on values in prices of the previous year. Before Statistics Netherlands supplied such data, the CPB compiled them itself. Because of the data requirements for their more complicated and more disaggregated models, the CPB was and is strongly in favour of a system of chained (Laspeyres) volume indices and chained (Paasche) price indices (see the appendix for the formulae). This could be realised in a series of input-output tables in prices of the previous year. One important motive underlying the CPB's attitude in this respect was their unhappy experiences during the oil crises in the 1970s; their model at the time used fixed weight indices and values in constant prices of a fixed base year.

1981 to present

The result of the discussions in the late 1970s was that from the reporting year 1981 onwards two important methodological (and also organisational) changes were introduced in the Dutch national accounts. The first was that for various variables in the national accounts, time series of volume indices and deflators were calculated by chaining the year-to-year indices. The basis for this was the compilation of input-output tables (replaced in 1987 by supply and use tables) in constant prices of the previous year. An important organisational change was that from 1981 onwards, the annual input-output tables in current prices and in prices of the previous year, value changes, volume changes and price changes were all compiled simultaneously. As a result, yearly Laspeyres volume changes became available, weighted with the values of the previous year, in combination with Paasche deflators.

At present, the Statistics Netherlands annual national accounts publications contain the following time series: values in current prices, annual volume growth rates, volume indices,

annual price changes, indices of deflators and values in prices of a base year (recently: 1990). The series of volume indices and deflators are chain indices derived by multiplying the annual changes. The values in prices of a constant base year are calculated with the help of chained volume indices. Hence in this case, sub-series are non-additive to aggregates in the Dutch national accounts publication.

Opinions of users of the Dutch national accounts

The authors asked a number of institutions in the Netherlands who use national accounts data for model construction for their opinion on the choice between fixed weight indices and chain indices; and further about their experiences with the use of chain indices provided by Statistics Netherlands.

The CPB is the most important user of national accounts data in the Netherlands, and as such played an important role in the discussions preceding the introduction of chain indices in the Netherlands. The CPB had and still has a strong preference for chaining single period indices based on annually changing weights. In their opinion, values in constant prices for a longer period, based on fixed weights, yield meaningless data. They say that their experience with the use of chain indices is excellent. For them, the non-additivity of values in constant prices is no problem. Discrepancies from aggregations are not eliminated.

The Netherlands Economics Institute (NEI) approve chain indices as a good base for the construction of economic models. However, model constructors must carefully 'tune' the specification of their models to the characteristics of the data. They do not find the often mentioned problem of the aggregation discrepancies a real problem, but more a matter that calls for special attention when presenting the data to the public.

Researchers at the economics faculty of Groningen University do not use constant price series at all. Their macro-economic models require figures on volume changes. So the issue of non-additivity is not relevant for them. If only constant price figures were available, these could only be used if they yielded the correct volume indices.

The department for monetary and economic policy of Netherlands Central Bank (DNB) says that indices with annually changing weights have the advantage of a strong connection with actual developments. Hence this department has no problems with Statistics Netherlands practice.

The department for economic research of the DNB use annual changes as well as values in current and constant prices in their macro-economic models. If there are problems with mathematical discrepancies in model results, the solution is mostly found by an adjustment of the changes in stocks.

Results from changing vs. fixed weighting schemes and different index number formulae on the basis of Dutch data

In discussing the results we shall consider the chain Fisher volume indices as the standard with which we compare other results. Fisher indices are good approximations of superlative indices which can be seen as ideal indices from a theoretical point of view.

Period 1986–1993

The Dutch supply and use tables define 250 industries, 850 commodities and 10 final demand categories. Supply and use tables are available from 1986 onwards. For the years 1987–1993, the value in current prices, the value in prices of the previous year, the volume index and the deflator are available for every cell of the supply and the use table. For the calculations, the price and volume indices of the cells are considered as individual indices. At higher levels of aggregation indices are calculated with different index number formulae and with fixed and changing weighting schemes.

Table 1 gives the alternative estimates of the growth rates of GDP. The reader will find similar results for imports and final expenditure categories and for output, intermediate consumption and value added of

Table 1. Volume growth rates (t/t-1) of GDP (market prices) according to different index number formulae (1986–1993) (%)

	Laspeyres (weights 1986)	Laspeyres (chain)	Fisher (chain)	Paasche (chain)	Paasche (weights t,1986)
1987	1.4	1.4	1.4	1.4	1.4
1988	3.4	2.6	2.6	2.6	2.7
1989	4.8	4.7	4.6	4.4	4.6
1990	4.2	4.1	4.0	3.9	3.5
1991	2.3	2.3	2.2	2.2	2.0
1992	2.0	2.0	2.0	2.0	2.0
1993	1.3	0.8	0.8	0.8	0.7

three industries in the original paper. The results in the column 'Paasche (weights t, 1986)' are obtained by deflation with fixed base (1986) Laspeyres deflators and henceforth will be called 'fixed weight Paasche volume indices'.

A remarkable and – for statistical practice – very important conclusion which can be drawn from Table 1 is that the Laspeyres chain indices (like the Paasche chain indices) provide good approximations of the Fisher chain indices, and that the Laspeyres fixed weight indices do less or not at all. See for example 1988 and 1993.

Period 1921–1939

Since the interwar period is characterised by large fluctuations in economic growth rates and price movements, it provides a good data set to test different index number formulae and weighting schemes.

The years 1921/29 and 1934/39 are periods of growth and 1929/34 is a period of economic decline. Table 2 shows that for all sub-periods the chain Laspeyres indices give much better approximations of the chain Fisher indices than the fixed weight Laspeyres indices. Relatively speaking, the differences between the chain Laspeyres, Fisher and Paasche indices are small.

Concluding remarks

We have discussed Dutch practice with chain indices from 1980 onwards. In the discussions preceding the introduction of chain indices, the CPB, the most important user of national accounts data, played an important part, pleading a case for annually changing weights and chain indices. The CPB still has a strong preference for chaining one-period growth rates based on annually changing weights. They describe their experience with the use of chain indices as excellent.

Table 2. Average annual volume growth rates of GDP at market prices according to different index number formulae (Interwar period) (%)

Period	Laspeyres (weights 1921)	Laspeyres (chain)	Fisher (chain)	Paasche (chain)	Paasche (weights t,1921)
1922–1929	5.2	4.7	4.6	4.5	4.5
1930–1934	–1.7	–1.5	–1.5	–1.6	–2.1
1935–1939	4.5	3.8	3.9	4.0	4.5

Three other users of national accounts data say that chain indices are a good base for the construction of economic models. They further state that:

– it is necessary for model builders to carefully tune the specification of their model to the characteristics of the data;
– non-additivity need not be a real problem as long as researchers give special attention to the presentation of the data to the public;
– for policy makers it is important that chain indices correspond strongly with actual developments.

If we take the chain Fisher indices as a standard, the most important conclusions to be drawn from alternative estimates of volume growth rates are:

– in nearly all cases both chain Laspeyres indices and chain Paasche indices give good approximations of chain Fisher indices;
– most substantial deviations from the chain Fisher indices are found with the fixed weight Laspeyres formula. This is very important since fixed weight Laspeyres volume indices often are used in constant price estimation of national accounts data;
– fixed weight Paasche indices generally speaking act better than fixed weight Laspeyres indices, but in some cases there are also severe deviations from the chain indices.

Appendix: Index number formulae

In this appendix expressions for the index number formulae are given. For these expressions we use the following definitions:
p_0, p_{t-1}, p_t: price of product i in the base year (0), the previous year (t-1) and the current year (t), respectively.
q_0, q_{t-1}, q_t: quantity of product i in the base year (0), the previous year (t-1) and the current year (t), respectively.
p_0q_0, $p_{t-1}q_{t-1}$, p_tq_t: value of product i in the base year (0), the previous year (t-1) and the current year (t), respectively.
The index numbers can now be defined as (where all summations are over products i):

1) Fixed weights

$$\text{Laspeyres volume index} = \frac{\sum p_0 q_t}{\sum p_0 q_0} = \frac{\sum p_0 q_0 \frac{q_t}{q_0}}{\sum p_0 q_0}$$

$$\text{Paasche volume index} = \frac{\sum p_t q_t}{\sum p_t q_0} = \frac{\sum p_t q_t}{\sum p_t q_t \frac{q_0}{q_t}}$$

$$\text{Fisher volume index} = \sqrt{Laspeyres * Paasche}$$

2) Annual changing weights

$$\text{Laspeyres volume index} = \frac{\sum p_{t-1} q_t}{\sum p_{t-1} q_{t-1}} = \frac{\sum p_{t-1} q_{t-1} \frac{q_t}{q_{t-1}}}{\sum p_{t-1} q_{t-1}}$$

$$\text{Paasche volume index} = \frac{\sum p_t q_t}{\sum p_t q_{t-1}} = \frac{\sum p_t q_t}{\sum p_t q_t \frac{q_{t-1}}{q_t}}$$

$$\text{Fisher volume index} = \sqrt{Laspeyres * Paasche}$$

Biodiversity declining in the Netherlands: an indicator to describe the changes in the number of wild species

Arco J. van Strien

Many wild plant and animal species have declined considerably in the last decades (WCMC, 1992). The 1992 *Earth Summit*, the United Nations Conference on Environment and Development, was held in Rio de Janeiro with the aim of halting this worldwide decline of biological diversity. The Rio Convention on Biological Diversity, or Biodiversity, was signed by more than 150 nations. Article 7 of the Convention prescribes that nations should monitor their biodiversity. Since Rio, the development of indicators describing changes in biodiversity has been intensified (Reid et al., 1993; Ten Brink, 1997). In the framework of the Dutch National Nature Outlook 97 (RIVM, 1997), Statistics Netherlands has developed an indicator to summarise the changes in the richness of species on a national scale.

The simplest way to sum up changes in the number of species is to count the number of wild species present in the country at different points in time. However, this is not adequate because the number of species changes very slowly in time; many species have declined considerably in the Netherlands, but have not yet disappeared entirely. It is more informative to take the increase and decrease of species into account, so that overall changes can be noticed long before the number of species itself changes. However, looking at the number of increasing and decreasing species, as in the State of the Nature II Report (Bink et al., 1994), can be misleading. The further increase of an already common species is usually not advantageous; it may even threaten other species through competition mechanisms.

Thus, the increase of rare species is more relevant than the increase of common ones. For this reason, we took only changes in rare species into account and did not pay attention to species of which the rarity status is above a certain threshold. The threshold value chosen more or less coincides with the rarity thresholds used in the Dutch *red species lists* (see for instance Lina and Van Ommering, 1996). These red lists contain species threatened in their survival because they have become rare.

Method and data

Four time periods were distinguished: 1900–1950, 1950–1980, 1980–1990 and 1990–1995. For each period the rarity of each species was classified according to the division in Table 2. Estimates of rarity status were available for birds, reptiles, amphibians, mammals, butterflies, grasshoppers and crickets, dragonflies, plant species, and a representative selection of fungi species. No data were obtained for aquatic species. Furthermore, for plant species no data were available for the last period.

The rarity status is defined by the number of 5x5 km squares in which the species was present. Such squares are not appropriate for many mammals and birds, though, as they are too mobile or live in colonies. Instead, we used classes of numbers of individuals (Table 2), similar to those applied in the red species lists.
By summing the scores of the rarity classes across all species, we get a total score for the entire species group for each time period. For example. Table 1 gives the scores if only two species were to occur in the country.

The total score has decreased from 4 to 2. Using the first period as a reference base, set at 100, the value dropped to 50. Obviously, the lowest index possible is zero; it would occur if both species became extinct in the Netherlands. The maximum index possible

Table 1. Example of scores for two species

	1950	score	1990	score
species 1	very rare	1	extinct	0
species 2	moderately rare	3	rare	2
total		4		2

occurs when both species are categorised as *rather common to very common*. This corresponds with completely empty red species lists. The index value is not affected when a species decreases in presence from, say, 1,500 to 500 5x5 km squares, because this remains above the threshold value of 189 squares (Table 2). Species that have always been rare and have not changed in rarity do not influence the index changes.

All species in each of the species groups mentioned were included in the computations, with two exceptions:

1. species that inhabit the country irregularly. For example, three new grasshopper species were excluded as which it is unclear whether they will still be here in the next few years. Migratory butterflies were also excluded if they hardly or never breed here. Bird species that only occasionally breed in the Netherlands were also excluded. Only bird species which have bred here at least 20 times (= years) between 1900–1950, 15 times in 1950–1980; 6 times in 1980–1990 and 3 times in 1990–1995 were counted.
2. exotic species i.e. species from foreign countries that were introduced here or escaped from captivity. Examples are the Egyptian goose and many cultivated plant species. However species that could have reached the country spontaneously, were included. Also a few exotic species that have inhabited our country for a very long time, like the Pheasant, were regarded as being native.

Results

Table 3 lists the results for the nine species groups, using the first period as the reference base. Almost all species groups have decreased in rarity status during this century (Table 3). Together, the vertebrate species (groups 1 to 4 in Table 3) have lost 16 index points this century. With a loss of 43 index points, the results are even worse for insects (groups 5 to 7). This is, however, mainly due to the decrease of butterflies (-30 points). The 'big extinction' of species in the Netherlands is especially true for this group: 25% of butterfly species have become extinct (Table 3). This degree of extinction is much lower for the other species groups, though the number of extinct species can be said to be considerable. Forty-four plant species have disappeared entirely during this century, but 18 species have appeared or re-appeared. Though a large number of plant species have decreased (362) from 1900–1950 to 1980–1990, many others have increased in occurrence (259). As a result, plant species have not decreased very extremely compared with other groups. Many fungi have also become extinct. According to the red list of

Table 2. The rarity classes used. The maximum number of 5x5 squares is 1,677

Class	Score	Number of 5x5 km squares	Number of individuals
Extinct	0	0	0
Very rare	1	1 – 10	1 – 250
Rare	2	11 – 79	250 – 2,500
Moderately rare	3	80 – 189	2,500 – 25,000
Rather common to very common	4	more than 189	more than 25,000

Table 3. Index values of rarity classes per species group (first period = 100). No data were available for the last period for plant species

		1950–1980	1980–1990	1990–1995
1.	reptiles (n=7)	100	92	92
2.	amphibians (n=16)	93	93	89
3.	breeding birds (n=191)	102	107	108
4.	mammals (n=62)	98	94	95
5.	butterflies (n=70)	88	71	70
6.	grasshoppers (n=42)	91	87	90
7.	dragonflies (n=60)	94	91	97
8.	plants (n=1194)	96	95	–
9.	fungi (n=108)	100	86	78

Table 4. The number of extinct species (e) and new species (n) per period compared with 1900–1950. Data for fungi were incomplete

			1950–1980	1980–1990	1990–1995
1.	reptiles (n=7)	e	0	0	0
		n	0	0	0
2.	amphibians (n=16)	e	0	0	0
		n	0	0	0
3.	breeding	e	4	4	7
	birds (n=191)	n	13	20	25
4.	mammals (n=62)	e	0	2	3
		n	0	3	3
5.	butterflies (n=70)	e	1	15	17
		n	0	0	0
6.	grasshoppers (n=42)	e	3	4	4
		n	1	1	1
7.	dragonflies (n=60)	e	3	6	5
		n	0	1	1
8.	plants (n=1194)	e	32	44	–
		n	17	18	–

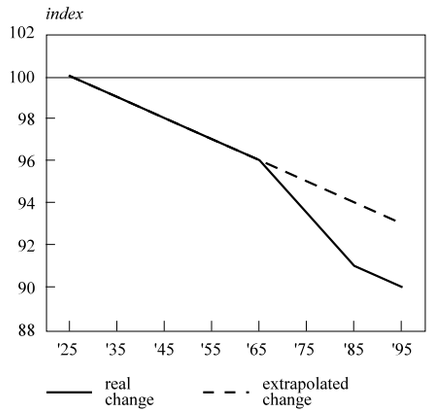
fungi, 202 of the 2,475 species are now extinct. Apparently, the decline of fungi in particular has not come to halt yet (Table 3).

The breeding birds are the only group of species that have become more common this century. A considerable number of new species have arrived here on their own strength, such as the Collared Dove and Little Egret. The number of new bird species exceeds the number of species that have become more rare or extinct (Table 4).

If we average the indices per species group across all nine species groups, the mean index is 100, 96, 91 and 90 respectively (Figure 1). This is a substantial loss in biodiversity, comparable with the extinction of 10 out of every 100 formerly common species this century.

The greatest change occurred between 1950 and 1990; the mean index value fell from 96 to 91 in this period. We can get a better picture by transforming the periods into years. We assumed that the first period indicates the situation in 1925, and that the years 1965, 1985 and 1995 reflect the three other periods. If we extrapolate the loss from 1925 to 1965, which is one index point per decade, we would expect an index of 94 and 93 for 1985 and 1995 respectively (see Figure 1). In

Figure 1. Change in indicator



reality, these index values were lower, suggesting an extra decrease between 1965 and 1985, on top of the gradual loss during the whole century. The index value of 1990–1995 is only slightly lower than in 1980–1990. The interpretation of this small change is not straightforward, however, as the length of the periods differed. The last period is so short that even substantial changes may remain unnoticed (see also Van Strien, 1993).

Discussion

Some alternatives in the computation of this indicator are worth considering. One might value a change in occurrence of a species from very rare to extinct as more important than a change from moderately rare to rare, because the disappearance of a species is more drastic and might be irreversible. This implies a relatively higher score of the lowest rarity classes. But other scores for these categories led to hardly different results.

In the approach described above, the appearance of new species compensates the extinction of others in the index. Again, one might argue that the disappearance of species is more relevant. But both the extinction and appearance or re-appearance of species are often caused by the same large-scale fluctuations in climate (Van der Meijden, 1995). A biased result may easily arise if the disappearance of species were to weigh more heavily than the appearance of others. Weighting species is only allowed when there are extra reasons, for instance when the international value of disappearing species is high. However, as this makes the indicator more complicated, we have not implemented such weighting up to now.

We also explored the alternative of taking all species into account, i.e. all non-native species as well as native species. This led to very different results for most species groups, namely a much smaller decline during this century. The reason for this is that a considerable number of species have been introduced in the course of this century. It means that general conclusions on the development of groups of species depend to a considerable degree on the species selected. Non-native species are usually not desired from the point of view of nature conservation. Therefore, they need to be excluded from the computations, and careful selection is needed to determine which species should be considered as native.

All species groups were aggregated into one mean index. We believe that this mean index more or less reflects the overall change in the biodiversity, because the index value is based on the data of a few thousand species. But there are several tens of thousands of other species in the Netherlands. So the question is how representative are the selected species groups exactly for the entire biodiversity. This is one of the most important questions in current biodiversity research. It is essential for all countries to minimise the number of species to monitor for reasons of feasibility, without losing the opportunity to evaluate the changes in biodiversity.

Note that the indicator developed stresses the changes occurring in rare species. Changes in common species do not affect the index values, though this may also be regarded as relevant. For instance, the large- scale decline of several meadow birds and many plant species due to agricultural intensification in the Netherlands have led to many policy and management measures, even though these species are still far from rare. This requires another indicator that reflects the changes in

important species per ecosystem rather than the changes in the total number of species per country (see Ten Brink, 1997).

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Forecasting the foreign population in the Netherlands

Dorien Manting

In 1997 Statistics Netherlands published its first forecast of the foreign population residing in the Netherlands. The forecasts were compiled for seven different population groups: people with a background linked with Surinam, Turkey, Morocco, Netherlands Antilles/Aruba, Indonesia/former Dutch East Indies, rich OECD member countries and other (poor) countries. A further distinction is made between first generation, those born outside the Netherlands, and the second generation, who are born in the Netherlands but have foreign parents.

There are two definitions of resident foreigners:

– a narrow definition defines resident foreigners of the first generation as all persons born outside the Netherlands who have one or two parents born outside the Netherlands, and the second generation as all persons born in the Netherlands having two parents born abroad;
– a second, wider, definition circumscribes the first generation of resident foreigners as all persons born abroad, irrespective of whether or not their parents were born abroad, and the second generation as all persons born in the Netherlands with at least one parent born abroad.

As we can see from Table 1, the size of the foreign population – particularly the second generation – depends heavily on which of these two definitions is applied. The size of the total second generation is 430,000 in the narrow definition but over 1.2 million in the broad definition. The choice of the definition is especially influential in the case of residents with background links to the OECD countries [1)]: their number more than doubles to 849,000 when the wider definition is applied. Other population categories vary in a much more limited range. The Turkish resident population, for example, varies from 264,000 in the narrow to 272,000 in the broad definition.

Table 1. Number of foreign people by country on 1 January 1996

	Narrow definition			Wide definition		
	First generation	Second generation	Total	First generation	Second generation	Total
	x 1,000					
Turkey	167	96	264	167	104	272
Morocco	141	78	218	141	85	225
Surinam	179	71	250	181	101	282
Neth. Antilles + Aruba	56	12	68	62	31	94
Indonesia + former Dutch East Indies	149	71	220	178	263	440
OECD countries	295	46	340	348	501	849
Other (poor) countries	298	57	354	330	130	460
Total	1,284	430	1,714	1,407	1,215	2,622

Methodology

The forecasts cover the period from 1996 to 2015 and predict the different foreign categories by sex, single year of age, and generation. The forecasts start out from 1 January 1996 and are based on a cohort component model.

The future size of the first generation is determined by assumptions on age and sex specific mortality rates and on migration numbers. The size of the second generation is also based on assumptions on age and sex specific mortality rates and on the number of children born out of the first generation. This number of births is computed with the aid of age specific fertility rates, the number of women aged 15–49 in the first generation, and the proportion of children born to couples of which both the man and the woman are foreign (narrow definition).

In the forecast according to the broad definition of foreigners, all children born to foreign mothers as well as a proportion of those born to Dutch mothers (and foreign-born fathers) also contribute to the second generation. A zero net migration was assumed for the second generation.

Assumptions on fertility and mortality are made for the target year of 2015 whereas migration assumptions are made for the target year of 2010 and held constant thereafter. The assumptions discussed below are based on the medium variant of the population forecast.

Migration

Assumptions made with regard to future migration patterns are a very important factor in estimating the future size of the foreign population. Migration assumptions formulated for Statistics Netherlands 1996-based population forecasts also form the basis for the forecasts of the foreign population. This means that both forecasts use the same migration assumptions for different groups of foreigners. We added the expectation of zero migration for people born in the former Dutch East Indies and Indonesia. The importance of migration assumptions lies in the fact that they largely determine the size of the future first generation. These assumptions also indirectly influence the second generation, since they establish the number of first generation foreign women. The number of 15–49 year-old women of the first generation generates the number of second generation children born in the Netherlands.

It is assumed that net migration will decrease between 1996 and 2010 to about one thousand Turkish and two thousand Moroccan persons a year, and that net migration from Surinam will be at a level of four thousand people a year. A positive yearly net migration from the Netherlands Antilles is also anticipated (a thousand people a year). Furthermore, there will also be a positive net migration from the OECD countries. And lastly, a large stream of migrants is expected to come from other, poor, countries. On a yearly basis, migration from other countries will be at a level of about 26 thousand people, consisting mainly of family formation and family reunion of asylum seekers who have been granted official permanent resident status.

Information on second generation migration is rather limited. For 1995, the number of second generation immigrants was about the same as the number of second generation people leaving the Netherlands. This zero net migration is assumed to last until 2015.

Mortality

At the moment, with the exception of people from the former Dutch East Indies, Indonesia, and the OECD countries, the majority of the foreign population is very young. As a consequence, mortality assumptions do not have much impact on the size of the other future foreign population categories. We therefore decided to assume that foreign mortality rates will not differ from that of the general population of the Netherlands. This does not mean that we think that there are no differences in mortality between the different population categories. Theoretically, it would be better to make different mortality patterns, but this would have hardly any impact. Small numbers lead to great fluctuations in mortality patterns. Also, theories do not give any clue as

to whether mortality is higher or lower than that of the native population: there are arguments for both. In the population categories for which mortality assumptions do matter, such as the population from the former Dutch Indies, Indonesia and the OECD countries, who are older, mortality is probably the same as for the population as a whole.

Fertility

Assumptions on fertility developments in the near future are made for each foreign category separately, in terms of total fertility rates (table 2). To draw up accurate forecasts of future reproductive behaviour, tendencies of fertility in the Netherlands as well as those in the countries of origin were studied. The general expectation of studies of reproductive behaviour of immigrants to the Netherlands and surrounding countries is that fertility generally tends to decline towards the level in the new country of residence. Also, it is expected that better education will lead to lower future fertility among certain foreign population groups. Furthermore, research among young foreigners shows that they expect to have fewer children on average than

2. Some general assumptions; forecasts of the foreign population 1996, per variant

Fertility (for the year 2015)	Low	Medium	High
	Total Fertility Rate (TFR)		
The Netherlands (2035)	1.4	1.7	2.0
Turkey	1.6	2.0	2.4
Morocco	2.1	2.5	2.9
Surinam	1.4	1.7	2.0
Neth. Antilles + Aruba	1.4	1.7	2.0
Indonesia + former Dutch East Indies	1.4	1.7	2.0
OECD countries	1.0	1.3	1.6
Other (poor) countries	1.6	2.0	2.4
Forecast of foreign population (narrow definition):	Proportion of live births to a foreign mother and a Dutch father as a percentage of all live births to a foreign mother, per foreign category		
Turkey	15	10	5
Morocco	15	10	5
Surinam	25	20	15
Neth. Antilles + Aruba	35	30	25
Indonesia + former Dutch East Indies	75	70	65
OECD countries	75	70	65
Other (poor) countries	35	30	25
Forecast of foreign population (wide definition):	Proportion of live births to a Dutch mother and a foreign father as a percentage of all live births in the Netherlands		
Turkey	0.3	0.4	0.5
Morocco	0.2	0.3	0.4
Surinam	0.4	0.5	0.6
Neth. Antilles + Aruba	0.2	0.3	0.4
Indonesia + former Dutch East Indies	0.4	0.5	0.6
OECD countries	1.3	1.4	1.5
Other (poor) countries	0.8	0.9	1.0

their parents had. In short, it is expected that the Turkish and Moroccan fertility levels will decline up to 2015, but that they will remain higher than the general Dutch fertility rate. It is assumed that in 2015 the total fertility rate will be somewhat lower for Turks than for Moroccans (2 and 2.5 respectively), and that the rate for people from the Netherlands Antilles and Aruba, Surinam and Indonesia will be the same as that for the Dutch population, i.e. about 1.7 in 2015. The fertility of people born in the OECD countries will be held constant at a level of 1.3. This is so low because this group consists of many women who only live in the Netherlands for a small part of their reproductive life. It is therefore not equal to their ultimate total fertility rate. For people born in other countries, the recent level of 2.0 is held constant for the period 1996–2015, simply because we do not yet have much information on the reproductive behaviour of this group.

Besides assumptions on fertility, we also have to make assumptions about how many of the children born to foreign mothers will have Dutch-born fathers and vice versa, as the choice of definition will affect the size of the second generation. In forecasts using a narrow definition, only children born to a foreign mother and a foreign father are seen as second generation. Children born in mixed marriages with one Dutch parent do not belong to this group. In the forecast using the broad definition, however, any child born to a foreign mother or father belongs to the second generation, regardless of whether the other parent is foreign or not. The general expectation is that mixed marriages, and hence the number of children within them, will increase in the future. Among the current groups, however, the trends differ to quite an extent. People from Surinam, for example, quite often have a Dutch-born spouse, whereas this is rarely the case for Turkish people.

The general expectation is that there will be more mixed marriages in the future when the number of migrants who grew up in the Netherlands will increase strongly compared with the number who grew up in their country of origin. This will probably lead to a cultural gap between the two groups, which, together with growing number of immigrants in the Netherlands, may lead to more immigrants choosing local partners.

Short summary of the results

According to the forecasts using the narrow definition, the total foreign population will

Table 3. Number of foreign persons by country 1 January 2015 [1)]

	Narrow definition			Wide definition		
	First generation	Second generation	Total	First generation	Second generation	Total
	x 1,000					
Turkey	184	171	354	184	196	380
Morocco	170	163	333	170	185	355
Surinam	232	124	355	233	179	412
Neth. Antilles + Aruba	65	26	91	71	58	129
Indonesia + former Dutch East Indies	95	71	165	113	273	386
OECD countries	379	68	447	423	542	964
Other (poor) countries	767	235	1,003	798	402	1,200
Total	1,891	858	2,749	1,992	1,835	3,827

[1)] Forecasts of the Foreign Population 1996, medium variant.

increase from 1.7 million in 1996 to 2.7 million in 2015. The first generation will number 1.9 million in 2015, the second generation will increase to 858 thousand people in that year. According to the forecasts using the wide definition, the total foreign population will grow from 2.6 million to 3.8 million (table 3).

According to the forecast using the narrow definition of foreigners, the size of all groups will increase in the future. The first generation will grow, with the exception of those born in the former Dutch East Indies and Indonesia. The number of people coming from other, poor, countries will rise from about 354 thousand now to more than a million in 2015. This figure is based on the assumption that migration among this group will amount to about 26 thousand people a year, consisting mainly of family formation and family reunion of asylum seekers obtaining the status of permanent resident. People from the OECD countries will take second place in 2015.

In 1996 about one quarter of the foreign population belonged to the second generation; this will grow to about a third by 2015.
Both the first and second generations are young compared with the Dutch population. Among the first generation, the largest groups are those in their twenties and thirties. In 2015, the largest groups will be in their thirties and forties. Because of the continuous inflow of young immigrants, the population will remain relatively young. The second generation is much younger in general, about half is under ten. The number of people in their twenties will rise from 45 thousand in 1996 to 188 thousand in 2015.

Uncertainty of the forecasts

The results presented here are based on the *Medium variant* of the population forecasts. However, the forecast of the foreign population is uncertain, more uncertain than the national population forecasts of Statistics Netherlands. This is because there are fewer data on the foreign population, sometimes even no data at all (for instance, in some cases there are data on nationality but not on country of birth). Furthermore, some population categories are small, which means that changes have more impact.

The forecasts for people born in other, poor, countries are especially uncertain, because of the heterogeneity of this group and because of their short migration history in the Netherlands. Therefore, two other variants were also formulated: the *Low (L)* and *High (H) variants.* The *Medium variant* describes a probable future. In the *Low variant* the assumptions with respect to fertility, migration, mortality and mixed marriages have been combined in such a way that they will lead to a relatively low population growth, whereas the *High variant* takes the opposite assumptions.

The *Low variant* predicts a foreign population of 2.2 million in 2015, the *High variant* foresees 3.4 million, both according to the narrow definition.

Note

[1)] When the text refers to OECD countries, these are the so-called 'rich' OECD countries, i.e. all OECD member countries except Mexico.

New methodology for traffic accident registration: just how safe are Dutch roads?

Jacco C. Provoost

Road safety is an important issue in Dutch society. Somewhere between one and two million traffic accidents happen every year, killing over a thousand people, injuring at least a quarter of a million and causing around eleven thousand million guilders worth of material damage. In order to develop an effective safety policy it is necessary to have a good insight into the road safety problem. Until recently the only source of information was the police registration of road accidents. However, surveys in the last decade have shown that this registration is far from complete, and, more alarmingly, that the percentage of traffic accidents the police register decreases every year. In order to get reliable figures about traffic accidents and road victims, Statistics Netherlands has started a project together with the Ministry of Transport, Public Works and Water Management and the Institute of Road Safety Research in which numerous sources are combined to get a better picture of the road safety issue. The results of the new method show that the real number of traffic victims is much higher than reported.

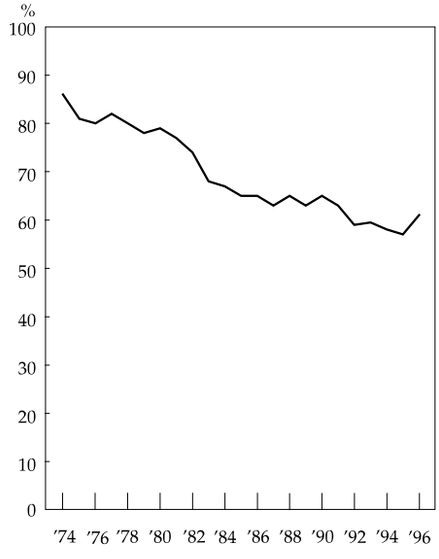
Incompleteness of the police registration

Since the early seventies, all police reports concerning traffic accidents are processed centrally. This used to take place at Statistics Netherlands but was later transferred to the Ministry of Transport, Public Works and Water Management. The police registration contains detailed information of traffic accidents and victims of these accidents. However, this registration is not complete because:

– the police only record accidents to which they are summoned;
– they do not have capacity to be present at every call;
– they do not draw up a report for every accident;
– they do not send in every report they draw up.

The completeness of the police registration depends to a great extent on the seriousness of the accidents. Nearly all fatal road accidents are registered, compared with approximately 20% of accidents without injury. Surveys also show selectivity in a number of categories, for example, accidents which involve a car are better registered than those which do not, children are registered less compared with other ages, etc.

Figure 1. Registration of hospitalised road victims by the police



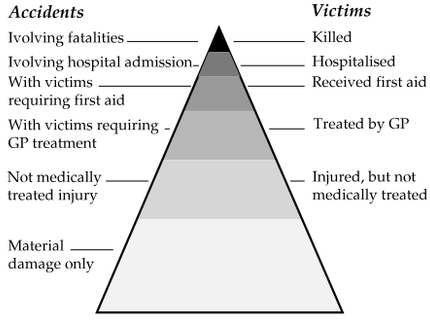
Police registration clearly does not accurately reflect road safety. However, the biggest problem is the fact that the registration rate (the percentage of accidents in the police registration) shows a downward trend: over 80 per cent of hospitalised road accident victims were recorded in 1975 compared with just over 60 per cent today.

This problem makes it impossible to follow developments: it is unclear whether a fall or a rise is the result of a changed registration rate or an actual change. In 1996 the police reported an increase in hospitalised victims, while the actual number decreased by 3%.

Alternative sources

As it is impossible to influence the registration rate, a different approach to the registration of traffic accidents was adopted. This new approach was based on the use of other sources containing information on road accident victims, and started out by ranking the traffic accidents and victims by gravity.

Figure 2. Traffic accidents and victims ordered by gravity



As stated above, the registration rate of fatalities is virtually 100 per cent, so no other source is needed for this category. Victims of road accidents who are taken to hospital are automatically recorded in the National Medical Registration, which contains data on all patients admitted to Dutch hospitals. For victims who only required first aid there is a continuous registration system at the first aid posts of fourteen hospitals. This system specifies traffic accident victims among victims of personal accidents requiring first aid. There are no alternative sources for accident victims who require no medical help and accidents with material damage only. In order to chart these categories, Statistics Netherlands started a continuous survey among 70,000 households a year.

Integration process

In turned out to be difficult to combine all the different sources. The main problem is that the alternative sources are not as detailed as the police registration, which contains over 80 variables on road accidents and victims. To obtain comparable information, the alternative sources have to be matched with the police registration which is a time absorbing process. Therefore not all categories are available yet, and the calculation of others will be done in the near future.

Another problem is the quality of the alternative sources. It appears they record some accidents erroneously as traffic accidents, while they neglect others which undisputably are traffic accidents. This is because the registration of traffic victims is only a secondary task for the alternative sources. A lot of effort is put into checking the sources and where possible improving the quality.

Although the new methodology depicts the real road safety problem far more accurately, it is impossible to give an exact description. Therefore confidence intervals were determined for the figures, based on the knowledge that minor accidents are far more common than serious ones and are much more difficult to measure.

Results

The results of new methodology confirm the results of the earlier surveys. The real number of hospitalised road accident victims is almost

Table 1. Confidence intervals by gravity

Road Victims	Confidence Interval
	%
Killed	1
Hospitalised	5
First aid	10
Minor injury (incl. GP)	20
Material damage only	20

twice the number registered by the police. The real number of victims receiving first aid treatment in hospitals is even five and a half times the number reported by the police.
As Statistics Netherlands only started this survey in September 1995, official results for the year 1996 are not available. Estimates based on the last quarter of 1996 give an estimated lower bound of one and a half million accidents with minor injuries or resulting in material damage only, implying a lower bound of 18% of police registration.
Division of the victims by age reveals an underrepresentation of young ages in the police registration, while when the figures are considered according to means of transport, accidents involving bicycles are underreported by the police.

Conclusion

The only police records of road accidents which are completely reliable are those concerning accidents resulting in fatally injured victims. On the basis of comparisons of figures based on the new methodology with those based on the police registration, it

Table 2. Road accident victims 1996

Road victims	New figures registration	Police registration	Registration rate
			%
Killed	1,180	1,180	100
Hospitalised	19,420	11,966	62
First Aid	91,200	16,381	18

Table 3. Road accident victims by age 1996 (figures rounded to nearest ten)

Age	Hospitalised	Registration rate	First aid	Registration rate
		%		%
0– 4 yrs	470	42	5,350	4
5– 9 yrs	940	41	5,900	8
10–15 yrs	1,000	74	10,150	12
16–17 yrs	1,730	65	7,900	22
18–24 yrs	3,060	75	16,700	20
25–34 yrs	3,210	71	17,200	20
35–49 yrs	3,210	63	14,350	21
50–64 yrs	2,520	54	8,050	20
65 and older	3,280	44	5,500	20

Table 4. Road accident victims by means of transport 1996 (figures rounded to nearest ten)

Means of transport	Hospitalised	Registration rate	First aid	Registration rate
		%		%
Car or van	6,230	84	22,400	33
Lorry or bus	130	59	400	39
Motorcycle	1,360	70	4,300	19
Moped	3,000	75	13,300	26
Bicycle	7,000	36	46,300	8
Pedestrian	1,600	60	3,700	27
Other	110	30	750	6

appears that the actual number of road victims is much higher than reported up to now.

Although the new procedure gives a far more accurate picture of the real situation than the police registration, the methodology must still be improved. More detailed categories will have to be determined and the quality of the alternative sources must also be improved. By April 1998, when the first official results of our survey become available, we expect to have a more complete picture of road safety.

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