The sample project

An evaluation of pps sampling for the producer and import price index

2005:03

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Abstract

There are acknowledged problems attached to the current sampling method for the Producer and Import Price Index. In 2003, the sample project was launched to evaluate and propose a method for drawing the sample, which would enable the development and usage of the most suitable sampling method, taking into account the prerequisites and resources that the PPI product has. This report attempts to investigate whether a pps sample is able to fulfil the above-mentioned requirements. The advantages of a pps sample are that the units are selected objectively, that there are possibilities for estimating sampling error and that the weights are automatically supplied by the method. In addition, the method started the development of a process for initiating new price quotations, a strategy for sample completion and a structure for the rotation of companies. In summary, taking into consideration the PPI product's resources, the introduction of a pps sample brings with it many advantages regarding a structured and documentable method of high statistical quality.

Contents

Introduction

In order to be able to fulfil Statistics Sweden's vision to be the leader in the development, production and distribution of statistics, it is important to always try to use the current best method for all statistical products. There are acknowledged problems attached to the present sampling method used for Producer and Import Price Index, PPI[1]. The method provides inefficient and time-consuming calculations of weights and does not have a distinct system for rotation and sample completion. This, together with an occasional increase in resources, has led the PPI programme to begin an evaluation of the sampling method used. In February 2003, the sample project was launched, with Helen Andersson ES/PR[2] (Project manager), Maria Åhl ES/PR and Stefan Svanberg ES/MET[3]. During 2003, a sample on imports and exports was drawn, followed by work with sample completions. The objective of the project was to evaluate and propose a method for drawing the sample, which would enable the development and usage of the best possible sampling method, with respect to the prerequisites and resources that the product PPI has.

Currently, the sample for PPI is a non-probability cut-off sample with subjective selection. The existing sample[4] has evolved from a historical process, where price quotations have been established at roughly the same pace as they have disappeared. The purpose with the sample completion has been to cover, with at least one quotation, all CN products[5] in domestic supply, exports or imports, exceeding SEK 350 million and all product groups[6] exceeding SEK 250 million. Sample completion has also aimed to establish an adequate basis regarding confidentiality for groups of products that are to be published and also, from a quality perspective, to have a sufficient number of price quotations within commodity groups of significant size[7].

Objective

The purpose of this project is to evaluate if pps sampling is a good method for the Producer and Import Price Index. More widely, this also includes the development of a process for initiating new price quotations, a strategy for sample completion and a structure for the rotation of companies.

[1] A detailed description about Producer and Import Price Index can be found in Chapter 2. The Producer and Import Price Index will be shortened to PPI in the future. Not to be mixed up with Producer Price Index which is also shortened to PPI

[2] Prices Unit, Economic Statistics

[3] Methodology Unit, Economic Statistics

[4] Company and Combined Nomenclature, 8-digits. Henceforth, the Combined Nomenclature will be designated as CN

[5] 8-digit CN

[6] SE-SIC, Swedish Standard Industrial Classification, 5-digits.

[7] Haglund M (2002). *PPI Urvalsfrågor, Urval PPI Indexnämnden mars 2002.doc*. s. 1

Assumptions

- The total number of price quotations shall be unchanged. That is, approximately 4000 notations in total for the domestic, export and import markets
- The primary goal is to deliver price indices/deflators to the product groups of the National Accounts
- The allocation shall aim to minimize the sampling error for the total index, although some limitations for special product groups may arise
- The sample shall be able to rotate in a controllable way, while retaining statistical quality[8]

Limitations

The frame used for the sample based on Foreign Trade statistics has a cut-off limit, i.e. that all individuals (company and commodity) with a trade value of less than SEK 10 million are excluded[9]. Another frame used for the sample is based on statistics from the Production of commodities and industrial services, which is a census survey for companies with twenty or more employees. It illustrates the Swedish production of commodities well but not totally. Data on smaller companies, i.e. those with ten to nineteen employees, are not as complete as these are not collected by a questionnaire but are based upon register information and model estimations[10].

Only companies with production in Sweden are monitored for exports, due to the definition of the export market as being a proportion of the output of Swedish producers, which results in the exclusion of all trading companies.

Motivation and research structure

A sample can be constructed using a number of different techniques. The sample techniques can be divided into two principal categories: non-probability sampling and probability sampling. Non-probability sampling often implies that a subjective judgement has to be made regarding the companies and products selected to be a part of the survey[11]. Probability sampling has two well-known advantages over non-probability sampling: firstly that it gives a guarantee that the products have been chosen in an impartial and objective way and secondly that it creates possibilities for estimates of sampling error. For example, it is possible to obtain a measure of the quality of the sample through variance estimation. Another benefit related to probability sampling is the possibility to create a distinct system for sample completion. A more scientific approach can also lead to psychological advantages for members of staff and respondents. A further advantage of probability sampling is that the weights are provided by the method, i.e. every stratum contains both units drawn with certainty and sample units. The units drawn with certainty represent their own value

[8] Haglund M (2002). PPI Urvalsfrågor, Urval PPI Indexnämnden mars 2002.doc. s. 2

[9] Foreign Trade website
http://www.scb.se/statistik/HA/HA0201/_dokument/HA0201_BS_2004.doc

[10] Business Statistics website
http://www.scb.se/statistik/NV/NV0207/_dokument/NV0207_BS_2002.doc

[11] Note that cut off sampling does not imply a subjective judgement

and the sample units represent the remaining value in the stratum[12]. Different sampling methods were compared by Stefan Svanberg, methodologist at Statistics Sweden. When comparing a stratified random sample, a cut-off sample[13] and a pps sample, it can be shown that the stratified random sample and the pps sample give almost the same result, but since the sampling size is often small, stratified sampling is not feasible. When comparing cut-off sampling and pps sampling the results almost always differ, but for certain commodity structures a pps and a cutoff sampling yields the same sample[14]. Thus, it was decided to introduce a pps sample to the PPI product at the Prices Unit at Statistics Sweden.

To appraise if a pps sample is a more suitable sampling method than the one used today and leads to expected improvements for the PPI product, a sample will be drawn based on the theory for a pps sample[15]. The empirical results will then be analysed to see if a pps sampling approach agrees, in practice, with the given assumptions and the objective to create a specific system for the practical work with the sample.

[12] A stratum consists of one homogenous subset

[13] Optional under coverage

[14] In the test sample in 2002 this occurred for crude oil, stratum 11

[15] See the section *pps sampling*

Theoretical frame of reference

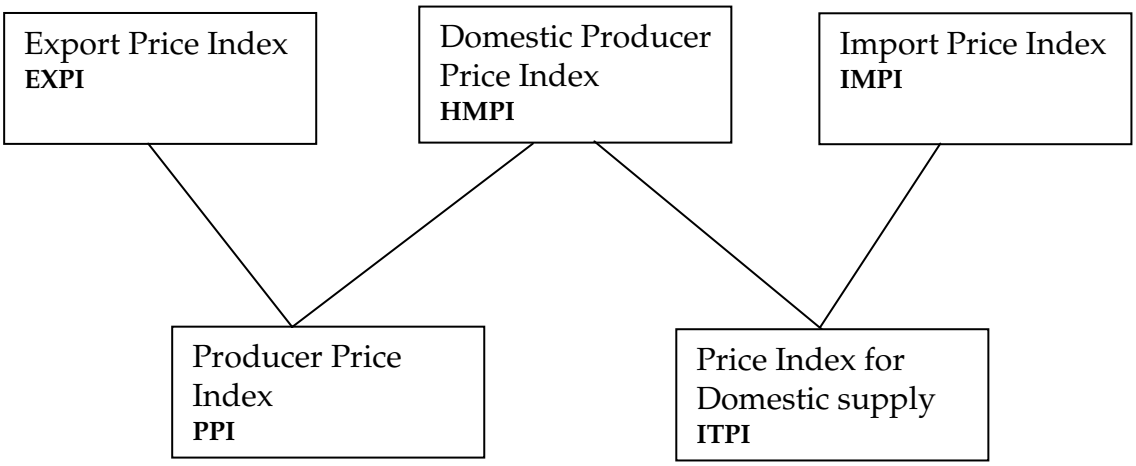
This chapter follows the description of the theory used in the empirical study. For readers unfamiliar with the terminology, it will begin with a section describing *The Producer and Import Price Index*. The following sections will start with the theory about *PPS sampling*, *Practical consequences of a pps sample, Strata* and will thereafter explain *Variance estimation*. The last section contains a description of the *Allocation* theory.

The Producer and Import Price Index

Approximately 4 000 prices are collected monthly from around 1 300 companies[16]. The data collected refer to domestic, export and import prices and monthly price indices are calculated for each of these main groups. With some exceptions, the survey's product coverage spans agriculture and forestry, fisheries, mining and quarrying and manufacturing, as well as electricity, gas, heat and water supply (CPA categories A-E).

The Domestic Producer Price Index measures the development of prices for products that are manufactured and sold in Sweden. The Export Price Index measures producer price changes for goods sold for export, while the Import Price Index is the price index for imported goods. The Producer Price Index, PPI, combines the domestic and export sales producer price indices. The price indices calculated monthly are linked annually to the December index of the previous year. Data are collected roughly between the 1st and the 20th of the month after the statistical month concerned and are published around the 25th.

Figure 2.1.1
Interrelationships between the various price indices



The price index at the producer and import stage is intended to reflect average price development, both overall and for various product groups. Prices are measured, respectively, at the first distribution stage, when the goods are supplied by the Swedish producer, and at the first purchasing stage, when the goods enter Sweden. Price index series, with a rough product group breakdown, have been calculated since 1860. From 1920

[16] June 2004

onwards, a wholesale price index has been reported monthly, with a more fixed structure and a more detailed product group breakdown than previously. This set of statistics took on its modern form in 1963, when a more systematic, international classification of the sectors of economic activity was introduced[17].

For the calculated price index to be a good measure of price changes, it is very important that the prices are comparable from one month to the next. The best way to accomplish this is to specify a typical transaction for the specified commodity category and to submit each month the current price of such a transaction. The specification should contain a very detailed description of the chosen product so that it can be distinguished from other related products[18].

PPS sampling

It is not always advisable to use equal probability selection. Sometimes estimates can be improved by varying the probabilities with which units are sampled from the population. One method for accomplishing this is called sampling with probabilities proportional to size, or pps sampling[19]. This form of pps sampling is denoted πps in scientific literature, where π stands for "without replacement". Since only sampling "without replacement" is of use for PPI, this method will be denoted as pps sampling in this report.

Information about a population characteristic is to be obtained from observations of a probability sample from the population U = (1, 2,…, N). Within the frame, the units in U correspond one-to-one and also contain unit-wise auxiliary information. The auxiliary data are assumed to be size values s = (s_1, s_2,…, s_k), $s_k > 0$, which are typically positively correlated with the study variable y = (y_1, y_2,…, y_N). (For example: for the PPI, the value of the size for each individual matches the production, import or export value. The unit may be a commodity group, a company or a commodity group and a company and the variable to be studied is price change). Given the size values s = (s_1, s_2,…, s_k) for all individuals, the sample design is said to be of a pps scheme if the sample inclusion probabilities, π_k, are proportional to s_k; k = 1, 2,…, N. This gives an enumeration factor for each individual of $\frac{1}{\pi_k}$, which means that the chosen individual represents $\frac{1}{\pi_k}$ individuals, itself and $\frac{1}{\pi_k} - 1$ others[20].

[17] Haglund M. (2003). *Description of Swedish Producer and Import Price Indices*. Further reading can be found at http://www.scb.se/statistik/PR/PR0301/A_Description_of_Swedish_Producer_and_Import_Price_Indices.pdf

[18] Haglund M (2003). *Kommunikation med uppgiftslämnare.doc*. s. 1

[19] Scheaffer R, L Mendenhall 3 W & Ott R, L. (1996), Elementary Survey Sampling 5th ed., Duxbury Press, United States of America. s. 314

[20] Rosén B. (2000), On Sampling with Probability Proportional to Size, Statistics Sweden, SCB-Tryck, Sweden. s.1

Example 1: A random sample where N=100 and n=10.

If a random sample is used, the sample probabilities are given as $\frac{n}{N} = 0.1$.

The enumeration factor will be $\frac{1}{0.1} = 10$; each individual in the sample will represent ten individuals, itself and nine others.

- Example 2: A random sample where N=100 and n=10.

The population is divided into two strata. Within one stratum, all five individuals are chosen. The sample probability is equal to 1 and all individuals only represent themselves. In the other stratum, five out of ninety-five individuals are chosen. The probability sample is $\frac{5}{95} = \frac{1}{19}$, each individual within the sample represents nineteen individuals, itself and eighteen others[21].

A fixed sample size is assumed and leads to the inclusion probabilities λ_1, λ_2,…, λ_k with sample size n.

$$\lambda_k = \frac{ns_k}{\sum_{j=1}^{N} s_j}, k = 1,2,\ldots,N. \quad (1.1)$$

Formula 1.1 may yield λs exceeding 1, which is incompatible with it being a probability. Therefore, all $\lambda_k \geq 1$ are placed in a so-called "take all" stratum[22]. Henceforth, assume that λ_k<1, k=1,2,…..,N.

A scheme with inclusion probabilities according to 1.1 has the following Horvitz-Thompson estimator for the population total τ(y).

$$\hat{\tau}(y) = \sum_{k \in Sample} y_k / \lambda_k \quad (1.2)$$

A "perfect" pps scheme should satisfy $\pi_k=\lambda_k$, k=1,2,…..,N. In this case, a more generous approach will be applied, and it is accepted that $\pi_k \approx \lambda_k$ holds as a good approximation for k=1,2,…..,N. From 1.2, this will give the following result.

$$\hat{\tau}(y) = \frac{\sum_{j=1}^{N} s_j}{n} \left(\sum_{k \in Sample} y_i / s_k \right) \quad (1.3)$$

An order pps design[23] involves the following steps.

Step 1: Establish the sample size and calculate λ_k for k = 1,2,…,N.

[21] Svanberg S (2003), Internal report: πps urval. s. 1

[22] In practice, those companies where λ_k >p are included, where p<1

[23] It should be noted that this sample design is only an approximate πps sample

Step 2: Create independent random variables U_k for k=1,2,…,N with uniform distributions at the interval [0,1]. Ranking variables, Q_k are computed as follows;

$$Q_k = \frac{F(U_k)}{F(\lambda_k)}, k = 1,2,\ldots,N. \tag{1.4}$$

Step 3: Rank the frame with the rank variable in ascending order. The sample consists of the units with the n smallest Q values.

If the function F is of the form F(x)=x, Q_k will be given by:

$$Q_k = \frac{U_k}{\lambda_k}, k = 1,2,\ldots,N;^{24} \tag{1.5}$$

and the sample will be called Uniform order pps[25]or Sequential Poisson Sampling[26]. There are two reasons why this is chosen in PPI. First it is easier than other pps schemes, which minimizes the risk of errors. Second it is less sensitive to the choice of sampling frame than other schemes that can be very dependent on the construction of the frame. Since there is a problem with both under and over coverage in the frame, this favours Uniform order pps[27]. An alternative scheme is Pareto pps, used for Producer Price Indices for services and the Consumer Price Index, which is better for large samples. For this project, however, the sample size is small and therefore the Uniform order pps scheme is chosen.

Practical consequences of a pps sample

The unit corresponds to company and commodity. The estimation used for prices is the following.

$$\tau(\mathrm{y}) = I_{01} = \sum_i w_i \frac{p_{i1}}{p_{i0}} = \sum_i w_i I_{i,01}, \text{ where } w_i = \frac{p_{i1}q_{i0}}{\sum_i p_{i0}q_{i0}}, i = 1,2,\ldots N \ ^{28} \tag{1.6}$$

In the formulas, p represents price, q quantity and i unit, company-commodity. The price p may be a compound price, which is then replaced with P. If the measure of size is interpreted as a value, then $w_k = \lambda_k/n$ for

[24] Rosén B. (2000), A User's Guide to Pareto πps Sampling, Statistics Sweden, SCB-Tryck, Sweden. s. 1-3

[25] Rosén B. (2000), s. 2

[26] Ohlsson E. (1990), Sequential Poisson Sampling from a business register and its Application to the Swedish Consumer Price Index. Statistics Sweden R&D Report 1990:6, SCB-Tryck, Sweden

[27] The uniform order pps depends on the size value and a random variable when the Pareto pps depends on a constant and the size value. The constant depends on the delimitations made and therefore changes within the frame will have an effect on the estimation of the total

[28] For an exact description of the Index formula used for PPI see Haglund M. (2003). *A Description of Swedish Producer and Import Price Indices* at http://www.scb.se/statistik/PR/PR0301/A_Description_of_Swedish_Producer_and_Import_Price_Indices.pdf

k= 1,2,…,N. In this case, $y_k = w_k I_{i,01}$ and the estimated total, the HT-estimator, is[29]

$$\hat{\tau}(y) = \sum_{sample} \frac{y_i}{\pi_i} = \sum_{sample} \frac{w_i I_{i,01}}{\lambda_i} = \frac{1}{n} \sum_{sample} I_{i,01}. \quad (1.7)$$

For non-response, the following non-response model can be used. The units respond independently of each other, with the same probability. For $\hat{\tau}(y)$, formula 1.7, n is changed to n', which is the total number of respondents. This is to deal with over coverage due to companies that have ceased production but that are still included in the frame. This implies a smaller sample than selected, since units will be deleted and there will be a change in sample probabilities. One way to establish the sample size, n, is the following: let n''>n and rank the frame by the rank variables. Select n'' first once within the frame and select units, in order, until n units are obtained. The sample probabilities will change since the denominator in equation 1.1, the sum of the value of size, changes. The sample probabilities are still proportional to s, which does not change the estimate. Note that the sample probabilities still need to be less than 1 for those units not included in the group drawn with certainty. This can be avoided if the n'' chosen is not too large and if the group drawn with certainty contains all units where $\lambda_k > p$, where p<1. The figure p is called the Pareto limit[30].

Strata

The population is divided into L subpopulations of N_1, N_2, ……, N_L units respectively. These subpopulations are mutually exclusive and, together, they comprise the whole population, so that $N= N_1+ N_2+ \ldots\ldots,+N_L$. The subpopulations are called strata. When the strata have been determined, a sample is drawn from each, independently from each other in different strata. The sample sizes within the strata are denoted by n_1, n_2,…..,n_L, respectively[31].

Variance estimation

The population of interest consists of unknown measurements, the value of the mean μ and the variance σ^2 are not known. n measurements are selected and their properties are studied to be able to gain some information about the population. Let (x_1, x_2, ……,x_n) be the data set to be treated and n be the population size. It is assumed that the measurements are independent. The variance estimation is calculated as follows;

$$s^2 = \frac{1}{n-1} \sum_{1}^{n} (x_i - \bar{x})^2 \quad (1.8)$$

From the equation above, the standard deviation s is calculated as $\sqrt{s^2}$.

[29] Svanberg S (2003)

[30] In this case p= 0.9

[31] Lohr S, L. (1999), Sampling : design and analysis, Duxbury Press, Pacific Grove, Calif, London. s. 89

Allocation

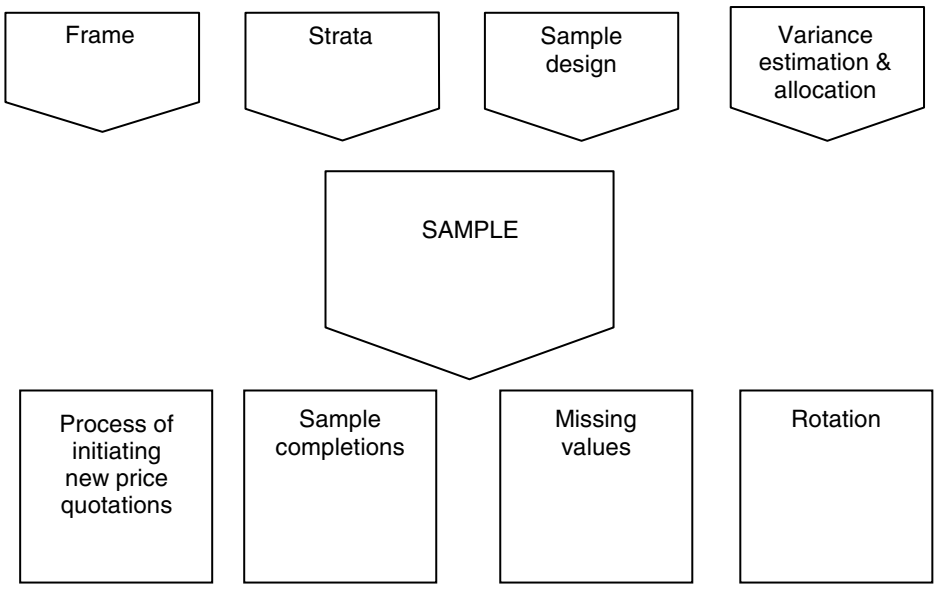
Based on the variance estimation, the number of price quotations for each stratum is assigned. Lines of Businesses with large variances will have more observations but those with a small variance should not have fewer observations. A small variance can reflect measurement problems rather than a sampling error, at the same time as a large variance cannot solely be explained by too few price observations. Thus, based on calculations of the median of the standard deviation in each stratum and year (1998-2003), a minimum and maximum were set. Let N_{si} be the value of each stratum, where i=1,2,…,L, and N be the total value, then the number of price observations *n* in each stratum is assigned as follows:

$$n=\frac{\hat{\sigma}\cdot N_{si}\cdot N}{\sum_{i}(N_{si}\cdot\hat{\sigma})} \tag{1.9}$$

Empirical study & analysis

During 2002, Stefan Svanberg ES/MET[32] and Matti Särngren ES/PR[33] created a test sample for the import market. The experience, PMs and SAS programs made during the test sample have been of great help during the project work. Further descriptions of the test sample are included in this chapter.

This chapter contains a complete description of the empirical work carried out in the project. The frames used are presented in the section *Frames* followed by *Strata*, *Sample design*, *Variance estimation & allocation* and *The sample*. *The process of initiating new price quotations*, *Sample completion*, *Missing values* and *Rotation* are explained in the following sections. It is essential to include certain elements when drawing a sample and a flow chart was designed to attempt to simplify these.



Frames

The frame used for the sample drawn in 2003 for the export and import market is based on data from Foreign Trade statistics (FTS)[34] and the statistical Production of Commodities and Industrial Services (PRODCOM)[35]. Note that the data is one year old, i.e. the data used for the 2004 sample made in 2003 are based on figures from 2002. The data contain information about a company's production, imports or exports within a specific commodity group[36]. Each commodity group can be connected to a

[32] Methodology Unit, Economic Statistics

[33] Prices Unit, Economic Statistics

[34] Delivered from the Foreign Trade Unit, which will henceforth be denoted as FTS. The data received from the FTS are defined as transaction code 1 for intrastat and the equivalent production code for extrastat

[35] Delivered from the Business Activities Unit. Henceforth Production of Commodities and Industrial Services will be denoted as PRODCOM

[36] As of 2004, only CN at a 6-digit level will be available

five-digit Swedish Standard Industrial Classification code[37]. The smallest unit feasible is company-commodity group. Since it is not possible to measure prices on this level, the company is requested to choose a representative transaction within the chosen commodity group.

To be able to make a sample of high quality, a good frame is essential. One dilemma with the data from FTS and PRODCOM is that they do not correspond with each other, i.e. the domestic market is not equal to production minus exports. This results in the domestic market becoming negative for a number of detailed aggregates. Since every price quotation should have a positive weight and thus a positive sample probability, this needs to be corrected. The work involved with the subjective correction is both time-consuming and difficult to document. This problem was the reason why no pps sample was drawn for the domestic market. A suggestion of how this could be solved can be found under Chapter 4 Domestic market.

Working with the two data sets that form the frame has resulted in two observations. Firstly, great caution has to be taken due to the inconsistency between the two data sets and secondly, problems occur from using a one-year old data set. Having said this, it should be noted that the frame based on statistics from FTS and PRODCOM is the best possible frame available and, therefore, it remains the frame to be used for exports and imports.

Strata

During the test sample, a limit of measuring every 500 millionth SEK was set due to the fact that it resulted in a desirable amount of units[38]. The limits chosen in the 2004 sample were based on the same assumption, but consideration was also given to under coverage. Based on data from FTS and PRODCOM, strata groupings were made according to the Swedish Standard Industrial Classification, SE-SIC. Each stratum was made to be at least equivalent to SEK 1.75 billion (imports) and to SEK 2.25 billion (exports). This criterion is based on the requirement to measure every 350 millionth SEK and 450 millionth SEK respectively, at the same time as the smallest sample size within a stratum should be five units[39]. Due to the condition that a stratum should have at least five units, small SE-SIC groups may have to be aggregated according to a "tree structure". This structure is built in a way that only allows similar lines of business to form a stratum. Despite this, some divergence from the rule of five units per stratum was made. Extraction of crude petroleum and natural gas was, despite its size, set to have only four observations. The explanation is that the products have one underlying factor, namely the price of crude petroleum. The price variation for the price development is considered smaller than other product categories and the restriction is thereby motivated. The export markets Forestry, logging and related service activities, Mining of coal and lignite, extraction of peat, Other mining and quarrying and Tobacco pro-

[37] http://www.scb.se/Grupp/ekonomi/_Dokument/SNI2002_Aktivitet.pdf a comparision to CPA/SPIN2002 for an english version

[38] In *Assumptions* the number of price quotations was set to approximately 4000

[39] To be able to publish indices with a good quality and for secrecy reasons it was decided that five units was the minumum

ducts were also restricted to two units due to a very small export value[40] in these product groups.

During the work to develop a new method for the domestic market, one stratum grouping[41] was made for all three markets, see Appendix 1. The decision to have the same stratum grouping for all three markets was based on the simplification involved, considering the weights when the Producer Price Index and Price Index for Domestic Supply are calculated[42]. The same stratum grouping for all markets also means that, for example, the export market will set stratum 11, Crude petroleum and natural gas; service activities incidental to oil and gas extraction excluding surveying, to zero since there are no exports of this product group from Sweden[43]. Other markets may also have limitations assigned to certain stratum. Since no change of the stratum grouping was done for the new sample, it is difficult to analyse the results. Therefore, the next sample drawing will show the pros and cons of the method of having the same stratum grouping for all three markets.

Sample design

When both the frames and the stratum groupings were decided, a decision about the sample design had to be made. The sample units available are company and commodity group. The sample can be designed using three different methods.

- Design 1: company and commodity group are drawn as one unit. A single stage sample
- Design 2: commodity group is drawn first and thereafter company. A two stage sample
- Design 3: company is drawn first and thereafter commodity group. A two stage sample

Furthermore, another sample step is included. Once a contact with the company is established, it is necessary for them to carry out a subjective step when choosing a representative commodity within the sampled commodity group. For this project, sample design alternative 1 was chosen, i.e. that company and commodity group are drawn as one unit. Foreign Trade statistics and the National Accounts prefer design 2, since they are interested in statistics at specific commodity group level. However, design 2 would bring with it a more costly method for establishing new price quotations. If a company lacks exports, imports or production for the selected commodity, a new company has to be contacted. PPI has a preference for design 3 for practical reasons. When contacting the selected company that is deficient in that commodity, a closely related commodity group may be chosen instead. This would save a lot of valuable time since contacting companies is a time-consuming process. In addition, given that a subjective choice has to be made about the commodity in the end by the company, there is much to be gained from choosing the company first, since they have the most updated information about which commodity

[40] According to data from FTS

[41] The sample is comprised of 110 different stratum

[42] See figure 2.1.1

[43] According to data from FTS

corresponds to their most typical transaction[44]. In view of the fact that the three above-mentioned statistical products differ in their view of the optimal sample design, a compromise was made and design 1 was selected as the preferable sample design.

The compromise to use sample design 1 where the commodity and the company are chosen in one step has been shown to work well. Some problems that have arisen, with companies that do not import, export or produce any commodities within the selected commodity group, could have been remedied if the company selected could, itself, select both the commodity group and a typical transaction, i.e. design 3. However, it should not be forgotten that other problems could arise with this method, where there would not be good coverage of certain important commodity groups. On the other hand, thorough scrutiny and extra effort to collect these important groups could counteract this problem. However design 1 will be recommended as the preferable method due to the fact that it is the compromise that has the most advantages in light of the present knowledge.

Variance estimation & allocation

Data from a six-year period (1998-2003) were used to calculate the variance estimation. The variance estimation calculations were made on the price indices, with the base of December the previous year, in each stratum and market by month. The median of the standard deviation for each year was calculated, primarily to avoid extreme values. From this, the median of the standard deviation within each stratum over the six-year period was finally calculated[45]. These values, based on the variance estimation, were used to assign a number of price quotations to each stratum. The allocation method, as explained in the theory section *Allocation*, is based on the assumption that a small variance can reflect measurement problems rather than sampling error, at the same time as a large variance cannot solely be explained by too few price observations. The model is also based on the fact that, since the data material is somewhat uncertain, the standard deviation of a stratum should not have a total impact on the allocation. This explains the choice of using the square root of the standard deviation. Based on calculations of the median of the standard deviation, s_m, in each stratum and year (1998-2003), a minimum of s_m=2 and a maximum of s_m =15 are set[46]. Analysing the results, it was seen that the median of the standard deviation, s_m, ends up between 2 to 15 in approximately 90% of the cases. See Graphs 9803/medianstd01-03 in Appendix 2, 3 and 4 respectively. Thus, all s_m between 0 and 2 will be given a value of $\hat{\sigma}$ equal to $\sqrt{2}$ and all s_m larger than 15 will be given a value of $\hat{\sigma}$ equal to $\sqrt{15}$. Values of the standard deviation between 2 and 15 will be given the value $\sqrt{s_m}$, which reflects the variance estimation within each stratum.

[44] Read more about typical transactions in the last part in section *The Producer and Import Price Index*

[45] Appendix 2,3 and 4 shows the results

[46] s_m stands for the median of the standard deviation

Table 3.4.1

s_m interval	$\hat{\sigma}$
0-2	$\sqrt{2}$
>2 and <15	$\sqrt{s_m}$
15-∞	$\sqrt{15}$

The allocation method used on the test sample on the import market in 2002 did not, as the suggested method above, reflect the variance estimation. The variance estimation made was only based on one year and was therefore considered too uncertain to have a total impact on the number of price quotations assigned to each stratum. The subjective interval used was as follows: s_m =0-5 was given $\hat{\sigma}$=1, s_m =5-30 was given $\hat{\sigma}$=1.25, s_m =30-50 was given $\hat{\sigma}$=1.5, s_m =50-∞ was given $\hat{\sigma}$=2. Tests made using both methods show similar results but the former method is to be used since it takes the variance estimations into account and therefore has a more scientific approach.

Strata with an s_m larger than 15 during the period of time[47] are listed in Table 3.4.2 below.

Table 3.4.2

0112	Growth of vegetables, horticultural specialties and nursery products	Domestic market Import market
0113	Growth of fruit, nuts, beverage and spice crops	Domestic market Import market
01o[48]	Growing of crops; market gardening; horticulture (Except vegetables, horticultural specialties, nursery products, fruits, nuts, beverage and spice crops) and Farming of animals.	Export market
05	Fishing; operation of fish hatcheries and fish farms; service activities incidental to fishing.	Domestic market
232	Refined petroleum products	Export market Import market
24130	Other inorganic basic chemicals	Domestic market Export market Import market
273o[49]	Cold drawing, Cold forming or folding, Wire drawing, Other first processing of iron and steel n.e.c of non-ECSC[2] ferrow-alloys.	Import market
27450	Other non-ferrous metal production	Import market
3002	Computers and other information processing equipment	Import market
322	Television and radio transmitters and apparatus for line telephony and line telegraphy	Domestic market

[47] Data are based on the period 1998 - 2003

[48] 01111, 01113, 01114, 01119, 01212, 01221, 01222, 01228, 01231, 01232, 01241, 01242, 01252, 01253 and 01259. This stratum might not be the best stratum grouping since it includes so many different commodity groups

[49] 2731, 2733, 2734 and 2735

It is essential to first identify the strata with a large variance and then analyse how is it possible to correct it. A clarification follows about the actual strata, but further investigation is needed before any adjustments are made. 0112, 0113 and 01o are all strata involving products with prices that generally fluctuate a great deal with the different seasons, such as vegetables, potatoes, fruit and so on. Stratum 05 includes data received from the Unit for fishery statistics and, historically, has had an unusual price development for several commodities. These have been investigated and improved so the estimated variances are smaller for the last couple of years. Strata 232, 273o and 27450 all contain commodities that vary, depending to a great extent on world market prices. The commodities specifications in the two latter strata are being examined by another project to see if a more detailed specification could help to clean the price development from everything that is not a pure price change. Stratum 24130 is a so-called "problem market". There is also a problem here with measuring the pure price change of the selected commodity. One reason why the stratum is rather volatile can be the fact that the category "other inorganic basic chemicals" includes a vast variety of commodities. Strata 3002 and 322 both involve high technology products and there is therefore a problem with quality adjustments, in that it is difficult to ascertain what is a pure price change and what is a change in the quality of the products, which have a rapid technological development.

In conclusion, the new allocation method, whereby the number of price quotations is assigned with respect to the variance estimate within a stratum over a period of time, outweighs the old method used in the test sample and will therefore be used in the future. Note that it has not been used in practice and should therefore be used with some care when tested in reality the first time. The new allocation method also illustrates which strata have large s_m and therefore need to be investigated further, something which has to be left for another project.

The sample

The four building blocks that make it possible to draw a sample, i.e. frame, strata, sample design and variance estimation, were consequently identified and here a description follows of the work with the sample. The SAS computer program was used to draw the actual samples for the export and import market. Controls were made to verify that the largest 8-digit CN were included in the sample, which is an important control, primarily because the Foreign Trade statistics require a price index for certain CN. The new samples were compared with the existing ones and, although some differences were found, they were fairly similar. The differences were divided into three categories:

- A stratum had too few observations compared to the number of the new sample and therefore needs sample completion.

- A stratum had too many observations compared to the new sample and, depending on how many units that corresponded, sample completion or a cut in the number of price quotations was needed.
- A stratum corresponded well to the new sample on company level but needed to change CN group to be a perfect match.

Only the sample units drawn with certainty and those strata with an insufficient coverage have been sample-completed in the 2004 sample for the import and export market. A complete list of the markets selected for sample completion can be found in Appendix 5.

The work involved in drawing a new sample was, as described in the previous sections, very focused on the preparations before actually writing and using the SAS program to draw a sample. One of the most important things discovered in this step was that, although the new sample deviated more in some strata than in others from the existing sample, it corresponded to a great extent. This was quite a relief since the work with the sample completions was due to begin. It should also be noted that, when a new sample is to be drawn, it is important to document and sort the sample so that it is both easy to compare with the old sample and easy to view and work with. The decision not to complete the whole sample was made due to lack of staff and time resources. It was also seen as a test round to be analysed and, if necessary, developed. These experiences will be described in the next four sections.

Process of initiating new price quotations

The work with a new sample method not only involved drawing a sample but also included establishing new price quotations based on the information from the units drawn in the new sample. The work to complete the import and export samples started in September 2003. During the autumn, no specific model was used for the completions, making the work rather difficult. In response to this, the continued work with the sample completions for 2004 started with a thorough examination of the completion cycle. A cycle is eight weeks long, starting with the first send outs and ending with phone calls[52].

- v1 Send out an inquiry to reply within four weeks
- v3 “Soft” reminder
- v4 “Tough” reminder
- v4-5 Start reminding companies by telephone
- v8 End of telephone calls

The reason to end the cycle with phone calls is, of course, firstly to lower the rate of non response but, secondly, to be able to find out the reasons behind the non response for possible further action[53].

Other observations made during the autumn included the following:

[52] The cycle was worked out together with Petra Jansson and Maria Martinsson, Statistics Sweden, who have experience from the same set of problems within the project *Producer Price Index with Services*

[53] Biemer P. & Lyberg L. (2003), Introduction to Survey Quality, Hoboken, New Yersey. s. 188ff

The send outs for the current completion year will be done in September, together with the regular monthly send out. The necessary information from Business Statistics and Foreign Trade will have been delivered by this time. Since the work is supposed to follow an eight-week completion cycle, this would allow enough time before starting work with the weights for the next year[54]. Every staff member involved in the cycle should be able to call approximately 20-30 companies each week (80-120 over a 4-week period). While deciding how much completion can be done, it is important to take into account the number of staff members who will be able to work with the completion during the period in question. Further observations included the importance of addressing the letter to CEO/Controller, firstly to ensure that the letters are sent to the same person in the company and secondly to know who to ask for if a phone call is necessary. One observation made during a visit from Statistics Norway was that they send out a first letter to companies asking only for the appropriate contact for the survey. Not only can companies usually answer that question with ease but also, having a contact selected as a representative by the company itself, makes the work easier regarding continued contact with the company.

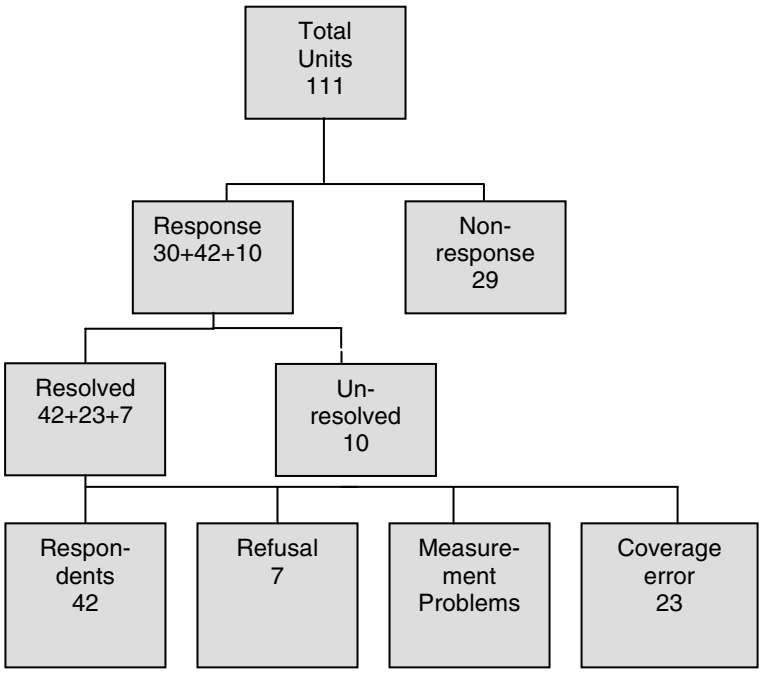
Sample completions involve a significant amount of time-consuming work throughout the year. It should therefore be kept in mind, as the work continues over the years, that when the cycle starts in September, the work needs to be prioritised if the goals are to be achieved. The Norwegian method of approaching a new company should be considered in the continued work. The method of sending the letter to the CEO/Controller has given a response rate of 59% for exports and 78% for imports, but this could perhaps be higher if the Norwegian method was used. Although the response rates are relatively high, it remains that no information is received from the companies not responding and, presumably, these may be difficult to contact.

Sample completion

Figure 3.7.1 shows the disposition of the sample regarding response and non-response. *Total units* are the total number of companies that have been contacted for sample completion. The total units are divided into *response* and *non-response*, i.e. units where there is or is not any information. The responded units include new price quotations (8), established contacts with companies (1&2) and no price quotation established (9). These separate into units *resolved* and *unresolved*. *Resolved* refers to those units that lie within the frame of units where final information exists, i.e. 8 and 9. *Unresolved*, on the other hand, are those units where a contact with the company is made but no information is known about whether this will result in a new price quotation or not. As a last step, the resolved units can be divided into respondents (new price quotation established), refusals, measurement problems (e.g. internal pricing or unique transactions) and coverage errors. The figures in the disposition are from new companies on the export market.

[54] The weights are calculated yearly in Producer and Import Price Index which results in a significant workload during January and February

Figure 3.7.1



Adapting the figures in Table 3.7.2 Appendix 6 to the disposition gives a good overview of respondents and non-respondents. Table 3.7.2 shows the response rate for the total number of send outs. It can be seen that the work with the completion of price quotations from new companies has been more successful than with the existing companies. Established price quotations (8) are 48 % and 64 % for new companies for exports and imports, respectively. For existing companies, this was only 36 % and 31 % respectively. Hence it follows that the response rate for existing companies is much lower than for new companies. One possibility, based on telephone conversations with respondents, is that the letters sent were slightly confusing. An individual who already gives price information for a company can, for example, be asked about the same CN that they have already reported to Statistics Sweden. This is due to the fact that companies with a very large value for a CN are selected in the sample more than once.

There are different reasons why a company is classified as 9, depending on whether it concerns exports and imports, but also for new and existing companies. Table 3.7.3 shows a list with the most common explanations.

Table 3.7.3

Exports New Companies	Existing Companies
23% claim they do not have any production	44% claim they do not have any exports
23% have gone bankrupt	28% already report prices on the chosen commodity
20% are without information	
Imports **New Companies**	**Existing Companies**
34% are without information	36% claim they do not have any imports
44% claim they do not have any imports	32% already report prices on the chosen commodity

As can be seen in Table 3.7.3, one of the most common reasons why the respondents cannot give us new price quotations is that they only have one type of transaction within that product group and that is already monitored. Given this information, there might be ways to escape this confusion, such as a more precise letter or telephone contact with the respondents. The other main reason why a company is not able give information is if they do not import, export or produce any commodities within the specific commodity group. This indicates a frame problem. It should be remembered that the figures used when calculating the probability sample are one year old and therefore might not completely reflect reality. In addition, 9j No information can refer to refusals as well as lack of information in the respondent file. A lack of information can only indicate negligence on the part of the staff at PPI since a company must write an explanation of why it cannot participate in the survey to be able to be dismissed. This negligence makes total analysis more difficult, since it relates to as much as 34 % of new import companies.

Missing values

One problem that was encountered during the sample completion was the question of non-response or missing values. The question of which strategy should be used if, after a contact with a company is established, it is discovered that they do not produce or import the chosen commodity any more, had to be answered. The solution was to use a less detailed CN level, without departing from the SE-SIC level. A larger sample than necessary was drawn to cover any missing values. See the section *Practical consequences of a pps sample* for further explanation.

This missing values strategy seems to have been successful but no specific statistics have been produced to evaluate in how many cases this was used. The method might need to be further highlighted so that it is common knowledge for anyone working with the sample completions. Also, as written in the section *The process of initiating new price quotations*, it is important to come to terms with the reasons behind the non-response, and therefore a follow up with phone calls to companies who have not responded is motivated.

Rotation

It is essential that the model used for the sampling has a well-functioning rotation system. This is to help reduce the response burden for small companies by time-limiting their participation. The rotation system also needs to be such that it is manageable, considering the product's staff and time resources. The suggestion is to draw a sample every year for each market but only to complete the sample for those individuals chosen with certainty. This is proposed since the sample design is such that the largest companies within each stratum will be chosen with certainty and when a total change of the sample is not manageable it is more important to at least update these ones. This will result in the establishment of approximately 400 price quotations for each market each year with about 200 companies. The sample for all lines of business will be revised following a five-year schedule. The new strata grouping of 110 will result in 22 strata that will be updated every year, depending on the sample size of a stratum. This depends on how many persons can participate in the sample completion and how many companies are contained in the chosen strata for that year. One possibility may be to have one session of sample completions in the autumn and one in the spring. Note that, to be able to exclude small companies, it is as important to have a good elimination structure as to sample-complete.

The suggestion for rotation is to have a structure whereby the units chosen with certainty are always sample-completed together with a fifth of the other strata so that, over the five years, there will be a complete review. This structure will simplify the work with the exclusion of small companies to ease their workload, which was one aim of the new rotation structure.

Domestic market

In this section, a proposal for continued work with the domestic market will be discussed and analysed.

As described in the previous sections, a probability sample was drawn for the export and import market during 2003. The next step will be to include the domestic market. As described under *Frames*, the frame used for the domestic market is not ideal since it results in negative weights. This may be due to re-export or trade margins because companies report on different CN to FTS and PRODCOM. The methods used for preventing and reducing coverage bias involve using more than one frame and removing duplicates and incorrect inclusions from the frames[55]. The questions that need to be answered are how do we create an adequate frame for the domestic market? And what weights should the price quotations be given? The following section will try to answer these questions.

The proposal for a possible method to solve the domestic market is as follows. It is necessary to take into account two different levels of consistency, namely the consistency between strata and the consistency within a stratum. For example, it is undesirable to obtain a negative stratum total as well as negative values on a company-commodity level within a stratum. The idea is to with little deviation from the method used for imports and exports, propose a method for the frame and sample design that will try to reduce the inconsistency. The stratum grouping is suggested to be equal for all three markets. On the other hand to be able to reduce the discrepancy between the two frames used, some delimitations are needed. When the delimitations have been conducted, the idea is to draw a single stage sample using design 1 as for the two other markets. The following example will describe the method in more detail.

Example: Domestic market
Step 1: Decide a stratum grouping for all markets based on data from the PRODCOM and FTS. This step is common for all three markets.

Step 2: Calculate weights for each stratum and market and allocate their sample sizes. To be able to do step 2 for the domestic market, the frame based on PRODCOM and FTS needs to be consistent, which is not the case, as explained above. Delimitations have to be imposed, such as the exclusion of trading companies. To see how much the two data sets differ, a test was done, in which the two sets were matched. 75 units[56] were found only in the PRODCOM and 5597 units only in FTS. 3423 units were found in both, which therefore makes a calculation of the domestic market per stratum impossible. At first, totals for the markets were calculated without any delimitation. Note that the value of the domestic market is SEK 369 billion.

[55] Biemer P. & Lyberg L. (2003), Introduction to Survey Quality, Hoboken, New Yersey. s. 80
[56] Company and 8-digit CN

Table 4.1.1
Total values 2002 (SEK billion)

Producer market	Export market	Domestic market
1145	775	369

The domestic market was calculated for all strata, see Table 4.1.2 in Appendix 7. For 80 of 110 strata, there is a positive result for the domestic market. This result indicates that it might be possible to work with consistency, with some delimitation. The first delimitation was to exclude known trading companies from the files. The total value amounted to SEK 6 billion. The companies not included in PRODCOM were excluded from the exports. The total value of those companies (1181) was SEK 135 billion (2418 units). It should be noted that, before introducing this method, a more systematic analysis than this test should be done, including a control to ensure that no large and important companies are missed. Thereafter, a new domestic market was calculated for each company. 141 companies out of 5938 had a negative domestic market, the largest deficit being SEK 2 billion. In Tables 4.1.3 and 4.1.4 in Appendix 7, the strata values are calculated when "re-export" is included and, correspondingly, excluded. There is also an under coverage of exports, whereby all companies with exports of less than SEK 10 million are excluded, as described earlier. A domestic market is again calculated for each unit and, out of 19207 units, 2293 are shown to be negative. At stratum level, 104 of 110 are positive. This indicates that considerable delimitations might enable step 3.

Step 3 As for the export and import markets the company and commodity, with a positive domestic market total on each stratum, will be drawn in a single stage. When the company is contacted, they are asked to make a subjective choice of a typical transaction within the selected commodity groups. They are also asked if the chosen product group is wrong and corrections can be made at this stage. The suggested method will hopefully result in fewer problems when weights are to be calculated on a stratum level. Calculations of weights on lower levels may be of lower quality but, at the same time, this is also the case reality. On the other hand, the lack of quality for the weight calculations might be a gain in time and resources. Before the method can be approved, it should be tested in reality, which is planned to be done during 2005.

Conclusion

Different methods have different strengths and weaknesses and the purpose of this project has been to evaluate and weigh these back and forth. A pps sample brings the advantages that the units are drawn in an objective way and that such a method allows possibilities for estimates of sampling error and provides the weights. In reality, the current annual calculation of weights is very time inefficient and, with the pps sample method that itself provides the weights, a lot of time can be saved. These three important advantages, together with the fact that, as an extension, the pps sample drawn in 2003 introduced a new system regarding initiating new price quotations, sample completion and rotation, have led to the discovery of more strengths than hoped for. However, although it is practical to have a good system regarding the work with the sample, it is also essential to remember that this may involve more work. As written in the introduction, the current sample does not have any systematic process for these aspects, so introducing this will initially generate an increased need for resources. Also, the introduction of a pps sample does not solely increase the quality of the sample. To be able to obtain the best possible sample, there also have to be improvements regarding non-sampling error.

One important lesson learned in the project was that many of the problems could be solved with a better knowledge of the lines of business. When working with the frame, knowledge about an industry or sector can help distinguish trading companies from producers. It can provide clues about structural changes that are not known, since the data are one year old. It would also help to group kindred lines of business together into strata. Furthermore, it can be of tremendous help when making contact with the companies. As a first step, to help recognise which unit to contact in cases of complex company structures and secondly, to increase understanding when helping the company to choose a representative transaction. This was an observation that followed throughout the project and, therefore, it will be suggested that, together with the introduction of a pps sample, an intense period of knowledge gathering about the different industries will be launched.

The importance of minimizing the total survey error for the survey gives reasons to discuss the different quality dimensions in Statistics Sweden's quality policy[57]. Quality is a multidimensional concept, of which one dimension is accuracy measured by total survey error. Total survey error consists of the two components: sampling error and non-sampling error. Sampling errors arise due to selecting a sample instead of the entire population and are intentional errors, in the sense that they can be controlled by adjusting the size of the sample. Non-sampling errors, on the other hand, are unpredictable and not so easily controlled. In this report, non-sampling errors could arise from difficulties in adjusting for quality differences, inaccurate data from the respondents, refusals to participate, difficulties with frame coverage or data entry mistakes. Since the goal of this survey is to provide data that are as accurate as possible, subject to the cost and

[57] Andersson C, Lindström H. & Polfeldt Thomas. (1999:3), Att mäta statistisk kvalitet, SCB-Tryck, Sweden

timeliness constraints, there are processes in this survey that could be improved and consequently minimize the total survey error[58].

Suggestions for continued work

Here follows a list of recommendations for the future:

- Investigate an optimal stratum grouping method. The method of having one stratum grouping for all three markets has not been tested.
- Analyse those strata showing large variances on SE-SIC level, to assist in correcting these. At the same time, it would be advisable to look at those strata with zero variance and investigate the reasons for this more thoroughly.
- Analyse the outcome of the proposed but untested allocation method.
- Further develop a design for the rotation system to be able to exclude small companies.
- Test the proposed method for the domestic market in reality before the method can be approved.
- Continue the work with the frame and knowledge gathering about lines of business to be able to receive the best possible sample method.

[58] Biemer P. & Lyberg L. (2003), Introduction to Survey Quality, Hoboken, New Jersey. s. 16ff

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Appendix 1

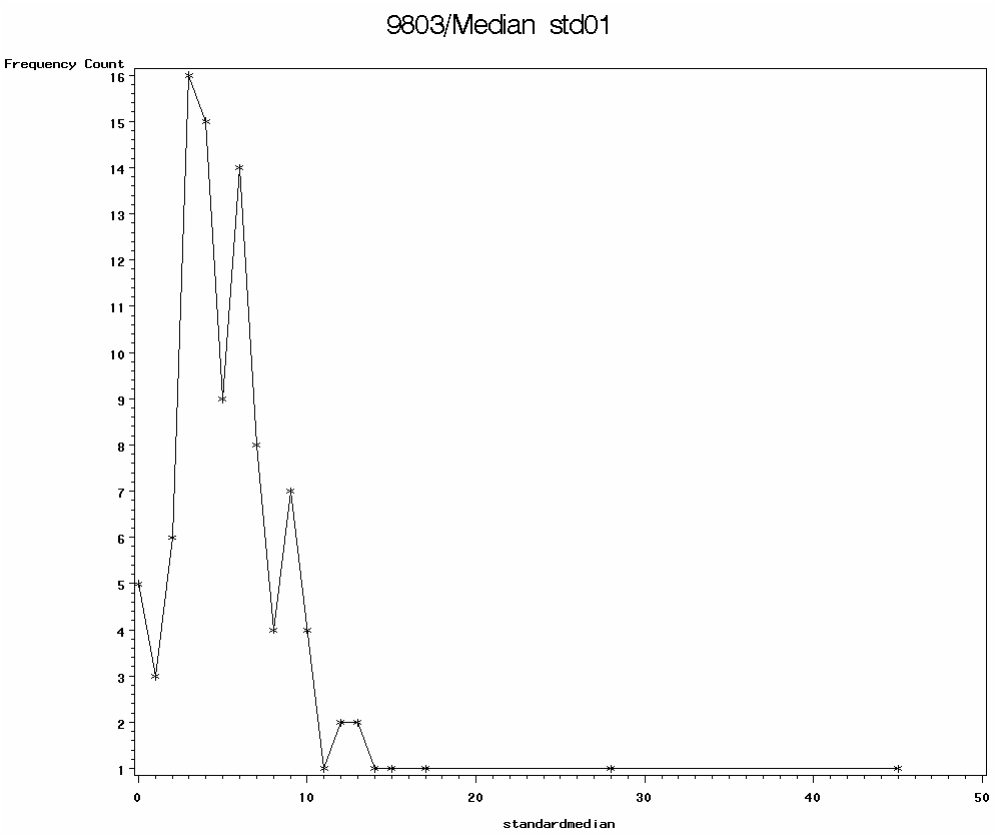
Table 3.2.1

SNI5	STRATUM	SNI5	STRATUM	SNI5	STRATUM
01111	01o	15420	154	17600	17o
01113	01o	15430	154	17710	17o
01114	01o	15511	155	17720	17o
01119	01o	15512	155	18100	18o
01120	0112	15520	155	18210	18o
01122	0112	15611	156	18221	182
01124	0112	15612	156	18222	182
01131	0113	15620	156	18231	182
01139	0113	15710	157	18232	182
01212	01o	15720	157	18233	182
01221	01o	15810	158	18234	182
01222	01o	15821	158	18240	18o
01228	01o	15822	158	18300	18o
01231	01o	15830	158	19100	19
01232	01o	15841	158	19200	19
01241	01o	15842	158	19300	19
01242	01o	15850	158	20101	201
01252	01o	15860	158	20102	201
01253	01o	15870	158	20103	201
01259	01o	15880	158	20201	20o
02010	02	15890	158	20202	20o
02011	02	15910	159	20203	20o
02019	02	15920	159	20301	203
05000	05	15930	159	20302	203
05010	05	15940	159	20400	20o
10100	10	15950	159	20510	20o
10200	10	15960	159	20520	20o
10301	10	15970	159	21111	2111
10302	10	15980	159	21112	2111
11100	111	16000	16	21113	2111
12000	12	17110	17o	21121	21121
13100	13	17120	17o	21122	21122
13200	13	17130	17o	21123	21123
14110	14	17140	17o	21129	21129
14120	14	17150	17o	21211	212
14130	14	17160	17o	21219	212
14210	14	17170	17o	21220	212
14220	14	17210	17o	21230	212
14300	14	17220	17o	21240	212
14400	14	17230	17o	21250	212
14500	14	17240	17o	22110	22
15111	151	17250	17o	22121	22
15112	151	17401	17o	22121	22
15120	151	17402	17o	22130	22
15130	151	17403	17o	22140	22
15200	152	17510	175	22150	22
15310	153	17520	175	22222	22
15320	153	17530	175	22240	22
15330	153	17541	175	23100	23o
15410	154	17549	175	23200	232

Table 3.2.1

SNI5	STRATUM	SNI5	STRATUM	SNI5	STRATUM
23300	23o	26821	26o	29569	2956
24110	24o	26829	26o	29600	296
24120	24o	27100	271	29711	297
24130	24130	27210	272	29719	297
24140	24140	27220	272	29720	297
24150	24o	27221	272	30010	3001
24160	24160	27222	272	30020	3002
24170	24o	27310	273o	31100	311
24200	242	27320	2732	31200	312
24300	243	27330	273o	31300	313
24410	244	27340	273o	31400	314
24420	244	27350	273o	31501	315
24510	245	27410	274o	31502	315
24520	245	27420	27420	31610	3161
24610	246	27430	274o	31620	3162
24620	246	27440	27440	32100	321
24630	246	27450	27450	32200	322
24640	246	28110	281	32300	323
24650	246	28120	281	33101	331
24660	246	28210	282-3	33102	331
24700	24o	28220	282-3	33200	332
25110	251	28300	282-3	33400	33o
25120	251	28610	286	33500	33o
25130	251	28621	286	34100	341
25210	25210	28622	286	34200	342
25220	252o	28629	286	34300	343
25230	252o	28630	286	35110	351
25240	25240	28710	287o	35120	351
26110	261	28720	287o	35200	352
26120	261	28730	287o	35300	353
26131	261	28740	287o	35410	35o
26132	261	28751	2875	35420	35o
26140	261	28759	2875	35430	35o
26150	261	29110	2911	35500	35o
26210	26o	29120	2912	36110	3611
26220	26o	29130	2913	36120	361o
26230	26o	29140	2914	36130	361o
26240	26o	29210	2921	36140	3614
26250	26o	29220	2922	36150	361o
26260	26o	29230	29230	36210	36o
26300	26o	29240	29240	36220	36o
26400	26o	29310	293	36300	36o
26510	26o	29320	293	36400	36o
26520	26o	29401	294	36500	36o
26530	26o	29402	294	36610	36o
26611	26o	29409	294	36620	36o
26619	26o	29410	294	36630	36o
26620	26o	29420	294	40100	40
26630	26o	29430	294	40110	40
26640	26o	29510	295o	40120	40
26650	26o	29520	2952	40131	40
26660	26o	29530	2953	40200	40
26701	26o	29540	295o	40210	40
26709	26o	29550	2955	40300	40
26810	26o	29561	2956	41000	41

Appendix 2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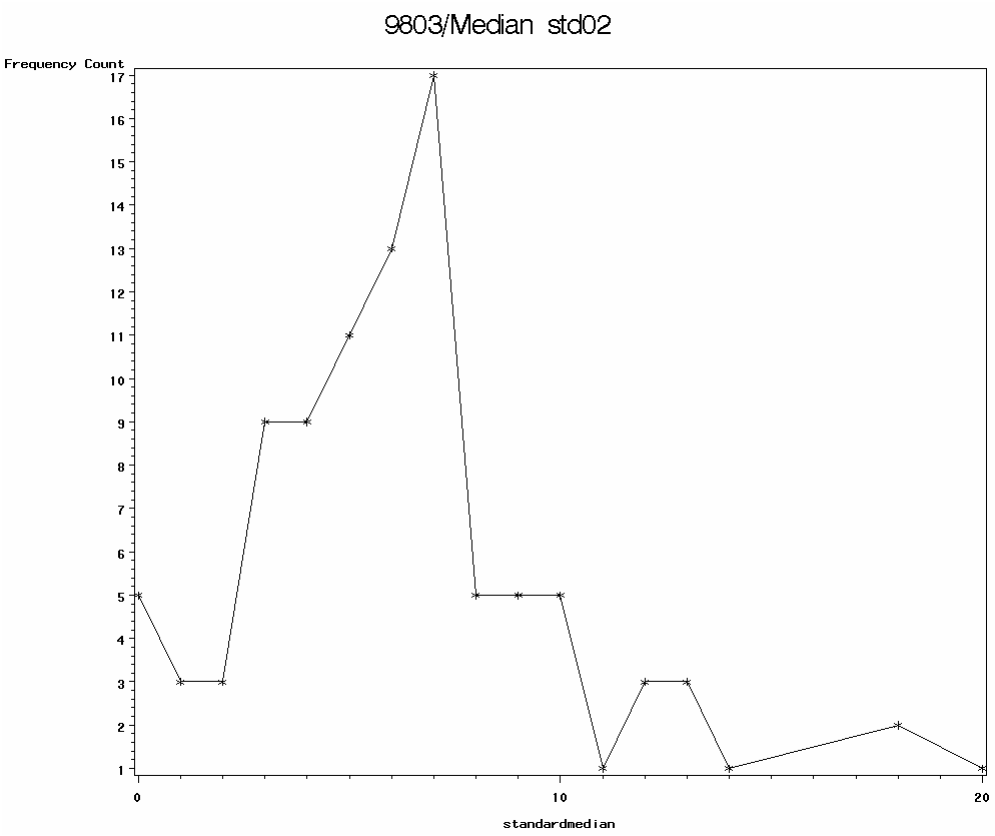
standardmedian

Appendix 3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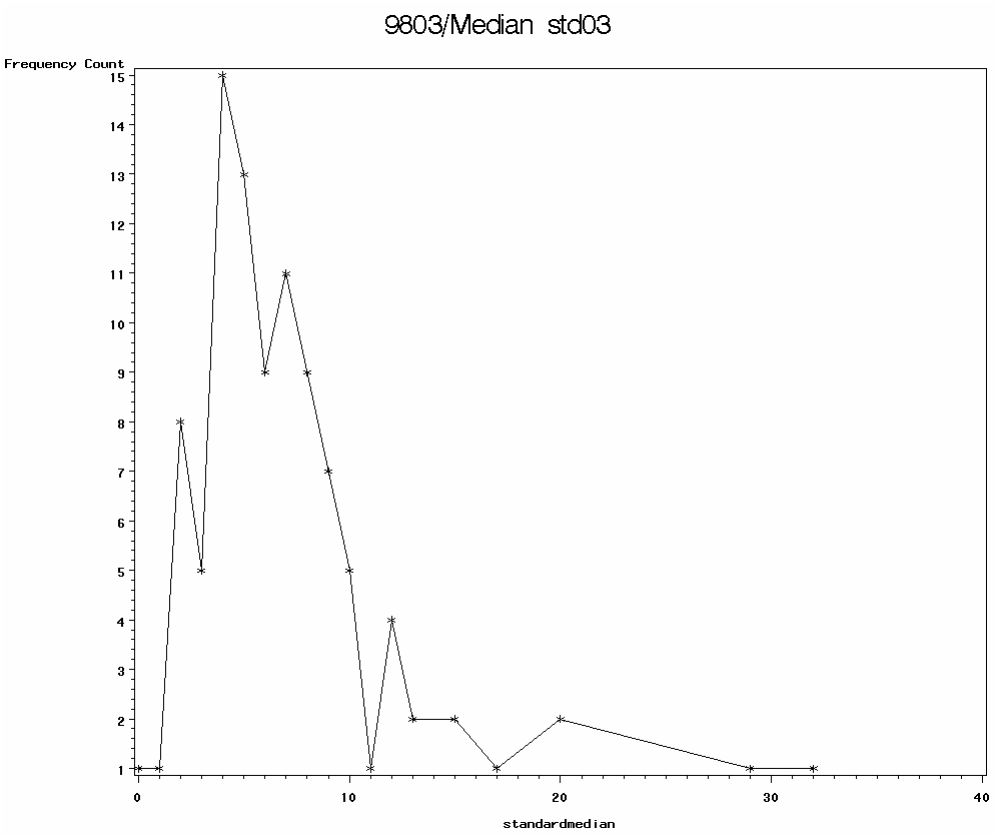
20
standardmedian

Appendix 4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0
10
20
30
40
standardmedian

Appendix 5

The sample completed stratum groups 2003/2004

Import	
113	Growing of fruit, nuts, beverage and spice crops
5	Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing
10	Mining of coal and lignite; extraction of peat
151	Production, processing and preserving of meat and meat products
152	Production, processing and preserving of fish and fish products
153	Processing and preserving of fruit and vegetables
16	Manufacture of tobacco products
1822	Manufacture of other wearing apparel and accessories
1823	Manufacture of underware
20	Manufacturing of wood and of products of wood and cork, exept furniture; manufacture of articles of straw and plaiting mat.
2111	Manufacture of mechanical or semichemical pulp
2112	Manufacture of paper and paperboard
232	Manufacture of refined petroleum products
23o	Manufacture of coke oven products and processing of nuclear fuel.
24130	Manufacture of other inorganic basic chemicals
24160	Manufacture of plastic in primary forms
2466	Manufacture of other chemical products n.e.c
252	Manufacture of plastic tubes
27420	Aluminium production
27450	Casting of metals
29230	Manufacture of non-domestic cooling and ventilation equipment
2956	Manufacture of other specials purpose machinery n.e.c
296	Manufacture of weapons and ammunition
3002	Manufacture of computers and other information processing equipment
311	Manufacure of electric motors, generators and transformers
314	Manufacture of accumulators, primary cells and primary batteries
3162	Manufacture of other electrical ecuipment
321	Manufacture of electronic valves and tubes and other electronic components
322	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
323	Manufacture of television and radio recievers, sound or video recording or reproducing apparatus and associated goods
331	Manufacture of medical and surgical equipment and orthpaedic appliances
332	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes
341	Manufacture of motor vehicles
343	Manufacture of parts and accessories for motor vehicles
353	Manufacture of aircraft and spacecraft
361	Manufacture of furniture

Export	
159	Manufacture of beverages
18	Manufacture of wearing apparel; dressing and dyeing of fur
22	Publishing, printing, and reproduction of recorded media
23	Manufacture of coke, refined petroleum products and nuclear fuel
244	Manufacture of pharmaceuticals, medicinal chemicals and botanical products
2461	Manufacure of explosives
2466	Manufacture of other chemical products
281	Manufacture of structural metal products
2875	Manufacture of other fabricated metal products n.e.c
29120	Manufacture of pumps and compressors
2921	Manufacture of furnaces and furnace
29230	Manufacture of non-domestic cooling and ventilation equipment
322	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
323	Manufacture of television and radio recievers, sound or video recording or reproducing apparatus and associated goods
341	Manufacture of motor vehicles
353	Manufacture of aircraft and spacecraft

Appendix 6

Table 3.7.2
Response rate[59]

	export				Import			
	New		Existing		New		Existing	
	CN		CN		CN		CN	
Total units	111		98		192		202	
Units in scope (9+8)	feb	jun	feb	jun	feb	jun	feb	jun
9a Total (non respondents)	24(18)	30(23)	17(12)	18(12)	25(24)	29(27)	22(22)	25(24)
9b No export/import (non respondents)	3	3	8	8	7	7	8	9
9c Price quotation exists (respondents)			5	5	1	1	8	8
9d Wrong CN (non respondents)			1	1	2	2	4	4
9e Unique transactions (non respondents)	4	5	1	1	3	4		
9f No production (non respondents)	7	7	1	1		1		2
9g Bankruptcy (non respondents)	7	7				1		
9h Wrong CPA heading (non respondents)	2				3	3		
9i Internal pricing (non respondents)		1					1	1
9j No information (respondents)	1	7	1	2	10	10	1	1
8 New price quotations (respondents)	32(27)	42(37)	28(22)	31(25)	86(76)	111(94)	53(44)	58(47)
Units out of scope (1+2)								
1 Contact established	10(7)	10(7)	4(3)	3(2)	29(14)	23(12)	6(6)	13(9)
2 We must contact the company					3(3)	2(2)	1(1)	1(1)
7 Mail return						3		
Unresolved								
Number of remaining price quotations	45	29	49	46	49	27	120	105
Per cent (with 1,2 & 8)	0,48	**0,59**	0,37	**0,39**	0,66	**0,78**	0,32	**0,39**
Per cent (with 8)	0,36	**0,48**	0,32	**0,36**	0,48	**0,64**	0,28	**0,31**

[59] The figures in paranthesis corresponds to number of companies

Appendix 7

Size of markets with different limitations

Table 4.1.2
Values of different markets with todays stratum grouping

STRATUM	Pcisstratum valueBsek	Expstratum valueBsek	Domesticstratum valueBsek
22	46.48	3.12	43.35
343	61.88	28.47	33.42
322	66.63	40.23	26.40
151	25.76	1.62	24.14
341	96.12	75.41	20.71
158	27.72	7.29	20.43
271	47.89	28.11	19.78
232	38.76	19.96	18.80
155	19.71	1.49	18.22
201	33.31	21.47	11.84
26o	15.11	4.16	10.94
203	15.73	5.07	10.66
281	14.83	4.59	10.23
159	14.73	5.12	9.61
2875	12.79	4.95	7.84
212	14.88	7.65	7.23
244	49.29	43.59	5.70
3611	8.58	2.90	5.69
342	11.54	6.12	5.42
2111	19.23	14.13	5.10
361o	7.04	2.39	4.64
352	5.79	1.41	4.38
311	11.61	7.29	4.32
153	5.21	0.96	4.25
21122	15.53	11.62	3.90
156	4.64	0.82	3.81
2922	15.58	12.04	3.54
286	13.94	10.50	3.45
27440	8.29	5.04	3.25
252o	7.72	4.49	3.23
25240	7.32	4.29	3.03
25210	7.96	4.93	3.02
157	3.09	0.15	2.93
243	7.19	4.37	2.82
24140	11.49	8.80	2.69
13	7.19	4.61	2.58
296	4.18	1.62	2.55
21121	11.31	8.83	2.47
21123	14.34	11.96	2.38
20o	5.23	2.97	2.26
24o	3.85	1.71	2.14
14	2.87	0.77	2.10
154	3.64	1.63	2.01
261	4.83	2.86	1.97
287o	6.51	4.65	1.86

Table 4.1.2

STRATUM	Pcisstratum valueBsek	Expstratum valueBsek	Domesticstratum valueBsek
312	9.95	8.13	1.82
27420	7.77	6.00	1.77
24130	4.54	2.81	1.73
332	13.75	12.07	1.68
29230	9.58	8.03	1.55
16	1.76	0.26	1.50
10	1.38	0.08	1.30
273o	4.51	3.24	1.27
293	4.88	3.63	1.24
2732	4.59	3.38	1.21
2913	4.06	2.87	1.19
251	6.41	5.33	1.08
2956	10.11	9.09	1.02
2955	4.14	3.14	1.00
313	5.37	4.47	0.90
282-3	1.81	0.91	0.90
315	3.30	2.46	0.84
35o	2.24	1.46	0.78
351	3.11	2.34	0.77
2912	7.42	6.78	0.64
3614	7.01	6.38	0.62
152	3.20	2.68	0.52
3001	2.24	2.01	0.23
2952	13.25	13.05	0.20
27450	1.15	0.95	0.20
2921	0.97	0.79	0.18
175	3.69	3.57	0.12
2953	2.73	2.66	0.07
331	13.26	13.23	0.02
272	5.49	5.47	0.02
323	20.77	20.75	0.02
3161	1.55	1.56	-0.02
242	0.12	0.20	-0.08
0112		0.19	-0.19
295o	3.19	3.38	-0.19
111		0.21	-0.21
2911	4.99	5.35	-0.36
274o	2.77	3.17	-0.41
245	2.99	3.44	-0.46
294	11.99	12.45	-0.46
3162	3.11	3.57	-0.47
0113	0.00	0.48	-0.48
21129	25.89	26.39	-0.49
18o	1.05	1.69	-0.65
33o	1.37	2.12	-0.75
02	0.08	0.84	-0.76
23o	0.96	1.84	-0.87
29240	9.53	10.45	-0.92
314	0.64	1.59	-0.95
24160	9.96	11.22	-1.26

Table 4.1.2

STRATUM	Pcisstratum valueBsek	Expstratum valueBsek	Domesticstratum valueBsek
40	0.17	1.63	-1.47
2914	4.69	6.15	-1.47
297	8.96	10.44	-1.48
19	0.49	2.07	-1.59
321	3.60	5.24	-1.64
01o	0.02	1.93	-1.91
17o	3.09	5.05	-1.96
36o	3.18	5.17	-1.99
05	0.01	2.36	-2.35
182	0.93	3.50	-2.57
246	6.71	10.20	-3.49
353	8.25	13.49	-5.24
3002	2.57	7.97	-5.39
resten	0.00	5.79	-5.79
12			
41			

Table 4.1.3
All companies are included

STRATUM	Pcisstratum valueBsek	Expstratum valueBsek	Domesticstratum valueBsek
343	61883.48	26580.42	35303.06
22	30376.83	1677.369	28699.46
322	66630.68	39298.78	27331.91
151	25763.27	1055.429	24707.84
341	96122.31	73964.26	22158.05
158	27718.1	6022.86	21695.24
271	47888.19	26968.01	20920.18
232	38758.36	19589.89	19168.47
155	19709.77	1265.571	18444.2
201	33309.11	19854.42	13454.69
26o	15105.02	3264.832	11840.18
203	15725.89	4515.597	11210.29
281	14826.27	3856.529	10969.75
159	14725.32	4780.686	9944.631
2875	12790.94	3432.893	9358.051
212	14877.95	6739.236	8138.718
244	49293.63	42808.47	6485.155
3611	8584.594	2278.914	6305.68
342	11537.03	5762.836	5774.196
311	11614.46	6156.038	5458.418
361o	7035.911	1787.819	5248.092
2111	19227.05	14040.06	5186.985
286	13942.03	8865.625	5076.408
2922	15579.76	10593.91	4985.856
153	5214.651	622.7835	4591.868
352	5794.816	1273.414	4521.402
25240	7317.264	2927.202	4390.062
332	13750.3	9534.797	4215.505
21122	15526.74	11447.49	4079.253
252o	7717.532	3657.925	4059.607

Table 4.1.3

STRATUM	Pcisstratum valueBsek	Expstratum valueBsek	Domesticstratum valueBsek
156	4635.235	625.2093	4010.026
25210	7956.221	3973.658	3982.563
312	9948.715	6371.333	3577.382
27440	8288.375	4713.368	3575.007
243	7187.176	3712.649	3474.527
24140	11494.43	8135.249	3359.181
287o	6506.899	3444.467	3062.432
157	3089.094	77.33856	3011.755
20o	5227.172	2221.523	3005.649
2956	10108.48	7177.955	2930.527
296	4178.511	1547.275	2631.236
29230	9575.853	6989.773	2586.08
13	7190.323	4605.211	2585.112
21123	14342.57	11782.87	2559.702
261	4830.243	2295.348	2534.895
24o	3851.364	1324.193	2527.171
21121	11305.36	8804.104	2501.252
14	2869.856	489.3904	2380.466
27420	7769.833	5457.657	2312.176
154	3644.022	1488.936	2155.086
24130	4537.817	2515.652	2022.165
2912	7421.006	5452.745	1968.261
251	6406.986	4464.611	1942.375
323	20769.71	18831.19	1938.517
2913	4058.157	2217.679	1840.478
293	4876.304	3091.02	1785.284
315	3300.985	1633.713	1667.272
3614	7009.08	5372.066	1637.014
273o	4514.036	2912.625	1601.411
16	1759.295	224.9799	1534.315
313	5366.528	3893.595	1472.933
2732	4588.515	3173.811	1414.704
2955	4137.311	2725.651	1411.66
10	1383.963		1383.963
294	11985.29	10701.58	1283.715
331	13256.21	12030.91	1225.302
351	3111.276	1902.431	1208.845
282-3	1805.141	621.6501	1183.491
2952	13251.23	12084.17	1167.055
35o	2241.404	1116.972	1124.432
152	3201.917	2158.131	1043.786
175	3690.003	2759.022	930.9806
29240	9530.201	8613.483	916.7182
17o	3088.109	2387.965	700.1438
245	2985.231	2302.555	682.676
272	5489.981	4827.666	662.315
3001	2244.149	1722.992	521.157
2953	2726.97	2270.609	456.3615
3162	3106.611	2709.994	396.6166
2921	969.036	597.7141	371.3219

Tabel 4.1.3

STRATUM	Pcisstratum valueBsek	Expstratum valueBsek	Domesticstratum valueBsek
18o	1045.079	690.1895	354.8895
27450	1146.72	828.7254	317.9946
3161	1548.758	1262.399	286.3585
21129	25894.31	25740.25	154.0592
295o	3185.167	3149.561	35.60642
242	122.259	115.5937	6.66534
33o	1368.395	1407.093	-38.6983
0112		47.8363	-47.8363
2911	4985.95	5152.085	-166.135
274o	2766.052	2964.552	-198.5
111		213.1478	-213.148
36o	3182.117	3409.735	-227.618
0113	4.554	331.6935	-327.139
297	8957.536	9297.179	-339.643
24160	9960.316	10361.98	-401.663
182	928.715	1408.767	-480.052
02	77.675	593.5549	-515.88
321	3602.403	4153.331	-550.928
19	485.129	1068.855	-583.726
314	636.211	1275.379	-639.168
2914	4688.028	5458.492	-770.464
23o	964.615	1807.456	-842.841
01o	18.131	1456.506	-1438.38
40	168.793	1625.456	-1456.66
05	10.917	1921.695	-1910.78
246	6712.429	8879.751	-2167.32
3002	2574.245	5993.877	-3419.63
353	8248.067	13215.3	-4967.23
		5145.252	-5145.25
12			
41			

Table 4.1.4
Sizes when all export companies not included in the Production of Commodities and Industrial Services are excluded

STRATUM	Pcisstratum valueBsek	Expstratum valueBsek	Domesticstratum valueBsek
343	61883.48	24611.58	37271.9
232	38758.36	1932.349	36826.01
322	66630.68	34787.03	31843.65
22	30376.83	573.3389	29803.49
151	25763.27	464.3101	25298.96
341	96122.31	71314.72	24807.58
271	47888.19	24068.97	23819.22
158	27718.1	4152.78	23565.32
155	19709.77	1044.353	18665.42
201	33309.11	15252.35	18056.76

Table 4.1.4

STRATUM	Pcisstratum valueBsek	Expstratum valueBsek	Domesticstratum valueBsek
244	49293.63	32994.59	16299.03
26o	15105.02	2827.631	12277.39
281	14826.27	3133.211	11693.06
203	15725.89	4197.682	11528.2
2875	12790.94	2607.113	10183.83
159	14725.32	4669.633	10055.68
212	14877.95	5879.537	8998.417
3611	8584.594	1555.008	7029.586
286	13942.03	7309.81	6632.223
311	11614.46	5179.527	6434.929
2922	15579.76	9421.042	6158.721
2111	19227.05	13223.15	6003.896
331	13256.21	7271.103	5985.111
342	11537.03	5578.757	5958.275
323	20769.71	15031.5	5738.209
361o	7035.911	1432.662	5603.249
332	13750.3	8183.27	5567.032
312	9948.715	4721.066	5227.649
25240	7317.264	2255.791	5061.473
153	5214.651	472.0618	4742.589
2956	10108.48	5390.434	4718.048
24140	11494.43	6845.579	4648.851
352	5794.816	1212.075	4582.741
21122	15526.74	11178.33	4348.414
25210	7956.221	3697.12	4259.101
252o	7717.532	3481.778	4235.754
156	4635.235	625.2093	4010.026
3614	7009.08	3039.173	3969.907
27420	7769.833	3813.764	3956.069
27440	8288.375	4465.704	3822.671
243	7187.176	3545.754	3641.422
353	8248.067	4676.807	3571.26
287o	6506.899	3086.74	3420.159
297	8957.536	5573.128	3384.408
20o	5227.172	1894.054	3333.118
29230	9575.853	6363.485	3212.368
24o	3851.364	792.5998	3058.764
157	3089.094	77.33856	3011.755
2952	13251.23	10241.55	3009.674
251	6406.986	3488.637	2918.349
296	4178.511	1323.615	2854.896
29240	9530.201	6718.924	2811.277
13	7190.323	4420.443	2769.88
261	4830.243	2125.527	2704.716
21123	14342.57	11671.93	2670.646
272	5489.981	2920.565	2569.416
152	3201.917	649.426	2552.491
21121	11305.36	8791.2	2514.156
315	3300.985	830.0341	2470.951
14	2869.856	421.1596	2448.696

Table 4.1.4

STRATUM	Pcisstratum valueBsek	Expstratum valueBsek	Domesticstratum valueBsek
21129	25894.31	23456.2	2438.109
2732	4588.515	2181.709	2406.806
2912	7421.006	5088.563	2332.443
293	4876.304	2571.934	2304.37
24130	4537.817	2263.038	2274.779
154	3644.022	1454.263	2189.759
273o	4514.036	2341.563	2172.473
2955	4137.311	1973.438	2163.873
294	11985.29	9904.405	2080.886
2913	4058.157	1980.742	2077.415
313	5366.528	3485.185	1881.343
17o	3088.109	1378.266	1709.843
351	3111.276	1472.923	1638.353
16	1759.295	151.6167	1607.678
245	2985.231	1381.063	1604.168
10	1383.963		1383.963
282-3	1805.141	450.6	1354.541
35o	2241.404	944.442	1296.962
175	3690.003	2477.172	1212.831
3002	2574.245	1521.992	1052.253
2953	2726.97	1675.563	1051.407
3162	3106.611	2071.841	1034.77
18o	1045.079	226.8039	818.2751
3001	2244.149	1433.263	810.8856
36o	3182.117	2414.632	767.4853
182	928.715	252.5962	676.1188
321	3602.403	2946.635	655.7683
295o	3185.167	2530.876	654.2908
27450	1146.72	549.9055	596.8145
246	6712.429	6142.087	570.3417
33o	1368.395	855.4422	512.9528
24160	9960.316	9463.003	497.3126
2921	969.036	509.5998	459.4362
19	485.129	93.855	391.274
3161	1548.758	1174.014	374.7444
40	168.793	10.78035	158.0127
274o	2766.052	2730.087	35.96529
02	77.675	42.68462	34.99038
242	122.259	92.70835	29.55065
314	636.211	622.406	13.80497
0113	4.554		4.554
05	10.917	35.08109	-24.1641
2911	4985.95	5016.853	-30.9027
2914	4688.028	5339.279	-651.251
01o	18.131	797.8215	-779.691
23o	964.615	1768.046	-803.431
		3779.464	-3779.46
0112			
111			
12			
41			

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2005:02 Svenska hälsoräkenskaper. Ett system framtaget inom ramen för de svenska nationalräkenskaperna