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Department of Economic Statistics

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Project: Quality of Manufacturing Statistics and Evaluation of Methods for Producing Preliminary and Final Figures

Final Report

Preface

This report is based on contract No 944 1001 between Eurostat and Statistics Norway, and is the final report on the project. The title of the project is Quality of Manufacturing statistics and evaluation of methods for producing preliminary and final figures.

The report is written by Ms. Anne Sofie Abrahamsen, Mr. Morten Qvenild Andersen and Mr. Richard Ragnarsøn at Statistics Norway. The steering group for the project has been Mr. Bjørn Bleskestad, Head of Division, Division for Energy and Industrial Production Statistics, and Mr Leiv Solheim, Head of Division/Research Fellow, Division for Statistical Methods and Standards.

Statistics Norway, Division for Energy and
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Contents

1 Introduction

1.1 Background of the project

This report is the final one of the project Quality of Manufacturing Statistics and evaluation of the methods for producing preliminary and final figures, based on contract No 9441001 between Eurostat and Statistics Norway.

The work on the project started in October 1999. Due to delays in the Manufacturing statistics, the latest final files with structural statistics at that time was the 1996 statistics. This was also the first year when these statistics were based both on information for the enterprises and the local KAUs, to comply with the requirements of the Regulation 58/97 concerning Structural Business Statistics. The analysis of the effect of editing presented in the report therefore starts with the 1996 statistics, and the results from this work were also reported in the preliminary report for the project, sent to Eurostat in December 1999. Further analysis of the editing process and evaluation of new methods of editing are in this final report based on the 1998 Manufacturing Statistics.

Quality analysis is presented in Chapter 6, which also covers the quality report to Eurostat, according to Commission regulation No 1618/1999 of 23 July 1999. This chapter is also based on statistics for the 1998 reference year. However the quality analysis goes further than the report required by Eurostat, and includes a comparison with other data and statistics for the manufacturing industry as well, such as the Prodcom statistics and annual accounts from the Norwegian Register of Company Accounts. Methods for producing preliminary figures are discussed and presented in chapter 5, and the proposed method for preliminary figures is meant to be used for the first time for the statistics for the reference year 2000.

At the Division for Energy and Industrial Production Statistics in Statistics Norway the work with the report has been useful as a tool to help us to focus on the needs for continuos awareness of the process of producing statistics, inter alia to meet the needs for timeliness. At the time of completing the report, March 2001, the editing of the 1999 statistics will have been finished, and the national publishing of main figures can take place in April. This also means that the final figures will be reported to Eurostat within the time limits in the Regulation.

2 Summary

2.1 User needs and description of the current organisation

The user needs for structural business statistics for the manufacturing industries are widespread, from the extensive and continuos use of the national accounts and for the recent years also from environment statistics and analysis, to different ac hoc use in research projects. Public bodies and private organisations, firms and individuals are also users of the statistics. For many users comparability over time is essential. On the other hand, the statistics have to adapt to new user needs and also try to use new information sources to reduce the burden for the enterprises and keep the costs of producing the statistics as low as possible, even if this influences the comparability over time. Given this widespread user needs – assessment of the quality claims to the statistics is difficult. The production process aims at finding and correcting errors at micro- level, but errors like measurement errors may be hard to detect, and the resources limit the work. Description of design and organisation of the statistics, and information to users on types of errors and uncertainties then become important.

Traditionally the local kind of activity unit, the local KAU, has been the statistical unit in manufacturing statistics. Statistics Norway has a time series database going back to 1966 which contains data on a micro- level for these units. The reason for the choice of this unit is the need for information for "clean" industry groups to be used by the national accounts in input - output analysis, and later on the same kind of needs from the environmental statistics and analyses to calculate environmental consequences of manufacturing activities. The local dimension is needed for regional statistics and analyses. Both the local KAU and the enterprise unit are units included in the Central Register of Establishments and Enterprises at Statistics Norway. As from 1996, the statistics give information both for the enterprise and the local KAU units. The data collection for the enterprise unit consists of a copy of the standard financial report that the tax authorities collect from the enterprise. For the local KAUs information is collected on statistical questionnaires that also include necessary information at the enterprise level not included in the financial report.

The sample is based on a cut off sample where all the local KAUs with at least ten employees at the time of sampling are included. The population for the statistics is all enterprises and local KAUs in the manufacturing sector, except enterprises with individual proprietorship where the owner is working alone, and except local KAUs with employment less than half a man year. For the 1998 statistics the sample consists of 3,528 enterprises and 4,495 local KAUs, and the population consists of 11,046 enterprises and 12,105 local KAUs. For the 7,518 enterprises and 7,610 local KAUs, which were not included in the sample, information is collected from the annual accounts sent to the Register of Company Accounts and information from other administrative sources on turnover and employment. Other characteristics for these units are estimated.

2.2 The effect of editing and proposals for new methods

The analysis of the effect of editing shows that there are only small changes in classification variables for the units, like the NACE group. In the 1996 statistics, the editing process only led to change in industry group for 3 per cent of the local KAUs. For the characteristics for the units, the editing process, however, led to change in one or more of the characteristics for almost all units, only 1.2 per cent of the local KAUs remained unchanged in the 1996 statistics. Many of the changes – a total of about 2/3 – had to do with blank items. The blank items come partly from forms where all items are blank, and partly from forms where only some items are missing. In the latter case information on total energy costs and investment is often missing. The former problem relates to 10 and up to 20 per cent of the different questionnaires in the statistics. This fact raises the question if more questionnaires should be returned to the enterprises when they obviously lack information. On the other hand, with a

unit response of more than 95 per cent after the editing is finished, it is not likely that the production of figures in Statistics Norway, based on other available micro- information could be avoided entirely. However, we have now attempted to calculate some of the missing information for smaller units, rather than to produce figures unit by unit.

The effect of unit (thousand) errors is also analysed. Even though they have large effects, they are relatively few in numbers. In the editing program for the standard financial report there is presently a function for correcting all figures for an enterprise if unit errors occur.

The based on the 1998 statistics analysis further search for efficient editing methods, that is methods that detect and correct errors with the greatest changes first. Such efficient editing methods are important both for the final figures, and when we are going to produce preliminary figures from micro- data. However analysing the editing process for selected characteristics shows different patterns. This means that it may be difficult to find routines that are efficient for all (important) variables.

2.3 Preliminary figures

The requirement for preliminary figures for structural business statistics in the Regulation 58/97 is to send them to Eurostat within 10 months after the end of the reference year. This makes it in practice impossible to produce these figures on the basis of micro- information for the reference year in question. The report points out that instead of making a separate set of preliminary figures based on short-term statistics and other information, it is possible to base the preliminary figures on results from the preliminary national accounts. By using this method we may gain from work already done in the national accounts with evaluation of information from short-term statistics and other sources. More importantly we may avoid confusing the users by presenting a separate data set, which easily could differ from information for the same sectors and the similar characteristics in the national account figures.

This method is, however, not presented in detail, since our main proposal for making preliminary statistics is based on a method which partly uses the micro- information from the reference year in question, and micro- information from administrative sources as well. The method will by the micro-approach give preliminary figures at a detailed level, and also create substantial new information to the national accounts and other users, compared to the short-term statistics and the first set of preliminary figures on this basis. However, the method will, at least for the time being, only be able to produce preliminary statistics about 12 months after the reference year. Given the delays also in preliminary statistics from other countries, the method still could be interesting for international reporting.

2.4 Quality measures and quality report

The report includes the first analysis of quality in manufacturing statistics, which is based on the Commission regulation No 1618/1999 of 23 July 1999 for quality reports in structural business statistics. A model for estimating the coefficient of variance is presented, and the calculation of the coefficient is given by 3-digit NACE groups for the characteristics value added, gross investment, personnel costs and wages and salaries. Relatively large variations within an industry group or few local KAUs in a sub-sample result in large coefficients of variation. When the sample covers the whole population, the coefficient of course is zero.

Other aspects of quality are also analysed and evaluated. Frame errors are likely to be relatively small in the Norwegian statistics, due to a fairly good and comprehensive business register, and coordination between registers in different public bodies. However, for the characteristic measurement errors would occur, due to differences in accounting practice. Here, gross versus net keeping of income and cost

items could lead to significant measurement errors. Other sources for this kind of errors are that the reporting year for some enterprises does not coincide with the calendar year.

3 Users needs and description of the current organisation

3.1 Background/General view on manufacturing statistics

3.1.1 Users

The manufacturing sector is one of the most important production sectors in the economy. The manufacturing statistics are versatile and detailed, down to municipality level, and give a good foundation for regional analysis, the National Accounts and environmental statistics. There are many and different users of the manufacturing statistics: public bodies and private organisations, firms and individuals, internal and external, national and foreign ones that need these kinds of statistics for their work. A reliable general view of the composition of and the development trends in Norwegian manufacturing is extremely important in the debate about economic as well as political questions.

According to international agreements, Norway is obligated to send annual reports on manufacturing statistics to Eurostat and the OECD.

Below, some of the central users of manufacturing statistics are listed.

- Internal users comprise several different divisions within Statistics Norway. The main user in many ways is the National Accounts (N.A.). All data at the most detailed level are available for the N.A., and there is also a close interaction between the staff members of the NA and the manufacturing statistics in such a way that details in methodology or the actual data are continuously discussed. Another user of detailed manufacturing statistics is the division of Environmental Statistics, which contributes to the quality of the statistics through their use of data and through detailed discussions about methodology. Several short-term statistics use the manufacturing data for weights and other adjustments. Furthermore, the Research Department of Statistics Norway is a frequent user of the manufacturing time series database, and also other statistics, such as the Fishery statistics. Information on industry classification, employment and turnover from the manufacturing statistics are used for updating the business register.
- There is a whole range of external users, and some of the most important ones are branch organisations (most of them organised in the Confederation of Norwegian Business and Manufacturing), ministries (Ministry of Finance and Ministry of Industry) and several research and analysis institutes. Common for these demanding users is that they often purchase special excerpts from the statistics on a more or less regular basis. As a result of the co-operation with these users, we get feedback on quality through these analyses and through viewing the statistics from other angles.
- International organisations have become particularly important users in recent years, and the two main users are Eurostat and the OECD. Especially the EEA-agreement had consequences for the statistical cooperation with the EU and Eurostat. Several statistical regulations had to be adopted, which included detailed rules from data capture to data transmission. Data on manufacturing statistics are transmitted to Eurostat as soon as they are available. Regarding quality, Statistics Norway receives comments and questions concerning possible errors or other diffuse parts of the data transmitted. The OECD receives detailed manufacturing data, and also from this source data quality is investigated on the basis of slightly different aspects.

3.1.2 Background, design and organisation

The legal basis for the manufacturing statistics is the Statistics Act N° 54 of 16 June 1989, which states that "The King may by regulation or resolution impose upon any person an obligation to provide the information which is necessary for the production of official statistics...". The manufacturing statistics comprised in 1996, 11,380 local KAUs and 10,339 enterprises in manufacturing, mining and quarrying, as defined by the Norwegian Standard Industrial Classification (SIC), which is a national version of the NACE Rev. 1. Information on oil and gas extraction is not included.

The statistics are based on information from enterprises and data from administrative registers, among others: The Norwegian Register of Company Accounts and Central Coordinating Register for Legal Entities (both in Brønnøysund), and The Central Register of Establishments and Enterprises at Statistics Norway. The manufacturing statistics are collected and published on two levels, as information is collected both on the local KAUs in each enterprise and from the legal entity (enterprise).

The manufacturing statistics cover all enterprises and local KAUs in manufacturing, mining and quarrying except enterprises where the owner is working alone and except local KAUs with employment of less than half a man-year.

The manufacturing statistics are based on questionnaires to local KAUs in enterprises, with at least one manufacturing local KAU that has 10 or more persons employed. These enterprises are obligated to send in the information included in the Standard Industry Form (income statement and balance sheet), which is the foundation for enterprise statistics. For smaller enterprises turnover and employment are collected from The Central Register of Establishments and Enterprises at Statistics Norway and some information from The Norwegian Register of Company Accounts.

The manufacturing statistics offer a detailed overview on employment, production value, production costs, energy consumption, stocks and investments by industry and regions. The statistics are published every year in the series Norwegian Official Statistics (Manufacturing Statistics).

Norwegian manufacturing statistics are coordinated with corresponding statistics from the EEA, and in accordance with the EEA agreement aggregated data are to be reported to Eurostat, the Statistical Office of the EU.

A result of change and adjustment according to the Regulation for Structural Statistics is more focus on enterprises in contrast to local KAUs as a unit while preparing the statistics. As a result of this there are from 1996 on, more detailed data material on enterprises than previously and more focus on accounts. At the same time it has been extremely important for Statistics Norway to retain the local KAU dimension in the basic data in order to continue with time series and make sure the comparability is secured.

3.1.3 Definitions, characteristics and classification

3.1.3.1 Definitions

A local kind-of-activity unit is defined as a functional unit which at a single physical location mainly is engaged in activities within a specific activity group. This definition conforms to the one framed by ISIC Rev. 3, and the one in the Council Regulation No. 696/93 of Eurostat.

An **enterprise** is defined as an organisational unit comprising all economic activities engaged in by one and the same owner. Hence an enterprise is a legal entity covering one or more productive units (local KAUs).

The following guidelines are used in order to divide the activity of an enterprise into separate local KAUs:

- activities engaged in by an enterprise in different municipalities, are treated as separate local KAUs.
- activities in different industry classes (4-digit) may be classified as separate local KAUs when this is necessary for statistical purposes, even if the activity is located at the same site. To divide a local unit into several local KAUs, each of the activities has to be of a certain size, normally engaging at least three persons. Some exceptions have been made to this rule, dependent on the feasibility for the respondents.

Auxiliary units are locally distinct units, which mainly provide services for one or more local KAUs in the enterprise of which the unit is a part. Typical examples are central and local administrative offices, sales offices, stock departments etc. These units furnish separate reports, but they are not regarded as separate local KAUs. Auxiliary units furnish reports on persons engaged, compensation of employees, working expenses, investments, etc. An auxiliary unit is grouped under the same industry as the local KAU within the enterprise or groups of companies to which the unit mainly renders its services. If the unit serves various local KAUs of different industry groups, more auxiliary units may be organised within a locally limited area. The value of the services from such auxiliary units (the value of production) is set equal to compensation of employees and cost of goods and services consumed. These services are entered as cost of goods and services consumed by the receiver (internal delivery).

Local KAUs under construction In order to make the survey of current investment expenditure in manufacturing, mining and quarrying as complete as possible, investment reports are collected from large local KAUs under construction, even if they do not start operating in the year surveyed. These units are not counted as separate establishments.

3.1.3.2 Activity classification

The activity classification is in accordance with the edited Norwegian Standard Industrial Classification (SIC), which is based on the industrial classifications approved by the EU (NACE Rev. 1) and the UN (ISIC Rev. 3). The classification has a six-level hierarchical structure. Further information can be found in the publication Norwegian Standard Industrial Classification (NOS C 182).

Local KAUs (enterprises) engaged in activities belonging to different classes have been classified according to the activity that represents the largest share in the total value added created by the local KAU (enterprise).

3.1.3.3 Characteristics on local KAUs

Persons engaged (employment) includes all persons working in the local KAU, also persons on sick leave, vacation and strike. However, outworkers and persons on military leave are excluded. The figures given in the tables are annual averages.

The number of *proprietors,* or *owners,* also includes unpaid family workers (i.e. workers without regular pay). Only individual proprietors and partners actively engaged in the work of the local KAU are included. Working shareholders in corporations and co-operatives are counted as ordinary employees.

Employees comprises salaried managers and directors as well as transport workers, messengers, newsmen, watchmen and cleaning personnel.

Gross value of production (value of gross output) (excluding VAT) is defined as the market value of goods and services produced. It also includes rental income and gross profit of goods sold in the same condition as purchased.

Cost of goods and services consumed
(excluding VAT) is defined as the sum of:

(1) Raw and auxiliary materials and components used as direct input in the manufacturing process
(2) Consumption of purchased ready-made containers and packaging material
(3) Contract work done by others
(4) Fuels and electricity consumed
(5) Repair work done by others
(6) Other costs

Value added is - if nothing else is stated - defined at market prices and equals gross value of production (value of gross output), less cost of goods and services consumed, excluding VAT.

Value added at factor prices equals value added at market prices including subsidies, less indirect taxes except VAT and investment levy.

Compensation of employees comprises salaries and wages in cash and kind, other benefits for the employees and social expenses levied by law.

Compensation of employees does not include compensation of individual proprietors, partners or family workers without regular wages.

Gross investments is defined as the acquisition of fixed durable assets, new and used, with an expected productive life of more than one year, less receipts from sales of fixed durable assets.

3.1.3.4 Characteristics of enterprises

Certain characteristics from the enterprise's current account are not broken down to local KAU level. An enterprise may consist of several local KAUs in different industries, in such a way that industry figures on the enterprise level may differ somewhat from the corresponding local KAU-based distributions. This is because an enterprise is classified according to its largest activity.

Operating income comprises sales income, provision income, rental income, own investment works, public subsidies and other income connected to the operation. Variables connected to the enterprise's main activity as well as its secondary activities are included. Public expenses are excluded. Internal deliveries between the enterprise's local KAUs/divisions are not included.

Operating costs consists of commodity consumption, wage and salary costs, ordinary depreciation and write-downs and other costs connected to sale, production and administration. The costs are listed as deductible value added tax.

Operating profit/loss equals operating income minus operating costs.

Profit for the year equals the operating profit/loss in addition to the result of financial income and financial costs and the result of extraordinary income and costs.

The connections between operating income and gross production value and operation costs and commodity costs are the following:

Operating income – cost of purchased goods + changes in stocks of finished goods and goods being processed - gain in sale of operating equipment + duties - subsidies
= *Gross production value.*

Operating costs – wage and salary costs - cost of merchanted goods - ordinary depreciations and write-downs - changes in stocks of finished goods and goods being processed
= *Cost of goods and services consumed.*

3.1.3.5 Characteristics - registers

The Register of Company Accounts (RCA) is a register based on financial statements of companies in Norway. The financial statement contains main figures from the profit and loss account and the balance sheet. The specification of the financial statements is however less detailed than the Standard Industry Form, which covers income statement and balance sheet which enterprises are required to report to the tax authorities. From the register we get information on operating income, costs of goods, personnel costs, production costs and other operating costs.

The Central Register of Establishments and Enterprises at Statistics Norway (CEE) gives us turnover and employment figures for small local KAUs. Turnover and employment for local KAUs in the sample of manufacturing statistics can not be collected from the CEE. This is because the figures from manufacturing statistics are being used to update turnover and employment in the register. The turnover is therefore calculated as the sum of production on own account, other income from sale, sale of merchandise, contract work, and repair work.

For small units outside the sample, the *number of owners* (0, 1, or 2) is calculated by using type of ownership and employment. The *number of employees* is calculated as the difference between the number of persons employed and the number of owners.

3.1.4 Data collection

3.1.4.1 Population and sampling frame

The Central Register of Establishments and Enterprises at Statistics Norway is the frame for finding the population of the manufacturing statistics. The essential extent of new entries in this register comes from The Register of Legal Entities in Brønnøysund. The population consists of all local KAUs within mining and quarrying and manufacturing, except for one-man local KAUs and local KAUs with employment of less than half a man-labour year. The total number of local KAUs in the population for 1996 is 12,091, which includes auxiliary local KAUs.

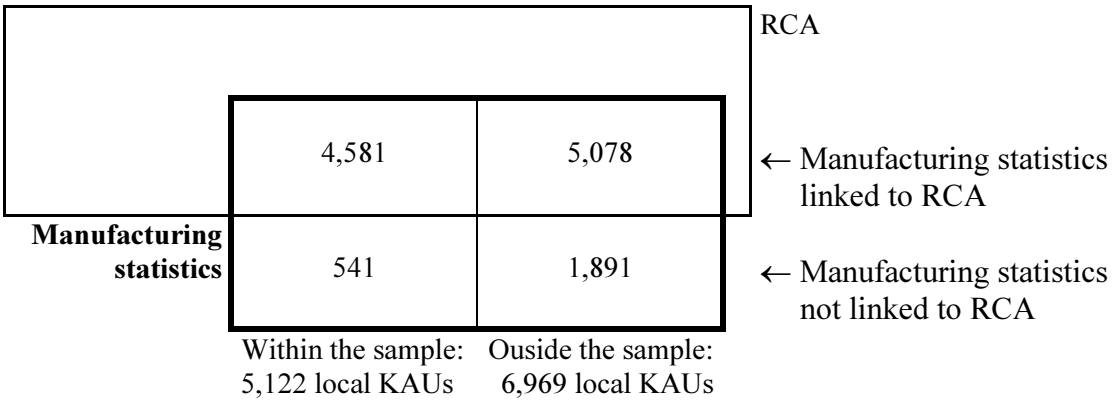
The sample consists of all active (status = 9) local KAUs with at least 10 persons employed in mining, quarrying and manufacturing at the time of establishing the sample (cut-off sample). In addition all local KAUs in multi-KAU enterprises that have at least one local KAU with at least 10 persons employed in manufacturing, are included. This leads to “small” local KAUs in the same enterprises as “large” local KAUs in manufacturing, being included in the sample, as questionnaires are sent to the enterprises. (With questionnaires on local KAU level). In this way questionnaires and a copy of The Standard Industry Form, are collected from all enterprises that have manufacturing activity with at least 10 persons employed. For local KAUs with less than 20 persons employed, a simplified questionnaire is used. Data for the local KAUs outside the sample are estimated and imputed based on annual accounts, employment and turnover.

3.1.4.2 Sample

In 1996 we received questionnaires from 5,122 local KAUs. This means that 6,969 local KAUs were not included in the sample. Auxiliary local KAUs (local KAU type 4) in the sample are not used as a part of the foundation for the estimation of the local KAUs outside the sample.

For joint-stock companies there are some sum variables available from The Register of Accounts (RCA), that we can use as auxiliary variables in the estimation. Linking the population/sample and the RCA-file gives:

Figure 3.1.4-1 Population/sample and RCA



The Population and the sample are divided by type of local KAU and links to RCA-figures in table 3.1.4-1.

The share of local KAUs in multi-KAU enterprises in the sample, is high (ca 84 %) and for the Auxiliary local KAUs in multi-KAU enterprises almost all are included. The 6,969 Local KAUs outside the sample represent 7% of total turnover and 11% of total employment in the population.

The account figures in RCA come from enterprises – for this reason the figures are only used for estimation of local KAUs in single KAU enterprises.

Table 3.1.4-1 RCA - Figures by type of local KAUs

	Population			The sample		
	RCA-figures	**No RCA-figures**	**Total**	**RCA-figures**	**No RCA-figures**	**Total**
Local KAUs in single KAU enterprises	7,262	1,984	9,246	2,452	179	2,631
Local KAUs in multi-KAU enterprises	1,735	401	2,136	1,470	315	1,785
Auxiliary units in multi-KAU enterprises	662	47	709	659	47	706
Total	9,659	2,432	12,091	4,581	541	5,122

3.2 The editing process

All questionnaires are checked in random order. Even though all the respondents have the same deadline (ca. 1 June), only about half of the questionnaires are returned within the time limit. Some local KAUs get an extension, and some return the questionnaire shortly after the deadline. Three months after the deadline approximately 80% have sent in the questionnaires. The remaining are received after several reminders, and ca. 150 local KAUs are fined in Nov./Dec. for not having returned the questionnaires.

The questionnaires are received at Division 230 (Division for Energy and Industrial Production Statistics), where the editors skim through them, checking that the different items are filled in, and deciding whether the questionnaires should be returned to the local KAU because important

information is missing. It is also checked that The Standard Industry Form (SIF) is enclosed. The questionnaires which are approved are sent in, in groups, to Division 450 (The Division for Data Collection), where they are optically read/punched in. The Standard Industry Form is also punched in.

After each group of questionnaires have been read optically and The Standard Industry Forms have been punched in, The Division for Data Registration returns raw data files to the IT-Office (Office 203), which puts the data into an Oracle-database. The editors may then start the editing and the approval of the questionnaires. All questionnaires from the local KAUs in the sample are checked and approved before they are further used in the production of manufacturing statistics.

During the editing process, the hardest work concerns the multi-KAU enterprises. In single KAU enterprises each questionnaire entails only a few items, which can not be found in The Standard Industry Form (SIF). These questionnaires are mainly checked for sum errors and correspondence with the SIF and whether the figures look reasonable according to the figures from previous years for the local KAU.

In multi-KAU enterprises more items need to be checked. The editors use Excel to sum up the information from each local KAU in the enterprise, to check the enterprise-information against the Standard Industry Form. They also compare the figures with the previous years information from the enterprise.

Both for single KAU enterprises and multi-KAU enterprises the editors thoroughly check that the sum of production income (V290 and V291) and the total cost of goods (V310 Raw material, V312 Packaging material, V314 Costs on sale of commodities and V316 Contract work) corresponds with the figures from the SIF. The number of persons employed (V150) is checked thoroughly as well.

For larger enterprises it is checked during editing that investments (V590_A) and fixed assets (V590_S) correspond with the figures from the annual accounts, which we get copies of as PDF-files on CD-ROM from the Central Register of Accounts. The annual accounts are also used for those enterprises, from which we do not receive any Standard Industry Forms. In addition the editors have access to the short-term manufacturing statistics for investments from The Division for Economic Indicators (Division 240).

In some cases the editors contact directly the enterprises directly to get further information. Information is found on the Internet as well. The knowledge each editor has from editing experience is also an important factor in the editing process.

The editors check that the information from the enterprise looks reasonable compared with information from the production statistics (PRODCOM). In the Oracle-database different ratios are calculated and then checked by the editors. Among others the number of Man-hours (V180) is divided by the number of Man-labour years to see if the ratio is normal. Accordingly Wages (V340 in the questionnaire or from the SIF for single KAU enterprises) is divided by the number of man-hours to find the cost of wages per man-hour.

The editors check Sale of self-produced commodities (V210) against Total cost of goods (V310, V312, V314 and V316) and that Sale of commodities (V220) have reasonable link to the Costs on sales of commodities (V314).

The Standard Industry Form (SIF) is often looked upon as the answer by the editors (as we expect this form to be more correct then the questionnaires). The SIF may, however, be filled out insufficiently, especially when it comes to the distribution of costs of production. Because of this the editors sometimes make corrections in the SIF. Sum operating income and sum operating costs will however normally stay unaltered.

The editors also check the register information on the questionnaire, such as name, address, municipality codes, classification, type of local KAU (single KAU enterprises, multi-KAU enterprises, auxiliary local KAUs) etc. If they find errors, the questionnaire is corrected in the database (if necessary the type of questionnaire is changed). A note about the change is then sent to The Central Register of Establishments and Enterprises at Statistics Norway.

As the editors have finished their checks, files with the local KAU information are extracted from Oracle. Some information is not collected from the questionnaire but from the SIF. This information is included in the files as well, before a number of checks are executed with the use of the statistical programme SAS. Many of the checks previously executed by the editors are now repeated electronically. For instance lists are printed out with local KAUs that have large wages per man-hour, large increases in costs of goods etc. in proportion to the preceding year. The editors are checking these lists, and possible errors are corrected in the database, on the questionnaire and in the Standard Industry Form.

When all the corrections are made, a new and final sample file for the manufacturing statistics is produced.

3.3 Estimation

Each local KAU in the population, which does not fill in a questionnaire gets a predicted value for all items in the questionnaire, by the use of auxiliary variables from registers. Turnover and employment are available for all units in the population. They are collected from The Central Register of Establishments and Enterprises for small units not included in the sample, but have to be calculated for units within the sample. In addition the Register of Company Accounts (RCA) for joint-stock companies contains some sum variables that can be used as auxiliary variables in the estimation. Even though the RCA-figures can only be used for local KAUs in single KAU enterprises, almost 70% of the local KAUs outside the sample will have RCA-account figures, which are being used in the estimation.

Sum variables from the Register of Company Accounts (RCA) that are used in the estimation of variables are

- operating income
- cost of goods
- other costs = other operating costs + production costs
- personnel costs

The estimation is done in several steps. First the main variables gross value of production, costs of goods, other costs and compensation of employees are estimated by using the corresponding variables in the RCA or by the use of turnover. (Model 1)

Thereafter the estimated values are divided further into other variables which sum up to Gross value of production, cost of goods, other operating costs and compensation of employees. The investment variables are estimated directly by the use of turnover. (Model 2)

Model 1: for the sum variables gross value of production, cost of goods, other operating costs and compensation of employees

The common ratio model is being used in the estimation of each variable based on the corresponding variable in the RCA, or turnover when RCA-figures are not available.

(1) $\mathbf{Y_i = \beta X_i + \varepsilon_i}$, where ε_i is stochastic variables with: $E(\varepsilon_i) = 0$

$Var(\varepsilon_i) = \sigma^2 * X_i$

Y_i are - Gross value of production, cost of goods, other operating costs and total wages for the local KAU i.

X_i are - Gross value of production, cost of goods, other operating costs and total wages for the local KAU i collected from RCA.

or - turnover for the local KAU i (used in the estimation when RCA figures are missing)

or - employment for the local KAU i (used in the estimation of compensation of employees when the RCA figures are missing)

For the local KAUs in the sample the connection between the variables in the questionnaire and the corresponding auxiliary variables from the RCA is very good, most often better than the connection with turnover. The models work well for most of the divisions and the calculations are done on the lowest possible classification level, which means for subclasses (5-digit) in the Norwegian Standard Industrial Classification.

Model 2: Further separation of estimated values with no direct link to the RCA

For many variables the correlation with the sum variables is low. The reason can be a large share of variables in the questionnaires with value 0. The separation on detailed variables for the small local KAUs outside the sample is done by using distribution keys made from the sample, which declare each variable as a share of the sum variable. For each local KAU in the population the value of variable j can be written as:

(2) $Y_{ji} = a_{ji}x_i$

x_i is the value of the sum variable, i = 1, 2, . . . , N

a_{ji} is a stochastic variable independent of x_i

$\sum a_{ji} = 1$ for all i

$E(a_{ji}) = \alpha_j$ and $Var(a_{ji}) = \sigma_j^2$

$\Rightarrow E(Y_{ji}|x_i) = \alpha_j x_i$;

The distribution of a_{ji} depends on the variable.

For small local KAUs with less than 10 persons employed, the sum variables (gross value of production, cost of goods, other operating costs and compensation of employees) are divided among variables by using this model. From the sample we have registered $a_{ji}' = y_{ij}/x_i$, i = 1, 2, . . . , n, which may be assumed to be independent, random drawings from the distribution of a_{ji}. For each unit not included in the sample, *i*, a random draw of a distribution from the sample $\underline{\hat{a}}_{i*} = (\hat{a}_{1i*}, \hat{a}_{2i*}, ..., \hat{a}_{ki*})$ is made with a probability 1/n, *i** = 1, 2, ..., n. This distribution is being used to estimate the value of the variables j = 1, 2, . . ., k for unit *i* outside the sample:

$\hat{Y}_{ji} = \hat{a}_{ji*} x_i$ for all variables

This is a form of “hot deck” imputation. Preferentially only local KAUs within the same classification with less than 20 persons employed are used as foundation for the distribution keys. However when data are missing for this size group, local KAUs with less than 100 persons employed or if necessary all local KAUs in the sample are being used.

To impute the main variables for large local KAUs (more than 10 persons employed) outside the sample we use the distribution of the nearest "neighbour" in the sample, sorted by the main variable.

Total sum of each individual characteristic (variable) is estimated by:

$$\hat{t} = \sum_{s} Y + \sum_{U-s} \hat{Y}$$

where relevant groups are summed up (i.e. division).

Some variables need special attention
Compensation of employees is predicted by using employment as auxiliary variable, and the payroll tax is calculated as fixed percentage of compensation of employees.

Investments vary a lot and the correlation between investments and available register variables is low. Models used for estimating totals are not so good for investments as for other main variables. Investments are estimated for all local KAUs outside the sample, using the same methods as we use for estimating the value of variables for small local KAUs above. We have, however, no longer a sum variable as basis for the division on the different variables. The condition in model 2 that $\sum a_{ji} = 1$ *for all i* is no longer valid. Each individual investment variable is estimated, by using turnover for the local KAU. The total sum of investments is calculated by adding up each type of investment.

Total cost of energy (value) exists for all local KAUs (estimated for the small local KAUs with less than 10 persons employed). In manufacturing statistics before 1998 these costs are separated on the different kinds of energy, according to the same methods as for the sum variables above. The method differs from the separation of the other sum variables, as the sample of local KAUs that fills out information on the separation of energy, has a higher cut-off limit than for the rest of the manufacturing statistics. Quantity figures for the different kinds of energy sources are estimated from average prices. A price is calculated for each energy source as the average price of all local KAUs in the sample, regardless of classification. An exception from this is electric power for pulp, paper and paper products and energy intensive industry, where the average prices for the divisions are calculated. There is low correlation between total energy use and the use of different kinds of energy. Some kinds of energy are so special, that it seems unreasonable to estimate the use of these for small units. This concerns coal, cox, firewood, paraffin, marine gas oils, heavy distillates, damp and other fuels. The following subclasses are imputed as though they are just using electricity, as no unit at 3-digit NACE is included in the sample: 10.300, 18.100, 24.200, 36.500, 37.200.

4 Statistical analysis of the effect of editing based on 1996 manufacturing statistics

The evaluation of the extent and the effect of editing are mainly based on the manufacturing questionnaire – but with a brief examination of the Standard Industry Form as well. For comparison reasons ready edited files and files with data registered directly from the questionnaires have been used. The analysis is mainly done on the local KAU level.

The file that is based on the manufacturing questionnaires contains 119 variables, of which 23 are character variables (local kind-of-activity units (local KAUs) and enterprise numbers, name, industry and other characteristics), 5 are numerical register and control variables, e.g. the previous year's employment and trade) and 91 are numerical variables from the most comprehensive parts of the questionnaires. This chapter is mainly highlighting changes during the editing of some of the most important ones of these 91 questionnaire variables.

4.1 Changes in population/sample

At the time of the dispatch of the questionnaires the sample consisted of 6,781 local KAUs. The files before and after editing contained 6,819 local KAUs. All the original manufacturing variables (91 variables) are kept – from the time of the registration before editing, while classification variables like names, industry, state etc. are not kept. For comparison reasons these are taken from the original frame file. The transitions to and from the manufacturing population/sample and other changes in classification variables are therefore not necessarily an effect of editing, but may be real changes that are registered through other surveys.

Table 4.1.1-1 Industry and status codes for local KAUs in the survey

	All local KAUs, independent of industry and status	Local KAUs with manufacturing industry and status 9
Original sample	6,781	5,263
Access after dispatch	38	18
Transition to manufacturing status 9		19
Transition from manufacturing status 9		- 178
Sample	6,819	5,122

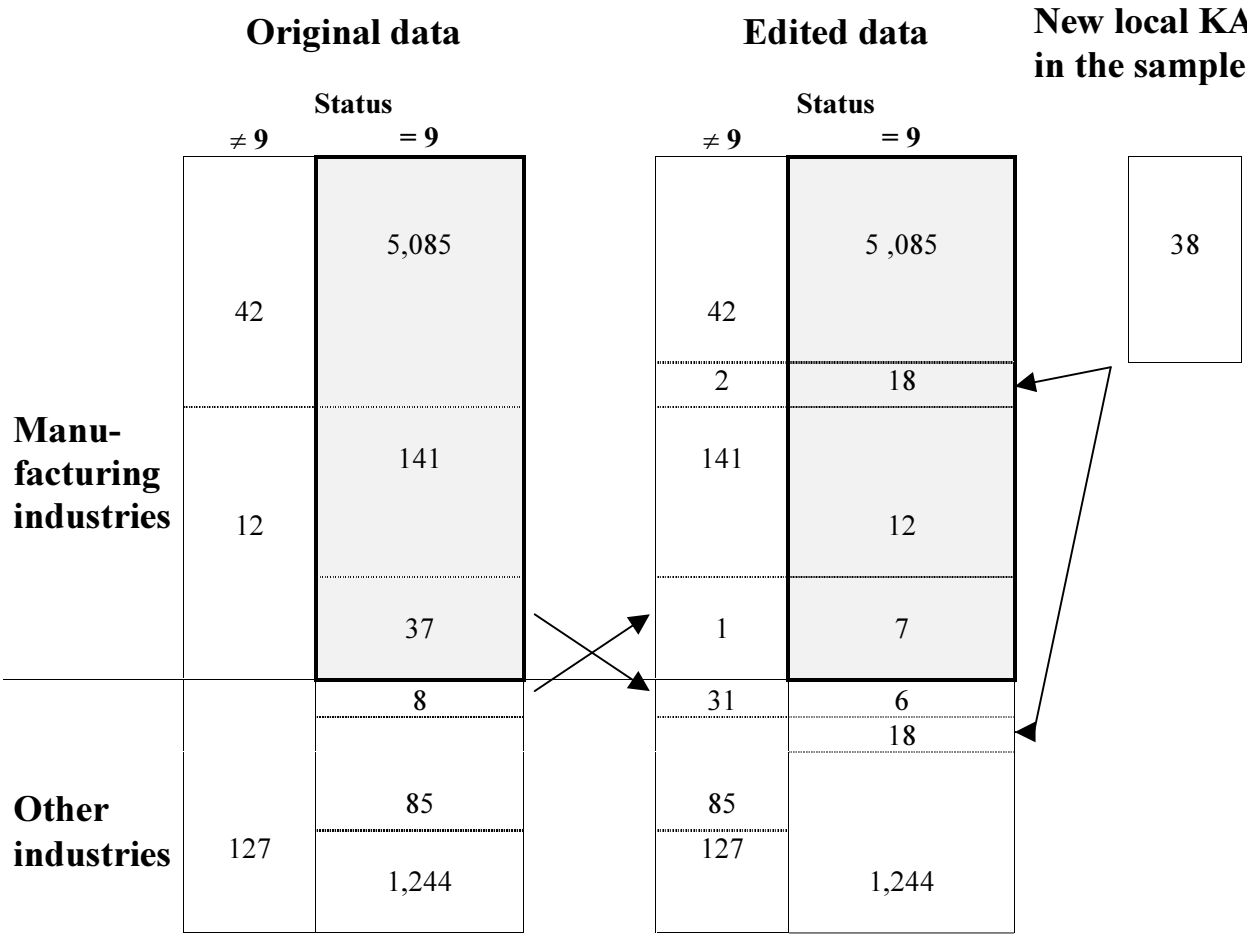
The number of local KAUs without changes in classification variables of all the local KAUs in the survey is for:

All industries/status codes:	5,941
Manufacturing industry/status 9:	4,602

The changes between the manufacturing industries and other industries for active/non-active local KAUs in the sample can be seen in Figure 4.1.1-1. The grey area within the box with bold edges indicates the active local KAUs within mining and quarrying and manufacturing, while crossings are shown by the figures following the same line. We can see that there are few KAUs that are changing from manufacturing/mining and quarrying to other industries (37=31+6) and still fewer that are changing the other way (8=1+7). On the other hand, there are more changes in the status code.

Figure 4.1.1-1 The change of sample local KAUs to and from the population in the period of editing

Original sample: 5,263 local KAUs in the manufacturing divisions with status 9
Edited sample: 5,122 local KAUs in the manufacturing divisions with status 9



The change of industries within mining and quarrying and manufacturing occurs for 173 of the local KAUs in the sample. The changes are shown by level of industrial code according to SIC in Table 4.1.1-2.

Table 4.1.1-2 Division changes

Level of change	Number of local KAUs
Total changes	173
1.-2.digit SIC	115
3.digit SIC	26
4.digit SIC	23
5.digit SIC	9

SIC=Standard Industrial Classification

The changes on the 2-digit level are mainly due to changes in 78 local KAUs from SIC 23.200 – manufacture of refined petroleum products – to SIC 26.820 – manufacture of other non-metallic products n.e.c.

4.2 Manufacturing questionnaire – local KAUs

4.2.1 Questionnaire

The questionnaire for manufacturing is to be filled in with characteristics on the local KAU level. The questionnaires are to the most possible extent developed and connected to the standard chart of accounts and the Standard Industry Form. The manufacturing questionnaire contains more characteristics from the local KAUs in multi-local KAU enterprises than single local KAU enterprises – where the enterprise is in accordance with the local KAU. Accordingly, there are not the same numbers of items to be filled in for all the local KAUs. The number of variables varies dependent on type of local KAU (single local KAU in single local KAU enterprise, the usual local KAU in multi-local KAU enterprise or auxiliary branches) and the size of the local KAU (more or less than 20 employed).

The distribution of local KAUs in the sample by type of questionnaire and items, see Table 4.2.1-1

Table 4.2.1-1 The questionnaires

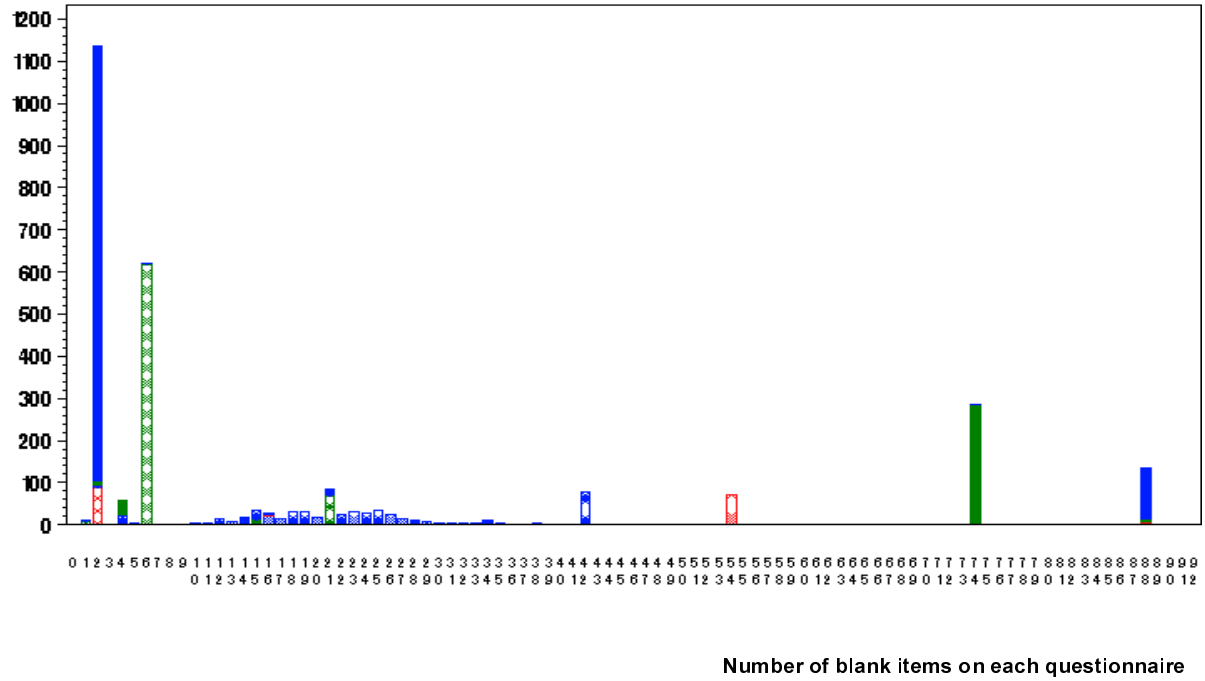
Questionnaire	Local KAU	Number of local KAUs	Number of items to be filled in
S2	Large local KAU in multi-KAU enterprises	1,174	88
S1	Large local KAU in single KAU enterprises	1,594	74
L2	Small local KAU in multi-KAU enterprises	578	54
L1	Small local KAU in single KAU enterprises	974	42
H	Auxiliary local KAU in multi-KAU enterprises	708	21
B	Mining and quarrying	93	88
A	Other division (Wrong questionnaire)	1	25

The editing results in extensive changes. Of all the local KAUs in the sample only a few ended up with no changes. The number of local KAUs without change in the code for industry division:

All industries/status codes:	118	(1.7%)
Manufacturing industry/status 9:	61	(1.2%)

Many of the changes during the editing – a total of about 2/3 – have to do with blank items. These are mainly changes from blanks for values, i.e. lacking or incomplete information. Figure 4.2.1-1 shows a clear pattern in the distribution by questionnaires of the items that are not filled in.

Figure 4.2.1-1 Number of edited items from blank by type of questionnaire



We can divide blank items into two groups: the situations where the local KAUs have not filled in any items in the questionnaires and the ones where only some items are not filled in. The four high columns to the right in Figure 4.2.1-1 comprise questionnaires where the local KAUs have not filled in any items in the questionnaire L1, L2, S1 and S2. For the questionnaire H, the column with 21 blank items consists mainly of questionnaires of type H that have not been filled in.

The number of each questionnaires where no items are filled in before editing is given below:

Questionnaire	**S2**	**S1**	**L2**	**L1**	**H**	**B**	**A**
Number of questionnaire without industry variables filled in initially	126	288	76	80	78	6	0
Share of questionnaires not filled in	11%	18%	13%	8%	11%	6%	0

Insufficiency when it comes to filling in the questionnaires is the background for the other observations in Figure 4.2.1-1. For many questionnaires we can see that two or six items are missing. Here the forms S2 and H are dominating. Table 4.2.1-1 shows which variables that most often have missing values, sorted by the number of insufficient filling ins.

Table 4.2.1-2 Insufficient filling in of questionnaire for items and type of questionnaire

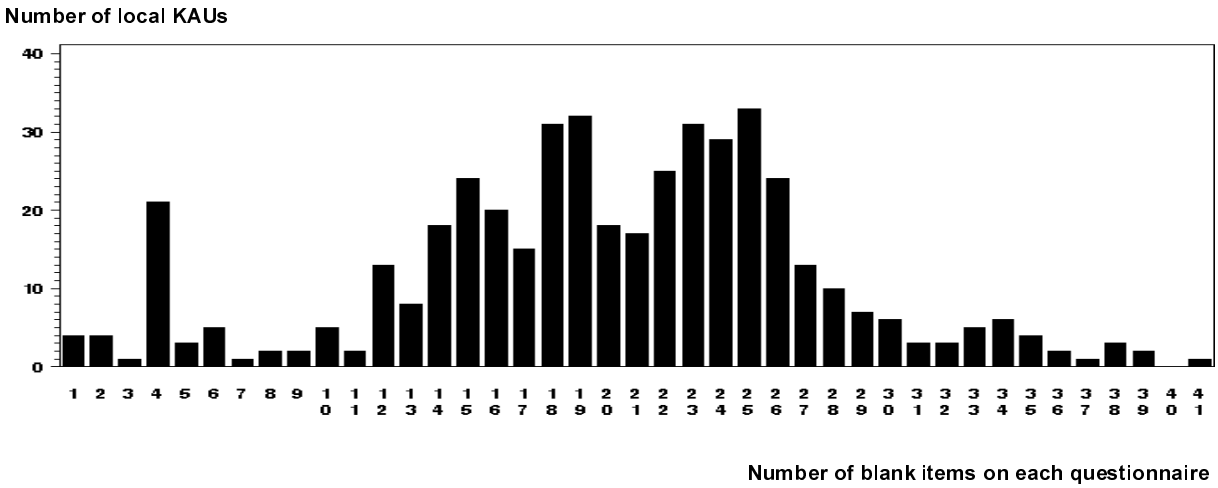
Items sorted by number of local KAUs that lack information (only items lacking filling in for more than 12 local KAUs are included in the table).

	Questionnaires							
Item	**A**	**B**	**H**	**L1**	**L2**	**S1**	**S2**	**Total**
V32_2	.	87	.	119	.	44	1,042	1,292
V520_A/S/R	1	.	617	223	1	.	2	844
V510_A/S/R	1	.	617	42	1	.	2	663
V560_A/S/R	.	.	.	405	1	.	2	408
V530_A/S/R	.	.	.	397	1	.	2	400
V240	.	.	.	372	1	.	2	375
V550_A/S/R	.	.	.	359	1	.	2	362
V230	.	.	.	357	1	.	2	360
V314	1	.	1	299	1	.	2	304
V120	.	.	.	302	.	.	.	302
V220	1	.	1	288	1	.	2	293
V250	1	.	1	275	1	.	2	280
V316	.	.	.	277	1	.	2	280
V540_A/S/R	.	.	.	267	1	.	2	270
V595_A/S/R	.	.	.	246	1	.	2	249
V312	.	.	.	223	1	.	2	226
V170	.	.	.	117	.	.	.	117
V391	.	.	.	55	.	37	.	92
V291	.	.	.	44	.	37	.	81
V150	.	.	.	69	.	.	.	69
V180	.	.	.	57	.	.	.	57
V590_A/S/R	.	.	.	56	.	.	.	56
V210	.	.	.	47	1	.	2	50
V310	.	.	.	34	1	.	2	37

Total energy (V32_2), especially on questionnaire S2, is conspicuously blank – as many as 1292 times. Many things are also missing in the investment, among others items V510 and V520 for the local KAUs with questionnaire H. The table shows that for most questionnaires, just a few and mostly the same items are missing. Forms of type L1 are different. There are many items missing with investment variable (V510-V595) showing up the most.

A segment of Figure 4.2.1-1 shows the distribution of insufficient filling in for the variables for the 454 local KAUs that just partially have filled in the questionnaire L1. (Figure 4.2.1-2)

Figure 4.2.1-2 Number edited from blanks on partially filled in L1 questionnaire



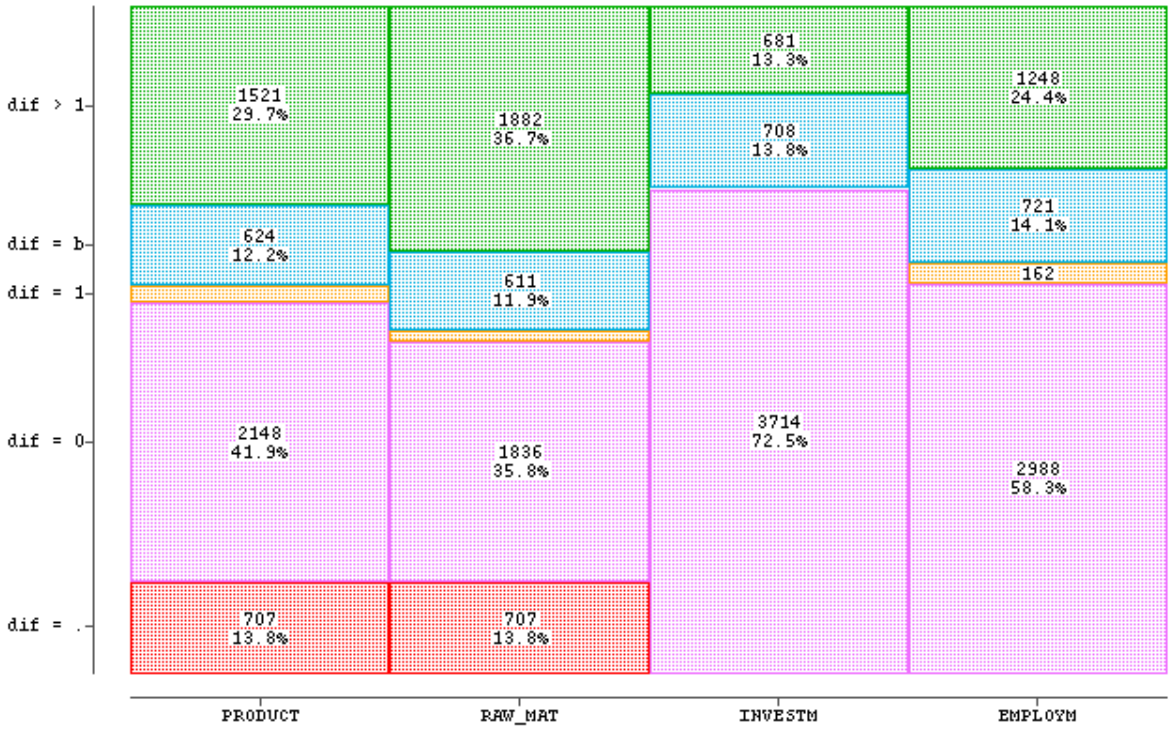
4.2.2 Changes during editing

The share of local KAUs where changes have been done during editing is illustrated in Figure 4.2.2-1 for four selected items: employment, sale of self-produced commodities, cost of raw material and investment. Changes are reported as absolute values. This means for instance that regarding change=1 the difference between edited value and original value either equals + 1 or = -1. Unit is one person for employment or NOK 1,000 for sale of self-produced commodities, cost of raw material and investments.

Changes/no changes are here divided into five categories:

real change	- the difference between original and edited value is larger than one unit	- dif > 1
change from blank	- items not filled in	- dif = b
adjustment	- change =one unit – most often adjustments in order to get the totals correct	- dif = 1
no changes	- no changes made during editing	- dif = 0
blank	- entry is supposed to be blank – most often no changes during editing	- dif = .

Figure 4.2.2-1 The local KAUs in the sample distributed by the extent of changes during editing of characteristics; sale of self-produced commodities, cost of raw material, investment and employment



The figure shows that there is a marked difference in the degree of change during the editing of the different variables. The share of local KAUs with real changes (dif>1) is almost three times as large for cost of raw material (37.7%) than for investments (13.3%). When the cost of raw material is changed to that extent – it is partially due to fact that the cost of raw material often is used as a balance entry during editing. The few changes in investments may be due to having no satisfactory register variable to base the editing on – such as we have for many other characteristics.

Changes due to incomplete filling in do not vary as much for these characteristics (from 11.9 to 14.1%).

For the adjustments of one unit, employment represents the largest number of local KAUs (162). For the employment variable such small changes are most possibly real. Fewer small adjustments for the sale of self-produced commodities have been made, even more seldom for cost of raw material and very few adjustments of investments

Even if we add up the groups for no change and should have been blank, we see that investments have a considerably larger share of unchanged (72.5%) than any of the other characteristics. The second highest share of unchanged items is employment (58.3%).

4.3 Editing of the individual variables

The 91 variables on the Manufacturing questionnaire are divided into 5 groups: Employment variables, production income, production cost, stock variable and investment/repair variable. During the analysis of the editing an important variable for each group was initially selected. Then the connections and the differences within and between the groups were evaluated.

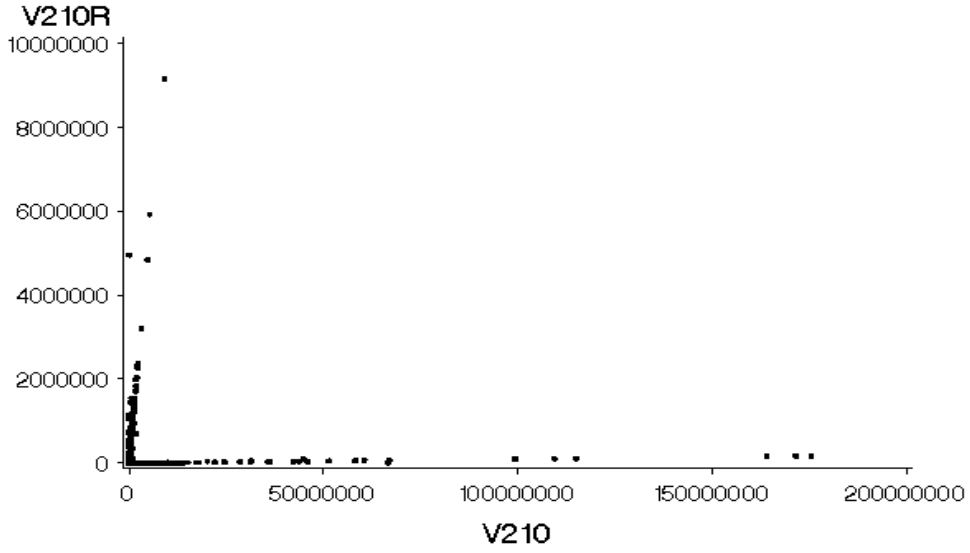
For the individual variable we look at the connection between the edited and the initial value for each local KAU in the sample plus the total effect of editing. The result of the total changes during editing is put together in chapter 4.6, while we at this point look more closely for details.

4.3.1 V210 - Sale of self-produced commodities

The sale of self-produced commodities may be considered as the most important variable. The effect of editing may be described by a plot with edited values against original values in Figure 4.3.1-1. For the local KAUs where the original value is not changed – the points are located along a diagonal with equal value on both axes. Changes are shown as deviations from this line. The pattern that emerges on the figure is typical for all income variables. The points that are to demonstrate the local KAUs without change are located along a steep line close to the Y-axis.

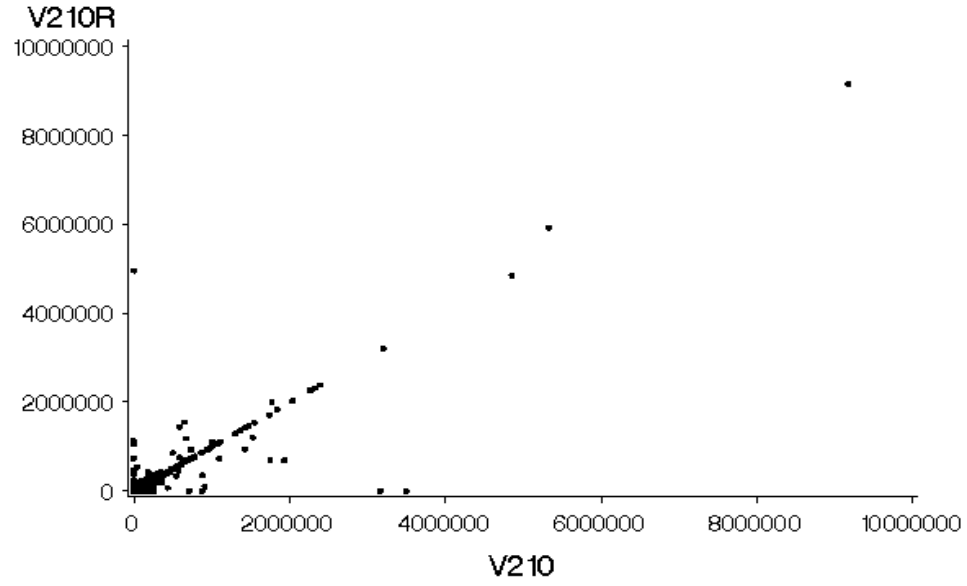
Figure 4.3.1-1 Plot of sale of self-produced commodities originally and after editing

V210 is original sale and V210R is sale after editing



The points that are located along the x-axis demonstrate great changes. These are the local KAUs that have used incorrect unit while reporting – unit equals NOK 1 instead of NOK 1,000. The ratio V210/V210R is in this case most often close to 1,000, and always higher than 400. This may be interpreted as a type of "thousand"-change. If we remove these – we will find the pattern for the remaining changes in Figure 4.3.1-2.

Figure 4.3.1-2 "Thousand-errors" removed



In this figure we can clearly see the diagonal with the local KAUs where editing did not result in any changes. Except for some few outliers – we can at this point clearly see a strong connection between the original and the edited values – also for the local KAUs where editing has resulted in change. The local KAUs that especially distinguish themselves are the ones where the sale of self-produced commodities is changed from 0 (along the y-axis) or to 0 (along the x-axis).

The extent of the changes in Figure 4.3.1-1 and Figure 4.3.1-2 may be described by:

(1) differences (V210D=V210R -V210)

or

(2) ratios (V210/V210R)

By far – the largest changes such as the "thousand-errors" will occur among the largest values of these criteria, however small differentials may lead to large ratios for the small local KAUs – and at the same time – large differences do not necessarily result in large ratios.

(1) Differences between edited and original sale of self-produced commodities

We can see on Figure 4.3.1-1 and Figure 4.3.1-2 that most of the differences (including no change) are extremely small. The changes are unevenly distributed. The most – and the largest changes are reductions of the original values. The average for the differences is -537,780. A table on percentiles gives a better overview of the changes. Table 4.3.1-1 shows that the negative differences are much larger in numerical value than the positive differences. The misalignment is clearly seen while comparing maximum and minimum value or by the comparison of the 99 percentile (1% of the differences are larger than 105,794) and 1 percentile (1% of the differences less than 12,022,238). When the "thousand"-errors are removed, the changes are almost symmetrical. All changes are found outside the upper and lower quartile (Q3 and Q1).

Table 4.3.1-1 Percentiles for differences between the initial and edited sale of self-produced commodities

	All	Thousand-error deleted
100.0% - Max	4,967,128	905,150
99.0%	105,794	55,000
97.5%	37,452	14,936
95.0%	14,226	5,164
90.0%	2,795	675
75.0% - Q3	0	0
50.0% - Med	0	0
25.0% - Q1	0	0
10.0%	-3,169	-1,327
5.0%	-19,598	-7,264
2.5%	-170,926	-20,000
1.0%	-12,022,238	-56,725
0.0% - Min	-175,311,287	-1,242,799

The differences comprise all the local KAUs in the sample where neither the original nor the edited sale of self-produced commodities is missing – a total of 3,791 local KAUs.

(2) The ratio between the original and edited sale of self-produced commodities

When there are no changes during the editing, the ratio between original and edited value is 1. Relatively small changes of a value will give a ratio close to 1. Very small or very large ratios show clearly errors of unit ("Thousand"-errors). Table 4.3.1-2 shows the number of local KAUs within the different intervals of the ratio. We may take notice of that for the ratio between original and edited sale of self-produced commodities more than 80% of the ratios (except the ones edited from blank) lie within the interval from 0.9 to 1.1. Even though the "thousand"-errors have large effects, they are relatively few. Only 0.5% of the ratios are lower than 0.009 and 2.1% of the ratios are larger than 400.

Table 4.3.1-2 The ratio between the original and edited sale of self-produced commodities

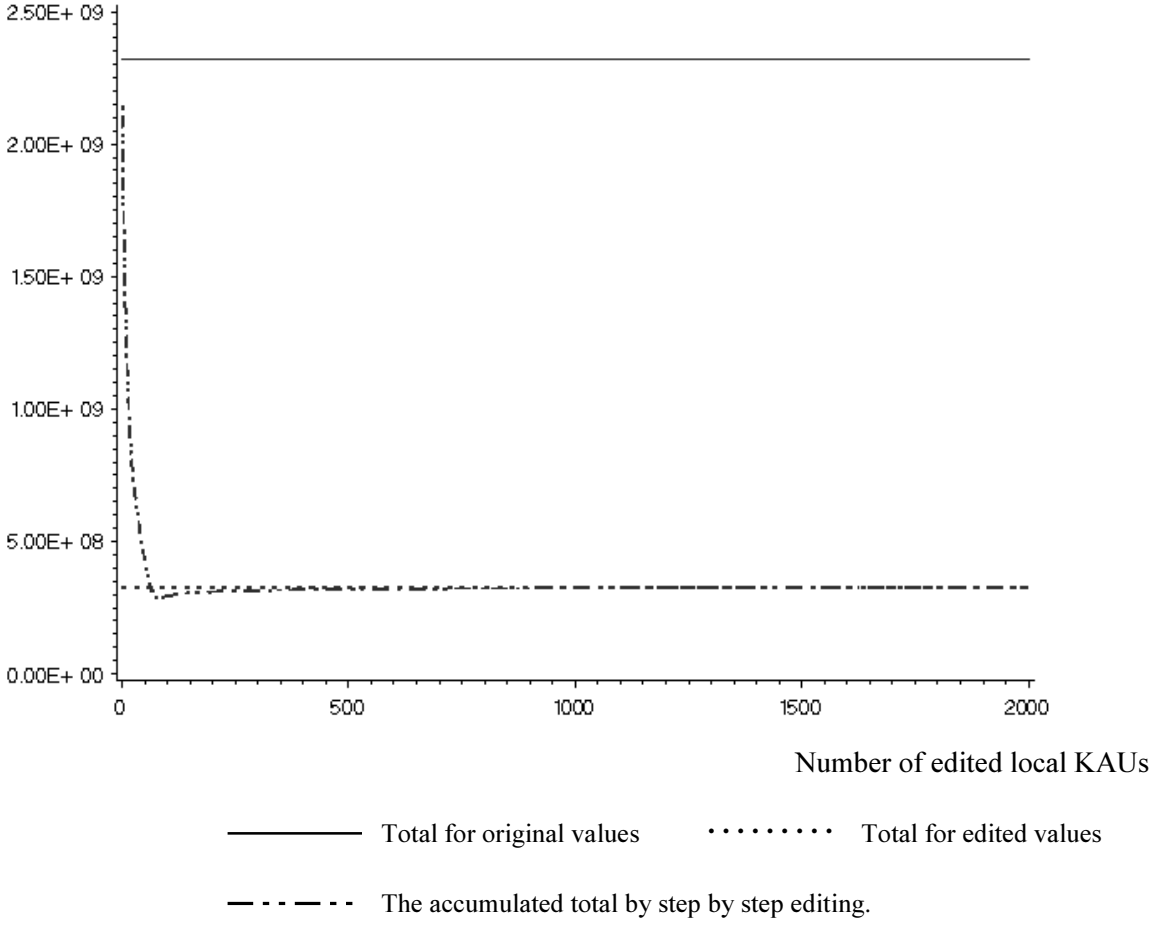
V210/V210R	Number of local KAUs	Per cent
[0]	151	4.4
(0 - 0.009)	18	0.5
[0.009- 0.9)	204	5.9
[0.9 - 1)	439	12.7
[1]	1,880	54.5
(1 - 1.1)	464	13.4
[1.1 - 5)	209	6.1
[5 - 12)	10	0.3
[400 - 900)	9	0.3
[900 -)	66	1.9

The local KAUs with missing for original or edited value (V210R=0 or blank and/or V210 blank) are not included (a total of 1,672 KAUs).

Efficient editing
A routine where the greatest absolute changes are edited first, is in general a theoretical efficient editing routine. This is illustrated for the sale of self-produced commodities in Figure 4.3.1-3 that shows the total sale of self-produced commodities in the sample; the original figures, the edited figures and the accumulated total during step by step editing by diminishing the size of absolute value of the change.

Figure 4.3.1-3 The step by step editing from the original total to the edited total

The largest changes are edited first

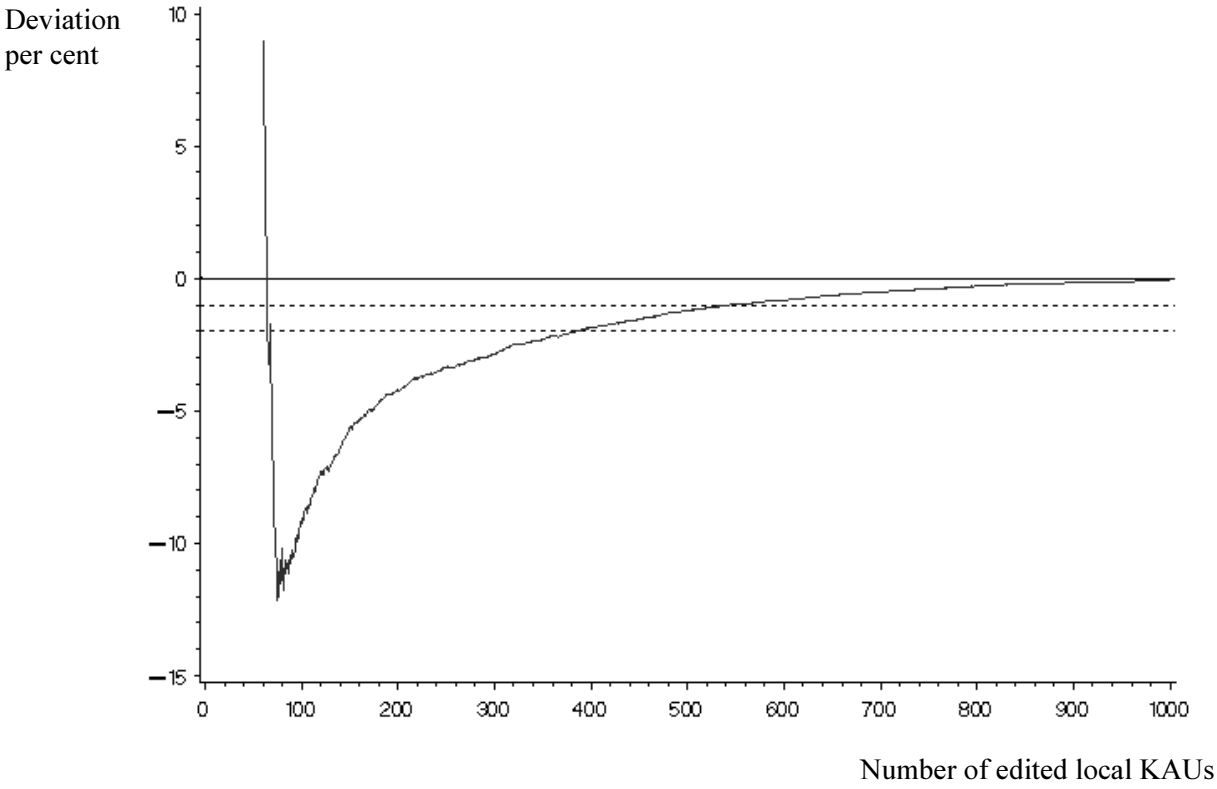


All the local KAUs for which the value has been changed (from blank as well) are included in the figure.

A segment of this figure – scaled with the deviation per cent from the edited total along the Y-axis – shows the approximation to the edited total more clearly:

Figure 4.3.1-4 Segment of Figure 4.3.1-3 - Deviation from the edited total during editing

Sale of self-produced commodities



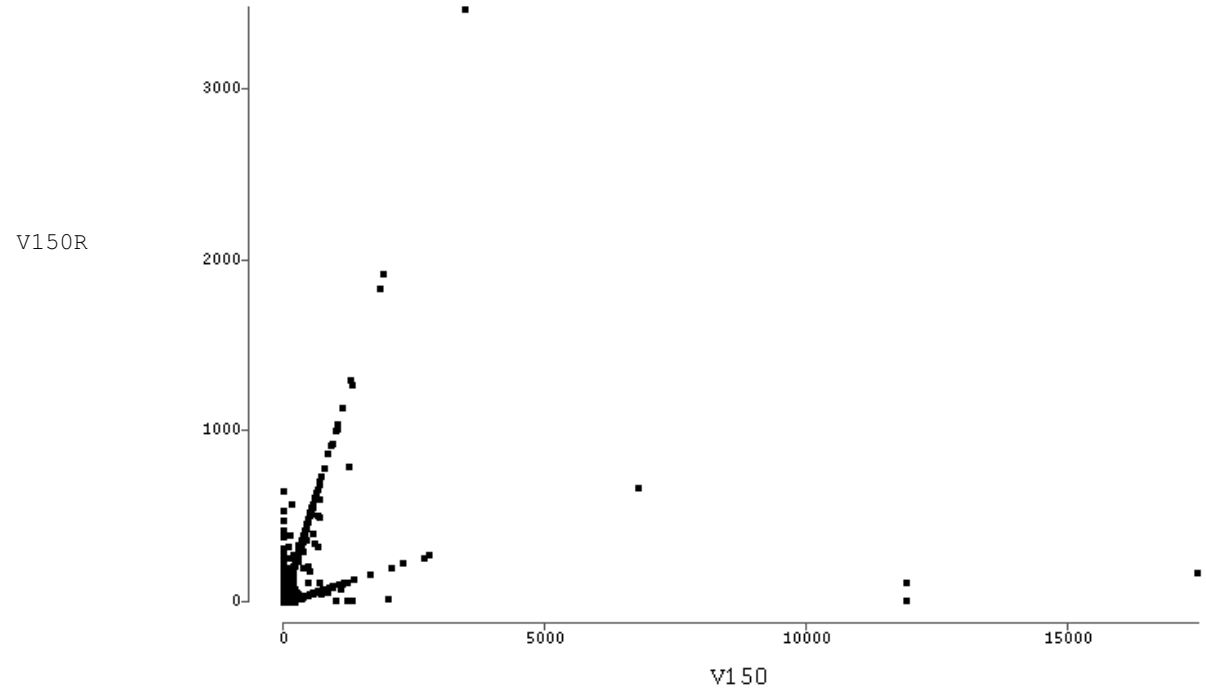
We can see that theoretically it is sufficient to edit about 400 local KAUs (18% of the local KAUs with changes in sale of self-produced commodities) in order to stay within a deviation of 2% or about 550 local KAUs (25%) within a deviation of 1% in relation to the total of the ready edited file or 700 local KAUs (31%) within a deviation of 0.5%.

4.3.2 V150 - Persons employed

The editing of employment is analysed the same way as the editing of sale of self-produced commodities in 4.3.1. Employment in the manufacturing questionnaire is defined as the sum of employees (=average of employees in February, April, June, September and November) and owners. The connection between original and completed edited employment (V150 and V150R) is plotted in Figure 4.3.2-1. Here we find a completely different pattern than in Figure 4.3.1-1.

Figure 4.3.2-1 Plotting of employment originally and after editing

V150 is original employment and V150R is edited employment



We can see several "lines". At the bottom – along the x-axis we will find "hundred"-errors. There are not many such changes. The line that slants upwards a little above shows the reduction in employment as a tenth of the original value of employment. These errors correspond to a certain degree to the "thousand-error" sale of self-produced commodities, and are caused by comma errors which occur because a comma is not registered during optical reading. The most dense line shows the local KAUs where no changes were done during editing. The local KAUs with the highest employment figures originally (employment of more than 5000) are removed, and we are left with a segment of Figure 4.3.2-1 in order to see other errors more clearly.

Figure 4.3.2-2 Segment of Figure 4.3.2-1

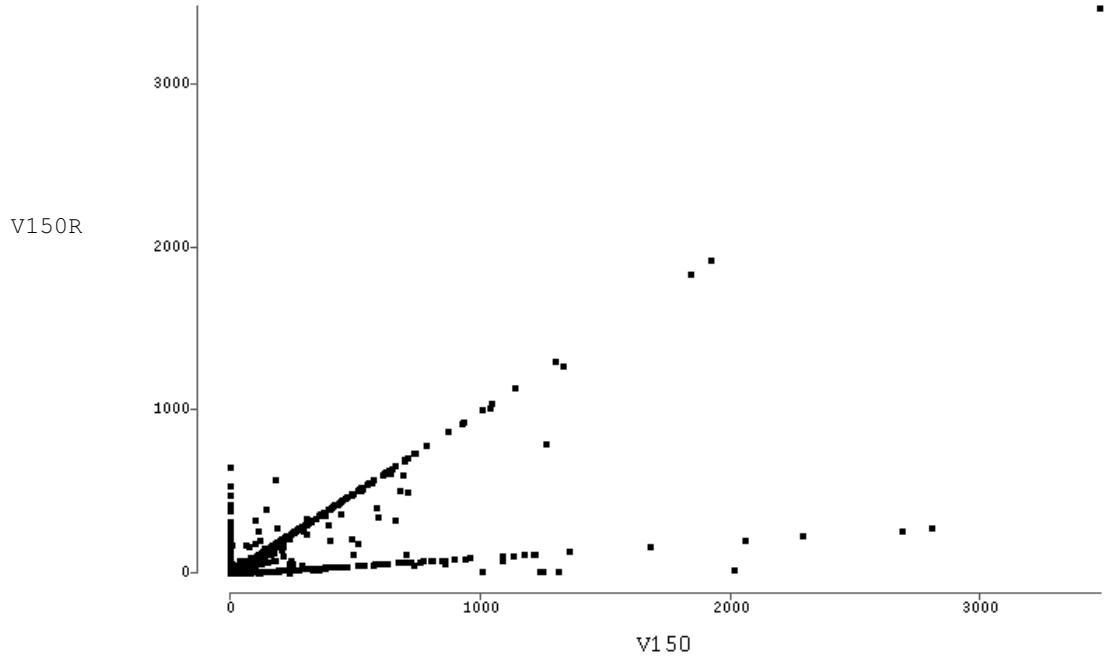


Figure 4.3.2-2 shows clearly the three lines: comma errors – explained above –, the diagonal with the local KAUs where employment is not changed during editing, and a line along the Y-axis that indicates the KAUs where the value of employment is changed from 0 originally.

For employment as well we are looking at changes during editing by:

(1) differences (V150D=V150R - V150)

and

(2) ratios (V150/V150R)

(1) Differences between the edited and the original employment
The profile for changes in employment during editing is similar to the changes in sale of self-produced commodities – with to a large extent no change or very small changes, and some large changes causing strong distortion, – shown in table 4.3.2-1. The average change is -21 employed persons.

Table 4.3.2-1 Percentiles for the differences between the original and the edited employment

	All	Comma errors deleted
100.0% - Max	652	400
99.0%	136	8
97.5%	68	1
95.0%	34	0
90.0%	15	0
75.0% - Q3	0	0
50.0% - Med	0	0
25.0% - Q1	0	0
10.0%	-3	-1
5.0%	-38	-6
2.5%	-176	-17
1.0%	-538	-51
0.0% - Min	-17,339	-591

The differences comprise all the local KAUs in the sample where neither the original nor the edited employment is missing, a total of 4,398 local KAUs.

(2) The ratio between the original and the edited employment

Table 4.3.2-2 Percentiles for the ratio between the original and the edited employment

V150/V150R	Number of local KAUs	Per cent
[0]	738	17.0
(0 - 0.11)	6	0.1
[0.11- 0.9)	64	1.5
[0.9 - 1)	51	1.2
[1]	2,925	67.5
(1 - 1.1)	133	3.1
[1.1 - 9)	230	5.3
[9 - 12)	167	3.9
[12 - 90)	10	0.2
[90 -130)	8	0.2
[900 -)	1	0.0

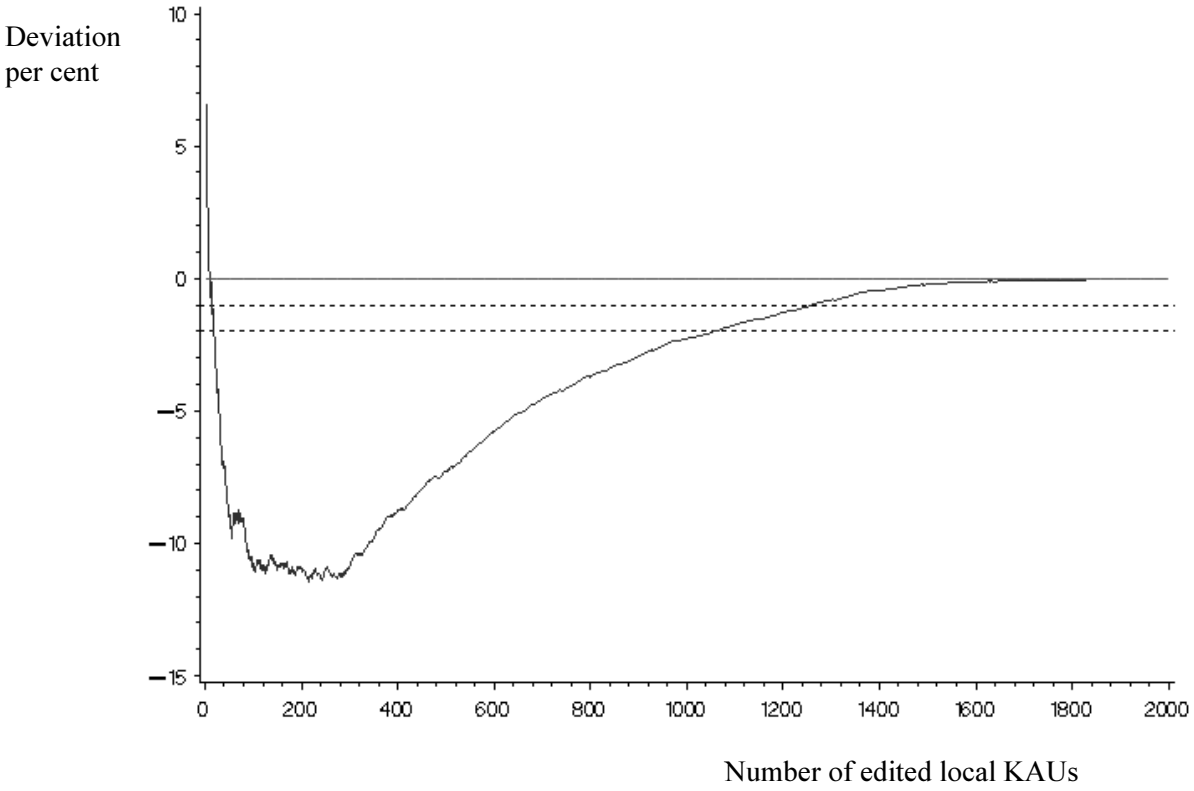
The local KAUs, which have missing for original or edited value are not included here (a total of 789 local KAUs)

The effect of the editing of total employment in the sample is shown in Table 4.4.1-2 for all changes and for different types of changes.

A theoretical efficient editing routine for employment would be to start out editing the local KAUs with the largest changes in employment. This is illustrated by Figure 4.3.2-3: accumulated figures subject to step by step editing of employment, measured in relation to edited total employment.

Figure 4.3.2-3 Employment – Deviation from the edited total during editing

Step by step editing based on the largest absolute change



We can see that by editing a little more than 1,000 questionnaires (47% of the questionnaires with changes in employment) with the greatest errors, the total will end up within a 2% deviation, while we have to edit more than 1,200 questionnaires (56%) in order to end up within a 1% deviation in relation to the total for ready edited employment. Deviation of less than 0.5% may be reached by editing 1,380 questionnaires, or 65% of the questionnaires where a change in employment has been made during editing.

4.3.3 Connection between the changes for different variables

The analysis focuses on production income and employment variables, and we are looking at correlation coefficients and plots.

4.3.3.1 Production income – correlation coefficients

The production income comprises Sale of self-produced commodities (V210), Sale commodities (V220), Repair work (V230), Contract work (V240), Other sales income (V250) and Other operating income (V260). A plot of edited and original value for these items is following the same pattern. The sum of production income on the manufacturing questionnaire is described as V290 and internal deliveries as V295. These items are not registered for the local KAUs in the single KAU enterprises on the manufacturing questionnaire.

It is reasonable to expect a certain connection between the changes in different income variables. If the sale of self-produced commodities is registered with the incorrect unit (thousand-error) – the incorrect unit will normally also be used for other variables. This should indicate high correlation coefficients.

We have found that the correlation coefficients are not as high as expected (table 4.3.3-1). This is mainly due to changes from/to 0 and other outliers.

Table 4.3.3-1 The correlation between changes (edited - original) in the production income
D as ending indicates difference, e.g. V210D=V210R-V210

	V210D	V220D	V230D	V240D	V250D	V260D	V290D	V295D
V210D	1.00	0.25	0.13	0.26	**0.35**	**0.39**	**0.99**	**0.52**
V220D	0.25	1.00	0.01	**0.54**	0.00	0.00	**0.43**	-0.00
V230D	0.13	0.01	1.00	0.03	0.00	-0.19	0.00	0.00
V240D	0.26	**0.54**	0.03	1.00	0.20	0.00	**0.46**	-0.00
V250D	**0.35**	0.00	0.00	0.20	1.00	0.12	**0.48**	0.00
V260D	**0.39**	0.00	-0.19	0.00	0.12	1.00	**0.37**	**0.49**
V290D	**0.99**	**0.43**	0.00	**0.46**	**0.48**	**0.37**	1.00	**0.49**
V295D	**0.52**	-0.00	0.00	-0.00	0.00	**0.49**	**0.49**	1.00

4.3.3.2 Employment variables - correlation coefficients

The employment variables consist of Employees (V110), Owners (V120), Number of persons employed (V150), Part-time employees (V170) and Man-hours (V180). Number of persons employed is the sum of employees and owners (V150 = V110 + V120).

A plot of original and edited number of employees follows the same pattern as the one for Number of persons employed. This is natural as it per definition is a close connection between the Number of persons employed and the employees. There are few changes in the number of owners, and when the changes are made, the number of owners is normally changed to 0. The number of part-time employed shall per definition be lower than the number of persons employed, and is corrected accordingly.

The correlation table, Table 4.3.3-2 between changes (edited – original) shows a high correlation between the changes for employees and the persons employed, and no correlation between other variables.

Table 4.3.3-2 The correlation between the changes (edited - original) in persons employed variables
(D as ending indicates change, e.g. V110D=V110)

	V110D	V120D	V150D	V170D	V180D
V110D	1.00	-0.00	**0.70**	-0.00	-0.03
V120D	-0.00	1.00	-0.00	0.02	0.00
V150D	**0.70**	-0.00	1.00	-0.00	-0.02
V170D	-0.00	0.02	-0.00	1.00	-0.01
V180D	-0.03	0.00	-0.02	-0.01	1.00

Rather high values have originally been recorded for part-time employees by some KAUs. This is partially erroneous recording because many of these values are transferred to man-hours carried out when editing. The low correlation between changes made in variables for owners, part-time employees, man-hours carried out and employment/employees means that we do not necessarily get an efficient editing of variables for owners, part-time employees and man-hours carried out by efficient editing of employees.

4.3.3.3 Connection between changes of important variables within different groups

For detailed analysis Persons employed (V150), Sale of self-produced commodities (V210), cost of raw material (V310) and acquisition investment (V590_A) are observed.

When we compare the editing of these variables we find a strong correlation between changes made for sale of self-produced commodities and changes in cost of raw material. We do not find a similar correlation between changes made for self-produced commodities and changes in investments or in persons employed.

Table 4.3.3-3 The correlation between changes (edited-original) in selected variables

	V150D	V210D	V310D	V590_AD
V150D	1.00	0.02	0.02	0.02
V210D	0.02	1.00	**0.91**	0.22
V310D	0.02	**0.91**	1.00	0.16
V590_AD	0.02	0.22	0.16	1.00

For correlation analysis on costs of production, stock variables and investments see chapter 7.3.1.

4.3.3.4 "Thousand"- error connections

Measurement errors, like the one when the unit is 1,000 NOK and the value is given in 1 NOK, give large effects by editing. It seems natural to think that such errors will exist for all items in the questionnaire, when they occur. We find that "thousand"-errors can vary from one item to another. Table 4.3.3-4 shows examples of this for Sale of self-produced commodities, Cost of raw material and Investments. The shadowed cells show the number of local KAUs for which only the change in one variable can be classified as "thousand"-error (the ratio of original and edited value is larger than 400). We find relatively good conformity between the sale of self-produced commodities and the cost of raw material (9+11). For investments and the sale of self-produced commodities, however, there are more deviations (34+225), especially for investments. The reason for this is probably the fact that the unit (1,000 NOK) in 1996 was not specified on the questionnaire, but only in the manual. This has been corrected on later versions of the questionnaire.

Table 4.3.3-4 "Thousand"- errors of sale of self-produced commodities linked to other "thousand"- errors

a. Cost of raw material

		V210/V210R		
		< 400	**> 400**	**Total**
V310/V310R	**< 400**	5,036	9	5,045
	> 400	11	66	77
	Total	5,047	75	5,122

b. Investments

		V210/V210R		
		< 400	**> 400**	**Total**
V590_A/V590_AR	**< 400**	4,822	34	4,856
	> 400	225	41	266
	Total	5,047	75	5,122

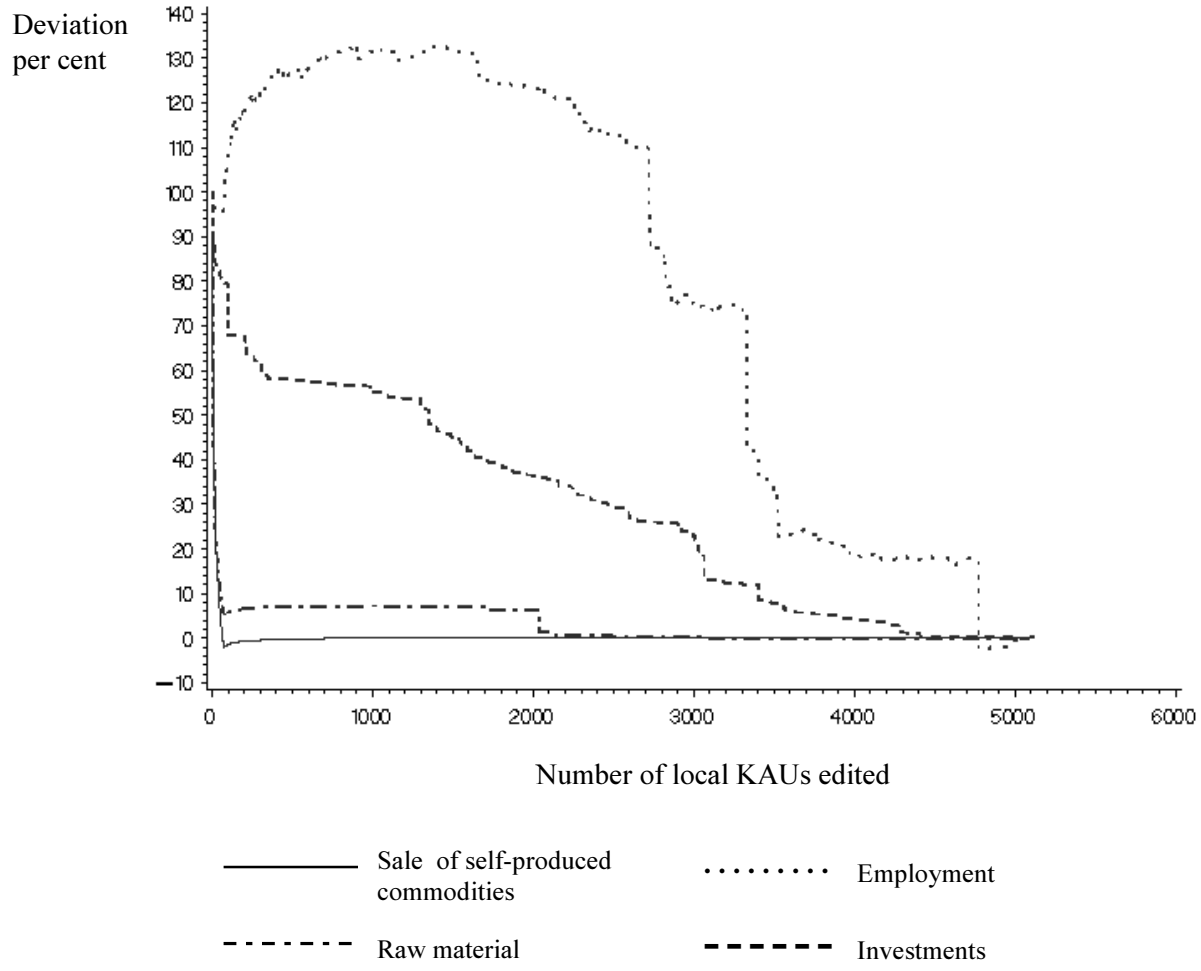
This is graphically illustrated in annex 7.3.2.

4.3.3.5 Efficient editing

The low correlation between changes in different variables such as we find in Table 4.3.3-1, Table 4.3.3-2 and Table 4.3.3-3 indicates that it may be difficult to find editing routines that are efficient for all variables. In Figure 4.3.3-1 it is as an example shown how the total figure for raw material costs, investments and persons employed will evolve if we choose to use the procedure that theoretically is efficient for sale of self-produced commodities (see Figure 4.3.1-3 and Figure 4.3.1-4).

The development for raw material costs is satisfactory. We only miss one great change in the category "thousand"-error where the KAU does not engage in the sale of self-produced commodities. The editing of investments is more doubtful, even if it is headed in the right direction at all times. Employment shows an incorrect development – where the largest changes occur late during editing – when we start with the KAUs that improve the most when it comes to the sale of self-produced commodities.

Figure 4.3.3-1 The procedure after an efficient routine for the sale of self-produced commodities
Deviation (per cent of original deviation) from the edited total during editing Step by step editing after the largest deviation between the original and the edited sale of self-produced commodities



4.4 The outcome of editing

Table 4.4.1-1 The sale of self-produced commodities
(4,415 out of 5,122 observations where edited value is not blank)

	Total, original values V210	Number of observations filled in originally	Total, edited values V210R	Number of observations filled in after editing	Changed during editing V210R - V210
Total sample	2,317,292,827	3,800	323,858,814	4,415	- 1,993,434,013
Changed from blank	-	-	45,743,308	624	45,743,308
Changed from 0	0	151	14,414,208	151	14,414,208
Changed to 0	31,846,207	73	0	73	- 31,846,207
Large changes					
The largest absolute change	175,475,966	1	164,679	1	- 175,311,287
The largest percentage change	1	1	8,856	1	8,855
The largest V210/V210R	66,803,000	1	12,000	1	- 66,791,000
"Thousand" errors:					
V210/V210R > 400	2,022,543,534	75	2,053,293	75	- 2,020,490,241
999<V210/V210r<1001	1,205,325,553	43	1,205,395	43	- 1,204,120,158
Small changes					
Not changed during editing	138,404,486	2,148	138,404,486	2,148	0
less than 1 %	180,888,806	2,385	180,873,365	2,385	- 15,441
less than 2 %	192,010,224	2,496	191,904,290	2,496	- 105,934
"Thousand" errors:					
V210r/v210 > 500	802	18	854,643	18	853,841

Table 4.4.1-2 Employment

(5,119 out of 5,122 observations where edited value is not blank)

	Total, original values V150	Number of observations filled in originally	Total, edited values V150r	Number of observations filled in after editing	Changed during editing V150r - V150
Total sample	313,885	4,399	256,064	5,119	- 57,821
Changed from blank	-	-	34,542	721	34,542
Changed from 0	0	738	26,831	738	26,831
Changed to 0	132	2	0	15	- 132
Enterprise employment figures *	2,990	46	1,254	46	- 1,745
Large changes					
The largest absolute change	17,514	1	175	1	- 17,339
The largest percentage change	12	1	180	1	168
The largest V150/V150r	11,940	1	10	1	- 11,930
"Hundred" errors:					
94 < V150/V150r < 120	36,543	8	365	8	- 36,178
"Ten" errors:					
9 < V150/V150r < 17	72,198	176	7,144	176	- 65,084
Small changes					
Not changed during editing	152,953	2,988	152,953	2,988	0
less than 1 %	154,905	2,997	154,898	2,997	- 7
less than 2 %	158,338	3,014	158,282	3,014	- 56
"Ten" errors:					
V150r/v150 > 7	28	6	337	6	309

* The total employment figures of the enterprise are filled in, in all the questionnaires of the local KAUs within the enterprise.

4.5 Standard industry form - enterprise

The file for enterprises consists of 3,621 samples. For a total of 486 enterprises no changes have been made for any of the variables during editing. Originally 508 enterprises had blanks for all variables. Except for blanks – editing is modest compared with the editing of the manufacturing questionnaire. There are some exceptions for some variables plus for some totals where these variables are included:

Variable	Name of variable	Number of changes
V610_1	Energy, fuel etc. concerning production	1,343
V625_1	Lighting, heat, water, renovation	1,162

More than half of these changes are transfers of a part of item V625_1 to item V610_1.

5 Methods for preliminary figures and further analysis of the editing process and new methods of editing based on 1998 Manufacturing Statistics

5.1 Editing of Manufacturing Statistics 1998

5.1.1 Introduction

The manufacturing statistics from 1998 are used to check the experiences from the Manufacturing Statistics 1996 and further develop the revision methods.

A total of 6 297 forms was collected from Local KAUs for the 1998 statistics. The sample is divided by type of local KAU and industrial classification (industry divisions and others) in table 5.1.1-1:

Table 5.1.1-1 Number of Local KAUs by type of local KAUs

	Total number of Local KAUs	Local KAUs in industry divisions
Local KAUs in single KAU enterprises	2,948	2,944
Local KAUs in multi-KAU enterprises	2,632	1,709
Auxiliary units in multi-KAU enterprises	717	681
Total	6,297	5,334

An automatic editing programme may be possible for the forms from the local KAUs in single KAU enterprises. Further analysis of editing the manufacturing statistics for 1998 focuses on a sample of local KAUs that:

- are local KAUs in single KAU enterprises
- have had the questionnaire for MS read optically
- are classified as a manufacturing industry on the edited form

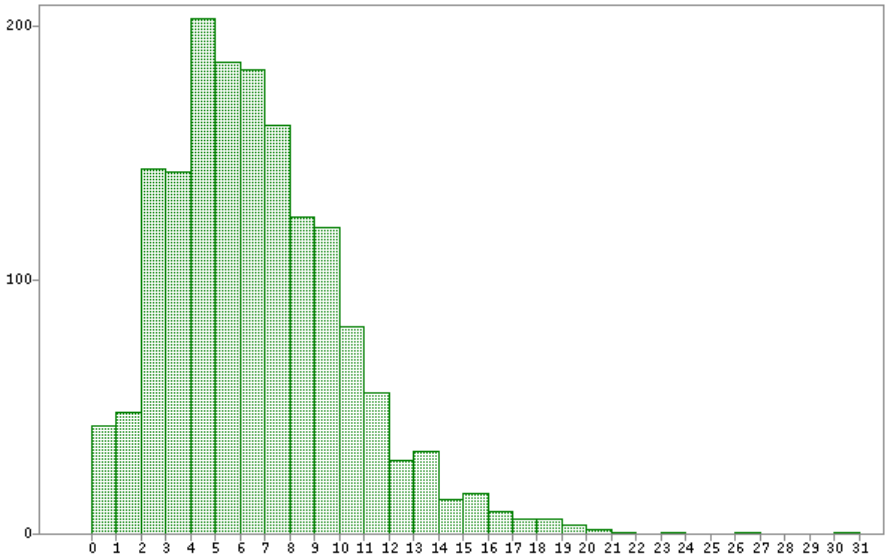
The sample consists of a total of 1,598 local KAUs.

For optically read forms all items that are not filled in are substituted with a 0. Consequently no local KAUs in the sample have blank items on their forms.

The editing resulted in changes on most of the forms, but by and large only a few items on each questionnaire were changed. Figure 5.1.1-1 shows the distribution of changes in the questionnaires.

Figure 5.1.1-1 Items changed during editing

Number of questionnaires



Number of items changed

The figure shows that 4-7 items were the most usual number of corrected items on the forms. A total of 1,439 forms had corrections on 10 or less items, whereas 43 forms had no corrections and about 200 forms had 4 items corrected. The items with most changes are listed below.

Table 5.1.1-2 Items in the questionnaire that most often were altered during editing

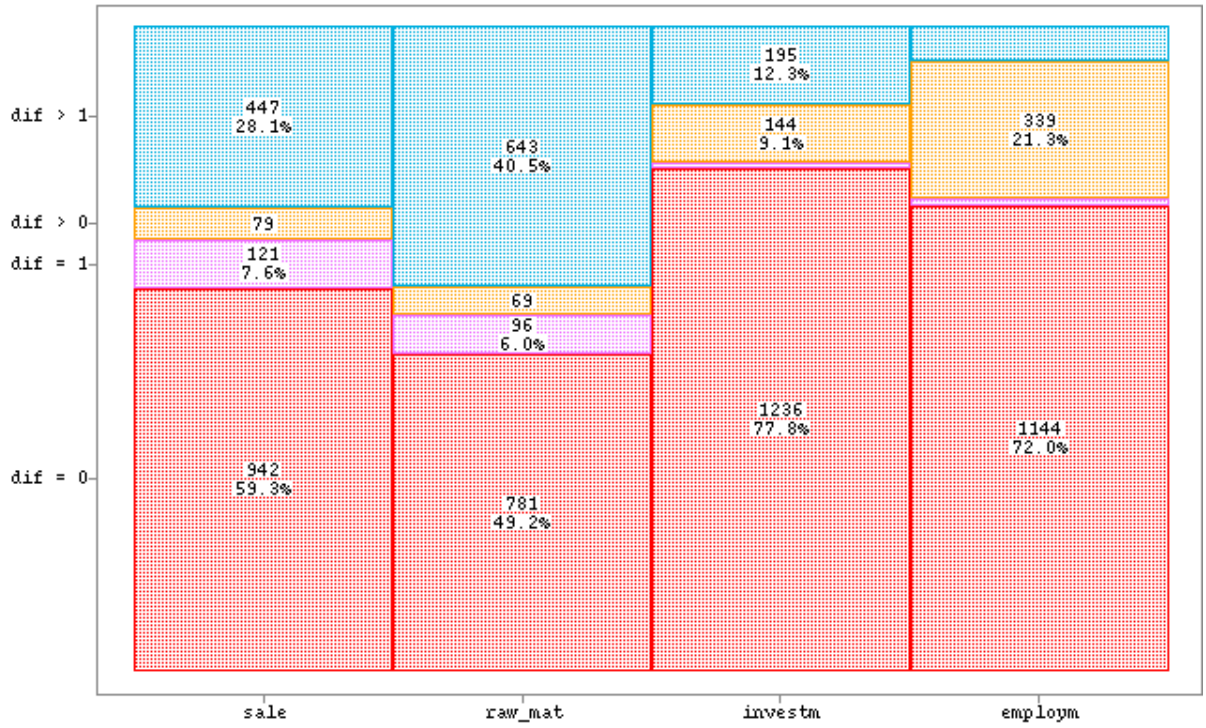
Item		Number of changes
V590_r	Total repairs	1015
V510_r	Repairs of machinery, tools, equipment and furniture	911
V291	Total production income	860
V310	Costs of raw material, semi-finished products and auxiliary materials	808
V391	Total production costs	806
V210	Sales of self-produced commodities	647
V150	Persons employed	445
V180	Man-hours carried out by employees	440
V250	Other sales income	435
V590_a	Total acquisitions	353

Single items on the MS-questionnaire are changed when not filled in completely, errors in the figures or small adjustments/rounding offs. The effect of editing may be divided into four categories:

no change	- edited value equals original value	- dif= 0
adjustment	-change equals one unit, most often done to make sums tally	- dif = 1
changed from zero	- items lacking figures	- dif > 0
other changes	- other real changes	- dif > 1

We choose to analyse the same central variables that were analysed for MS 1996 in chapter 4.2.2, sales of self-produced commodities, costs of raw materials, total investments/purchases and employment. These items are also among the most altered items on the MS questionnaire.

Figure 5.1.1-2 Changes during the editing of sales of self-produced commodities, employment, costs of raw material and investment



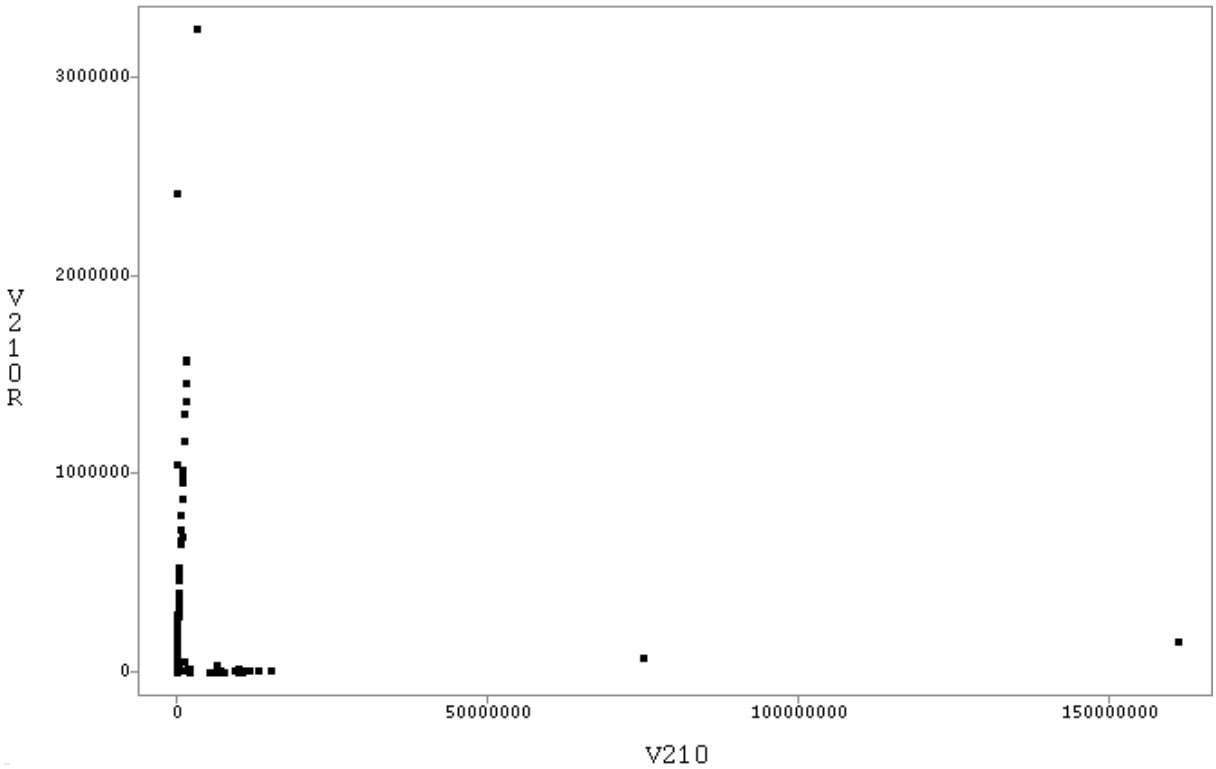
Compared with 1996 (figure 4.2.2-1) the main difference is that now there are no changes including blank entries. The reason for this is partly that auxiliary KAUs have been left out ('dif = b') and partly that blank entries have been set to 0 in the original data set.

Like in figure 4.2.2-1, figure 5.1.1-2 shows great differences in the pattern of changes for different variables. For these four items the cost of raw material is most often altered, but less than one half of the forms remained unaltered for this item. Investments have been altered the least of these four items, more than ¾ of the forms are unchanged. Adjustments are most often used for sales of self-produced commodities and costs for raw materials, something that is to be expected seen in connection with the Standard Industry Form (SIF). The item most often incorrectly recorded is employment with 0/blank – on more than 20 per cent of the forms. This amounts to a great portion for this item. For investments as well – relatively many values are missing.

Editing of a few important variables

A plot of V210 – Sales of self-produced commodities shows the same pattern as in 96 with the use of wrong unit while filling in the forms (figure 5.1.1-3):

Figure 5.1.1-3 Plot of sale of self-produced commodities originally and after editing



V210 is original sale and V210R is sale after editing

The ratio between original value and edited value shows how many changes that concern 1000-errors (table 5.1.1-3).

Table 5.1.1-3 The ratio between the original and edited sale of self-produced commodities

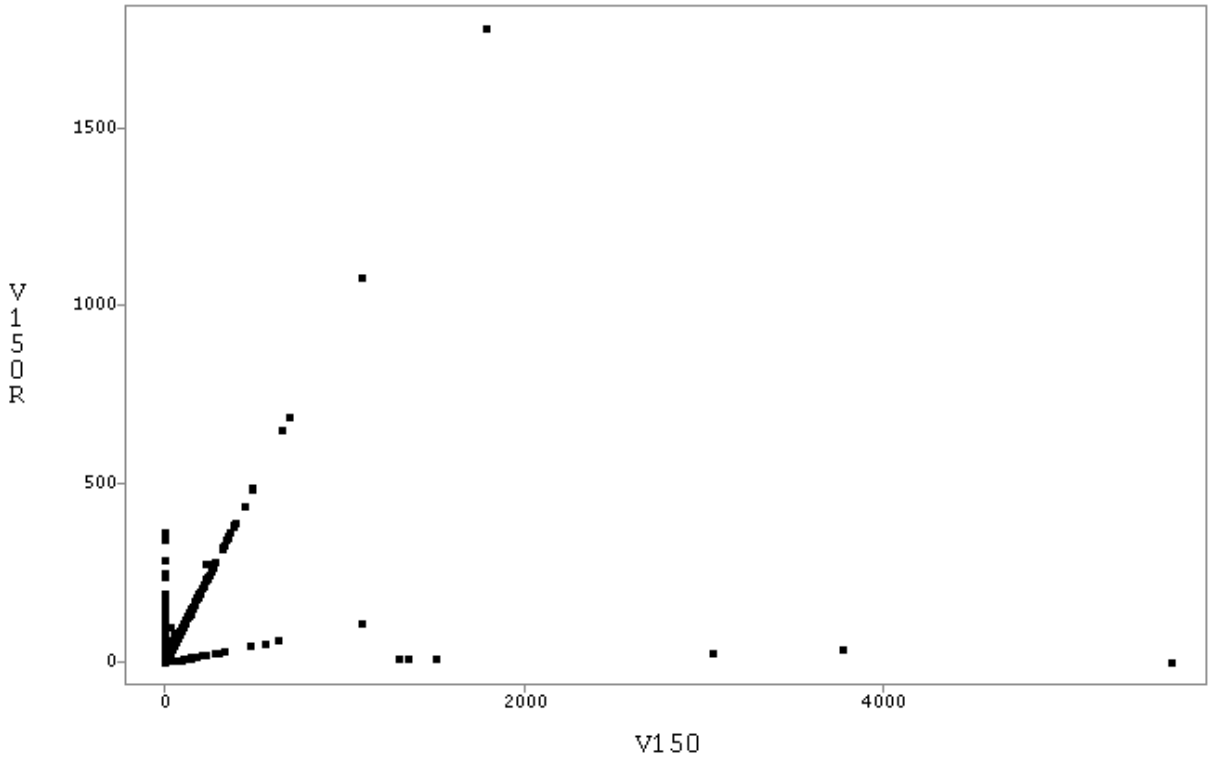
V210/V210R	Number of local KAUs	Per cent
[0]	79	5.32
(0.009 - 0.9)	44	2.96
[0.9 - 1)	221	14.89
[1]	857	57.75
(1 - 1.1)	211	14.22
[1.1 - 5)	37	2.49
[5 - 12)	4	0.27
[12 - 400)	7	0.47
[400 -900)	4	0.27
[900 -)	20	1.35

Just about 58% of the forms were not altered whereas nearly 30% of the forms have changes of less than 10% for sales of self-produced commodities. About 8% have major changes, including the 1.5% that have 1000-errors.

A plot, figure 5.1.1-4, of edited employment against original employment shows the same pattern as for MS 96.

Figure 5.1.1-4 Plotting of employment originally and after editing

V150 is original employment and V150R is edited employment



We clearly see decimal errors and lack of values for the original data, both in the plot and in table 5.1.1-4 on the connection between the original and the edited employment.

Table 5.1.1-4 The ratio between the original and edited employment

V150/V150R	Number of local KAUs	Per cent
[0]	339	21.40
(0 - 0.11)	2	0.13
[0.11- 0.9)	30	1.89
[0.9 - 1)	17	1.07
[1]	1,139	71.91
(1 - 1.1)	13	0.82
[1.1 - 9)	10	0.63
[9 - 12)	27	1.70
[12 - 90)	1	0.06
[90 -130)	5	0.32
[130 -)	1	0.06

Almost 72% of the forms were not altered during editing as far as employment went, but more than 21% of the forms lacked employment. Very few forms were changed, including the 2% that had decimal errors.

Automatic routines should easily be able to reveal and possibly correct errors like 1000-errors and decimal errors.

5.1.2 Editing routines

When analysing the edit procedure and possibly finding an automatic edit procedure the information from the MS forms (manufacturing structure on a KAU level) and the Standard Industry Form (SIF) are linked against registers and short-term statistics. The information from the different sources for these 1,598 KAUs in single enterprises consists of:

- distinctive register marks from the Central Register of Establishments and Enterprises at Statistics Norway
- MS questionnaire before revision - a total of 40 questionnaire variables
- MS questionnaire after editing - a total of 40 questionnaire variables
- The SIF before editing
- The SIF after editing
- final edited data from MS 97
- data from investment statistics, short-term statistics for 98

5.1.3 Standard Industry Form

The Standard Industry Form (SIF) which includes accounting variables to the tax authorities is hardly altered during editing. Even if we find certain items that often have been altered, principal items in the SIF may be considered as a sort of a key during the editing of the MS questionnaire.

Table 5.1.3-1 Items in the SIF that most often were altered during editing

Item		Number of changes
V610_1	Energy	1,214
V625_1	Light, heat, water	1,059
V400_1	Commodity costs	300
V690_1	Car expenses	217
V790_1	change of stocks	208
V910_1	Result financial income/costs	186
V902_1	Total operating costs	157
V650_1	Maintenance/repairs	155
V770_1	Other operating costs	145
V905_1	Operating result	119

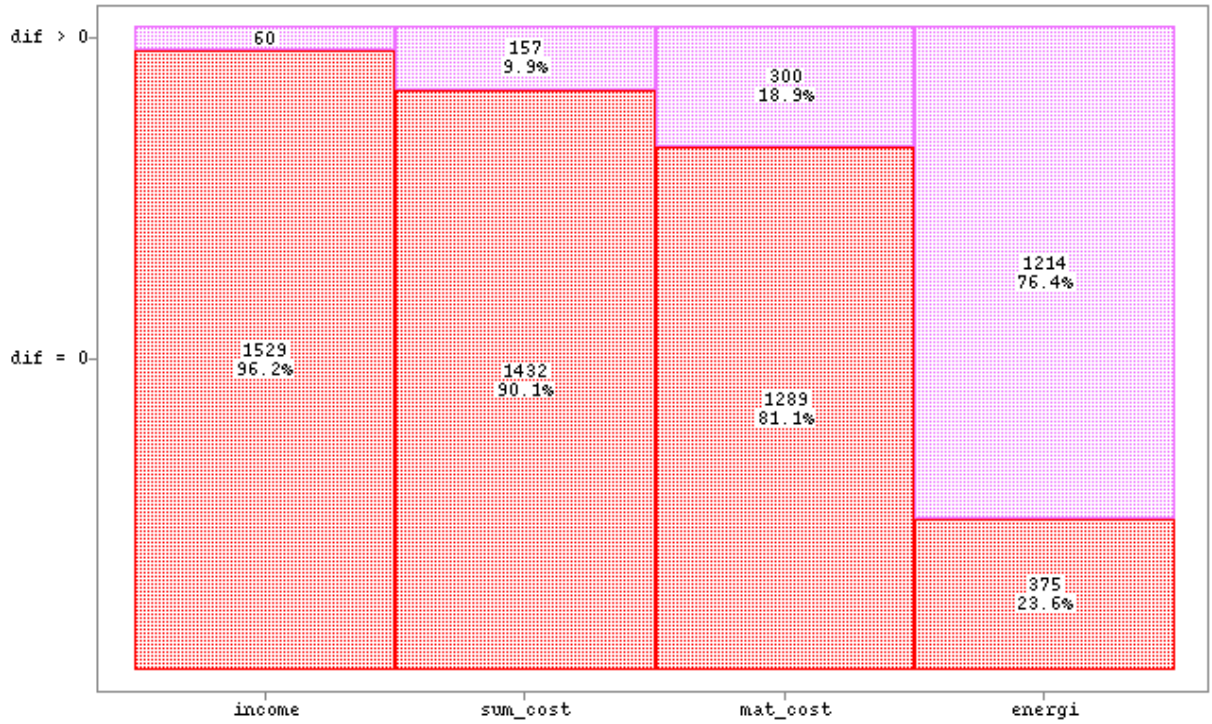
The effect of the revision of the SIF may be divided into two categories:

no change	- edited value equals original value	- dif = 0
change	- the item is changed	- dif > 0

We choose to compare certain principal items such as operating income – V901_1, total operating costs – V902_1, commodity costs – V400_1 and one item that very often was altered on the SIF, energy – V610_1. Figure 5.1.3-1 shows the distribution of forms with and without alterations for these four variables.

We see that the energy variable V610_1, which is the most often altered item on the SIF, clearly stands out compared with certain principal items.

Figure 5.1.3-1 Changes during the editing of the SIF items, total operating income, total operating costs, commodity costs and energy.



By linking the SIF with the MS questionnaire we may get good indications of which forms we should give priority during the manual check, and which ones to a certain degree can be checked automatically for "1000-errors" and certain other errors. The editing instructions that are presently used during manual editing may be linked towards a broad data basis and give us the possibility to pick out some few "difficult" forms for manual editing and edit other forms automatically.

We will use certain questionnaire variables to show how a few simple editing rules can pick out forms that should receive priority for manual editing and forms for automatic editing, and how this affect the total of original values towards the total of all edited values.

5.1.4 Income

We start with sales income from both forms and use these items for automatic checks of income variables by:

- forms with missing data get priority for manual checks
- the total for operating income on the MS questionnaire is to equal the total of the income items on the MS questionnaire
- 1000-errors are corrected. When the ratio between the income variables on the MS questionnaire and the income variables on the SIF is extremely high, the income variables on the MS questionnaire are reduced by 1/1000 of the original value.
- total income on the MS questionnaire that is to equal total sales income on the SIF, other income variables on the MS questionnaire are altered in relation to the alteration of production income.

These simple rules are used for variables V291 – total operating income, V210 – sales of self-produced commodities, V220 – sales of commercial goods, V230 – repair work, V240 – contract work and V250 – other sales income. The results of mechanical editing and manual examination of the forms that have received priority were:

Table 5.1.4-1 Income variable - Result of simple automatic editing and prioritised manual editing

	Original	Includes automatic editing		Includes prioritised manual editing		Editing completed	Deviation	
	Total	Number	Total	Number	Total	Total	Total	%
V291	497,643,080	487	141,226,825	8	101,330,701	101,513,333	- 182,632	0.2
V210	544,733,144	487	126,711,450	8	86,812,727	91,215,593	- 4,402,866	4.8
V220	30,064,207	487	7,105,870	8	4,509,726	4,988,881	- 479,155	9.6
V230	26,077,732	487	2,830,885	8	2,830,885	2,680,299	150,586	5.6
V240	1,676,984	487	1,056,408	8	1,056,408	2,081,032	- 1,024,624	49.2
V250	78,835,807	487	2,482,163	8	2,355,363	670,025	1,685,338	252

We can see that this very simple check gives quite good results for total income, but we must develop automatic checks further in order to cover adjusments between the income items.

5.1.5 Production costs

For single KAU enterprises the total production costs are taken directly from the SIF while the commodity costs are specified on the MS questionnaire. The total commodity costs on the MS questionnaire can be found in an item on the SIF. Automatic checks of the cost items lead to:

- forms lacking data are prioritised for manual checks
- the total for commodity costs on the MS questionnaire is to equal the total items of commodity costs on the MS questionnaire
- 1000-errors are to be corrected. When the ratio between the cost variables on the MS questionnaire and the cost variables on the SIF is extremely high, the cost variables on the MS questionnaire are reduced to 1/1000 of original value
- the total commodity costs on the MS questionnaire are to equal the commodity costs on the SIF, while the individual commodity cost on the MS questionnaire is changed proportionally with the change of total commodity costs.

These simple rules are used for the variables V391 – total commodity costs, V310 – raw material, semi-manufacture and auxiliary stuff, V312 – packaging, V314 – sold commercial products' costs and V316 – contract work. The result of the mechanical editing and the manual examination of prioritised forms were:

Table 5.1.5-1 Commodity costs - Result of simple automatic editing and prioritised manual editing

	Original	Includes automatic editing		Includes prioritised manual editing		Editing completed	Deviation	
	Total	Number	Total	Number	Total	Total	Total	%
V391	238,770,413	811	73 ,927,874	12	55,959,345	55,848,864	110 481	0.2
V310	279,950,463	811	67,914,883	12	47,985,425	47,084,772	900 653	1.9
V312	13,192,648	811	1,156,760	12	1,091,975	1,038,770	53 205	5.1
V214	11,519,601	811	2,940,848	12	2,962,848	3,708,977	- 746 129	20.1
V316	63,553,516	811	3,571,545	12	3,575,260	4,016,356	- 441 096	11.0

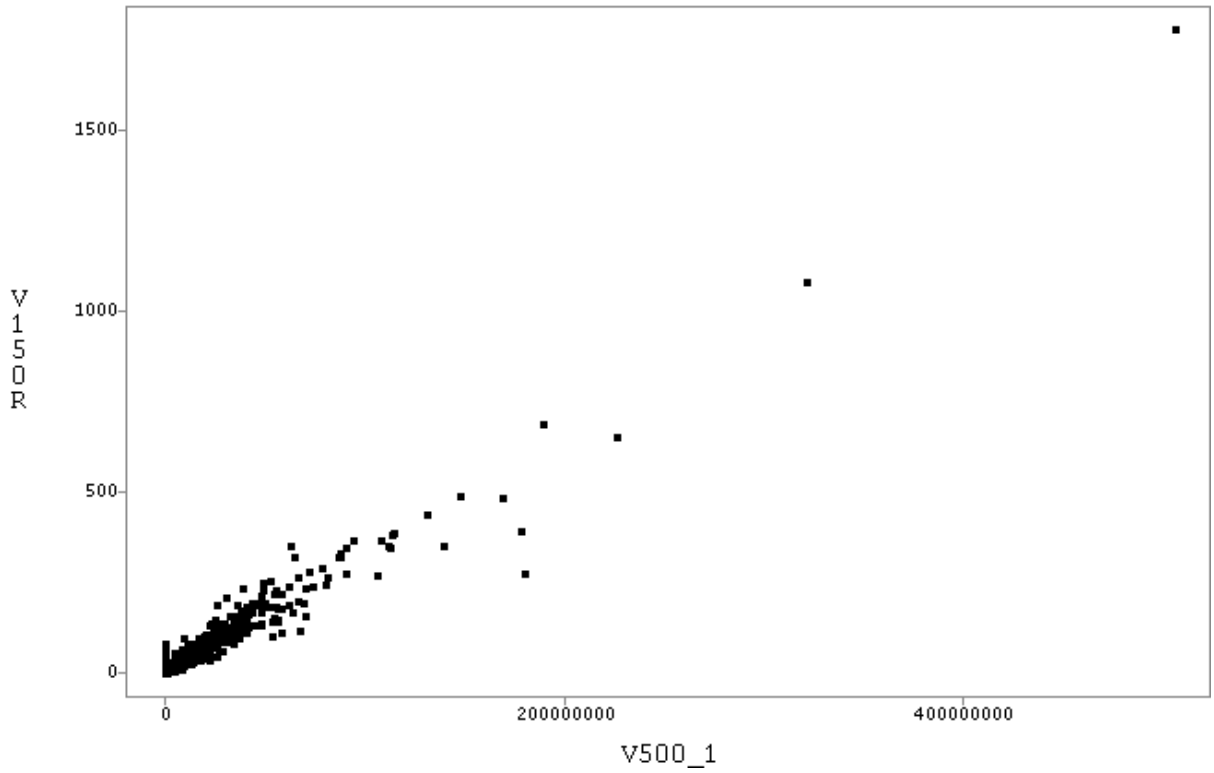
We can see that this very simple check gives quite good results for total income, but we need to develop the automatic check further in order to cover the moving of the items of expenditure.

5.1.6 Persons employed/employees

Employment variables on the MS questionnaire may be checked against wage costs on the SIF, an item that very seldom is corrected during editing (52 corrections in our sample). The connection between edited employment on the MS questionnaire (V150R) and original wage costs on the SIF (V500_1) is as we can see quite clear from the figure 5.1.6-1.

Figure 5.1.6-1 Connection between number of employees and total wages

V150R is edited employment and V500_1 is original wage cost from the SIF



The connection between number of employees on the MS questionnaire (V110R) and original wage costs on the SIF (V500_1) follows the same pattern.

Automatic editing of employees/persons employed/part-time employees applies to:

- decimal errors to be corrected if wage costs per employees (persons employed) are too low
- number of persons employed and number of employees are estimated with the help of wage costs if the number of persons employed and the number of employees are zero and the KAU has positive wage costs
- estimate if lack of filling in exists (e.g. by recording the number of persons employed (V150)= number of employees (V110) if V150=0 <V110)
- manual check if number of part-time persons employed (V170) is higher than number of employees (V150), possibly number of employees (V110)
- decimal error corrected if performed man-hours (V180) is too high in relation to the number of employees
- estimation of performed man-hours (V180) with the help of number of employees if the item is not filled in

The results of mechanical editing and manual examination of forms prioritised for manual editing are shown in table 5.1.6-1. The table shows that automatic editing and manual first prioritised editing give figures close to those from complete editing for employment variables. But there is a need for more investigations on part-time employees.

Table 5.1.6-1 Persons employed. Result of a simple, automatic editing and prioritised, manual editing

	Original	Includes automatic editing		Includes prioritised manual editing		Editing completed	Deviation	
	Total	Number	Total	Number	Total	Total	Total	%
V110	117,961	89	70,448	37	70,562	70,906	- 344	0.5
V120	648	89	323	37	88	34	54	1.9
V150	79,299	89	70,813	37	71,115	70,940	175	0.2
V170	94,010	89	93,560	37	6,262	6,848	- 586	8.6
V180	226,826,683	89	111,936,857	37	112,024,019	114,917,847	- 2,893,828	2.5

5.1.7 Investments

Short-term investment statistics, totalled for the year 1998, give us alternative figures for total investments for 591 of our sampled KAUs. These KAUs are marked with "+" in the plot that shows the connection between edited total investment/acquisition (V590_AR) and original investment/ acquisition (V590_A).

Figure 5.1.7-1 Plot of investment/acquisition originally and after editing

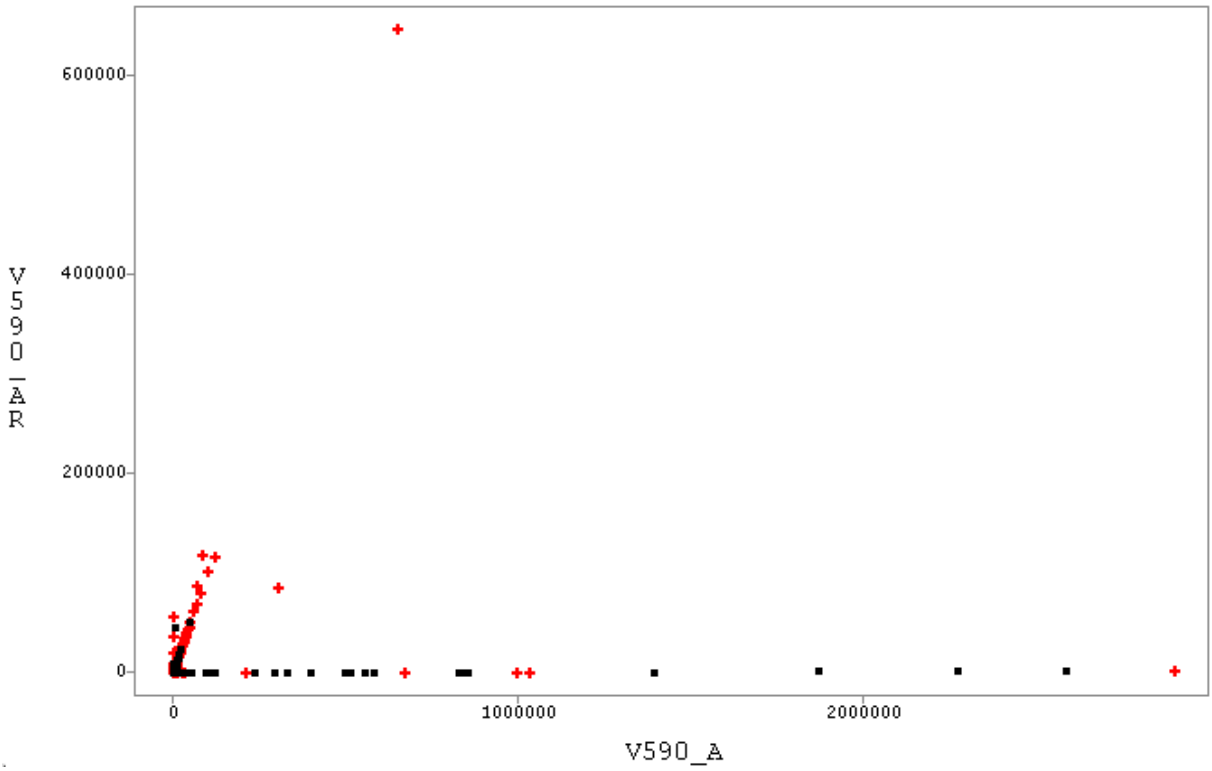
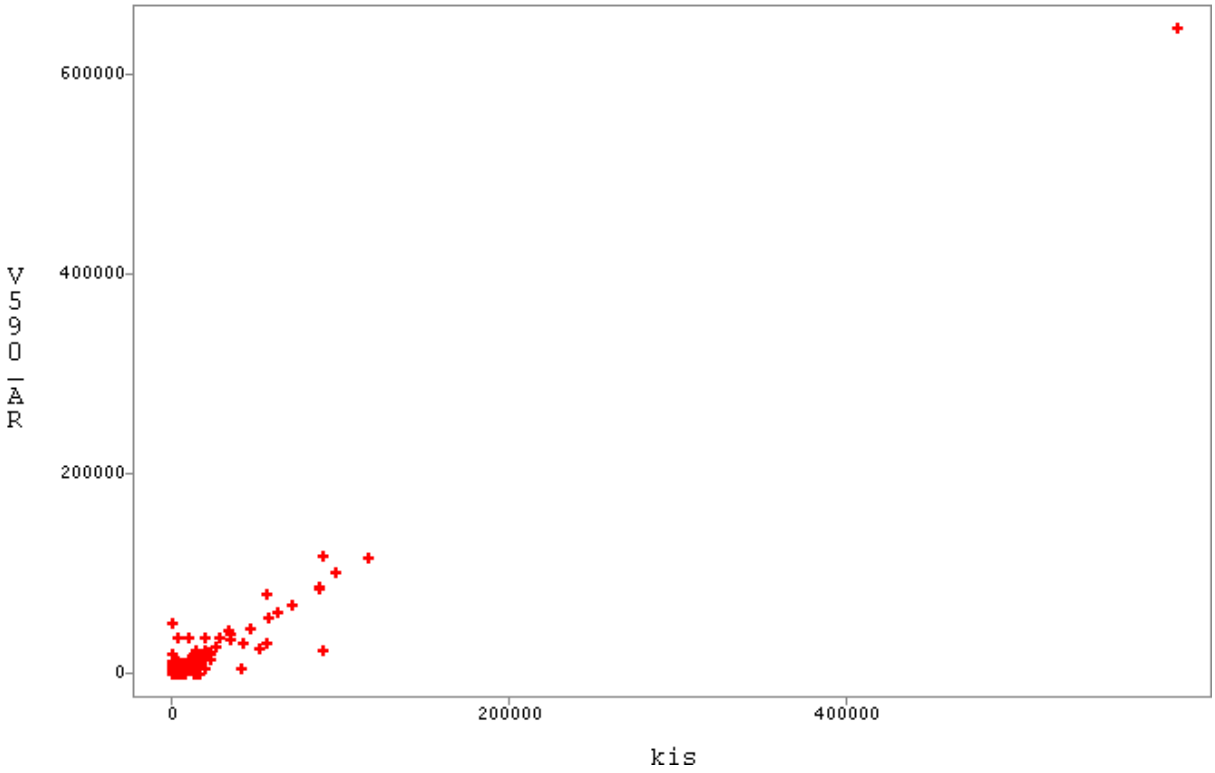


Figure 5.1.7-1 clearly shows "1000-errors" in the dots outwards along the x-axis, and that only a few of the KAUs with such errors are included in the short-term statistics.
For Local KAUs that are included in short-term investments statistics (kis) we find that the connection between edited total investments/acquisitions (V590_AR) and investment from short-term statistics is quite strong (see figure 5.1.7-2).

Figure 5.1.7-2 Connection between investment/acquisition from the MS questionnaire and from short-term investment statistics

V590_AR is edited total investment/acquisition and kis is investment from the short-term statistics



Investment on the MS questionnaire can not as the other items be compared with equivalent items on the SIF. We choose to use the short-term statistics if we have figures, otherwise we look at the connection between investments and income. The rules for manual editing and automatic editing are based on:

- forms lacking income variables are prioritised for manual checks
- forms with extremely high investments in relation to income are prioritised for manual checks
- lacking investment on the MS questionnaire is replaced by investment from short-term statistics
- item for total investment on the MS questionnaire should equal total investment items on the MS questionnaire
- "1000-errors" are corrected. When the ratio between investments on the MS questionnaire and investments from the short-term investment statistics – or the ratio between income variables on the MS questionnaire and income variables on the SIF is extremely high, the investment variables on the MS questionnaire are reduced to 1/1000 of original value.

These simple rules are tested on the variables for investment/acquisition V590_a – Total investments/acquisitions, V510_a - machinery etc., V520_a - cars and other transport equipment, V530_a – Buildings and welfare facilities etc., V540_a – Production buildings, V550 – Production structures, V560 – Land and V595_a – Investment and repair work done by own employees. The results of the mechanical editing and the manual examination of the prioritised forms were:

Table 5.1.7-1 Investment/acquisition – Result of simple automatic editing and prioritised manual editing

	Original	Includes automatic editing		Includes prioritised manual editing		Editing completed	Deviation	
	Total	Number	Total	Number	Total	Total	Total	%
V590_a	25,225,533	131	14,694,475	33	4,732,742	4,871,514	- 138,772	2.8
V510_a	16,999,629	131	12,117,642	33	2,930,795	3,072,466	-141,671	4.6
V520_a	2,027,006	131	1,460,798	33	197,791	218,429	- 20,638	9.4
V530_a	620,271	131	526,465	33	141,259	71,030	70,229	98.9
V540_a	4,347,152	131	3,403,172	33	1,013,228	966,796	46,432	4.8
V550_a	3,725,007	131	430,929	33	430,929	486,930	- 56,001	11.5
V560_a	40,875,558	131	2,348,717	33	58,957	56,342	2,615	4.6
V595_a	121,996	131	121,966	33	111,921	61,413	50,508	82.2

The simple rules we have used here give very good results for items for totals, but we have seen that there are problems with some detailed items. We do, however, have the data basis that should give good possibilities for further development of automatic editing.

5.2 Efficient editing

The editing is most efficient if the gross errors can be corrected first. One may then consider to which degree it is necessary to edit the forms where there are minor errors. The problem is that it is not easy to know which errors are the worse before the editing is done, and that some forms may have gross errors for some variables while errors on other variables may be insignificant. This may for instance result in the development of the different variables – during editing – following the graphs in figure 4.3.3-1.

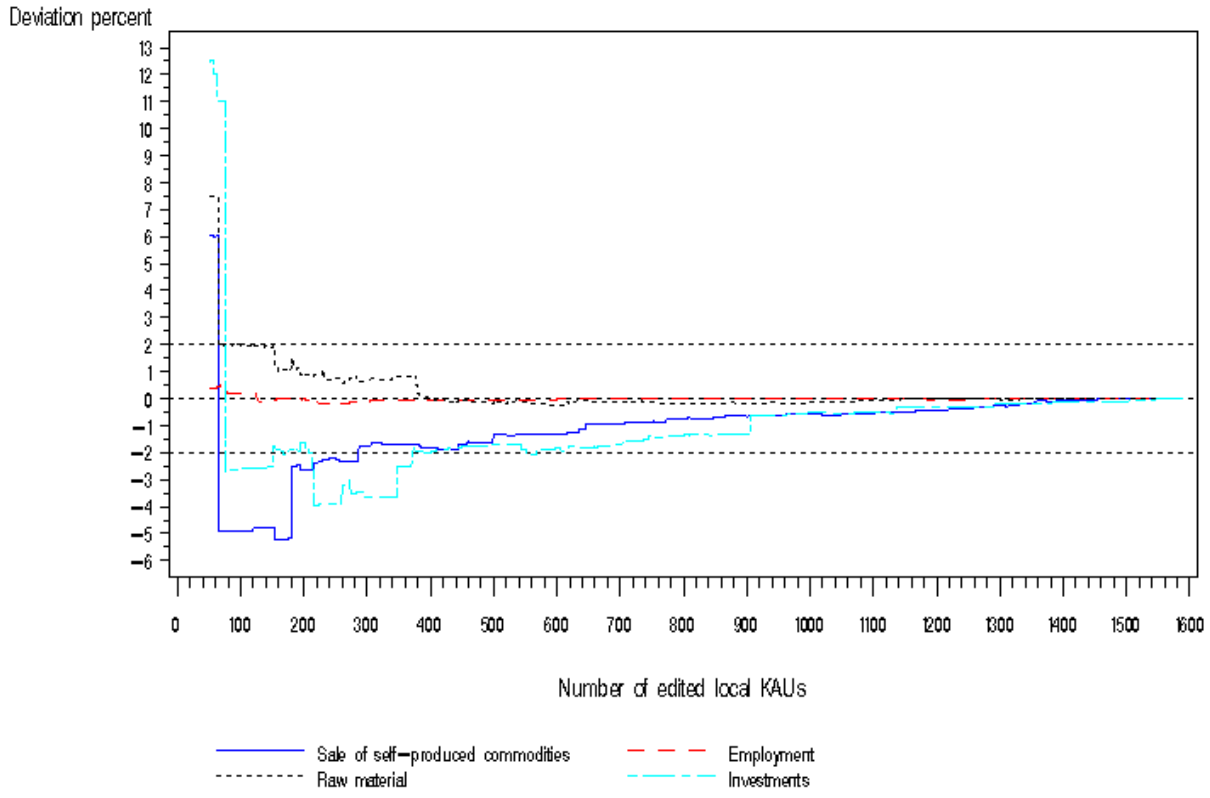
Still concentrating on the four items: sales of self-produced commodities, raw material, investments and employment, we will show an example where the priority list for manual editing offers a fast approximation towards a correct result. The basis is the data the way they are after automatic editing described in the previous chapter.

Prioritising:

1. prioritised manual editing
2. new units (not included in the previous year's structural statistics)
3. units registered with high values in 1998 and for items that were 0 the previous year or vice versa
4. the remainders are sorted according to the difference between the present year's and the previous year's items: sales of self-produced commodities, raw material, investments and employment.

When this prioritising is tested on single KAU enterprises for 1998 we achieve the development of deviations from the total showed in figure 5.2.1-1. The deviations are stated in per cent of the edited total and start on 100% for each variable. However, the first steps are not included in the figure, so that the smaller deviations become more visible.

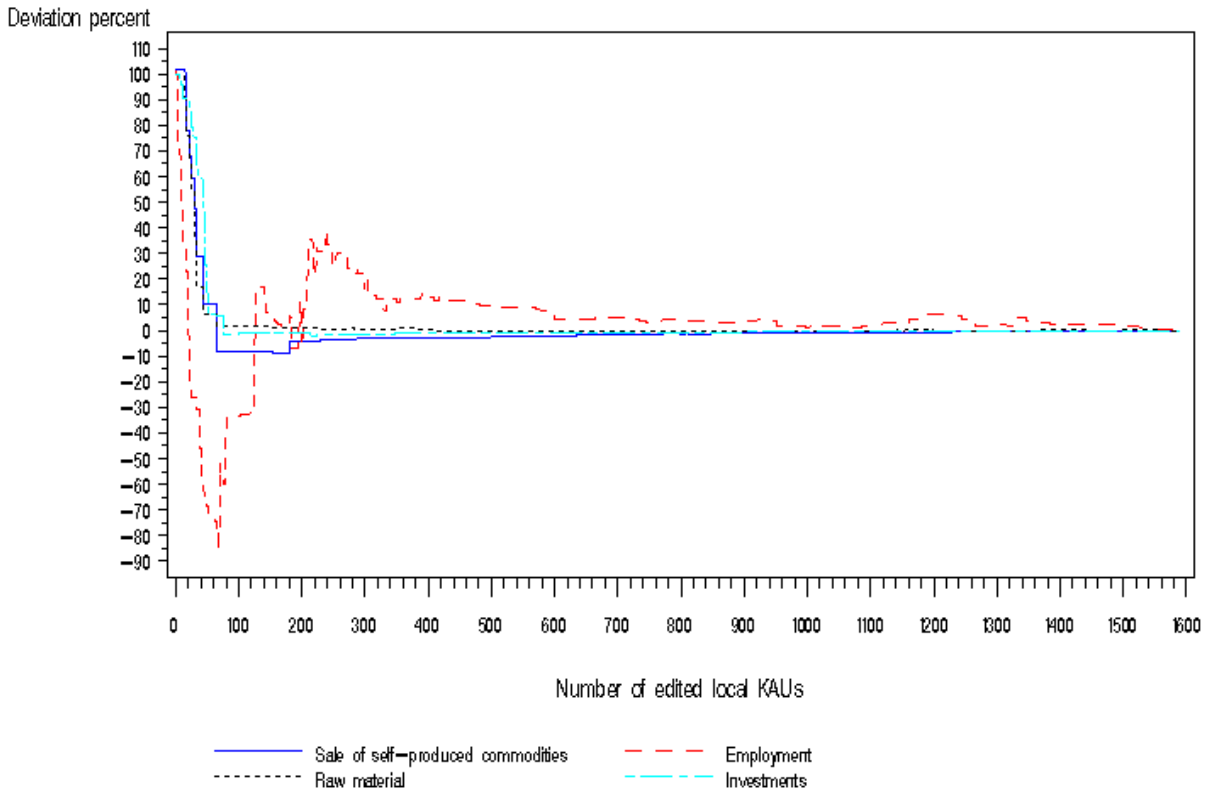
Figure 5.2.1-1 Deviation from edited total by step by step editing according to prioritised order



The figure shows that the deviation is within 2% of the total for employment after editing less than 60 KAUs, for costs of raw material with about 65 KAUs edited, for sales of self-produced commodities after editing about 280 KAUs and for investments after editing about 360 KAUs.

Relative deviation looked at in relation to deviation after automatic editing before the manual editing starts, develops during step by step editing as shown in figure 5.2.1-2.

Figure 5.2.1-2 Deviation relative to deviation before manual editing, development when step by step editing



The figure shows that the deviations soon are reduced considerably and then approaching 0. The deviation for employment is an exception, but the deviation at the start of manual editing is also small as seen in figure 5.2.1-1. The development of the four variables together is better than it was when we only used sale of self-produced commodities for edit priority (figure 4.3.3-1).

5.3 Preliminary figures

5.3.1 Preliminary figures based on preliminary national accounts

According to Regulation for Structural Business Statistics, preliminary figures shall be transmitted to Eurostat within 10 months from the end of the calendar year for the reference period. The information is to be given for the following characteristics according to Section 8 in annex 2 :

- Number of enterprises (11 11 0)
- Turnover (12 11 0)
- Production value (12 12 0)
- Total purchase of goods and services (13 11 0)
- Wages and salaries (13 32 0)
- Gross investment in tangible goods (15 11 0)
- Number of persons employed (16 11 0)

Since the information for the structural business statistics is based on accounting- information, most of the forms are returned to Statistics Norway in the period from the end of May to August/September. Taking into account also the summer holiday, it will not be possible to produce preliminary figures within the 10 months limit based on micro- data in a sufficient degree for reliable preliminary figures. This of course, leads to the

conclusion that the preliminary figures required by the Regulation have to be based on other information. In the discussion of methods so far, short-term statistics have been mentioned as the source for these calculations.

However, according to our view, there are some problems connected to this method, mainly concerning the situation for the users. Firstly, we do think that the main user- interest of these preliminary figures will be the information on increase/decrease from the previous year, and not the level of the values for the characteristics. This means that the methods for producing the figures, and the information to the users, must have as a reference other methods and works in the NSI and at the international level in the field of preliminary figures as indicators for economic development. On this background, we recommend that preliminary figures are coordinated with, or based on, preliminary national accounts figures for the manufacturing industries. In Norway, as in other countries, the preliminary national accounts are produced on the basis of existing short-term statistics and other available information, and put together in a coherent system which for the whole economy and for the different industry groups also secure consistency with employment statistics. According to the production cycle of national accounts in Statistics Norway, the basis for the calculation could be the preliminary national account figures for year t-1 published together with the first figures for the 2. quarter of year t+1.

Based on the corresponding concepts in the national accounts, and using the value for the percentage change from the NA, preliminary variables could be constructed for turnover, production value, total purchase, wages and salaries and gross investment. The only variable in Section 8 of annex 2, that primarily could not be based on this information, is the number of enterprises. By assuming that the average size of the enterprises is the same as in the previous year, the number of enterprises could however be calculated, or information could be taken from the Business register.

According to the Regulation the preliminary figures are to be reported according to the 3-digit NACE Rev. 1 level. Since the preliminary national accounts figures are published with a more aggregated level of breakdown (more corresponding to the 2-digit groups), this creates a problem. However, so far the preliminary figures for structural business statistics are also published by Eurostat on a 2-digit level only. Within the 2-digit group it could further be possible to construct the 3-digit groups by using short-term statistics and other information directly, but keeping the link to national accounts at the 2-digit level.

The method of coordination of preliminary business statistics with preliminary national accounts is therefore not without problems. Our view is however, also given the resource limits in the NSIs, that it would not be wise to establish a third set of preliminary figures in business statistics (short-term statistics, preliminary national accounts, preliminary business statistics) without being able to explain the differences in methods to the users. If the preliminary figures are based on using micro- information for a significant part of the enterprises for the reference year in question – and some administrative information from registers and other sources, the method will create real new information, even if some information from short-term statistics still is used. The method would then be understood by users and could at the national level also be input to the national accounts and here be used as input for a second and more reliable set of preliminary figures than the first one based on short-term statistics. However, Statistics Norway will not be able to produce these figures until December, which means two months too late according to the time limit given in the Regulation. Given the actual time of data- reporting also from other countries, this could still be judged as acceptable.

5.3.2 Preliminary figures based on partial editing and other information

By picking out certain local KAUs for prioritised manual editing, run the rest through automatic editing and then manually editing a random sample of the local KAUs not prioritised, we have a good basis for estimating the total figures. When the sample of local KAUs for further editing is selected at random, one may assume that the local KAUs that are not edited have errors similar to the local KAUs that were edited.

Let

Y_i = edited value of the analysis variable for unit i
Y_i' = automatically edited or original value of the analysis variable
s_0 = local KAUs edited according to prioritising 1 - 3 in chapter 5.2
s_1 = sample edited
s_2 = sample not edited

Estimate for completed edited total, $t = \sum_{i \in s_0} Y_i + \sum_{i \in s_1} Y_i + \sum_{i \in s_2} Y_i$, can then be estimated by:

$$\hat{t} = \sum_{i \in s_0} Y_i + \sum_{i \in s_1} Y_i + \frac{\sum_{i \in s_1} Y_i}{\sum_{i \in s_1} Y_i'} \sum_{i \in s_2} Y_i'$$

Simulation – example
From our sample of 1,598 local KAUs we put aside 176 local KAUs that are edited according to prioritising 1 to 3. From the remaining ones about half of the MS forms (after automatic editing) are randomly put aside for further editing. We use the formula above, put in edited value for the analysis variables for the half of the units that were supposed to be edited and estimate the edited total.

The results of two simple simulations are shown in table 5.3.2-1.

Table 5.3.2-1 Simulation of partly editing –- a random half is edited

		Total edited	Automatic and manual priority 1 editing	Estimated total - simulation no. 1	Estimated total - simulation no.2
Number of KAUs not edited		**1,598**	**78**	**176 + 719 = 895**	**176 + 690 = 866**
Variable					
V291 - Total income		101,513,333	101,329,438	101,363,701	101,439,277
V210	sales- self-produced	91,215,593	86,745,632	88,395,292	93,500,557
V220	sales- commercial goods	4,988,881	4,555,609	5,207,356	5,270,192
V230	repair work	2,680,299	2,840,366	2,881,389	2,901,146
V240	contract work	2,081,032	1,209,753	2,054,696	2,076,311
V250	other sales income	670,025	2,212,492	504,479	482,450
V391 - Total production costs		55,848,864	55,966,414	55,709,053	56,017,348
V310	raw material, semi-manufacture	47,084,772	48,019,702	47,262,411	47,385,597
V312	packaging	1,038,770	1,097,222	1,086,276	1,112,607
V314	costs, commercial goods	3,708,977	2,978,348	3,797,015	3,941,298
V316	contract work	4,016,356	3,528,284	3,462,008	3,845,311
V150 - persons employed		70,940	71,176	70,832	71,078
V110	employees	70,906	70,624	70,820	70,786
V120	owners	34	87	31	39
V170	part-time	6,848	6,260	6,761	7,029
V180	man-hours worked	114,917,847	112,085,987	114,165,270	115,557,763
V590_a - Investments		4,871,514	4,741,646	5,067,416	5,041,852
V510_a	machinery, equipment	3,072,466	2,936,802	2,990,447	3,139,188
V520_a	cars, transport means	218,429	198,720	210,117	224,212
V530_a	build., welfare facilities	71,030	141,259	272,812	55,697
V540_a	production buildings	966,796	1,015,196	1,082,427	1,023,797
V550_a	production structures	486,930	430,929	538,270	606,605
V560_a	land	56,342	58,957	47,845	53,297
V595_a	carried out by own employees	61,413	110,724	55,337	85,187

A comparison of the columns with "Estimated total"s and "Automatic and manual priority1 editing" against "Total edited" (where all 1,598 KAUs are edited) shows for most of the items that simulating manual editing for half of the KAUs instead of editing only the KAUs with priority 1, improves the estimates. Poorer estimates are in evidence for some items. These items were not considered too important during automatic editing. There are therefore gross errors here, which lead to great uncertainty. Better prioritising or better automatic routines may improve these estimates.

Table 5.3.2-2 shows the result of 60 simulations, average, standard deviation, coefficient of variation, minimum and maximum of estimated value.

Table 5.3.2-2 Simulation of partly editing – 60 repeated attempts.

Variable	Mean	Std Dev	Coeff of Variation	Minimum	Maximum
v291	**101,517,088**	**162,006**	**0.16**	**101,167,198**	**101,948,959**
v210	91,387,122	2,459,054	2.69	87,212,875	96,045,162
v220	4,940,030	250,785	5.08	4,367,605	5,363,137
v230	2,733,783	366,124	13.39	2,112,356	3,673,679
v240	2,053,140	237,313	11.56	1,542,369	2,992,692
v250	656,209	151,328	23.06	386,917	1,080,996
v391	**55,882,565**	**227,671**	**0.41**	**55,475,965**	**56,338,904**
v310	47,125,860	507,581	1.08	46,120,016	48,121,375
v312	1,062,178	76,735	7.22	932,924	1,186,801
v314	3,655,224	188,661	5.16	3,272,586	3,959,007
v316	4,084,126	438,936	10.75	3,287,520	5,083,230
v110	70,886	237	0.33	70,424	71,493
v120	34	5	16.82	20	47
v150	**70,946**	**161**	**0.23**	**70,620**	**71,295**
v170	6,871	171	2.49	6,523	7,259
v180	114,857,408	1,144,754	1.00	112,176,078	117,875,473
v590_a	**4,884,740**	**140,147**	**2.87**	**4,583,620**	**5,128,240**
v510_a	3,074,337	90,160	2.93	2,900,153	3,227,294
v520_a	219,277	10,930	4.98	199,673	245,300
v530_a	172,683	164,567	95.30	17,764	710,353
v540_a	990,569	80,707	8.15	834,475	1,104,076
v550_a	494,598	70,077	14.17	357,179	642,581
v560_a	50,609	2,867	5.67	42,523	56,844
v595_a	60,682	19,744	32.54	27,672	120,524

The coefficient of variation is really low for the main variables sum income, sum cost, employed/employees and sum investments, but somewhat higher for more detailed entries. This is natural because the main entries were given special attention during automatic editing and priority during manual editing.

5.3.3 Preliminary figures - plans ahead

Analyses in previous chapters have showed that automatic editing may give good results for local KAUs in single KAU enterprises. The procedure for automatic editing will be developed further, including as much as possible register information (turnover, employment, RCA-account figures), other statistics (short-term) and editing rules that are used in manual editing. We intend to produce preliminary figures for the 2000 Manufacturing Statistics from automatically edited questionnaires for single KAU enterprises, where about half of them then are manually edited, and manual edited questionnaires from all multi-KAU enterprises.

In order to get better estimates with smaller variation we have plans for automatic outlier detection in the estimation procedure. Influential observations will be identified and given weight equal 1. Then scatter plots of items that are important in the estimation method will ensure a quick manual check of other observations. This procedure will be interpreted already from the 1999 Manufacturing Statistics.

For producing preliminary figures for the whole population, we use the same methods of estimation as we use for making final figures (using RCA-figures, turnover and employment figures) for the local KAUs not included in the sample. The estimation method is described in chapter 3.3.

5.4 Collection of questionnaires

5.4.1 In general

The questionnaires for manufacturing statistics are produced in Oracle Reports, which means there is a possibility for printing the KAU's characteristics directly onto the questionnaire. The questionnaires are written for each enterprise so that all the KAUs that belong to an enterprise are written in succession, even if the enterprises may require three different types of questionnaires. The information on the questionnaire is collected from the data base information that exists in the Central Register for Establishments and Enterprises in Statistics Norway.

5.4.2 Reminders/When the questionnaires are received

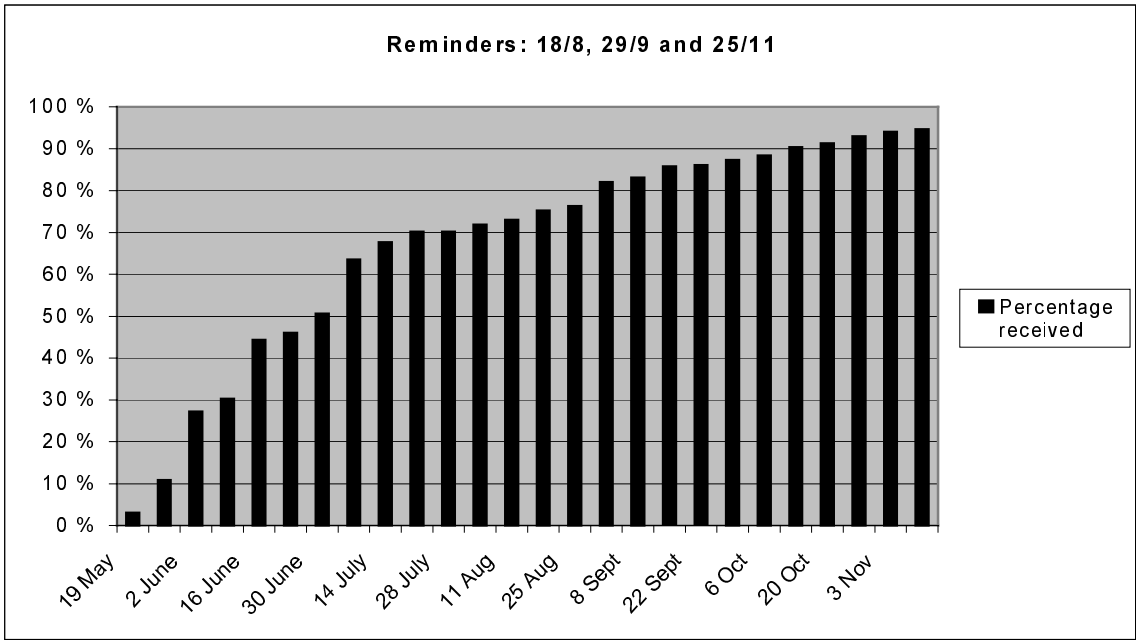
When the questionnaires from the enterprises get to Statistics Norway they are registered and checks are made on possible missing information and if all the questionnaire are received. We also check if the standard industry form is enclosed. If anything is missing a letter is sent to the enterprises notifying them about the missing information. This improves the situation considerably.

The fact that an enterprise is registered does not necessarily mean that nothing is missing. We have, however, chosen to just look at the first delivery. In the future it may be of interest to extend the analysis to also include the last delivery from the enterprise. Most of the enterprises deliver correctly the first time, so the analysis gives a reasonably good picture of how the questionnaires are delivered.

After the questionnaires are registered they are read optically. The ones that for one reason or another cannot be read optically (illegible writing etc.) are punched manually.

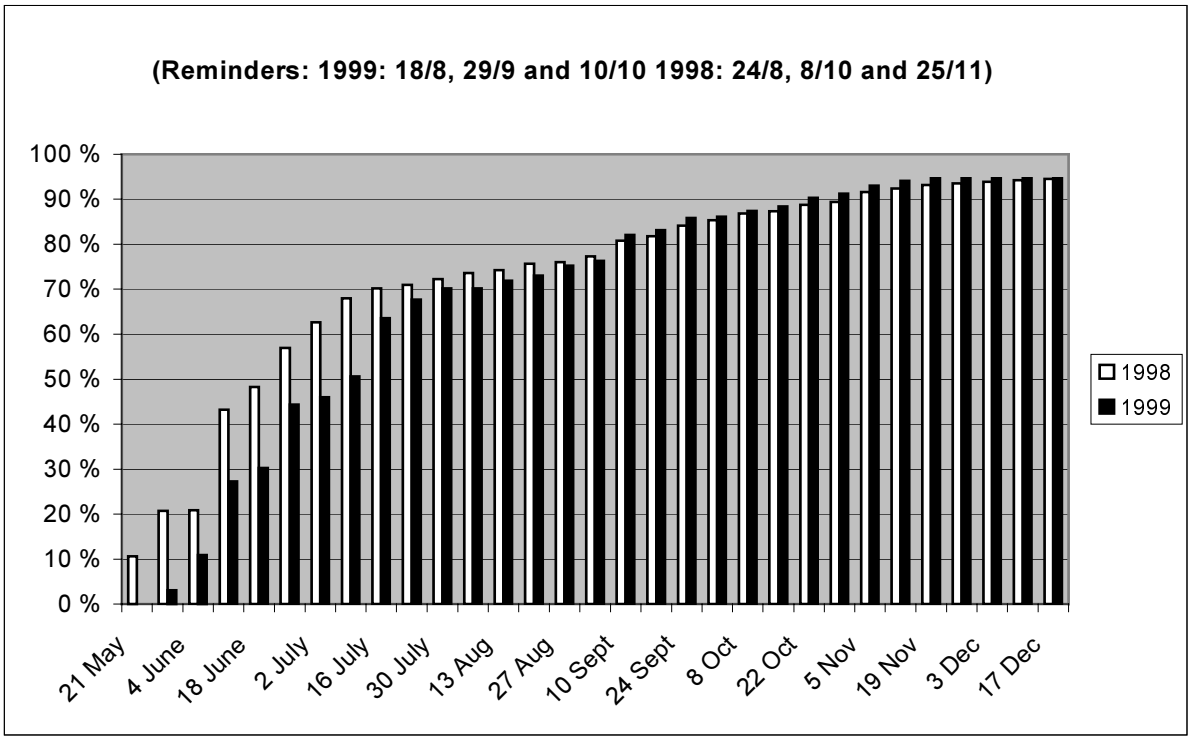
In Figure 5.4.2-1 we have looked at when the individual enterprise has been registered for the 1999 statistics. The deadline was June 15 and from the figure we see that within two weeks after the deadline 48 per cent of the questionnaires were registered. The general holiday in Norway is from about 10 July to 11 August, which is reflected in the figure by relatively little change during this time.

Figure 5.4.2-1 Share of forms received distributed by weeks



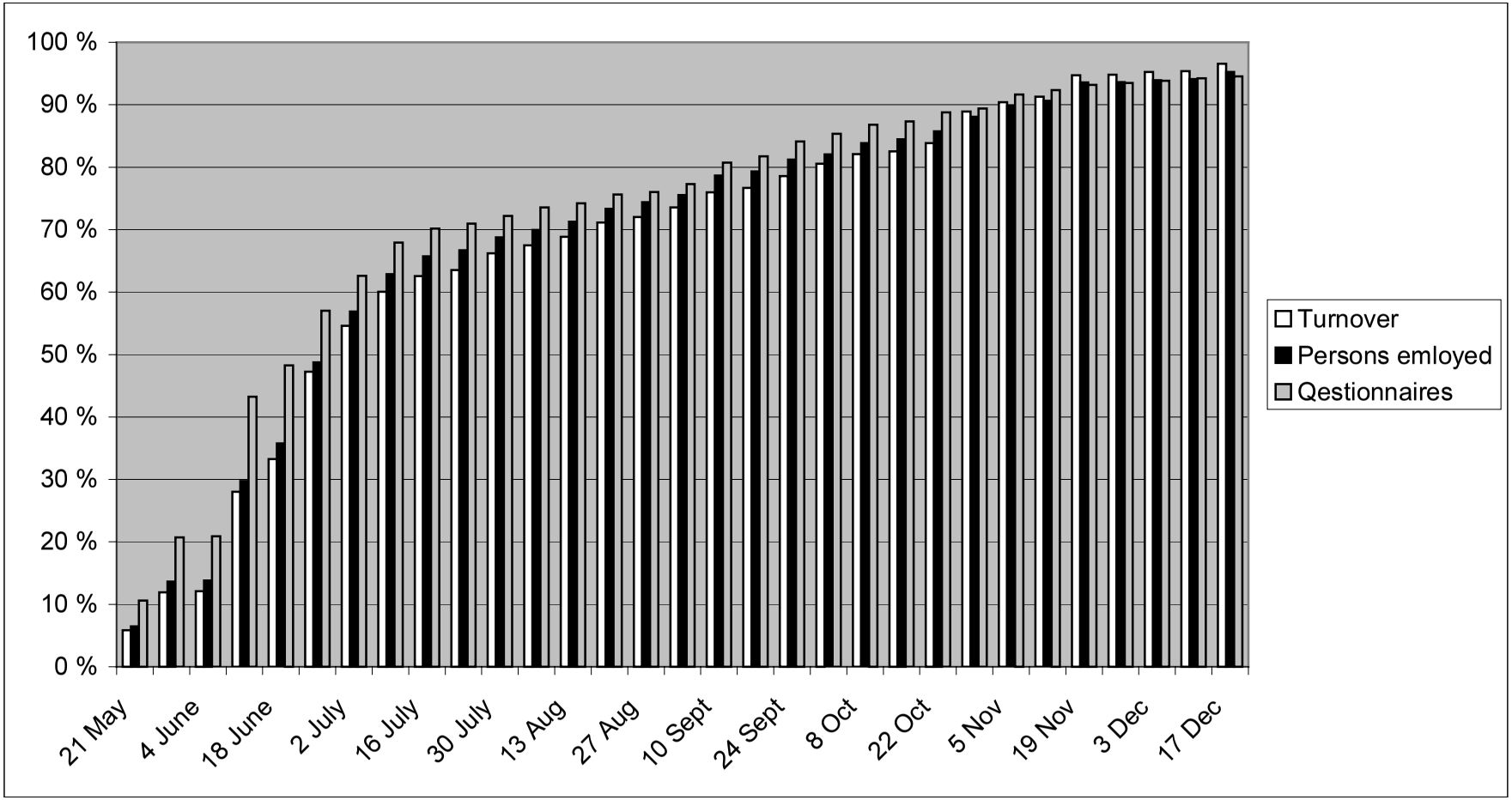
In Figure 5.4.2-2 we examine how the questionnaires for the 1999 statistics have been received compared with the 1998 statistics. The 1999 statistics were about two weeks delayed both for sending and deadline. The deadline for handing in the questionnaires was 15 June and 31 May. The reminders have deliberately been adjusted a couple of weeks in relation to the deadline, something that – in spite of a late dispatch – may have resulted in the fact that we passed the previous year's level on received questionnaires three weeks after the reminder.

Figure 5.4.2-2 Share of forms received distributed by weeks in 1998 and 1999



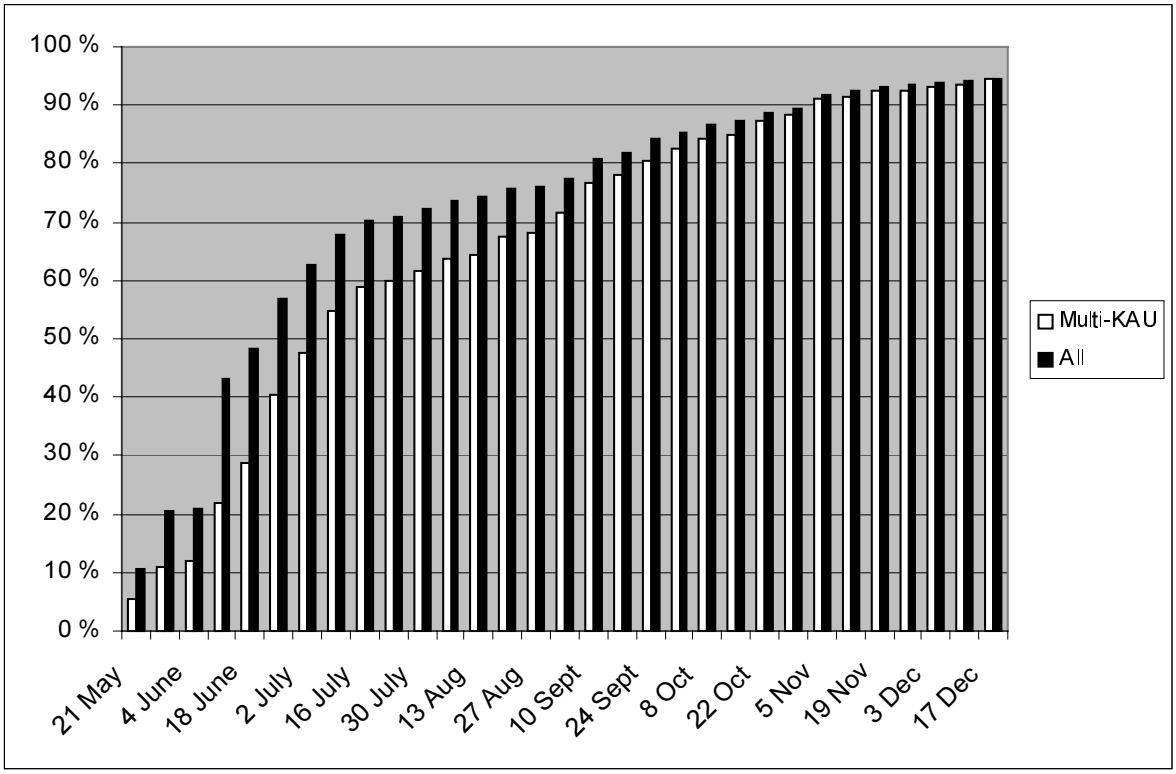
We also find it interesting to take a look at the size of the enterprises measured in turnover or employment. We have tried to demonstrate that by presenting the share of employment and turnover registered – together with the share of questionnaires received. If there is a tendency to receive large enterprises too late, this will show up by share of questionnaires being somewhat higher than the share of turnover/employment. In Figure 5.4.2-3 we can see that there is a relatively large share of small enterprises responding early. There is also a tendency for enterprises with lower turnover per employed person to deliver earlier than an enterprise with a higher turnover per employed person. We can see this by observing that the column for employment more quickly catches up with the column for share of questionnaires. As early as six weeks after the deadline everything has evened out, something that makes one believe that no special measures need to be taken as far as the large enterprises are concerned. A possible extension of the analysis would be to take a look at different size groups such as have been done by Trijssenaar 2000 at Netherlands' Official Statistics.

Figure 5.4.2-3 Share of questionnaires, turnover and employment registered distributed by week



Finally we have chosen to look for differences in time for registering single KAU enterprises and multi-KAU ones. This is particularly interesting in relation to producing preliminary figures early. The multi-KAUs have a more complicated enterprise structure, and we do not have satisfying data for these on a KAU level. We are therefore dependent on having some central accounting figures distributed on the individual KAUs. In Figure 5.4.2-4 we see the same pattern as we saw for turnover and employment in figure 5.4.2-3. There is a delay in the early stages for larger companies registered. The difference evens out after some time, and thereafter the multi-KAU enterprises do not stand out any longer. It may be useful to follow up the collection of the questionnaires from multi-KAU enterprises more thoroughly, as we are more dependent on figures from these enterprises than the single KAU enterprises for the production of good preliminary figures.

Figure 5.4.2-4 Share of questionnaires, Single KAU and Multi-KAU enterprises registered distributed by week



5.4.3 Electronic reporting

Statistics Norway (SN) is cooperating with the Directorate of Taxes and the National Registers in Brønnøysund in regard to electronic reporting. The project as far as SN is concerned consists of two main parts: Reporting information on the questionnaires to SN and the collection of accounting information that can be found in the Standard Industry Form. The latter is collected as a file from the enterprises' own systems. In addition work is being done on collecting reports electronically through the WWW. It is quite advantageous to work together with others in order to find a good solution for the respondents, since all to a great degree require similar information. In addition it would be a great help for the respondents that they could report on the different questionnaires to the different institutions using the same data programme. One of the most important purposes with the project is after all to lessen the burden for the individual enterprise.

An external company was given the task to develop a solution for the respondents –a solution with focus on the three parties concerned. The system is simple enough for SN to produce a dispatch with the questionnaires that the enterprise is to fill in (one for each Local KAU in the enterprise), and to send electronic mail to the individual respondent. SN has in advance filled in the characteristics that apply to the individual respondent. The respondent loads this in to his own computer programme (using a function key), and is then immediately ready to fill in the questionnaires for the KAUs. When the respondent has filled in the questionnaire, they are sent to SN electronically.

5.5 The database for editing

The database for editing is an Oracle database that is built up of different sections. There is one window for each of the sections in the database that can be opened. During the editing process the Division for Energy and Industrial Production Statistics have one database section for the Standard Industry Form with different automatic controls, one section for the Central Register of Establishments and Enterprises and one section for the data from the questionnaires with various automatic controls. In addition to the database, each editor has got access to PDF-files of the annual reports from most of the enterprises in the sample.

From the editing of the 1999 Manufacturing statistics on, the division, working together with the IT-Office, has begun the work adjusting the database to get better control of the editing process and making it possible for the editors to edit the manufacturing statistics without use of paper in the editing process. In the new database for editing, the images of the scanned questionnaires are linked to the organisation numbers of the local KAUs, subsequently This way the editors can see an image of the questionnaire, as they are editing the local KAU.

Statistics Norway is developing the database further, so that the editors can see data from different short-term statistics and the production statistics (PRODCOM), that are linked to the manufacturing statistics. The database will be finished at the start of the editing of 2000 Manufacturing statistics.

The division expects that more and more of the Standard Industry Form will be reported electronically in the project described in chapter 5.4.3. As the data arrive, they may be loaded directly into the database. Together with the optically read and punched in data from the questionnaires (with images), it makes it possible for the editors to check the data electronically. The advantage is that it easens to direct which questionnaires should be edited first. At the division the editing of multi-KAU enterprises, large single KAU enterprises and enterprises and local KAUs with the largest differences between the data from the questionnaires/the Standard Industry Form and other sources – like short-term statistics – will be prioritised.

6 Quality measures/Quality report

6.1 Introduction

This chapter on quality of the manufacturing statistics is based on the criteria for evaluation of quality of structural business statistics given in the Commission Regulation No 1618/1999 and also partly based on the ONS/SCB-report on "Assessment of Quality in Statistics" (Doc.Eurostat/Supcom97/lot6/99/ Final Report/).

6.2 Accuracy

Errors may and do occur in many steps of the data-capture process. Typical sources for errors are filling in forms incorrectly, registration errors, optical reading errors and editing errors. Other errors originate in the registers, different principles for accounting and possibly different interpretation of terms. Many errors and inconsistencies are discovered and corrected through a thorough editing process and through manual and machine checks.

Since data from most of the establishments with less than ten employees are estimated, there is bound to be more uncertainties connected to these data. The uncertainties will vary for the different variables because some of the variables are better covered in registers, e.g. employment and certain accounting variables.

6.2.1 Sampling error

In the manufacturing statistics a cut-off sampling procedure is used, and hence probability sampling is *not* utilised. Therefore design variances for the estimators can not be calculated, and a model has been applied for calculating the coefficients of variance.

6.2.1.1 Variables

Coefficients of variance are not estimated for variables covered completely by registers, but the following variables were register variables with complete coverage:

- number of enterprises
- number of local kind of activity units
- turnover
- number of employees

Model estimations of the coefficients of variation were done for the following variables:

- Value added
- Gross investments
- Personnel costs
- Wages and salaries

6.2.1.2 The model

Let $t^k = \sum_i y_i^k$ be the population total of variable *k*; *k* = (value added, gross investments, personnel costs, wages and salaries). The population total, t^k, is estimated by $\hat{t}^k$ as described in chapter 3.3.

The variance of the estimated population total, $\hat{t}^k$, is estimated by a ratio model:

$$y_i^k = \beta^k x_i + \varepsilon_i^k \quad ; \qquad Var(\varepsilon_i^k) = \sigma_k^2 x_i$$

where turnover is used as auxiliary variable x_i for all variables *k*.

Subsequently

$$\hat{Var}(\hat{t}^k - t^k) = \frac{\sum_U x_i \sum_{U-s} x_i}{\sum_s x_i} \hat{\sigma}_k^2$$

where σ_k^2 is estimated by:

$$\hat{\sigma}_k^2 = \frac{1}{n-1} \sum_s \frac{(y_i^k - \hat{y}_i^k)^2}{x_i^k}$$

for all variables *k,* independent of both the model and the auxiliary variable utilised in estimating $\hat{t}_k$.

Hence, the coefficient of variation is:

$$C\hat{V}(\hat{t}_k) = 100 \frac{\sqrt{Var(\hat{t}_k - t_k)}}{\hat{t}_k}$$

6.2.1.3 Coefficients of variation

The coefficients of variation based on model estimations by 3-digit NACE are given in table 6.2.1-1. Further information on uncertainty by the number of local KAUs in the population, the number of local KAUs in the sample and the number of local KAUs used in the basis for estimation of $\hat{y}_i^k$ and the coverage ratio (sample turnover of total turnover) is also given in table 6.2.1-1.

Table 6.2.1-1 Coefficients of variation

NACE3	Number of local KAUs			Coverage ratio	Coefficient of variation (per cent)			
	Popu-lation	Sam-ple	Estim. basis	Turn-over	Value added	Personnel cost	Gross investments	Wages
101	1	1	.	100.0	0.0	0.0	0.0	0.0
103	15	3	3	9.4	1.9	108.2	.	110.0
131	3	2	1	98.9	0.0	0.0	0.0	0.1
132	8	5	3	99.7	1.0	0.2	3.7	0.6
141	133	34	28	75.1	22.2	1.2	21.7	1.3
142	478	77	74	63.2	3.0	1.1	13.5	1.2
143	18	8	6	97.3	1.2	2.3	7.5	2.5
145	22	9	8	95.3	2.8	0.8	4.7	0.9
151	333	164	156	95.9	2.1	0.2	4.0	0.2
152	670	304	298	89.7	1.8	0.3	5.0	0.3
153	71	28	27	92.4	1.4	0.7	9.8	0.9
154	29	10	10	94.7	8.2	0.9	2.7	1.0
155	136	121	87	97.3	2.3	0.2	2.4	0.2
156	91	30	29	73.7	6.1	1.3	14.7	1.7
157	150	81	56	93.6	13.6	0.9	4.0	1.0
158	816	245	232	92.1	0.9	0.5	2.5	0.5
159	86	51	32	98.9	0.6	0.6	0.9	0.5
160	10	10	.	100.0	0.0	0.0	0.0	0.0
171	13	6	3	98.7	0.4	0.0	11.3	0.1
172	70	9	9	94.7	3.7	0.1	10.5	0.2
173	46	5	5	59.3	10.0	2.0	38.0	2.2
174	355	35	30	72.5	5.3	1.0	18.8	1.0
175	230	51	49	82.6	3.2	0.7	28.0	0.8
176	22	6	6	93.9	3.3	0.6	14.2	1.1
177	125	12	12	80.9	1.2	0.8	14.8	0.4
181	23	3	3	77.4	2.5	0.0	49.2	1.2
182	563	53	49	82.3	3.1	0.9	11.7	0.9
183	43	3	3	46.7	4.6	11.4	40.7	10.9
191	14	2	2	97.9	0.4	0.0	33.9	0.2
192	53	2	2	26.1	0.9	0.0	0.0	0.7
193	46	10	8	83.8	6.1	0.7	15.4	0.6
201	843	125	123	83.9	2.3	0.4	8.6	0.4
202	40	19	19	91.8	4.0	0.8	5.6	0.8
203	926	182	157	77.0	1.3	0.3	9.7	0.3
204	108	11	11	59.2	15.5	2.9	96.9	3.0
205	404	9	8	39.0	6.8	1.7	45.4	1.9
211	49	35	25	99.8	0.2	0.1	1.1	0.1
212	114	56	46	93.9	1.9	0.4	4.6	0.4
221	1,654	403	230	88.0	0.7	1.3	4.9	1.5
222	2,102	273	263	66.6	1.2	1.2	10.7	1.3
223	155	4	3	25.6	6.7	0.0	0.0	2.5
231	3	.	.	.	.	.	.	.
232	19	7	5	99.8	1.4	0.1	2.3	0.1
241	109	73	62	96.5	1.3	0.3	3.2	0.5
242	4	.	.	.	.	.	.	.

NACE3	Number of local KAUs			Coverage ratio	Coefficient of variation (per cent)			
	Popu-lation	Sam-ple	Estim. basis	Turn-over	Value added	Personnel cost	Gross investments	Wages
243	54	22	17	96.5	1.8	0.4	11.9	0.3
244	40	22	18	97.9	1.9	0.8	3.7	0.8
245	67	10	10	90.2	2.5	1.4	13.1	1.6
246	54	25	16	94.7	2.3	0.9	17.5	1.1
251	82	18	17	61.6	3.9	2.0	30.7	2.1
252	416	146	138	87.7	1.0	0.3	7.1	0.4
261	116	38	35	93.9	1.7	0.2	11.2	0.3
262	243	7	7	85.6	2.9	1.1	26.9	1.2
263	1	.	.	.	.	.	.	.
264	3	1	1	97.9	0.0	0.0	0.0	0.3
265	45	40	5	98.9	0.5	0.7	0.0	0.7
266	403	161	145	77.9	1.6	0.4	10.5	0.6
267	188	22	18	49.6	9.3	3.1	48.3	3.0
268	118	111	80	99.2	0.6	0.1	2.1	0.1
271	37	9	7	98.8	1.0	0.3	3.5	0.4
272	51	15	14	68.6	9.2	1.1	21.8	2.7
273	21	14	12	98.7	0.9	0.2	4.0	0.3
274	42	28	25	99.9	0.2	0.1	2.0	0.1
275	55	18	10	91.8	0.4	0.1	11.3	0.2
281	518	214	194	85.9	1.2	0.2	7.5	0.3
282	36	13	12	64.9	54.6	0.5	16.9	1.0
283	6	5	3	98.3	2.6	0.3	16.8	0.4
284	24	6	6	86.3	3.6	0.3	23.8	0.7
285	1,010	61	61	61.8	2.1	0.2	25.7	0.5
286	176	36	31	84.6	2.0	0.1	21.0	0.2
287	537	121	111	86.2	1.9	0.3	6.1	0.4
291	249	60	57	92.7	2.0	0.5	11.7	0.6
292	1,042	205	170	79.9	2.0	0.4	7.9	0.6
293	586	30	30	69.7	3.0	0.9	16.4	1.1
294	98	13	13	70.6	3.4	0.3	33.0	0.8
295	503	88	87	82.9	6.5	0.4	8.7	0.5
296	35	6	5	99.1	2.3	0.4	2.9	0.3
297	60	15	12	93.8	1.0	0.3	8.9	0.4
300	57	4	4	91.3	13.8	0.0	13.6	1.0
311	85	32	28	96.0	2.6	0.6	2.8	0.6
312	101	44	41	92.7	1.5	0.6	5.9	0.6
313	20	12	11	97.6	1.8	0.8	6.8	1.5
314	6	1	1	83.4	0.0	0.0	.	0.8
315	75	21	15	87.7	3.5	0.8	28.3	0.6
316	278	42	32	71.2	5.8	1.1	22.2	1.4
321	63	19	19	94.0	1.8	0.3	8.0	0.5
322	25	10	10	99.3	1.8	0.7	3.4	0.6
323	66	9	9	92.2	2.8	1.0	17.4	1.3
331	375	40	39	69.8	1.9	1.6	39.0	1.6
332	119	35	31	81.3	5.3	2.1	28.8	1.9
333	28	8	6	86.2	1.3	1.1	7.2	1.2
334	12	2	2	85.7	1.6	1.3	38.5	2.4
335	2	.	.	.	.	.	.	.

NACE3	Number of local KAUs			Coverage ratio	Coefficient of variation (per cent)			
	Popu-lation	Sam-ple	Estim. basis	Turn-over	Value added	Personnel cost	Gross investments	Wages
341	6	2	2	99.0	1.0	0.0	15.5	0.1
342	64	26	26	86.0	1.0	0.6	13.8	0.7
343	63	36	34	98.6	0.8	0.1	3.6	0.2
351	1,058	290	281	96.5	1.3	0.2	5.6	0.3
352	5	3	3	86.9	19.8	0.0	17.3	1.1
353	24	4	4	96.1	4.0	0.3	6.5	0.4
354	21	5	5	85.6	1.2	1.0	10.4	1.1
355	11	3	.	99.1	.	.	.	.
361	1,233	244	203	90.0	1.1	0.2	4.4	0.2
362	256	24	23	78.3	3.3	14.4	33.8	15.0
363	34	1	1	33.8	0.0	0.0	0.0	0.9
364	60	14	12	95.6	2.4	0.5	6.9	0.5
365	38	1	1	10.4	0.0	0.0	0.0	0.1
366	320	20	17	62.2	6.9	3.0	21.6	3.1
371	78	12	11	78.0	10.7	1.5	16.7	1.4
372	62	6	6	46.2	19.9	1.8	29.0	2.0

6.2.1.4 Comments on the coefficients

Generally, the coefficients of variation are higher when the variation in the sample is high, but decrease when the coverage rate increases.

When the sample covers the whole population the coefficient of variation is 0. For industry groups where the number of local KAUs used for estimation is low, the estimated coefficients of variation are consequently uncertain. In these situations, where the sample is small and without variation, the coefficient may turn out to be 0, which was the case in e.g. industry group 36.3 where there was only one local KAU in the sample and in the basis for estimation.

Relatively large variations within an industry group or few local KAUs in a sub-sample or weaknesses of the model (e.g. as a result of outliers) result in large coefficients of variation for the variables.

By studying the coefficients of variation for the four variables, we found first of all that the variation in personnel costs and wages and salaries was correlated, which is quite natural since wages and salaries is the main part of personnel costs. Furthermore, the coefficients of variation were extremely low for personnel costs for all the industry groups, except for three. For two of the three groups (10.3 and 18.3) the low coverage ratio indicated rather uncertain estimates of the variation coefficient, but for 36.5 either outliers or genuine large variation in the sample explain the relatively high coefficient of 14.4.

The main reason for the low variation in personnel costs is that the wages are stable and not so much affected by short-term fluctuations. The wages are also mainly set as a result of a central bargaining process, which regulates the wages and salaries within, among other sectors, the manufacturing industries.

Secondly, the variation coefficients for value added were fairly low, but they varied more than personnel costs, also for industries with rather high coverage ratios. This indicated that the real variation in this variable was larger compared with the personnel costs, and the main reason for this is that income and costs fluctuate more than personnel costs from one local KAU to another.

Finally, the largest coefficients were observed for investments, and they also varied a lot between the industries. Huge investment decisions are not made each year in each local KAU. Unlike wages or value added, investments are a more discontinuous variable regarding value, which can be zero or very low for several years, until an investment decision is made, e.g. building a new plant. The investment variable was also the variable which had the weakest correlation with the register variables turnover and employment, resulting in poorer estimations for non-sample local KAUs, and hence, larger deviations in the estimated correlation coefficients.

However, the general impression is that the coefficients of variance varied rather little between industries and were fairly low, with some exceptions concerning investments. Information on the variation coefficients can and will be used in an evaluation of the sampling plan. A main feature of the table on coefficients was that low coverage ratios and few units were correlated with relatively high values of the coefficients. This indicates that for some groups we should consider increasing the number of units in the sample, while for others we could increase the threshold without any substantial decrease in quality of the data concerning variation. We also have to bear in mind that the manufacturing database is also widely used as a micro database for detailed studies concerning industry (5-digit SN, the national NACE) and regions (at the municipality level).

6.2.2 Non-sampling error

6.2.2.1 Frame errors

Frame errors are indicated by changes in the population during the data editing process, described in chapter 4.1.

6.2.2.2 Measurement errors

Regarding the reporting year, the vast majority of the enterprises report for the calendar year. But a few enterprises report accounting data based on the business year, ending in different months. In the table below more than 100 000 enterprises are classified by the final month of their business year. The data are based on the official accounts for all joint-stock companies in Norway in 1996, and not only the manufacturing ones. However, since the number of enterprises not finalising their accounts in December is rather small, we can assume that the measurement error, in general, as a result of different reporting periods, is of minor significance. The distribution of enterprises on the end-year date for their reporting periods was quite similar and more or less unchanged from 1995 to 1996, which were the two years with available data.

Table 6.2.2-1 Number and proportion of enterprises by the final month of their business year

	Total	Jan.-March	April-June	July-Sept.	Oct.-Nov.	December
Number of enterprises	106,256	116	327	308	55	105,450
Proportion of enterprises	100.00	0.11	0.31	0.29	0.05	99.24

Different principles of accounting were important sources concerning measurement errors, and especially among the smaller enterprises, for which the legislation is less restrictive. Other errors, which repeatedly were discovered were net registration, e.g. that income was registered as cost reduction.

6.2.2.3 Processing errors

The effect of data editing on "thousand-errors" or "comma-errors" is described in chapter 4.

6.2.2.4 Non-response errors

6.2.2.4.1 Unit non-response

The unit non-response ratio was 5.5 per cent for the 1998 statistics, and just above 200 enterprises out of 3705 in the sample did not return the questionnaires after several reminders. Around half of these 200 non-respondents were fined, but the rest had other "valid" reasons for not replying.

Although the total non-response ratio was fairly low, the response ratios for some of the NACE groups were considerable, with 40 per cent for 232 as the highest (see Table 6.2.2-2 Unit non-response). However, for the large non-responding units, alternative data sources are used, such as accounting data (Register of Company Accounts or Standard Industry Form) and other surveys.

Table 6.2.2-2 Unit non-response

NACE3	Response Enterprises	Sample 1998 Enterprises	Non-response Per cent
All	**3501**	**3705**	**5.51**
101	1	1	0.00
131	3	3	0.00
132	4	4	0.00
141	17	18	5.56
142	30	30	0.00
143	5	5	0.00
145	5	5	0.00
151	120	126	4.76
152	263	283	7.07
153	15	17	11.76
154	5	5	0.00
155	18	19	5.26
156	8	8	0.00
157	25	27	7.41
158	194	208	6.73
159	20	20	0.00
160	2	2	0.00
171	5	5	0.00
172	9	9	0.00
173	5	5	0.00
174	24	26	7.69
175	43	44	2.27
176	5	5	0.00
177	10	11	9.09
181	3	3	0.00
182	45	46	2.17
183	3	3	0.00
191	2	2	0.00
192	3	3	0.00
193	8	8	0.00
201	95	100	5.00
202	13	15	13.33
203	150	155	3.23
204	10	10	0.00

NACE3	Response Enterprises	Sample 1998 Enterprises	Non-response Per cent
205	8	9	1.11
211	21	21	0.00
212	34	35	2.86
221	203	218	6.88
222	233	248	6.05
223	3	3	0.00
232	3	5	40.00
241	30	34	11.76
243	15	15	0.00
244	11	11	0.00
245	8	8	0.00
246	12	13	7.69
251	14	15	6.67
252	105	109	3.67
261	23	24	4.17
262	6	6	0.00
265	3	3	0.00
266	82	83	1.20
267	11	11	0.00
268	10	12	16.67
271	7	7	0.00
272	11	11	0.00
273	11	11	0.00
274	18	18	0.00
275	16	17	5.88
281	185	192	3.65
282	10	10	0.00
283	3	3	0.00
284	5	6	16.67
285	58	64	9.38
286	27	30	10.00
287	103	106	2.83
291	52	54	3.70
292	138	145	4.83
293	13	13	0.00
294	13	13	0.00
295	70	74	5.41
296	6	7	14.29
297	11	11	0.00
300	4	4	0.00
311	16	18	11.11
312	37	39	5.13
313	6	6	0.00
314	1	1	0.00
315	12	14	14.29
316	28	32	12.50
321	15	19	21.05
322	5	6	16.67
323	8	8	0.00
331	25	27	7.41

NACE3	Response Enterprises	Sample 1998 Enterprises	Non-response Per cent
332	28	31	9.68
333	5	6	16.67
334	2	2	0.00
341	3	3	0.00
342	25	26	3.85
343	28	32	12.50
351	236	252	6.35
352	2	3	33.33
353	3	3	0.00
354	3	4	25.00
355	3	3	0.00
361	189	199	5.03
362	18	19	5.26
363	1	1	0.00
364	13	13	0.00
365	1	1	0.00
366	15	16	6.25
371	6	7	14.29
372	3	4	25.00

6.2.2.4.2 Item non-response

Item non-response is a very difficult concept to measure, partly because of the registration procedures. If questionnaires are returned without having been filled in, they are not accepted and sent back to the respondents. Deciding whether a questionnaire is accepted as filled in or not is also a question for discussion.

Furthermore, most of the questionnaires are optically read, but the ones that can not be read this way are registered manually. For these we have no data on the changes made in the editing phase.

Since there are some pre-checks of the questionnaires and some questionnaires are manually registered, it is a bit difficult to give the number or ratio of non-response items. Having in mind these weaknesses, the item non-response ratios for the NACE groups are fairly low. For the main variables, employees, production on own account and investments the total percentage is lower than 0.5 per cent. Most of the ratios are zero, and for employees the highest ratio was 5.5 per cent non-response. Regarding production and investment, the highest ratios were respectively 16.7 and 15 per cent non-response. A preliminary conclusion is that if questionnaires are accepted, the main variables are filled in, though they often are changed during the editing process.

6.3 Timeliness

The schedule for the 1998 manufacturing statistics is sketched out in Table 6.3.1-1.

Table 6.3.1-1 Timetable manufacturing statistics 1998

Activity	Date	Year
Sampling	26 April	1999
Mailing	7 May	1999
Deadline	31 May	1999
1. Reminder	24 August	1999
2. Reminder	8 October	1999
3. Reminder	25 November	1999
Editing-start	1 November	1999
Editing-end	16 June	2000
Quality checks	23 June	2000
Estimations	7 July	2000
Publishing	13 July	2000
Data to Eurostat	1 November	2000
Final published	30 March	2001

1998 was not a particularly good year concerning timeliness for the statistics, primarily due to severe delays with our computer system. Especially the editing phase was delayed and prolonged. This has improved for the 1999 statistics, but other delays, partly as a result of new accounting legislation, have come up.

If we investigate the 1998 timetable more closely, we find out that the sample for the survey was drawn late April 1999, which was a bit late. On the other hand, most of the enterprises ought to have finished their accounts by the time they receive the questionnaires. Deadline for the respondents was 31 May, and a response rate of about 40 per cent was achieved by that date. The effect of the reminders are described in detail in chapter 5.4.2.

The editing did not start before the end of October 1999 due to problems with the computer system, and the editing was completed mid-June 2000. The editing phase was succeeded by a rather intense phase of quality checks, estimations and tabulations, preparing publishing of 1998 data on the 13 July 2000.

Main figures from the manufacturing statistics were published on the Internet, in the Daily Bulletin of Statistics, and early the following week a printed version was published in the Weekly Bulletin of Statistics.

However, several of the activities intertwine, and the phase of quality checks started before finishing the editing and continued after the first publishing of the main figures.

Data to international users (mainly Eurostat and the OECD) were transmitted rather late due to the above mentioned delays for the 1998 statistics. Internal users, i.e. within Statistics Norway, have direct access to the data files as soon as they are completed.

Finally, a whole range of tables, both local KAU and enterprise based ones, definitions and analyses, are published in the series NOS (Norwegian Official Statistics, Manufacturing Statistics). This publication is also available on the Internet.

6.4 Clarity and accessibility

In general, the Internet is the main channel for dissemination of statistics, and release of statistics always takes place on the Internet. The Internet release ensures that all users get access to the statistical releases simultaneously and implies a strict policy of non-differential treatment; ministries, the media and the public are all treated equally. To ensure that all users have equal access, all statistics made available on the web site may be used (read, copied, downloaded) free of charge. Statistics are released according to a release calendar that covers the next four months and is updated every month.

6.4.1 Publications and dissemination

The structural business statistics for manufacturing and mining and quarrying are disseminated both on the Internet and in printed editions.

The most important channels of publication are:
- Daily Bulletin of Statistics on the Internet and a weekly printed summary of the daily bulletins
- Official Statistics of Norway (NOS)
- Statistical Yearbook
- Regional statistics
- Other special publications, such as the Mining & Quarrying Statistics

Most of the publications, tables and documentation on manufacturing statistics are gathered on the site: http://www.ssb.no/emner/10/07/. This site also contains information and data on production and energy statistics. Other statistics concerning manufacturing, such as accounting statistics or production index, are also available on Statistics Norway's web site.

Main figures from the manufacturing statistics are published on the Internet, in the Daily Bulletin of Statistics, as soon as the editing and validation checks are finished, and values for the local KAUs outside the sample have been imputed.

The annual manufacturing statistics are first released on the Daily Bulletin of Statistics. In the first release, only rather aggregated data at 2-digit levels of NACE are published, and the focus is on main variables such as:

- Number of local KAUs
- Number of persons employed
- Compensation of employees
- Gross value of production
- Cost of production
- Value added
- Gross investments

From the moment the figures from the manufacturing statistics are published in the Daily Bulletin of Statistics, we start taking care of orders/producing tables for users that seek special reports. These users are mainly research officers, consultant firms, regional administrations, professional and industrial organisations and other external users that are paying for special reports. Commission statistics are partly published as special publications.

Approximately half a year later the publication Manufacturing Statistics is published in the series Official Statistics of Norway (NOS), where figures on the most detailed levels like subclasses, ownership, type of local KAU and size groups, are published. Detailed figures on regional level are

published as well. This publication may be bought from Statistics Norway, and is also published for free on the Internet.

Main figures for regions and municipalities are printed in the booklets Regional Statistics that are published by Statistics Norway. These are booklets for subscription, which very often are available for ordinary users at public libraries. Research organisations, region and municipality administrations are also important users of this information source. More detailed figures are produced on divisions for municipalities, than the figures presented in Regional Statistics. These figures can be bought directly from the Division for Energy and Industrial Production Statistic at Statistics Norway.

Figures from the manufacturing statistics are also published in other publications from Statistics Norway. Main figures from the statistics are presented in the Statistical Yearbook.

6.4.2 Results to respondents

On the questionnaires, there is a box where the respondents can indicate whether they would like to receive the main figures from the manufacturing statistics, that is – the short analysis and some main tables published in the Daily Bulletin. For 1998, the main figures were sent to one quarter of the respondents of the manufacturing statistics.

These reports are not customised in such a way that certain branch analyses are sent to the respondents in these specific branches. However, customised reports are sent to the respondents of the energy use statistics, which is a part of the manufacturing statistics system, but conducted as a separate survey. The respondents of the energy use survey receive a report that contains both an analysis of the branch and also information that serves as benchmarking against the other enterprises in the branch.

6.4.3 Users

For more information on users see chapter 3.1.1.

6.5 Comparability

6.5.1 Spatial comparability

In essence, Statistics Norway follows the recommendations and the definitions of variables laid down in Council Regulation no 58/97 concerning structural business statistics.

The Norwegian standard industrial classification (SIC94) is based on ISIC Rev. 3 and NACE Rev.1. The code system contains five digits, where the first four digits are identical to NACE rev. 1 and the fifth digit is a national subdivision.

6.5.2 Comparability over time

Statistics Norway's time series database on manufacturing statistics contains detailed data on micro-level, i.e. local KAU, for each year back to 1966. Comparability over time is a main concern whenever changes occur in e.g. industrial classifications, accounting principles, national and international obligations etc. However, always paying attention to the history hampers the flexibility concerning new or changed variables or the use of administrative data sources, but on the other hand each new comparable vintage of manufacturing statistics adds value to the database.

A rather large break came in 1993 when the activity classification was changed to, the NACE rev.1 comparable, SIC94. The previous industrial classification was based on the UN's ISIC Rev.2. Time series from 1966 to 1998 are available classified after ISIC Rev.2, but data based on NACE Rev. 1 are only available back to 1989. The manufacturing statistics were converted for 1989-1992 to correspond to SIC94/NACE rev.1, and we are going to continue this job for the annual data back to 1966.

Regarding enterprise data for manufacturing and mining and quarrying, these are comparable and available from 1996 on.

6.6 Coherence

Concerning the manufacturing sector, several different statistics measure some of the variables included in the manufacturing statistics, such as turnover, investments, stocks, production and others. A main objective with the manufacturing statistics is to measure the level of important structural variables in order to have figures for total manufacturing employment, number of enterprises, value added or investments, rather than focusing on changes from month to month based on relatively small samples. The manufacturing statistics serve in a way as "benchmarking" statistics for several short-term indicators and therefore, the comparisons in this chapter indicate the quality of these other statistics as much as the quality of the manufacturing statistics.

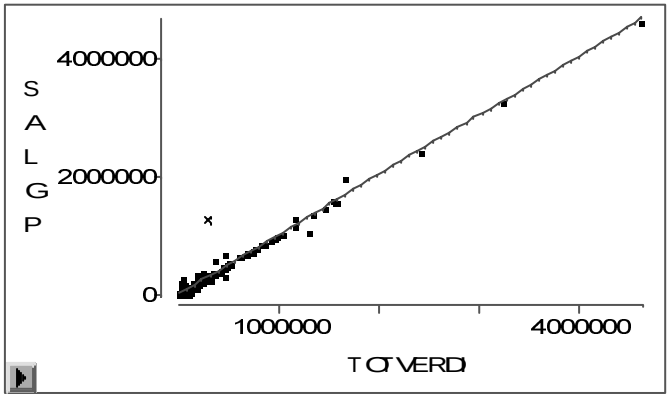
A comparison of enterprise and local KAU based manufacturing statistics is conducted for totals, changes and on micro data. Furthermore, we study how the national accounts' figures for manufacturing develop from the first preliminary figures to the final ones, where the manufacturing statistics' figures are incorporated.

6.6.1 Comparison of the manufacturing statistics with Prodcom

The production statistics in Norway are based on the Prodcom regulation and the Prodcom list. The survey is conducted annually and the observation unit is enterprise. Almost 90 per cent of the production value in manufacturing is covered through the Prodcom survey. However, there are minor differences in concepts and the total production is not estimated for publication in connection with the Prodcom survey.

By linking the single establishment enterprises, i.e. enterprises with one local kind-of-activity unit, with the local KAUs in the manufacturing statistics we were able to measure the correlation between the two surveys by constructing a production variable(salgp) closely linked to the production concept in the Prodcom survey(totverdi).

Figure 6.6.1-1 Manufacturing Statistics vs Prodcom



As we can see from the scatter plot in Figure 6.6.1-1 Manufacturing Statistics vs Prodcom, the coherence between the two surveys was quite good when comparing production value for 1 697 single establishment enterprises. Excluding one outlier from the calculation, the correlation between production in Prodcom(totverdi) and the production from manufacturing statistics(salgp) were 0.9958 in 1998.

For enterprises with more than one local KAU the comparison is complicated by internal deliveries, and was therefore excluded from this particular comparison.

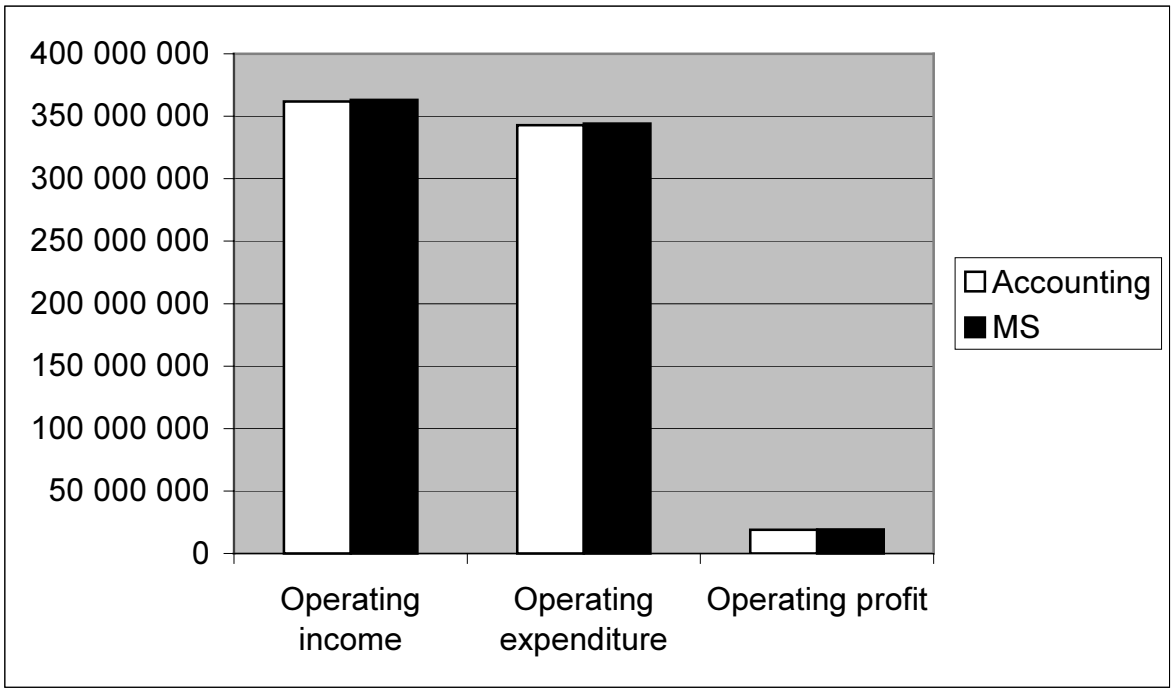
6.6.2 Comparison of the manufacturing statistics with accounting data

All joint-stock companies in Norway are obliged to send in their annual accounts to the Register Centre, the Register of Company Accounts (RCA). Statistics Norway receives a file containing accounting data for these enterprises, which are utilised both for making accounts statistics and as supplementary information for estimating data in other surveys, such as the manufacturing statistics. This is described more detailed in chapter 3.

Three main concepts concerning the income statement such as operating income, expenditure and profit should be rather identical when comparing mutual enterprises from the two sources, the RCA and the manufacturing statistics.

For 3272 enterprises in the sample – when it comes to definitions – identical data were available. This amounted to almost 90 per cent of the operating income in the sample and 80 per cent of the total operating income in manufacturing.

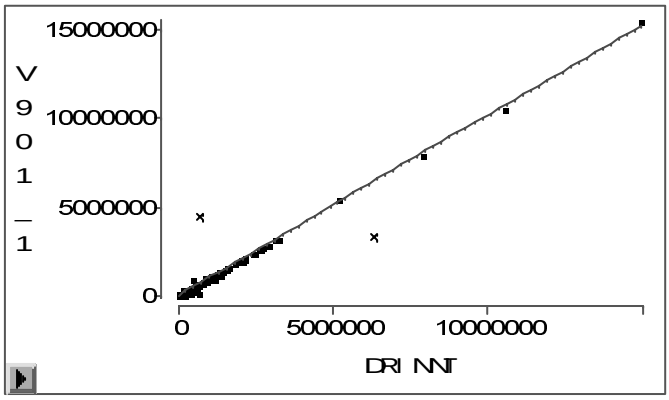
Figure 6.6.2-1 Comparison of the manufacturing statistics with accounting data



The difference between the manufacturing statistics data and the data from the RCA, was about 0.3 per cent for each of the three variables.

By doing a micro investigation for operating income, we can see from the scatter plot that the fit between v901_1(manufacturing statistics) and drinnt (RCA) was of high quality for the 3 272 enterprises. The correlation coefficient between the two variables was 0.9989 when excluding two outliers.

Figure 6.6.2-2 Comparison of operating income



6.6.3 Comparison of local KAU and enterprise data within the system of manufacturing statistics

According to the regulation on structural business statistics most of the variables to be reported are based on enterprise statistics, and only a few series are based on KAUs or NUTS. The enterprise level is also the lowest level concerning units where detailed accounting information is available. But for a lot of the more production related variables we have to make statistics based on the lowest level, the local KAU, because of the needs of important users, comparability over time, regional statistics and for constructing homogenous data at detailed levels of industry classification.

Adjusting data between enterprises and their local KAUs is a very time-consuming and complicated task for the respondents and the staff who edit the data, and also when it comes to estimations, analysis and presentations – the difference between enterprise and local KAU is causing a lot of work as well.

For these reasons it was important to investigate the final figures in order to find out if we succeeded in the demanding job producing coherent enterprise and local KAU based statistics.

Firstly, we studied the final figures for 1997 and 1998 for manufacturing and mining and quarrying. From table 6.6.3-1, we find that the values for the four different variables vary a lot between the enterprise and the local KAU based statistics. Also the relative change from 1997 to 1998 varies, as we can see from figure 6.6.3-1. Especially the increase in value added is substantially higher for the enterprise-based figures than the local KAU ones. This implies that increases or decreases in important variables depend on the unit of analysis.

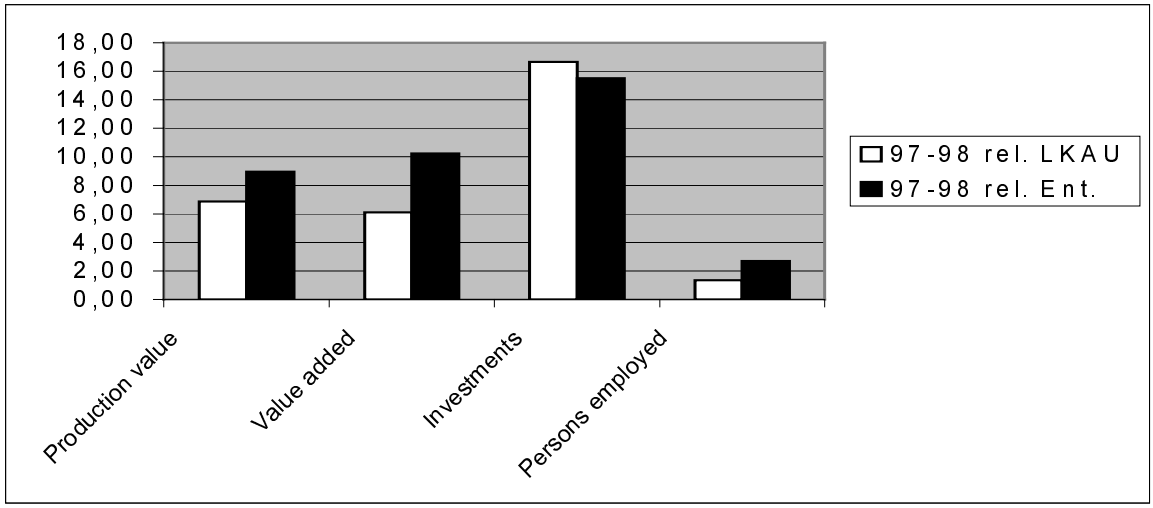
Reasons for this discrepancy lie in the characteristics of multi local KAU enterprises. Units within an enterprise may have internal deliveries of goods and services. These deliveries are included in e.g. the aggregated production value for the local KAU-based series, but not in the enterprise ones. Partly, the internal deliveries explain why the relative difference between value added (3 and 2 per cent in 1997 and 1998) in the two series was smaller than the relative difference in production value (9 and 11 per cent in 1997 and 1998) for the same series.

However, differences in the enterprise and local KAU populations are the main factor explaining differences between the two statistics. Again, multi-KAU enterprises are the source for discrepancy. The enterprise population consists only of enterprises classified in manufacturing industries, but includes local KAUs which are not manufacturing ones but part of manufacturing enterprises. Vice versa, the local KAU population consists of only local KAUs classified in manufacturing industries, but which could be a part of a non-manufacturing enterprise.

Table 6.6.3-1 Comparison of enterprise and local KAU figures

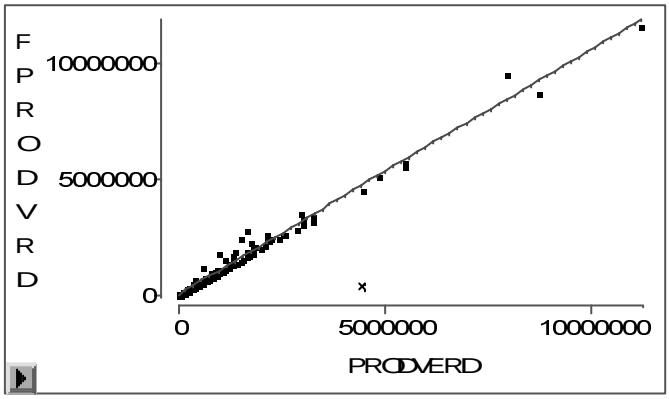
	Local KAU 1997	Enterprise 1997	Local KAU 1998	Enterprise 1998
Production value	433,673	390,146	465,720	428,594
Value added	127,384	123,975	135,669	138,101
Investments	17,728	16,573	21,268	19,615
Persons employed	296,184	291,532	300,269	299,616

Figure 6.6.3-1 Relative changes in basic variables for enterprises and local KAUs.



In order to investigate more coherent enterprise and local KAU data, the local KAU data were aggregated to enterprise levels for 3 528 manufacturing enterprises in the sample. Non-manufacturing local KAUs were also included in the aggregated data in order to make the data sets comparable regarding coverage, and these 3 528 enterprises comprised over 90 per cent of total production value.

Figure 6.6.3-2 Comparison of production value



At the micro-level data were quite consistent (see the correlation between production value from the enterprise data (prodverd) and the aggregated local KAU data (fprodverd) was 0.9952, excluding one outlier. The scatter plot and a linear regression model ($\hat{\beta} = 1{,}0599$) indicated that the fprodvrd values

were slightly larger than the corresponding prodverd values. The sum of production values for 3 527 enterprises for aggregated local KAU and enterprise data were respectively 406.8 and 388.6 billion NOK in 1998. The value added for the same enterprises was 123.3 and 122.7 billion NOK, and this minor difference indicated that most of the difference in production value may be explained by internal deliveries, since the calculation of value added, in theory, is independent of analysis unit.

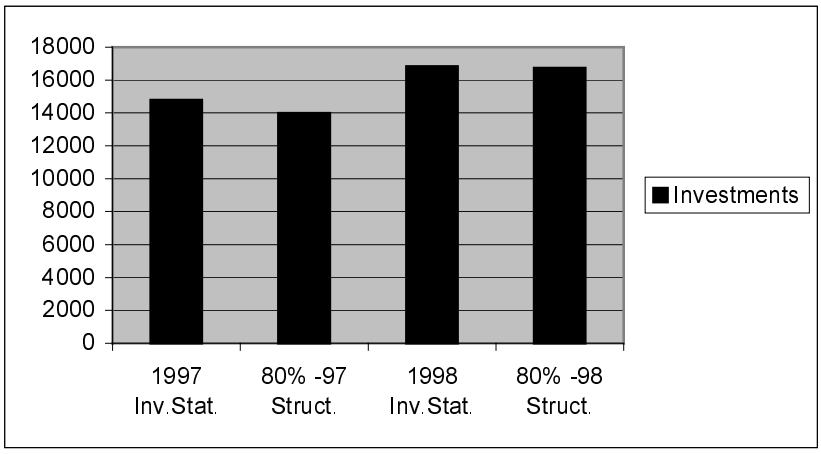
Deliveries to and from local KAUs within the same enterprise were also surveyed through the questionnaires, and total deliveries to other local KAUs in the same enterprise were 15.7 billion NOK and deliveries from other units amounted to 15.3 billion NOK. Ideally, the deliveries should add up to zero. On the other hand, the quality concerning local KAU statistics versus enterprise statistics was quite satisfactory, and the rather exhaustive work in doing these adjustments both by the editors and the respondents has been successful.

Another aspect of quality is that compared with previous local KAU-statistics, we are now able to verify the coherence between the local KAU data and the enterprises' official accounts. Consequently, we are more confident on e.g. the level of total costs, i.e. that all kinds of costs are covered also on the local KAU level. Actually, we experienced a much stronger increase in costs compared with production value from 1995 to 1996, which was the first year with both enterprise and local KAU-statistics for manufacturing.

6.6.4 Comparison of the manufacturing statistics with short-term investment statistics

Data on investment in manufacturing are collected both through the annual manufacturing statistics and through the quarterly investment statistics. The investment statistics are based on a sample which covers about 80 per cent of total investments, and though there are some minor differences in definitions aggregated data from the investment statistics are compared with 80 per cent of investments from the manufacturing statistics in figure 6.6.4.1.

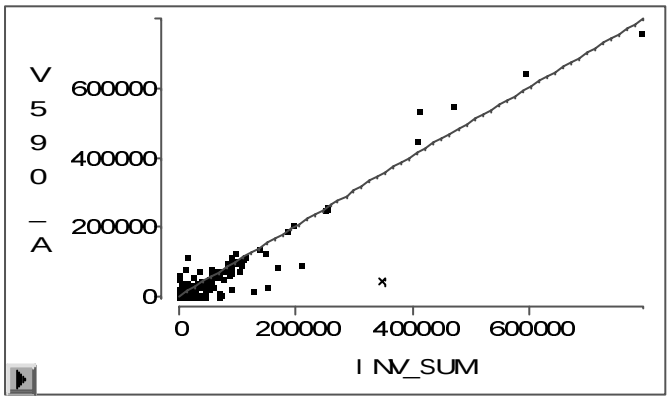
Figure 6.6.4-1 Comparison of investments



This rough comparison revealed that the difference in total investments between the statistics were rather small, especially for 1998 where total investments from the quarterly statistics amounted to 16.8 billion NOK versus 16.7 billion NOK in the manufacturing statistics (80 per cent of the total).

By investigating the investment data on micro level for 1879 local KAUs, we can see that there are some discrepancies (see scatter plot below), but the overall coherence between the two data sets was quite good. The correlation coefficient between investments from the manufacturing statistics (v590_a) and the investment statistics (inv_sum) was 0.9661, excluding one outlier.

Figure 6.6.4-2 Comparison of investments –micro data



On the other hand, during the editing process of the manufacturing statistics large deviations in investments between the two surveys are checked, and in some cases adjusted.

6.6.5 Comparison of the manufacturing statistics with the energy statistics

Total energy cost is a variable in the manufacturing statistics, and this variable is also collected through the annual statistics called Energy use in the manufacturing sector. The energy use statistics contain information on which type of energy used, e.g. electric power, fuel oil, petrol, coal etc.

Furthermore, the manufacturing statistics and statistics on energy use in the manufacturing sector are fully harmonised concerning total energy costs, unit and population. In addition, any differences in total energy costs are checked and adjusted if necessary, so for the final figures these two statistics are identical concerning energy costs.

Based on preliminary figures from the statistics on energy use in manufacturing, the total energy costs amounted to 9 984 million NOK in 1998. After adjusting the energy costs and population versus the manufacturing statistics, the final figure on total energy cost was 9 962 million NOK. This represented a correction of 0.2 per cent of total energy cost from the preliminary to the final figure.

6.6.6 Comparison of the manufacturing statistics with the national accounts

Several different sources of statistics are used when producing the national accounts of Norway, and the sources also vary according to when the computations take place. For instance, the first statistics on national accounts for a whole year at a rather detailed industry level are published early the second month the year after. After that, several adjustments are made on the basis of more and more available statistics, until the final national accounts figures are computed over two and half years after the reference year.

In table 6.6.6-1, we have followed several versions of the national accounts figures for three important variables in manufacturing and mining and quarrying for the reference year 1997. The purpose of this was to examine the coherence between the national accounts' figures and the manufacturing statistics for the same industries and to study the process from the first preliminary figures to the final figures and the impact of the manufacturing statistics in this process.

A main objective with the manufacturing statistics is to determine the level of several important variables in contrast with many of the short-term statistics, which focus on the change and the development from one period to another.

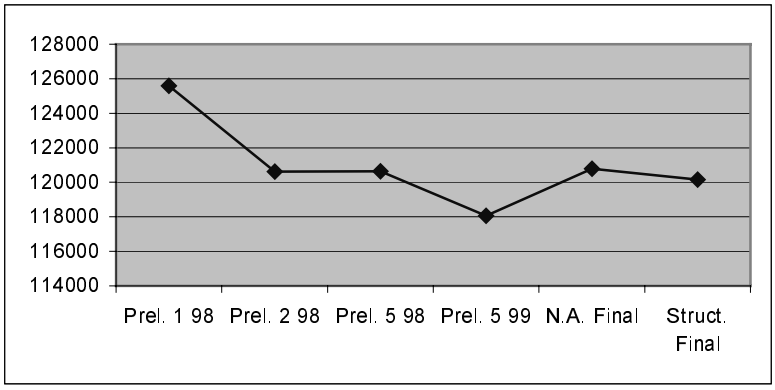
Table 6.6.6-1 Comparison of national accounts figures and manufacturing statistics figures

Production value						
	Prel. 1 98	**Prel. 2 98**	**Prel. 5 98**	**Prel. 5 99**	**N.A. Final**	**Struct. Final**
Mining and quarrying	4,884	5,013	5,012	5,609	5,543	5,486
Manufacturing	397,299	396,157	396,138	401,573	421,646	428,187
Value added						
	Prel. 1 98	**Prel. 2 98**	**Prel. 5 98**	**Prel. 5 99**	**N.A. Final**	**Struct. Final**
Mining and quarrying	1,972	2,053	2,052	2,160	2,163	2,162
Manufacturing	125,584	120,621	120,638	118,054	120,782	120,148
Investments						
	Prel. 1 98	**Prel. 2 98**	**Prel. 5 98**	**Prel. 5 99**	**N.A. Final**	**Struct. Final**
Mining and quarrying	333	261	261	273	242	243
Manufacturing	17,966	18,321	18,321	18,821	17,668	17,485

If we follow value added in manufacturing for the year 1997 from the first published figures early 1998 to the final figures computed in year 2000, we can see that the data varied between a rather high estimate (the first one) to a fairly low one (preliminary 1999). The first estimates are based on data for the previous year, the production index and the producer price index. Furthermore, turnover data from the VAT-register become available, and finally the annual structural business statistics are included in the calculations. We can clearly see from Figure 6.6.6-1 Value added in manufacturing, the impact of the manufacturing statistics on value added in the national accounts for the same sector. From the low estimate in 1999 of about 118 billion NOK, the value added for manufacturing in the national accounts was adjusted to 120,8 billion NOK after incorporating the manufacturing statistics in the national accounts. The final figure was fairly close to the total value added in the manufacturing statistics for 1997, 120.8 versus 120.1 billion NOK. However, there are several reasons why the figures were not identical, such as basic prices versus market prices, population and other aspects of definitions.

The final national accounts' figures for investments and production value also ended up quite close to the manufacturing statistics ones. (Production value was still considerably higher in the manufacturing statistics than in the national accounts' figure, but this is mainly due to difference in definitions.

Figure 6.6.6-1 Value added in manufacturing



6.6.7 Other comparisons

Other important sources of comparison are statistics on turnover (based on the VAT-register), the production index and employment data from the National Insurance Administration registers, one for employees and one for employers. These data sources are at the current stage used as rough indicators in comparisons with the manufacturing statistics. However, we are now studying in detail the coherence of employment data from the manufacturing statistics with the ones from the National Insurance, and if the quality is satisfactory, we will consider replacing the employment items on the questionnaire with register data.

6.6.8 Sample coverage

In 1998 the manufacturing population consisted of 12,751 units. 12,104 of these were local KAUs and 647 were auxiliary units. The sample is a cut-off sample where all local KAUs in an enterprise with at least one manufacturing local KAU with a minimum of 10 persons employed are selected. This implies that in addition to all manufacturing local KAUs with more than 10 persons employed – a number of local KAUs with less than 10 persons employed in multi-KAU enterprises are also selected. In 1998 the sample totalled 5,126 local KAUs and auxiliary units. Of these 971 local KAUs and auxiliary units had less than 10 persons employed.

The sample is selected regardless on how adequate coverage this results in for the individual industry. This implies that for some industries on a 5-digit level – according to the Norwegian version of the NACE, rev.1 – we have not included any local KAUs, whereas we for other industries have full coverage. In table 6.6.8-1 we show how adequate the coverage is for 5-, 4- and 2-digit industries. We have also looked at the coverage in relation to employment (Table 6.6.8-2). This table shows that in spite of the fact that more than12 per cent of the number of codes on 5-digit industry has a coverage of less than 50 per cent, these industries cover less than 2 per cent of total employment in Norway. We do want, however, to take a look at the sample in order to evaluate whether to select a random sample from those industries where we have a coverage of less than 20 per cent. These do, however, cover only 0.65 per cent of total employment.

Table 6.6.8-1 Sample coverage by industry division codes

Coverage	5-digit NACE	4-digit NACE	2-digit NACE
100 %	24	19	1
>90%	119	107	11
>80%	165	148	19
>70%	188	171	24
>60%	199	183	25
>50%	218	199	26
<50%	32	30	0
<20%	16	13	0
<10%	12	11	0
0 %	11	10	0
Total	250	229	26

Table 6.6.8-2 Sample coverage by industry division codes and share of employment

Coverage	5-digit NACE	Coverage of total persons employed	4-digit NACE	2-digit NACE
100 %	24	4.36 %	19	1
90 - 99.99%	95	54.31 %	88	10
80 - 89.99%	46	17.48 %	41	8
70 - 79.99%	23	11.66 %	23	5
60 - 69.99%	11	5.40 %	12	1
50 - 59.99%	19	4.93 %	16	1
20 - 49.99%	16	1.20 %	17	0
10 - 19.99%	4	0.48 %	2	0
0.01 - 9.99%	1	0.06 %	1	0
0 %	11	0.11 %	10	0
Total	250	100.00 %	229	26

7 Annexes

7.1 Questionnaire

See next page.

Manufacturing statistics 1996

Structure statistics

Subjected to professional secrecy
Statement duty

Statistisk sentralbyrå
Statistics Norway

Division for External Trade, Energy and Industrial Statistics
P. b. 8131 Dep.,N-0033 Oslo
Telephone: 22 86 45 00
Fax: 22 86 49 96

Deadline: May 23 1997

S2

Copy of the complete Standard Industry Form to be enclosed with the questionnaires!

The local KAU is classified within a subclass
If You mean this is a wrong classification, please describe the activity of the local KAU below:

Employment												**Number**
	Feb		April		June		Sep.		Nov.		Sum	
110 Employees		+		+		+		+		=		: 5
120 Owners (in liable companies and one-man enterprises)												
150 Persons employed												
170 Of this part-time employees (work less than normal working hours)												
180 Man-hours carried out by employees												

Production income (incl. internal deliveries) distributed on:	**1 000 NOK**
210 Sale of self-produced commodities	
220 Sale of commodities	
230 Repair work	
240 Contract work	
250 Other sales income	
260 Other operating income (rental income, own investment works, royalties and patents etc.)	
290 Sum (excluding subsidies and profit from sale of fixed assets)	
295 Of this: *Internal deliveries to other local KAUs in the enterprise*	

Production costs (incl. internal deliveries)	**1 000 NOK**
310 Raw material, semi-finished products and auxiliary materials	
312 Packaging	
314 Costs on sale of commodities	
316 Contract work (outside contribution and subcontract)	
320 Costs of energy	
330 Transport expenditures	
340 Wages, holiday allowance, fees etc.	
350 Payroll tax	
360 Repair and maintenance work done by others	
370 Rental costs (real property and fixed assets)	
380 Other goods and services consumed (see guidance)	
390 Sum (excluding stock changes, write-offs and write-down, loss on claims and loss from sale of fixed assets)	
395 Of this: *Internal deliveries from other local KAUs in the enterprise*	

Stock (in 1000 NOK)	**31.12.1996**	**1.1.1996**
420 Stock of goods under production (including projects)		
430 Stock of finished goods		

Investments and repairs	**Acquisitions**	**Sale (to market price)**	**Repairs**
510 Machinery, tools, equipment and furniture			
520 Cars and other transport equipment			
530 Buildings and welfare facilities			
540 Production buildings			
550 Production structures			
560 Land			
590 Total			
595 Investment and repair work done by the local KAU's own employees (part of 590)			

Consumption of energy	**Varenr.**	**Volume**		**Verdi i 1 000 kr**
Pit coal, briquettes	2701 0009		tonnes	
Coke and semi-coke of coal	2704 0009		tonnes	
Fire wood, wood waste	4401 1000		m^3 (solid)	
Petrol	2710 0010		litre	
Auto diesel	2710 0024		tonnes	
Paraffin	2710 0025		tonnes	
Fuel oil No. 1 and No. 2	2710 0026/27		tonnes	
Marine gas oils	2710 0028		tonnes	
Heavy distillates (Fuel oil 3A and 4A)	2710 0029		tonnes	
Heavy furnace oils (5 and 6)	2710 0092		tonnes	
Damp (1 oil tonne, toe, equals 10 Gcal)	2201 9007		toe	
Liquefied propane and butane	2711 12/1300		tonnes	
Other fuels, of this other gases (state which):				
Electricity (total cost including el. and concession taxes)	2716 0000		1 000 kWh	
Sum (equals item 320 under Production costs)				
Occasional power (part of item "Electricity" above)	2716 6000		1 000 kWh	

Other information and statements to Statistics Norway

☐ Want to receive the main results from the survey

☐ Want the questionnaire in the other Norwegian language

Inquiries from you to Statistics Norway may be addressed to

Regarding postponement: Arild Åmillom (tel. 22 86 47 65) or Arne Eltvik (tel. 22 00 44 19)

Regarding filling in: Per Hellem (tel. 22 86 47 63) or Slawomir Slazak (tel. 22 86 47 56)

Inquiries from Statistics Norway may be addressed to

Name: _____ Tel.: _____ e-mail: _____

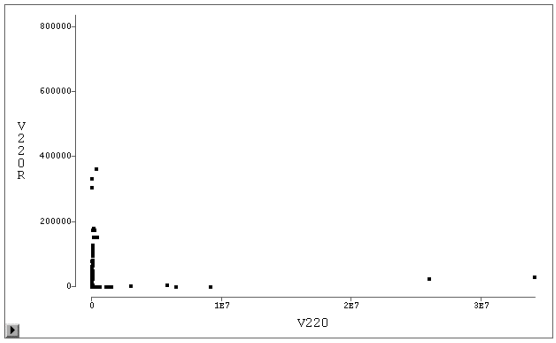
Place/Date: _____ Signature: _____

Homepage of the enterprise/local KAU on the Internet: _____

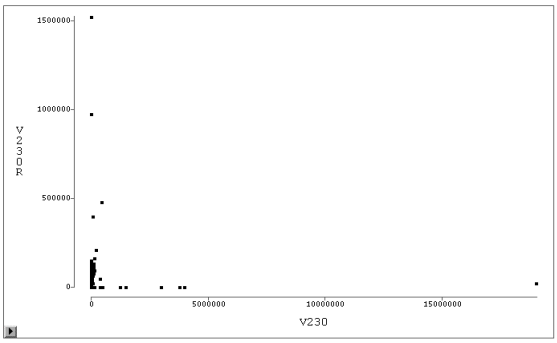
7.2 Plot of single variables originally and after editing

7.2.1 Production income-variables

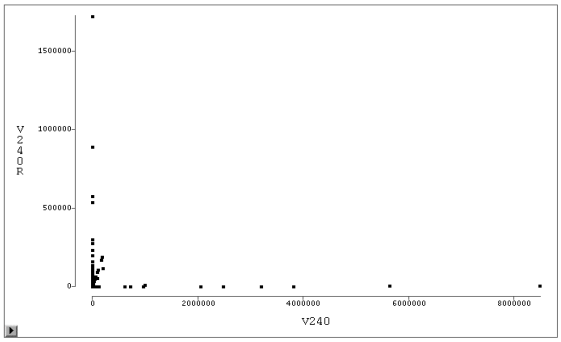
Sales of commodities



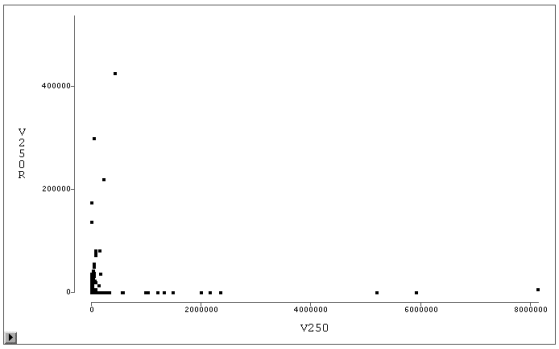
Repair work



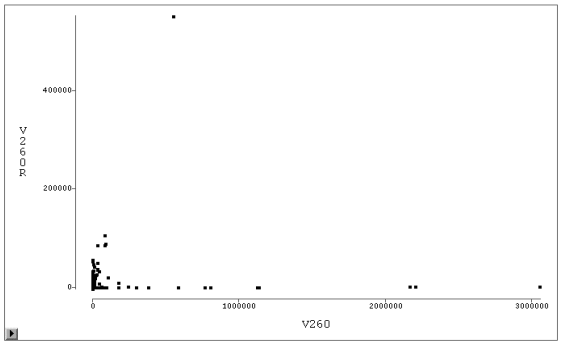
Contract work



Other income from sales

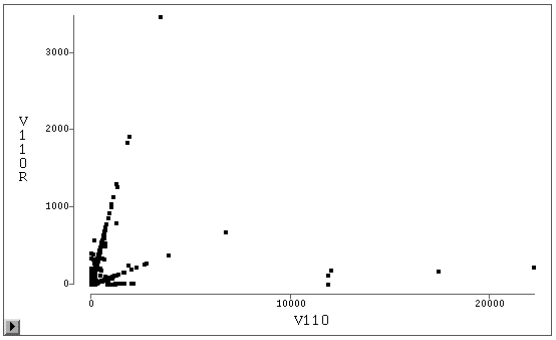


Other operating income

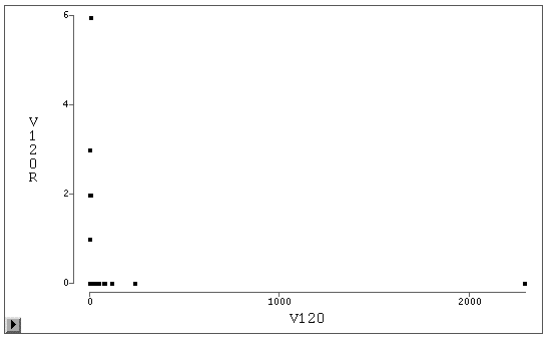


7.2.2 Employment - variables

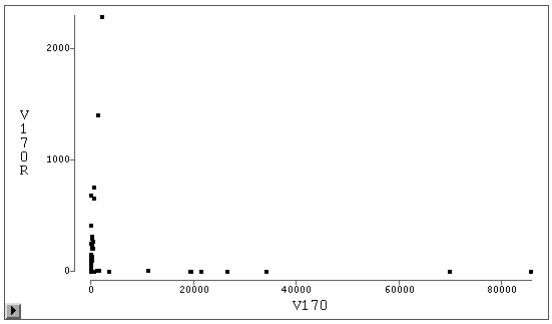
Employees



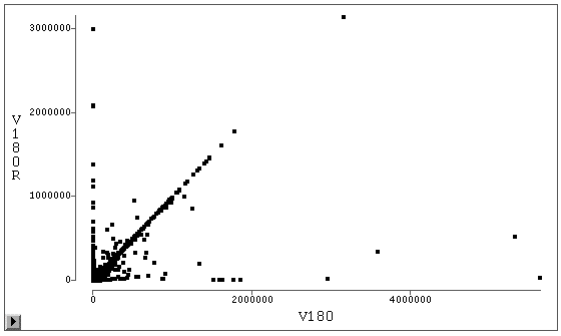
Owners



Part-time employees



Man-hours



7.3 Further on variables

7.3.1 Correlation between changes

7.3.1.1 Costs of production

Costs of production comprises Raw material, semi-finished products and auxiliary materials (V310), Packaging material (V312), Costs of sales of commodities (V314), Contract work (V316), Costs of energy (V320), Transport expenditures (V330), Wages, holiday allowance, fees etc. (V340), Payroll tax (V350), Repair and maintenance work done by others (V360), Rental costs (V370) and Costs of other goods and services consumed (V380). From the total costs (V390) the Internal deliveries (V395) are separated. Of all the items mentioned above, only the items V310, V312, V314 and V316 are to be filled in by single KAU enterprises.

Table 7.3.1-1Correlation between changes (edited - original) in operating costs

	V310D	V312D	V314D	V316D	V320D	V330D
V310D	1.00	**0.72**	0.21	**0.38**	**0.46**	**0.46**
V312D	**0.72**	1.00	**0.48**	0.07	0.21	0.25
V314D	0.21	**0.48**	1.00	0.02	0.01	0.22
V316D	**0.38**	0.07	0.02	1.00	0.03	0.13
V320D	**0.46**	0.21	0.01	0.03	1.00	0.14
V330D	**0.46**	0.25	0.22	0.13	0.14	1.00
V340D	**0.81**	**0.35**	0.19	**0.52**	0.32	**0.73**
V350D	**0.81**	**0.35**	0.19	**0.54**	0.34	**0.68**
V360D	0.24	0.11	0.11	0.31	0.14	0.17
V370D	**0.80**	0.28	0.17	**0.68**	0.26	**0.46**
V380D	**0.64**	**0.58**	**0.37**	**0.45**	0.04	**0.49**
V390D	**0.95**	**0.62**	**0.39**	**0.57**	**0.43**	**0.59**
V395D	0.31	0.19	0.11	0.06	0.19	**0.78**

(continues)

	V340D	V350D	V360D	V370D	V380D	V390D	V395D
V310D	**0.81**	**0.81**	0.24	**0.80**	**0.64**	**0.95**	0.31
V312D	**0.35**	**0.35**	0.11	0.28	**0.58**	**0.62**	0.19
V314D	0.19	0.19	0.11	0.17	**0.37**	**0.39**	0.11
V316D	**0.52**	**0.54**	0.31	**0.68**	**0.45**	**0.57**	0.06
V320D	0.32	0.34	0.14	0.26	0.04	**0.43**	0.19
V330D	**0.73**	**0.68**	0.17	**0.46**	**0.49**	**0.59**	**0.78**
V340D	1.00	**0.99**	0.28	**0.80**	**0.70**	**0.91**	**0.71**
V350D	**0.99**	1.00	0.29	**0.79**	**0.69**	**0.90**	**0.70**
V360D	0.28	0.29	1.00	**0.51**	0.14	0.31	0.09
V370D	**0.80**	**0.79**	**0.51**	1.00	**0.54**	**0.81**	0.26
V380D	**0.70**	**0.69**	0.14	**0.54**	1.00	**0.78**	**0.51**
V390D	**0.91**	**0.90**	0.31	**0.81**	**0.78**	1.00	**0.51**
V395D	**0.71**	**0.70**	0.09	0.26	**0.51**	**0.51**	1.00

We find a high correlation between many of the changes. Especially we may take notice of the fact that the changes in raw material are highly correlated with changes in most of the different costs of production.

7.3.1.2 Stock-variables

Stock-variables comprise stock of goods under production (V420_1 and V420_2) and stock of finished goods (V430_1 and V430_2), at the beginning and at the end of the year.

Table 7.3.1-2 Correlation between changes (edited - original) in stock-variables

	V420_1D	V420_2D	V430_1D	V430_2D
V420_1D	1.00	**0.99**	0.08	0.08
V420_2D	**0.99**	1.00	0.03	0.03
V430_1D	0.08	0.03	1.00	**0.85**
V430_2D	0.08	0.03	**0.85**	1.00

We can see a strong correlation between changes in stocks of the same kind at different times, but no correlation between changes in different kinds of stock-variables.

7.3.1.3 Investments

Investments comprises acquisitions (_A), sales (_S) and repair (_R) of machinery, tools, equipment and furniture (V510), cars and other transport equipment (V520), buildings and welfare facilities (V530), production buildings (V540), production structures(V550) and land (V560) and the total sum of all these items (V590).

Table 7.3.1-3 Correlation between changes (edited - original) in investment items (acquisitions)

	V510_AD	V520_AD	V530_AD	V540_AD	V550_AD	V560_AD	V590_AD
V510_AD	1.00	0.32	0.02	0.14	**0.41**	0.10	**0.85**
V520_AD	0.32	1.00	0.04	0.13	0.10	0.02	**0.35**
V530_AD	0.02	0.04	1.00	0.07	0.04	0.00	0.07
V540_AD	0.14	0.13	0.07	1.00	0.03	0.21	0.22
V550_AD	**0.41**	0.10	0.04	0.03	1.00	0.01	**0.79**
V560_AD	0.10	0.02	0.00	0.21	0.01	1.00	0.15
V590_AD	**0.85**	**0.35**	0.07	0.22	**0.79**	0.15	1.00

The table shows no strong correlations between changes in investment-variables, that concerns acquisitions.

7.3.2 "Thousand"-errors - the connection between different variables

Figure 7.3.2-1 Plot between edited and not edited costs of raw material, where local KAUs with "thousand"-errors in the variable sale of self-produced commodities are marked with +

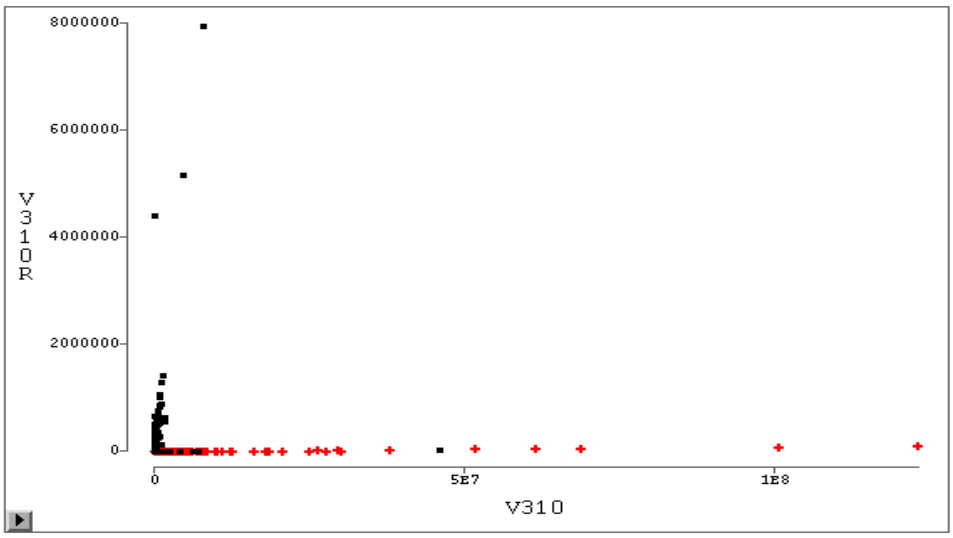


Figure 7.3.2-2 Plot between edited and not edited costs of investments, where local KAUs with "thousand"-errors in the variable sale of self-produced commodities are marked with +

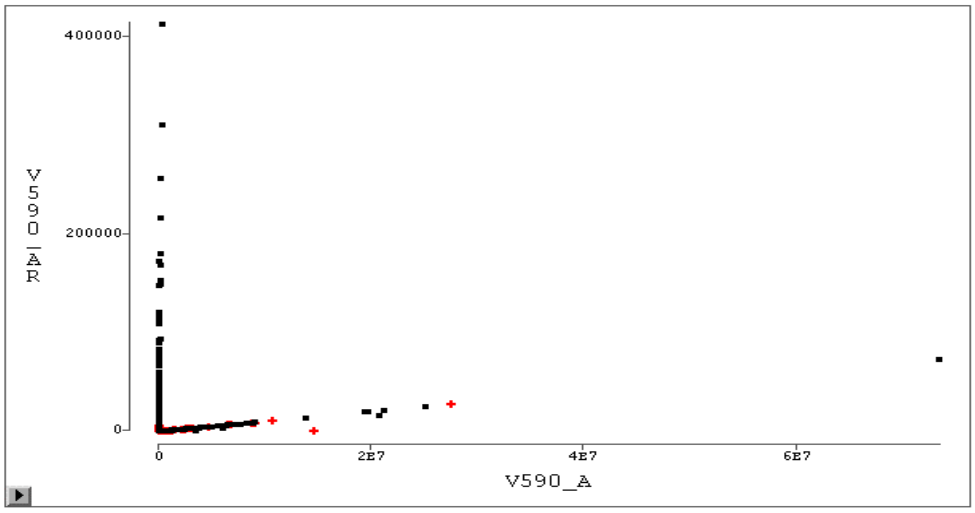


Table 7.3.2-1Variable list

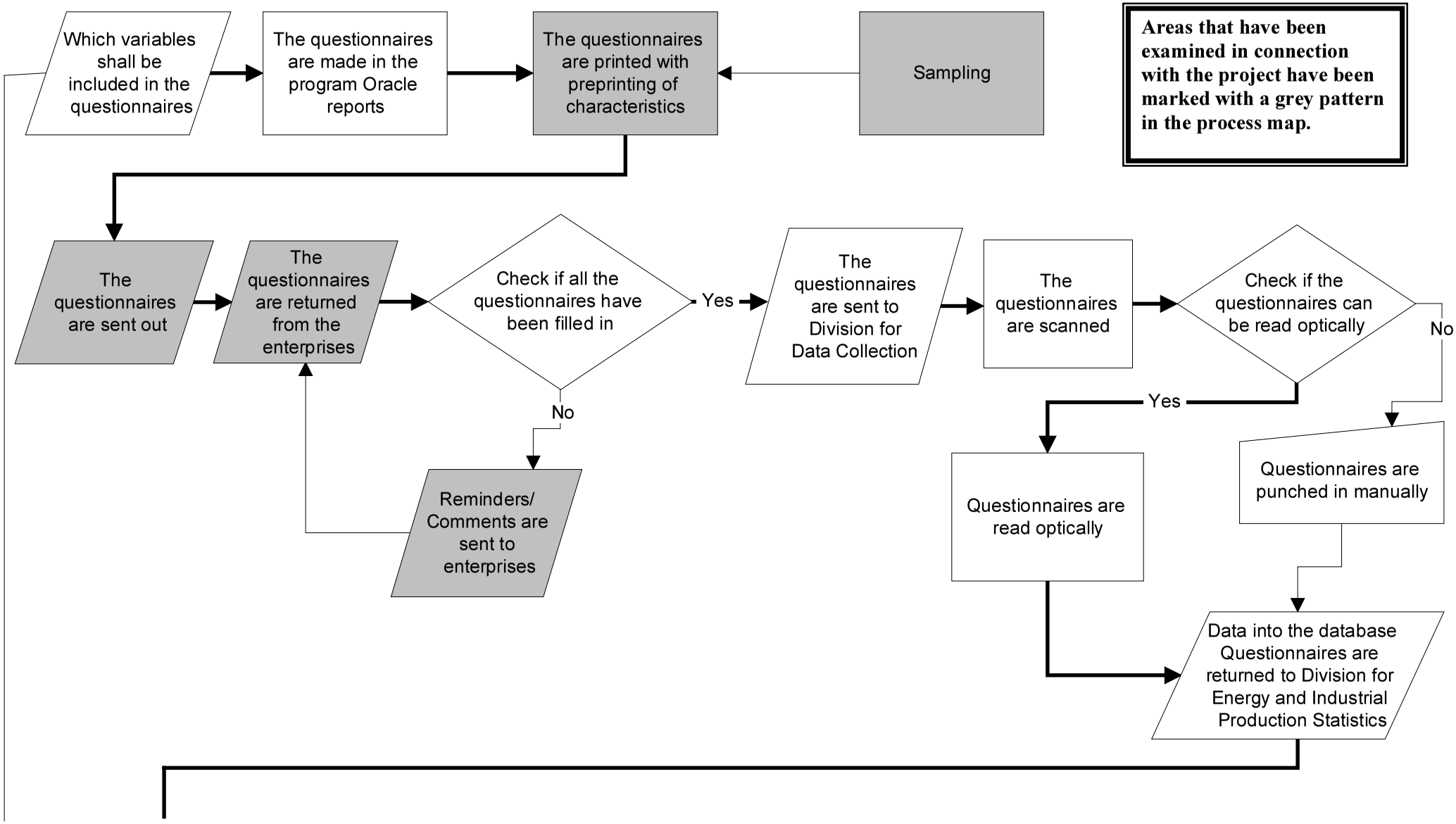
Questionnaire variables	
Variable	**Text**
v110	Employees
v120	Owners
v150	Persons employed
v170	Part-time employees
v180	Man-hours carried out by employees
v210	Sale of self-produced commodities
v220	Sale of commodities
v230	Repair work
v240	Contract work
v250	Other sales income
v260	Other operating income (rental income, own investment works royalties and patents etc.)
v290	Sum production income
v291	Sum production income
v295	Internal deliveries to other local KAUs in the enterprise (part of 290)
v310	Raw material, semi-finished products and auxiliary materials
v312	Packaging
v314	Costs on sale of commodities
v316	Contract work (outside contribution and subcontract)
v320	Costs of energy
v330	Transport expenditures
v340	Wages, holiday allowance, fees etc.
v350	Payroll tax
v360	Repair and maintenance work done by others
v370	Rental costs (real property and fixed assets)
v380	Other goods and services consumed
v390	Sum production costs
v391	Sum production costs
v395	Internal deliveries to other local KAUs in the enterprise (part of 390)
v420	Stock of goods under production (including projects)
v420_1	Stock of goods under production (including projects) 31.12
v420_2	Stock of goods under production (including projects) 01.01
v430	Stock of finished goods
v430_1	Stock of finished goods 31.12
v430_2	Stock of finished goods 01.01
v510_a	Acquisitions of machinery, tools, equipment and furniture
v520_a	Acquisitions of cars and other transport equipment
v530_a	Acquisitions of buildings and welfare facilities
v540_a	Acquisitions of production buildings
v550_a	Acquisitions of production structures
v560_a	Acquisitions of land
v590_a	Sum acquisitions
v595_a	Investment work done by the local KAU's own employees (part of 590_a)
v510_s	Sale of machinery, tools, equipment and furniture
v520_s	Sale of cars and other transport equipment
v530_s	Sale of buildings and welfare facilities

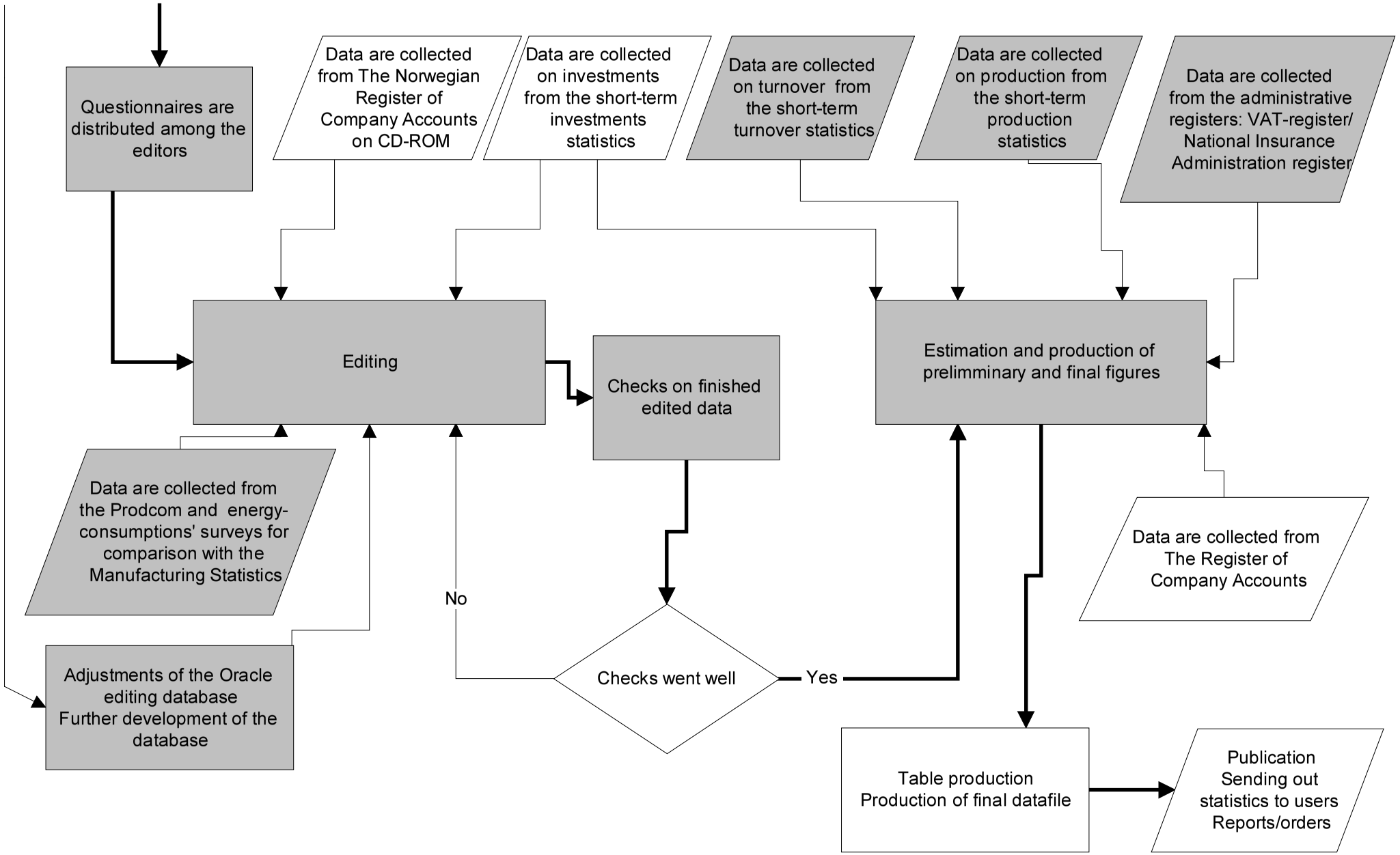
Questionnaire variables cont.	
Variable	**Text**
v540_s	Sale of production buildings
v550_s	Sale of production structures
v560_s	Sale of land
v590_s	Sum sale (to market price)
v510_r	Repair of machinery, tools, equipment and furniture
v520_r	Repair of cars and other transport equipment
v530_r	Repair of buildings and welfare facilities
v540_r	Repair of production buildings
v550_r	Repair of production structures
v560_r	Repair of land
v590_r	Sum repairs
v595_r	Repair work done by the local KAU's own employees (part of 590_r)
v32_2	Total energy

Standard Industry Form variables	
Variable	**Text**
V610_1	Energy
V625_1	Light, heat, water
V400_1	Commodity costs
V690_1	Car expenses
V790_1	change of stocks
V910_1	Result financial income/costs
V902_1	Total operating costs
V650_1	Maintenance/repairs
V770_1	Other operating costs
V905_1	Operating result
V901_1	Operating income
V500_1	Wage costs

7.4 Process map of the manufacturing statistics

Figure 7.4.1-1 Process map of the manufacturing statistics




Questionnaires are distributed among the editors
Data are collected from The Norwegian Register of Company Accounts on CD-ROM
Data are collected on investments from the short-term investments statistics
Data are collected on turnover from the short-term turnover statistics
Data are collected on production from the short-term production statistics
Data are collected from the administrative registers: VAT-register/ National Insurance Administration register
Editing
Checks on finished edited data
Estimation and production of prelimminary and final figures
Data are collected from the Prodcom and energy-consumptions' surveys for comparison with the Manufacturing Statistics
Data are collected from The Register of Company Accounts
No
Checks went well
Yes
Adjustments of the Oracle editing database
Further development of the database
Table production
Production of final datafile
Publication
Sending out statistics to users
Reports/orders

List of tables

List of figures

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