

Turnover in Other Services

Final technical implementation report

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Abstract

Amending Council Regulation (EC) No 1165/98 concerning short-term statistics requires a study in changing the reference period from quarterly to monthly for turnover in Other services. The study in Sweden has taken into account the benefits of reduced reference period in relation to the cost of collection and respondent burden.

The result is that it is possible to reduce reference period to monthly without severe higher survey cost and respondent burden. But costs and burden of respond increase if improvement of timeliness should be implemented.

Therefore the conclusion of this study is that the quarterly statistics for Other services in Sweden can modify the existing statistical method. It should include calculations based on both questionnaires and administrative data from the value added tax register. A method based on questionnaires for large enterprises and data from value added tax register for the remaining enterprises. This results in reliable estimates on monthly bases with acceptable costs.

If timeliness has to be improved another method has to be applied. For preliminary results a sample survey should be used. Then for calculations of more definitive results, administrative data should be supplemented. This corresponds to the aim of change reference period *and* improving timeliness for both Eurostat and domestic demands. But in this alternative the survey costs and burden of respond increase and additional resources are needed.

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1. Introduction

Amending Council Regulation (EC) No 1165/98 concerning short-term statistics requires a study in changing the reference period from quarterly to monthly for turnover in Other services. In part D following is amended:

“The studies shall be carried out taking into account the benefits of a reduced reference period in relation to the cost of collection and burden on business to assess the feasibility of reducing the reference period of a quarter for the turnover variable (No 120) to a reference period of a month”. The commission will then take a decision if there will be a revision of reference period for the turnover variable in Other services.

Services are now a key factor in the national economic system. The economic contribution from this sector continuous to grow. The service sector and their services and products affect enterprises in all sectors. Until now statistical surveys have focused much more on the manufacturing sector and on the production part in the economic statistical system. The service sector is rather unexplored compared to areas as agriculture, manufacturing and construction. Focus is now to make this sector to become more explored so that knowledge of this part of the economy grows. Different improvements can be done, for example examine new service industries, change reference period from annual to quarterly and quarterly to monthly and also improve timeliness.

When the service sector increase, its importance creates a demand for reliable statistical sources. In the future, one of the sources could be a service production index. Users can have more information about the service sector and can do better forecasts and better calculations for the economic system. To create a service production index, a monthly survey for Other services is one step further.

Today Sweden examine Other Services through a quarterly survey. Both questionnaire and administrative data is used. The production time is approximately 50 to 60 days. Because administrative data is used, improving timeliness has not been an alternative. The results are disseminated in Sweden's statistical databases and delivered to Swedish National Accounts and Eurostat. Also a statistical quarterly report is disseminated. Other users get data on requests.

The Council Regulation (No 1165/98) says that the turnover variable should be transmitted for different industries. Some industries at two digit level and some at three digit level and some as sums of industries. Data is transmitted every quarter. Besides that, the National Accounts demand is more detailed. Each quarter the results for approximately 80 industries in different levels are transmitted to the National Accounts.

2. Purpose of the action

The study shall take into account the benefits of reduced reference period in relation to the cost of collection and burden on the business to assess the feasibility of reducing the reference period of a quarter to a reference period of a month for the turnover in Other Services.

The action will submit an Interim technical implementation report and a Final technical and financial implementation report containing the possibility to produce the turnover indicator in Other Services monthly instead of quarterly. Purpose of the action is summarized in appendix 1.

3. The action includes

This project aims to find a statistical model that helps us to change the quarterly survey into a monthly survey and maybe where administrative data can be used together with questionnaires. The possibility of improving the timeliness should be explored. The project is going to investigate when data can be disseminated. Is it possible to work with different time scenarios for national dissemination and for an early European estimate?

The study shall look into if there are industries among Other Services that are of more interest to produce at a monthly base than others. A detailed timetable for the collection is going to be proposed together with a possible course of action.

Statistics Sweden shall weigh the pros and cons for a reduced reference period, cost of collection and burden of business. The expected results of the action are a final report with a possible scenario for a monthly turnover indicator for Other Services.

4. Project description

This part of the report will describe the work, which are going to be done in this project. This part starts with a briefly description of the survey today and then this project examination is described.

4.1 Survey today

Other Services are examined every quarter, split on administrative data and questionnaire. The enterprises, which get a questionnaire each quarter, are all large enterprises and a sample of the minor enterprises that are included in an enterprise group. Turnover for other enterprises than mentioned above comes from the Value Added Tax (VAT) register from the Tax Authorities. The smallest enterprises that do not report their turnover to the Tax Authorities

each month are calculated with a special model. They only report their turnover once a year.

The enterprises that submit their turnover to Statistics Sweden should do so at the 25:th in the following month at the latest. For example should the reference period first quarter be reported at the 25:th April at the latest. The only variable that is asked for in this survey is total turnover in each industry.

Following industries are examined in the quarterly survey; 50, 51, 55, 60, 61, 62, 63, 64, 70, 71, 72, 74, 80, 85, 90, 92 and 93 (NACE Rev 1.1).

In the year 2003 the total population was 400 818 enterprises. 4 710 enterprises submit their turnover by questionnaire and the rest by administrative data from Swedish Tax Authority or calculated by a statistical model (enterprises that only report turnover to the Tax Authority once a year).

Swedish short term statistics follows the European regulation; Council Regulation of Short Term Statistics, EC 1165/98. This statistics is used as a key input into the calculation of the Swedish Gross Domestic Product (GDP). The results are disseminated about 50 to 60 days after current quarters end.

4.2 Reference period from quarterly to monthly

This is the main issue in this project. Can reference period improve from quarterly to monthly without much higher costs and with preserved quality? What are the benefits and what are the costs and burden for the enterprises?

If reference period for Other Services should be improved the methodology either could be the same as for the Swedish Retail trade statistics (monthly) or administrative data could be used together with questionnaire as today. If timeliness should not be considered, issues should be to suggest that administrative data should be used like today or even more. In Sweden there is a strong focus on the burden of response. Since the service sector includes many small enterprises it is even more important to work with administrative sources. On the other hand, it is also a strong focus on improving timeliness.

4.3 Statistical analysis

In the project the decision is to investigate the possibility to change the quarterly statistics in Other services and test different statistical models and different scenarios as follows:

4.3.1 *Scenario 1*

Use current method to change the reference period from quarterly to monthly. Some improvement in timeliness can be done if the VAT-register can deliver data earlier and more frequently.

Large enterprises submit figures each month, based on questionnaires. The rest is collected through the VAT-register.

Dissemination can be accomplish after approximately 70 days (T+70) after current month and current quarter. The results will be disseminated in Sweden and transmitted to Eurostat. Maybe an early estimate can be done each quarter so the results can be disseminated T+45.

4.3.2 *Scenario 2*

A survey based on questionnaires; see scenario 2a, 2b and 2c below.

4.3.2.1 *Scenario 2a*

A survey based on questionnaires. Reference period is monthly for all enterprises in the sample.

The survey is designed to produce reliable estimates on the industries that the National Accounts requires on a national level, today 84 industries. The 27 industries will be transmitted to Eurostat.

Dissemination depends on the date of respond, today T+25. If the last day of submit the figures are T+15 instead, the results can be disseminated approximately T+28. Otherwise dissemination can probably be at T+35.

4.3.2.2 *Scenario 2b*

A survey based on questionnaires. The total sample shall submit figures for each quarter. Large enterprises and a sub sample of minor enterprises shall submit figures each month.

The survey is designed to produce reliable estimates for the 27 industries that Eurostat requires. On a quarterly bases results for all 84 industries can be send to the National Accounts and be disseminated in Sweden.

Dissemination depends on the date of respond, today T+25. If the last day of submit the figures are T+15 instead, the results can be disseminated approximately T+28. Otherwise dissemination can probably be at T+35.

4.3.2.3 *Scenario 2c*

A survey based on questionnaires. The total sample shall submit figures for each quarter. Small enterprises are included in the full scale sample and distributed (randomly) into disjunct sub samples. Enterprises in the first sub sample should submit figures for the first month in the current quarter, the

second sub sample for the second month and the third sample for the third month.

The survey is designed to produce monthly estimates for the 27 industries that Eurostat requires but the estimates are not optimized as in scenario 2b. The advantage is that small enterprises only submit figures once in the current quarter. On quarterly bases, results for all 84 industries can be sending to the National Accounts and can be disseminated in Sweden.

Dissemination depends on the date of respond, today T+25. If the last day of submit the figures are T+15 instead, the results can be disseminated approximately T+28. Otherwise dissemination can probably be at T+35.

4.3.3 *Scenario 3*

A method based on both questionnaires and administrative data. The sample survey is designed to produce reliable estimates for the 27 industries that Eurostat requires. Then the more slowly estimate is based on current method including administrative data.

Dissemination of the preliminary results to Eurostat depends on the date of respond, today T+25. If the last day of submit the figures are T+15 instead, the results can be disseminated approximately T+28. Otherwise dissemination can probably be at T+35.

Date of dissemination of the definitive results (Eurostat and Swedish National Accounts) depends on delivery of administrative data from the VAT-register.

4.3.4 *Enterprises in an enterprise group*

Today large enterprises and enterprises in an enterprise group are in the questionnaire part of the survey. It is interesting to investigate if enterprises in an enterprise group can be included together in the administrative part of the survey instead. That can effect some of the scenarios above.

4.3.5 *Statistical analysis*

In the statistical analysis the staff at Statistics Sweden's methodology unit will look into these scenarios above. Hopefully together with other discussions and analysis, different solutions will come up. Positive and negative effects should be included for each of these changes.

4.4 **Administrative sources and current ratio method**

Statistics Sweden has today access to a VAT-register where data from the Swedish Tax Authorities is incorporated. The law for VAT in Sweden says that "large enterprises" with a yearly turnover larger 40 million SEK shall provide figures to the Tax Authority 25 days after the reference period as

latest. "Medium size enterprises" with a yearly turnover between 1 and 40 million SEK shall provide figures after 40 days after the reference period as latest. The small enterprises with a yearly turnover less than 1 million SEK can provide figures yearly.

The delivery includes total turnover (both domestic and export), export split in within EU and outside EU, value added tax split on different tax rates etc.

Until March 2005 the first delivery was made at T+40 containing mostly large enterprises but also some medium size enterprises. After T+70 days the next delivery was made with the remaining enterprises, mostly medium size enterprise but also some late large enterprises. To solely use the VAT-register therefore seemed very difficult. In Sweden there is a strong focus on the response burden. Since the service sector includes many small enterprises it is even more important to work with administrative sources.

Currently, administrative data is used for the small enterprises (except for those included in an enterprise group as mentioned before) in the frame population regarding other services to produce the quarterly statistics. This method means that information on turnover is collected from *all* small non-enterprise-group enterprises in the frame population, not only from a sample of small enterprises that would have been necessary if questionnaires had been sent out. The quality, in terms of sample error and non-response, of the survey has improved since this method was introduced. Statistics Sweden also focuses on response burden and this method enables to reduce the response burden among small enterprises.

When results from the survey must be sent to the National Accounts, only turnover values from (mostly) large enterprises is included in the VAT-register regarding the third month in a specific quarter. In order to produce the quarterly statistics using this administrative data for the small enterprises the third month must be imputed for the majority of these enterprises. This is done by a method called "current ratio imputation" and this method works well in this survey. This conclusion is based on evaluations¹, which have been possible to do, in retrospect, when the information on all small enterprises finally is included in the VAT-register regarding the third month in a quarter.

Current ratio imputation is used for the enterprises with information on turnover in the VAT-register for two of the three month in a specific quarter. For the minimal number of enterprises in the frame population, missing information on turnover in the VAT-register (or there is only information on

¹ Evaluation of current ratio in the short term turnover statistics at Statistics Sweden, report 2004 "Utvärdering av imputeringsmetoden current ratio i Statistiska centralbyråns omsättningsstatistik".

turnover regarding one month in the quarter) reweighing makes the compensation, imputed turnover values are then regarded as true values.

The current ratio method in the survey on Turnover in Other services is made by industry and quarter. This method would perhaps work better if it were made by industry and size category. But in order to have enough data to calculate the ratio it is necessary to use only industry.

The current ratio method works as follows:

$y_k^{(1)}$ = enterprise k:s turnover value month one

$y_k^{(2)}$ = enterprise k:s turnover value month two

$y_k^{(3)}$ = enterprise k:s turnover value month three

The imputed turnover value for enterprise k month three:

$$\hat{y}_k^{(3)} = (y_k^{(1)} + y_k^{(2)}) \cdot CR \quad (CR = \text{Current Ratio})$$

$$CR = \frac{\sum_r y_k^{(3)}}{\sum_r (y_k^{(1)} + y_k^{(2)})}$$

Where CR is based on enterprises (r) with information on turnover included in the VAT-register all three month in the quarter.

The most common missing month is the third month in a quarter, but if month one (or month two) instead is missing the same method is used (based on the y_k -values from the two month in the quarter where information on turnover is included in the VAT-register).

4.5 Improving timeliness

In the monthly survey for retail trade Statistics Sweden has improved timeliness. Results are today disseminated between 23 and 30 days after current months end compared with 40 to 45 days before the year 2003.

The quarterly short term statistics is more difficult to change because here is a survey model that also dependent on administrative data. VAT-data make the production time more sensitive. The results can not be calculated before enough enterprises is included in the administrative data set.

If the quarterly turnover statistics should change reference period to monthly a new strategy is needed and maybe also a new statistical model. There are two main scenarios; (a) Only improvement of reference period from quarterly to monthly and (b) Both improvement of reference period from quarterly to monthly and also improving timeliness.

5. Analysis

This chapter contains a description of Statistics Sweden's work in this project and a report on the results of the statistical analysis. The results includes both a statistical part and a another part were the costs and the respondent burden is reported.

5.1 Description of the study

As mentioned in chapter 4 this project includes a statistical analysis. In the project the decision was to investigate the possibility to change the quarterly statistics in Other services into a monthly based survey. In order to do that, different tests of several statistical models were handed out. Different scenarios were described.

First scenario is based on the current method but where the reference period will change from quarterly to monthly. In this scenario there will not be any sufficient improves in the timeliness. If administrative data can be delivered earlier some improvement of timeliness can be done.

The second scenario is based solely on questionnaires and can be split into three cases 2a, 2b and 2c. Scenario 2a is a survey where a sample will make it possible to calculate reliable monthly estimates for both the Swedish National Accounts and Eurostat. Scenario 2b involves one part where results to Eurostat can be estimated and one part where quarterly estimates can be disseminated at a more detailed level. Scenario 2c is the same as 2b but with another sample methodology.

The third scenario is based on both questionnaires and administrative data. The sample survey is design to produce estimates for the industries that Eurostat requires. And then, a second and more slowly, estimate is based on questionnaires and administrative data, i.e. the same method as today.

In the Interim technical implementation report there was two extra scenarios. One of them was mentioned (iv) and involves working with the Tax Authority to increase number of deliveries per month. This scenario now exists. Statistics Sweden is now getting data delivered once a week instead of once a month. More about this is discussed in the next chapter.

Finally, the last scenario in the Interim technical implementation report was scenario (v). It was based on a sub sample within the European Union. The result from this alternative is described in the next chapter.

5.2 Results of the statistical analysis

This chapter includes results of the statistical analysis. More detailed information about the statistical methodology is given in appendix 2.

5.2.1 *Statistical method*

A study has been performed in order to estimate required sample sizes to obtain reliable estimates regarding the different scenarios, for technical details see appendix 2. In this study reliable estimates means estimates with standard errors of the same magnitude as obtained in the present survey.

The study is based on the stock of enterprises included in the frame population established for the present survey referring to the year 2003. This study includes a survey design (cut-off limit, stratification and allocation) for each one of the scenarios. The different survey designs are worked out in order to meet the specific demands for presentation, magnitude of standard errors, timeliness etc.

Neyman (optimum) allocation is used to have some guidance when estimating required sample size in each stratum. Required sample sizes are estimated by pre-specifying a precision (in terms of a relative standard error) regarding the estimates in each domain.

5.2.2 *Sample sizes*

Different scenarios lead to different sample sizes (see above under chapter 5.2.1). To survey Other services on a quarterly bases with a method where administrative data (VAT) is used and where enterprises in an enterprise group is included the sample size is around 4 600 enterprises. But enterprises in NACE 80 and 85 (education, health and social work) are not VAT-obligated so they should not be included in this study. Therefore the number of enterprises in the sample survey today is around 3 850. Number of contacts (number of enterprises in the sample multiplied with frequency) each year is four times higher, totally 15 400 per year.

The row "Future quarterly survey" is based on the fact that enterprises in an enterprise group can be included in the administrative data instead of being surveyed by questionnaires, which considerably reduces the sample size.

The "new" method, for all scenarios, is based on the possibility of excluding enterprises in an enterprise group, for more detailed information see chapter 5.2.4 and 5.2.5. For more comparable analysis the existing sample without

enterprises in an enterprise group is 1 050 enterprises and 4 200 contacts per year.

Table 1 Number of enterprises in different scenarios excluding VAT-data.

Scenario	Number of enterprises	Contacts per year
<i>Existing quarterly survey</i>	3 850	15 400
<i>Future quarterly survey*</i>	1 050	4 200
Scenario 1	1 050	12 600
Scenario 2a	8 000	96 000
Scenario 2b	8 000	56 800
Scenario 2c	8 650	59 400
Scenario 3	3 000	36 000

*If enterprises in an enterprise group is included in the administrative data.

As table 1 show, scenario 2 (a, b and c) result in large samples. It is for the reason that no administrative data is used. A survey based on only questionnaires, results in large sample sizes. Depending on scenario the sample size will differ.

Scenario 2b and 2c is rather like accept that in 2c, were the sub sample is a disjunct sub sample, which leads to higher standard errors. The sample size increase due to secure and obtain requested minimal sample size in each stratum.

5.2.3 Administrative source

In Swedish turnover statistics the use of administrative data is important because it reduces survey cost such as costs for questionnaires, collection, reminding activity, verification etc. and reduces costs for the community such as costs for the respondents.

An aim is to decrease respondent burden for Swedish enterprises. If the requested data could be found at any other Authority, data should not be collected again (if it is possible). In Sweden there is a strong focus on the respondent burden which leads to look into other ways to collect economic data. Therefore some statistical solutions can be more acceptable to fulfill this requirement.

To improve quality and/or timeliness from the administrative source, one way was to create a demand for weekly deliveries or deliveries two times a month. If data could be sent from the Tax Authority more frequently than before the possibility to create changes in short term statistics increased. After contact with the Tax Authority and some other work, the delivery frequency is now weekly instead of monthly.

From March 2005 and forward Statistics Sweden receive data once a week and the VAT-register can be updated continuously.

Results from analysis considering the more frequently updating of the VAT-register is unfortunately based on a short time period. This area should be more analyzed but the positive effects, see below, is so important that this is something to take into consideration irrespective of statistical model.

At the delivery time of T+40 the monthly delivery is approximately 50 000 enterprises. After T+70 approximately 370 000 enterprises is included in the data set. For quarterly statistics it is possible to use administrative data for the two first months in the current quarter and then use current ratio method to impute missing values for the third month. This method works for quarterly statistics but can not be used in the same way for monthly statistics. Number of enterprises is too few to use as a base in monthly estimates.

Weekly delivery gives approximately 10 000 enterprises after T+20 days and 30 000 enterprises after T+30 days. This is, of course, less enterprises but is it enough for quarterly statistics? After T+55 approximately 360 000 enterprises is included in the data set which results in an improvement in timeliness of 15 days. This can be used for reliable estimates each month for all requested industries or use administrative data combined with questionnaires for earlier estimates.

5.2.4 *Enterprises in an enterprise group*

The reason for sending out questionnaires to enterprises included in an enterprise group is a study performed before this survey design was introduced. This survey design was introduced regarding the survey referring to the year 2001, before this survey was based only on questionnaires sent to a sample of enterprises. This study indicated that VAT-data was not possible to use for this category of enterprises depending on the way they reported VAT-data to the Tax Authorities. However, a recent study indicates that VAT-data can be used even for enterprises included in an enterprise group.

The current method is sensitive of number of respondent enterprises in each strata, i.e. the results can, in some cases, depend too much on small enterprises in an enterprise group because they are enumerated. After analysis of data for 2003 and 2004 the conclusion is that the negative effects in the VAT-register is not depending on this effect. Differences between the submitted turnover by questionnaires and the turnover value in the VAT-register do not depend on the fact that the enterprise belongs in an enterprise group. Other factors are more important, as if the enterprises include or exclude value added tax and export, how they account sales of marginal tax products and also different kind of measuring errors.

This means that Statistics Sweden plans to base turnover values regarding small enterprises included in an enterprise group on administrative VAT-data. The quality in the estimates on turnover will improve in terms of smaller standard errors because information on turnover will be collected from *all* small enterprise in the frame population. The response burden and costs will also be reduced. Some final analysis remains, maybe some industries have to be treated in special ways but the methodology change will likely be implemented next year referring to the year 2006.

5.2.5 *VAT-groups*

In Sweden enterprises have the possibility to apply for submitting monthly statement for a group of enterprises, so called VAT-groups. It means that one enterprise in an enterprise group can report figures to the Tax Authority for all other enterprises in the group. It causes problems because the reported enterprise account a much higher turnover compared to actual turnover and other enterprise's turnover is zero, which is false.

To be sure of this effect, an investigation of the VAT-groups has been done and the result is that this is not an important issue. The result show that totally 823 enterprises have permission today to be included in a VAT-group. 58 enterprises (7 per cent) are included and active in the turnover statistics 2005. After exclusion of large enterprises (they are always in the survey), special treated enterprises and enterprises in the monthly retail trade survey, there are 9 enterprises left. Of these 9 enterprises, 7 of them are included in health and social services, which are industries that are not VAT-obligated. Health and social services are already today surveyed by questionnaire. The other 2 enterprise's are in industry 74 (other business activities).

The result is that the effect of VAT-groups in not as large as feared. The positive effects of administrative data are larger than this negative issue. To be sure of its relevance each year, a yearly check can be done together with the sample work. It can eliminate existing problems that year.

5.2.6 *Sub sample within European Union*

In order to consider a solution with a European sub sample a contact with Eurostat has been taken. The result is that nothing, at this point, can be said about this kind of solution. Eurostat has announced that the study on a European sample, with national sub samples, would be very interesting for Eurostat, but at the moment they do not have the detailed survey information that is needed from the member states to do this feasibility study. However, once the Amending Council Regulation is in force, Eurostat probably will initiate studies in some of the member states concerning monthly turnover

statistics in Other services. It is possible that one of these feasibility studies could be to explore the use of a European sample.²

Because of this, the discussion about a sub sample scenario is completed but not forgotten. In the conclusion, this solution is mentioned.

5.3 Further results

Results as costs and respondent burden are essential because the recourses are limited and the costs for the community and the enterprises should decrease instead of increase over time.

5.3.1 Survey cost

The survey cost is calculated from the information of the different scenarios 1 to 3. For each scenario a sample size has been calculated, for more information see appendix 2.

Each scenario has there own methodology. The costs are based on the given methodology for each scenario. Following parameters has been integrated in the model for the cost calculation:

- Questionnaire (printing, sending out, postage etc.)
- Reminding activity including telephone remind
- Staff (collecting, verification, calculations etc.)

Table 2 Yearly survey costs for different scenarios

Scenario	Cost (SEK)	Index 2005=100
<i>Existing quarterly survey</i>	635 000	100
<i>Future quarterly survey</i>	176 000	28
Scenario 1	521 000	82
Scenario 2a	3 725 000	587
Scenario 2b	2 231 000	351
Scenario 2c	2 332 000	367
Scenario 3	1 417 000	223

In table 2 it is obvious that costs accelerate with the number of enterprises in the sample. If administrative data can be used for some or for the most of the enterprises it substantially cuts costs.

After this analysis scenario 2a can be eliminated. Together with the results from the analysis of respondent burden this scenario is expansive both for Statistics Sweden and the enterprises. To calculate and present results for all

² Contact person at Eurostat has been Jenny Runesson.

industries at a monthly basis and if timeliness should be improve, it requires a method with only questionnaires and that rise costs.

One solution to cut survey costs is to draw a sub sample from the ordinary sample as in scenario 2b and 2c. But also here the total survey cost will be high. Survey based on only questionnaires correlate with high cost. In these two scenarios the costs will decrease compared to scenario 2a but will nevertheless be to expansive. The recourses can be used in a more effective way.

From the cost analysis scenario 2a, 2b and 2c are not recommended. Together with calculations of respondent burden it is clear that these three scenarios should not be used for this purpose.

If data from enterprises in an enterprise group can be included in the VAT-data, the first scenario is the next cheapest. For comparison and because of the planned change in the survey in 2006 the method for the different scenarios also excludes enterprises in enterprise groups. The cost analysis illustrates that the first scenario is the cheapest alternative compared with the other four scenarios, but there is some other negative effects. A discussion about that is in the chapter 6 (Conclusions). Scenario 3 is more expansive in consideration of survey cost but if timeliness should improve this scenario is of interest.

5.3.2 *Respondent burden*

Today it is a strong focus on reducing respondent burden. If data are collected, the same data should not be requested again. The total administrative cost for enterprises should decrease in the future. But on the other hand demands for reliable economic statistics increase. Sometimes data from other sources can not be used because of mismatch in definitions and/or in time.

In this project it is very important to consider alternative collection of data since the survey today uses administrative data from the VAT-register. One reason to change method to the one that is used today was to minimize the survey cost and the respondent burden. To change this, back to a survey with only questionnaire, needs a lot of positive effects and a strong demand. Utilize administrative data, release recourses, that can be used in other parts of the survey, for example more frequently or more industries.

Results of calculations of respondent burden are showed in table 3. Different scenarios lead to different sample size and then to different impact on enterprises. The calculation is made as normal consequent study, i.e. sample size multiplied by frequency and spent time.

Table 3 Yearly cost for enterprises

Scenario	Cost (SEK)	Index 2005=100
<i>Existing quarterly survey</i>	2 634 000	100
<i>Future quarterly survey</i>	714 000	27
Scenario 1	2 142 000	81
Scenario 2a	16 320 000	620
Scenario 2b	9 656 000	367
Scenario 2c	10 098 000	383
Scenario 3	6 120 000	232

The yearly cost for enterprises increases substantially when sample size raise or when frequency increase. With this results the same conclusions can be made as for the survey costs above, i.e. scenario 1 is the cheapest alternative compared with the other four scenarios but also scenario 3 is of interest. The other scenarios are rather expansive which gives high respondent burden.

The costs for the community is larger then the figures above. But other costs are difficult to measure.

6. Conclusions

In this chapter the conclusions will be presented. First the demand will be summarized, and then what Statistics Sweden can do to accomplish the demands in the future.

6.1 Eurostat

Eurostat demand turnover statistics for Other services at different levels depending on industry. Statistics Sweden transmits results for 27 industries each quarter. The demand in the future will probably be delivering data each month for these industries.

6.2 National Accounts

The Swedish National Accounts demands turnover statistics each quarter for Other services. There are no demands for monthly data but in the future the calculation of the National Accounts will be faster than today. That is wherefore it exists a domestic demand for improving timeliness.

National Accounts hope that the quarterly turnover statistics can be calculated in the range of T+35 to T+37 days for preliminary results. Number of industries for these results shall be discussed together with the National Accounts at the time for changes in GDP calculations concerning improvement of timeliness.

6.3 Conclusions from this study

In this study several scenarios has been investigated. The aim was to find a statistical model that helps us to change the reference period from quarterly to monthly. After studying different scenarios there are both positive and negative effects, some scenarios are more of interest then others.

Scenario 1 is based on current used method. This is the most cost effective alternative, regarding both survey costs and respondent burden. Disadvantage is timeliness. The results can be disseminated after approximately 55 days after current quarters end.

Scenario 2a is a survey based only on questionnaires. This requires large sample sizes and it give large survey costs and heavy burden of respond. The benefits are that the monthly results can be disseminated in a more detailed level if improvement of timeliness should be applied. Also scenario 2b and 2c requires large sample sizes that results in large survey costs and heavy burden of respond.

Third scenario is a scenario where the focus is on the Eurostat demand. To fulfill that demand the survey is based on questionnaires. This gives reliable estimates on monthly bases for the industries that Eurostat requires. Then more definitive results are calculated with current used method. This alternative is cost effective compared with the second scenario but quite high compared with the first scenario.

First and third scenarios above are both based on sample surveys and administrative data. One important factor is that the Swedish National Accounts must have reliable quarterly estimates for Other services. The method has to be concentrate in both the monthly and the quarterly calculations. Another aspect is that the monthly statistics is primary for Eurostat but that a national publication can be made for the 27 industries. However, in Sweden today results in 84 industries are calculated on the National Accounts request. Maybe, in the future, the request from the National Accounts also changes to monthly statistics? A survey based on an administrative source, in this case the VAT-register, is designed to produce reliable estimates with low costs and low respondent burden for the enterprises and the community.

The problem of using VAT-data is the timeliness. VAT is more circumstantial. Figures go through the Tax Authority and that take some time. Results for Other services can not be as quick as the users demand because of this. However, the positive effects are substantial so a statistical model where it is possible to use administrative data should be considered as very interesting.

Other aspects as more frequently VAT-deliveries from the Swedish Tax Authorities and a sub sample within the European Union have also been discussed in this project. The VAT-deliveries are today received once a week compared to once a month before March 2005. Unfortunately this is too new to evaluate but further studies continuous, see chapter 5.2.3.

A sub sample within the European Union is an alternative but after discussions with contact persons at Eurostat that scenario is postponed and perhaps that is a next step after evaluating the first studies in this area.

After analyzing methods, data deliveries, survey costs, sample sizes, burden of response etc. this project has come to the conclusion that Other services can be surveyed monthly instead of quarterly. In fact, it can be implemented with rather low costs and small respondent burden, if focus is on monthly results and rather little of improving timeliness. However, the demands from the National Account have to be considered seriously and there is a strong focus of improving timeliness for the quarterly estimates.

The results from this project result into following recommendation:

Scenario 1 is the most cost effective alternative that allows us to achieve the change of reference period. The advantage of this alternative is higher than the disadvantages. However, when improving timeliness is considered the first scenarios positive effect contradict the disadvantage of slow production time. But the benefits for this scenario are strong.

If timeliness is an important factor, the third scenario should be considered as a possibility. It can also be modified. Number of industries that should be surveyed every month can be discussed but the advantage is that the result is on a relative aggregated level.

Statistics Sweden now awaits changes in the STS regulation. Statistics Sweden has the statistical methods and knowledge to implement the changes that are described above, but under the condition that the new regulation is in force and requires it and that funds is provided. Possibilities of implementation as resources and timetable are one of the things that have to be discussed in future. In the next chapter this kind of issues are briefly discussed.

Positive side-effects

Several positive side-effects have arisen from this project. For example:

- Weekly VAT-deliveries from the Swedish Tax Authority.
- A study of enterprises in VAT-groups.
- A study of enterprises in an enterprise group.

- Possibility to include enterprises in an enterprise group into the administrative data, i.e. the study resulted in a substantial reducing of the sample size.

7. Issues to be considered

If a new regulation require monthly data for Other services some issues has to be considered. Improving timelines is sometimes depending on date of response. Today the law in Sweden refers to a last day of submitting figures in this survey at T+25 days after the current quarters end. To improve timeliness in some cases the law has to change and be the same as for monthly Retail sale statistics. Last day of response need to be changed from T+25 to T+15. This will be an action of future work if timeliness should be improved.

This report reveals what can be done and what the costs will be, approximately. But a lot of future work should take place in order to fulfill the Amending Council Regulation (EC) No 1165/98 concerning short-term statistics. In the area of statistical method, as mentioned before, more closely studies of using administrative data and also a discussion about a European sub sample for a European estimate should take place.

Future work has to expand both at Eurostat and in all EU-member states to achieve a change of reference period. In Sweden the work will go on and discussions about resources, timetables and implementation will then take place.

8. Contact persons



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Appendix 1

Description of the operation

This is the appendix 1 in the document “Grant Agreement for an Action” with agreement number – 200444401004.

Purpose of the action:

- To submit an interim report containing the possibility to produce the turnover indicator in Other Services monthly instead of quarterly.

The study shall take into account the benefits of reduced reference period in relation to the cost of collection and burden on business to assess the feasibility of reducing the reference period of a quarter to a reference period of a month for the turnover indicator in Other Services.

The action includes:

This project aims to find a model where we can use administrative data together with inquiries. We will also explore the possibility of improving the timeliness. The project is going to investigate when data can be disseminated. Is it possible to work with different time scenarios for national dissemination and for an early European estimate? The study shall look if there are industries among Other Services that are of more interest to produce at monthly bases than others. A detailed timetable for the collection is going to be proposed together with a possible course of action.

Statistics Sweden shall weight pros and cons for a reduced reference period, cost of collection and burden of business.

Statistics Sweden has today full access to the VAT-register from the Tax Authorities. At T+40 days a first delivery is made containing large enterprises. After T+70 days the next delivery is made with the remaining enterprises (mostly small ones). To solely use the VAT-register therefore seems very difficult. In Sweden there is a strong focus on the respondent burden. Since the service sector includes many small enterprises it is even more important to try to work with administrative sources.

Expected results of the action

An interim report with a possible scenario for a monthly turnover indicator for Other Services.

Appendix 2

1 Introduction

Amending Council Regulation (EC) No 1165/98 concerning short-term statistics has required a study in changing the reference period from quarterly to monthly for turnover in Other Services. Different scenarios to obtain monthly statistics are presented in the final report and a cost calculation for each scenario is included. This appendix presents the basis, on which estimated sample sizes (and furthermore number of questionnaires) are calculated, for the different alternatives. Number of required questionnaires is an important input when estimating cost.

Estimated sample sizes regarding three scenarios are included in this appendix. One scenario based on the method currently used but on a monthly basis (based on a mixture of data collected from questionnaires and on data collected from the VAT- register) and two scenarios based only on questionnaires sent to a sample of enterprises.

The main advantage with surveys based only on questionnaires, compared to surveys where administrative data is used, is the obvious possibility to improve timeliness. Major disadvantages are of course response burden and costs.

2 Present survey

2.1 Survey design

The present quarterly survey on Other Services is mainly based on a mixture of administrative data (VAT) and data collected from questionnaires. The survey covers the following industries: 50, 51, 55, 60, 61, 62, 63, 64, 70, 71, 72, 74, 80, 85, 90, 92 and 93 (NACE Rev 1.1). The survey regarding the industries 801, 802, 803, 8042, 852, 852, 9271 and 9302 is based solely on questionnaires. This is due to the fact that the given information on turnover to the tax authorities is impossible to use. Remaining industries covered by the survey are based on VAT-data for small enterprises (except for those included in an enterprise group) and on data collected from questionnaires regarding large enterprises and small enterprises included in an enterprise group.

The current survey design means that information on turnover is collected (from the VAT-register) regarding *all* small non-enterprise-group enterprises in the frame population. A sample of small enterprises included in an

enterprise group is drawn and together with the about 1 000 large enterprises the number of questionnaires amounts to about 4 500 each quarter.

But, as mentioned in the final report a recent study indicates that VAT-data can be used also for enterprises included in an enterprise group. Statistics Sweden plans to introduce this methodological change regarding the reference year 2006.

The present survey design was introduced regarding the reference year 2001, before this the survey was based only on questionnaires sent to a sample of enterprises.

2.2 Domains of study

2.2.1 Domains of study required by the National Accounts

The domains of study required by the National Accounts are based on industries, se table 1:

Table 1 The domains of study in the survey on Other Services

Domain	Industries	Domain	Industries	Domain	Industries
50102		60100		74400	
5010A	50101+50103	60211		74500	
50200		60212		74600	
50301		60220		74700	
50302		60230		74810	
50400		6024X	6024+6030	748XX	7482-7487
50500		61000		80410	
51100		62000		80420	
51200		63100		80XXX	801-803
51300		63210		85110	
5141A	5141+5142	63220		85120	
5143A	5143+44+5147	63230		85130	
5145A	5145+5146	63300		85140	
51510		63400		85200	
51520		64110		853XX	85311+12, 85323, 85327+28
51530		64120		85322	
51540		64200		853XZ	8513, 85315+16, 85324-26, 85329
51550		70100		90000	
51560		70204		92130	
51570		7020X	70202+03+70209	921XX	9211+9212
51800		70300		92200	
51900		71100		92300	
55100		71300		92400	
55200		71400		92710	
55510		72000		93011	
5552X	55521+55529	741XX	7411-7414	93012	

5552Y	55522+55523	74200		93020	
55XXX	553+554	74300		930XX	9303-9305

Bold names on domains in table 1 indicate domains in the present survey that are based only on questionnaires.

2.2.2 Domains of study required by Eurostat

Estimates on turnover in 25 domains are compiled from the estimates on turnover in the domains presented in table 1. These estimates are sent to Eurostat on a quarterly basis. The total of NACE 50 and of NACE 51 are also included. The 25 domains are presented in table 2:

Table 2 Domains required by Eurostat on a monthly basis

Domain	Industry		Domain	Industry		Domain	Industry
501	501+503-4		519	519		741	741 excl. 7415
502	502		550	55		742	742+743
505	505		600	60		744	744
511	511		610	61		745	745
512	512		620	62		746	746
513	513		630	63		747	747
514	514		641	641		748	748
515	515		642	642			
518	518		720	72			

3 Three alternatives for changing reference period

Two scenarios, (2) and (3), in the final report are based only on questionnaires sent to a sample of enterprises. In order to calculate costs it is important to estimate required sample sizes regarding the scenarios. Scenario (1) in the final report is based on a mixture of data collected from questionnaires sent to large enterprises and on VAT-data regarding small enterprises. Number of large enterprises is an important input in order to calculate costs for this scenario. Estimated sample sizes regarding the following three scenarios are included in this appendix:

1) A survey based on the same method as currently used but on a monthly basis. This means that large enterprises are requested to give monthly turnover values and monthly VAT-data is used for the small enterprises.

2) A survey based on questionnaires, designed to produce reliable estimates on the 84 domains of study (industries or groups of industries) that the National Accounts requires on a national level. Estimates on the 27 domains Eurostat requires estimates on will be compiled from the 84 estimates and transmitted to Eurostat.

3) A survey based on questionnaires, designed to produce reliable estimates on the 27 domains of study (industries or groups of industries) that Eurostat requires on a national level. This preliminary result will be published in Sweden. Definitive estimates, published later, on the domains that the National Accounts requires will be based on the method currently used.

Alternative (2) and the preliminary estimates in alternative (3) require a different survey design compared to the present survey design. Different alternatives within scenario (2) are also considered in this appendix. This study will further on be focused on the 73 domains that are currently based on the mixture of administrative data and data collected from questionnaires. There are domains³ among those 73 that are not included in the 25 domains required by Eurostat.

The National Accounts requires, for additional domains (bold names in table 1), estimates on a quarterly basis but regarding those industries the same method as today (only questionnaires) can be used. These domains will not be discussed further in this appendix.

3.1 Alternative (1)

Alternative (1) means that large enterprises are requested to give turnover values monthly and monthly turnover values from small enterprises are collected from the VAT- register (and also small enterprises included in an enterprise group). Number of questionnaires regarding this alternative will be about 1 000 each month, principally the large enterprises in the current survey.

3.2 Alternative (2)

Alternative (2) means a survey based on questionnaires, designed to produce reliable estimates on the domains that the National Accounts requires on a national level. Reliable estimates means estimates with standard error of the same magnitude as obtained in the present survey. The National Accounts requires estimates on 73 domains; see table 1, included in the survey based on a mixture of administrative data and data collected from questionnaires. In each domain large enterprises will be completely enumerated because they are few and their impact on the estimates is very large. Turnover values from all large enterprises will be collected monthly independent of domain. This means that large enterprises in a domain where estimates are required only on a quarterly basis will be requested to give turnover values monthly. This is mainly due to practical reasons but also to possible forthcoming demands

³ 70100, 70204, 7020X, 70300, 71100, 71300, 71400, 72000, 90000, 92130, 921XX, 92200, 92300, 92400, 93011, 93012 and 930XX.

for changing reference period regarding these industries as well as to possible forthcoming demands of improving timeliness.

Within the framework of alternative (2) there are several possibilities considered:

3.2.1 Full scale sample (2a)

Turnover values are collected monthly from all enterprises included in the sample. This sample is designed to produce reliable estimates on the domains that the National Accounts requires. This means that estimates can be produced on the domains that the National Accounts **and** Eurostat requires on a monthly basis.

This alternative is ambitious regarding reference period, quality (in terms of standard errors) in the monthly estimates to Eurostat and possibilities in terms of timeliness. Disadvantages are heavy response burden and costs.

3.2.2 Sub sample (2b)

This alternative is based on alternative 2a above with the difference that only a sub sample of small enterprises is requested to give turnover values monthly. The rest of the small enterprises included in the “full scale” sample are requested to give turnover values quarterly. This means that turnover values from the large enterprises and from a sub sample among small enterprises are collected monthly. This sub sample among the small enterprises is designed to obtain reliable estimates on the domains that Eurostat requires, see table 2. This alternative means that reliable estimates can be produced on the domains that Eurostat requires on a monthly basis and on the domains that the National Accounts requires on a quarterly basis. This is obtained by adding the monthly turnover values for each enterprise in the sub sample and consider the result as the quarterly turnover value. Notice that an enterprise not responding all three months in a quarter must be regarded as non-responding for this quarter or be imputed regarding the missing month(s).

The disadvantage of this alternative compared to alternative 2a is the somewhat lower quality (in terms of standard errors) in the monthly estimates to Eurostat. The advantages are the reduced response burden and costs.

3.2.3 Mutually exclusive sub samples (2c)

This alternative is also based on the alternative 2a above. Turnover values from large enterprises are collected monthly. The small enterprises included in the “full scale” sample are distributed (randomly) into three mutually

exclusive sub samples (the sample size in each stratum is divided by three). Enterprises in a sub sample are then requested to give turnover values for one specific month in the quarter. This means that enterprises in sub sample 1 gives turnover values regarding month 1, enterprises in sub sample 2 gives turnover values regarding month 2 and enterprises in sub sample 3 gives turnover values regarding month 3. That is, an enterprise gives information once a quarter but the information refers to one month. This method means that estimates can be produced on a quarterly basis (by adding the estimates regarding month one, two and three) on the domains that the National Accounts requires. Estimates can also be produced on a monthly basis on the domains that Eurostat requires.

The quality, in terms of standard errors, in the estimates produced by alternative 2c will be lower compared to the quality in the estimates produced by alternative 2b. The reason, regarding the quarterly estimates, is that the negative correlation between the monthly estimates must be considered when calculating standard errors. The quality in the monthly estimates will also be lower compared to alternative 2b because the mutually exclusive sub samples are not designed to give reliable estimates on the domains that Eurostat requires.

The disadvantage of this alternative compared to alternative 2a and 2b is the lower quality (in terms of standard errors) in the monthly estimates to Eurostat as well as in the quarterly estimates to the National Accounts. The advantage is the further spread response burden (small enterprises are only requested to participate in the survey once a quarter).

3.3 Alternative (3)

Alternative (3) means a survey based on questionnaires, designed to produce reliable estimates on the 27 domains that Eurostat requires on a national level. Turnover values are collected monthly from all enterprises included in the sample. Estimates on the domains that the National Accounts requires are only produced quarterly and will be based on the same method as used today.

4 Estimated required sample sizes

4.1 The disposition of the study

A study has been performed in order to estimate required sample sizes for the different alternatives described above. This study is based on the stock of enterprises included in the frame population established for the survey referring to the year 2003 (the 73 domains based on a mixture of administrative data and data collected from questionnaires). This frame population was established in March 2003.

The survey on Other Services was, as mentioned before, earlier based only on questionnaires sent to a sample of enterprises and the survey design (cut-off limit, the stratification and the allocation) used in this study is principally based on the survey design used those days.

In this study reliable estimates means to produce estimates with standard errors of the same magnitude as the standard errors obtained by the present survey. Neyman⁴ (optimum) allocation is used to have some guidance when estimating required sample sizes in each stratum. Required sample sizes are estimated by pre-specifying a precision (in terms of a relative standard error) regarding estimates in each domain. The required precision, in each domain, used in this study are the same as used when estimating sample sizes in the present survey.

4.2 Survey design alternative (2)

4.2.1 Frame population

The frame population consists of all active enterprises in the Swedish Business Register (BR) classified into the economic activities of interest, with an annual turnover not below 200 000 SEK. The information on annual turnover is collected from the VAT – register and the information used is the most recent 12-month period available. In March 2003 information on the 12-month period December 2001 – November 2002 was available. The frame population consists of 164 026 enterprises.

4.2.2 Stratification

The frame population in this study is first divided into strata based on industries, so called activity strata. This stratification is done in order to fit the domains of study, see table 3.

⁴ Särndal, C.E., Swensson, B. and Wretman, J. (1992): Model Assisted Survey Sampling. New York: Springer-Verlag, section 3.7.4.

Table 3 Number of enterprises and annual turnover (million SEK) in each activity strata in the frame population established in March-2003

Domain	Number	Annual		Domain	Number	Annual		Domain	Number	Annual
	of enterprises	turnover			of enterprises	turnover			of enterprises	turnover
50102	2 265	162 721		5552X	461	1 246		71300	1 541	13 141
5010A	368	17 248		5552Y	21	1 219		71400	632	2 169
50200	7 109	34 297		55XXX	12 916	45 762		72000	9 724	118 046
50301	543	19 587		60100	19	12 047		741XX	20 150	82 594
50302	611	6 096		60211	58	22 406		74200	12 518	60 858
50400	537	6 289		60212	356	10 062		74300	249	5 240
50500	1 671	77 095		60220	6 715	13 391		74400	5 724	37 910
51100	2 080	43 033		60230	370	2 424		74500	676	9 490
51200	559	20 104		6024X	12 544	64 585		74600	388	7 658
51300	2 350	159 309		61000	455	32 072		74700	3 198	17 387
5141A	1 626	24 147		62000	111	55 489		74810	1 661	3 382
5143A	4 210	104 153		63100	265	7 465		748XX	5 389	31 507
5145A	974	72 995		63210	288	4 475		80410	755	1 211
51510	354	135 008		63220	100	2 733		85200	458	1 272
51520	383	19 867		63230	74	5 245		90000	511	12 148
51530	2 564	49 707		63300	1 190	50 040		92130	72	1 629
51540	1 143	28 248		63400	1 192	69 134		921XX	1 067	6 358
51550	644	20 178		64110	1	.		92200	306	14 822
51560	1 176	35 137		64120	209	3 674		92300	2 535	5 393
51570	422	7 042		64200	265	173 388		92400	107	1 676
51800	6 716	187 952		70100	120	982		93011	99	3 513
51900	242	3 027		70204	1 513	2 001		93012	349	566
55100	1 673	24 003		7020X	10 026	74 801		930XX	1 572	4 335
55200	642	1 539		70300	3 894	19 709		Total	164 026	
55510	27	1 756		71100	293	3 182				

Each activity strata is then divided into six size strata and the size measure used is annual turnover, the same information as used when establishing the frame population. The cut-off points for the different size groups are calculated by the $Cum\sqrt{f}$ - method⁵.

Six different sets of cut-off points are used because the amount of turnover varies between the activity strata, see table 4.

⁵ Särndal, C.E., Swensson, B. and Wretman, J. (1992): Model Assisted Survey Sampling. New York: Springer-Verlag, section 12.6.

Table 4 The activity strata connected to the different sets of cut-off points

Set	Activity strata									
1	55200	5552X	5552Y	60212	60220	60230	63210	63220		
	64120	70100	70204	70300	71400	74500	74600	74700		
	74810	80410	85200	92130	92300	93012	930XX			
2	60100	60211	63100	63230	64110	74300	921XX	92200	92400	93011
3	50200	50302	50400	51570	51900	55510	55XXX	6024X	61000	62000
	63300	71100	71300	741XX	74200	74400	748XX	90000		
4	5010A	50500	51560	55100						
5	51100	51200	5141A	51530	51540	63400	64200	7020X	72000	
6	50102	50301	51300	5143A	5145A	51510	51520	51550	51800	

Table 5 shows the cut-off points used in each set:

Table 5 The sets of cut-off points used, annual turnover in million SEK.

	Set 1	Set 2	Set 3	Set 4
Size Group 1	0,2 - < 1,5	0,2 - < 2,5	0,2 - < 3,0	0,2 - < 6,0
Size Group 2	1,5 - < 3,5	2,5 - < 10,0	3,0 - < 10,0	6,0 - < 20,0
Size Group 3	3,5 - < 15,0	10,0 - < 25,0	10,0 - < 40,0	20,0 - < 60,0
Size Group 4	15,0 - < 100,0	25,0 - < 100,0	40,0 - < 200,0	60,0 - < 200,0
Size Group 5	100,0 - < 1000,0	100,0 - < 1000,0	200,0 - < 1000,0	200,0 - < 1000,0
Size Group 6	1000,0 -	1000,0 -	1000,0 -	1000,0 -

Table 5 (continued) The sets of cut-off points used, annual turnover in million SEK.

	Set 5	Set 6
Size Group 1	0,2 - < 6,0	0,2 - < 10,0
Size Group 2	6,0 - < 25,0	10,0 - < 40,0
Size Group 3	25,0 - < 75,0	40,0 - < 100,0
Size Group 4	75,0 - < 300,0	100,0 - < 400,0
Size Group 5	300,0 - < 1000,0	400,0 - < 1000,0
Size Group 6	1000,0 -	1000,0 -

4.2.3 Completely enumerated enterprises

Enterprises in size group five and six (see table 5) are completely enumerated and this means that size group five and six includes 1 046 enterprises. Enterprises in the completely enumerated size groups amounts to nearly 60 percent of the total annual turnover in the frame population. Regarding the monthly estimates in alternative 2b and 2c there could be a possibility to reduce number of completely enumerated enterprises because

the domains are less detailed. But even if sampling would be permitted in size group five the allocation gives that enterprises in this size group should be completely enumerated.

4.2.4 Allocation

In order to estimate required sample sizes in each domain Neyman (optimum) allocation has been used. Required sample sizes are estimated by pre-specifying a precision regarding the estimates in each domain. The precision is given in terms of a relative standard error (coefficient of variation). The required sample size in each domain is then distributed over the size groups in order to minimize the variance in the domain.

In this study the same information (annual turnover) is used both for stratification and for allocation. This means that the given sample sizes normally are underestimated because the variation within strata is too small compared to if the calculations had been based on the study variable. The relative standard error will increase in practice when calculating on observed data

Information on completely enumerated size groups is given to the allocation before it is performed.

The Neyman allocation gives sample sizes based on minimized variance regarding the allocation variable in each domain. In practice, it is advisable not to trust the given sample sizes entirely because the allocation variable and the study variable (s) are not one hundred percent correlated. In business surveys it is also common to compensate for non-response in a stratum with the average based on the respondents (at least for small businesses). If too few units are selected in a stratum there is a risk that too few respond. To ensure a sufficiently large sample size in each stratum a minimal sample size is specified before the allocation is performed. In this study a minimal sample size in each stratum is set to 5 enterprises.

4.2.5 Required sample size alternative 2a

The sample in this alternative is designed to produce reliable estimates on the domains that the National Accounts requires. The allocation is performed in order to achieve estimates in each domain with relative standard errors of the same magnitude as the standard errors obtained in the present survey, see table 6.

Table 6 Estimated sample sizes required to obtain reliable estimates on the domains the National Accounts requires.

Domain		Number of	Number	Rel. St.	Domain		Number of	Number	Rel. St.
EU	NA	Enterprises	in sample	Error, %	EU	NA	Enterprises	in sample	Error, %
501	50102	2 265	118	1,5	630	63210	288	39	5,0
501	5010A	368	43	3,0	630	63220	100	33	1,5
502	50200	7 109	229	2,0	630	63230	74	29	4,0
501	50301	543	56	2,5	630	63300	1 190	55	2,5
501	50302	611	96	2,5	630	63400	1 192	81	2,5
501	50400	537	83	2,0	641	64110	1	1	-
505	50500	1 671	414	0,5	641	64120	209	34	1,5
511	51100	2 080	124	1,5	642	64200	265	47	0,5
512	51200	559	101	1,0	xxx	70100	120	28	5,0
513	51300	2 350	175	1,0	xxx	70204	1 513	151	3,0
514	5141A	1 626	158	2,0	xxx	7020X	10 026	95	4,5
514	5143A	4 210	241	1,5	xxx	70300	3 894	89	3,5
514	5145A	974	113	1,0	xxx	71100	293	37	3,0
515	51510	354	39	2,5	xxx	71300	1 541	80	3,0
515	51520	383	92	1,0	xxx	71400	632	34	5,5
515	51530	2 564	380	1,0	720	72000	9 724	147	2,5
515	51540	1 143	147	1,5	741	741XX	20 150	154	3,0
515	51550	644	112	1,5	742	74200	12 518	118	3,5
515	51560	1 176	124	1,5	742	74300	249	32	2,5
515	51570	422	137	0,5	744	74400	5 724	85	3,5
518	51800	6 716	279	1,5	745	74500	676	96	1,5
519	51900	242	82	1,5	746	74600	388	37	1,5
550	55100	1 673	122	2,5	747	74700	3 198	157	2,0
550	55200	642	84	3,0	748	74810	1 661	107	2,5
550	55510	27	15	2,5	748	748XX	5 389	78	4,0
550	5552X	461	132	1,5	xxx	80410	755	172	2,0
550	5552Y	21	19	2,5	xxx	85200	458	176	1,0
550	55XXX	12 916	615	1,5	xxx	90000	511	58	2,5
600	60100	19	19	-	xxx	92130	72	25	1,0
600	60211	58	45	0,5	xxx	921XX	1 067	49	3,5
600	60212	356	63	1,5	xxx	92200	306	33	2,0
600	60220	6 715	220	2,0	xxx	92300	2 535	100	3,0
600	60230	370	116	1,5	xxx	92400	107	26	1,5
600	6024X	12 544	230	2,5	xxx	93011	99	36	1,0
610	61000	455	50	3,0	xxx	93012	349	224	1,0
620	62000	111	32	2,5	xxx	930XX	1 572	96	2,5
630	63100	265	44	3,5	Total		164 026	7 988	

If the sample sizes presented in table 6 are used to produce estimates on the domains that Eurostat requires the estimated relative standard errors will be as presented in table 7:

Table 7 Estimated relative standard errors (RstE) in the domain Eurostat requires if the sample sizes presented in table 6 are used

EU- Domain	Estimated. RstE, %	EU- Domain	Estimated. RstE, %	EU- Domain	Estimated RstE, %
501	1,20	519	1,49	741	3,01
502	2,00	550	1,21	742	3,23
505	0,50	600	1,32	744	3,49
511	1,50	610	2,57	745	1,45
512	1,00	620	0,53	746	1,38
513	1,00	630	1,51	747	2,00
514	0,89	641	0,11	748	3,61
515	0,43	642	0,39		
518	1,50	720	2,48		

4.2.6 Required sample size alternative 2b

This alternative means that turnover values from large enterprises and from a sub sample among the small enterprises are collected monthly. This sub sample, see table 8 column "Sub sample", is designed to obtain reliable estimates on the domains that Eurostat requires. The precision required for each domain was a standard error of about 2,50 %. In order to obtain a complete sub sample a restriction on the allocation was not to exceed the sample size required by the National Accounts. This means that the obtained standard errors exceeds 2,5 % in some domains. In a few domains the relative standard error is smaller than 2.5% and this is due to the specified minimal sample size in each stratum.

Table 8 Estimated sample sizes required to obtain reliable estimates on the domains Eurostat requires

Domain	Number of Enterprises	Sub sample		Mutually exclusive sub samples	
		Number in sample	Estimated RstE, %	Number in sample	Estimated RstE, %
501	4 324	203	1,98	224	3,41
502	7 109	160	2,5	87	4,58
505	1 671	41	2,36	145	1,72
511	2 080	65	2,51	54	4,86
512	559	41	2,5	36	4,91
513	2 350	77	2,43	92	3,59
514	6 810	166	2,36	227	2,74
515	6 686	238	1,54	423	1,42
518	6 716	146	2,51	132	3,9
519	242	55	2,48	31	8,37
550	15 740	277	2,45	348	2,57
600	20 062	247	2,41	309	3,3
610	455	50	2,57	50	5,74
620	111	32	0,53	32	1,46
630	3 109	234	2,1	228	4,09
641	210	29	0,34	28	1,14
642	265	47	0,39	47	1,1
720	9 724	147	2,48	87	6,63
741	20 150	154	3,01	81	7,06
742	12 767	148	3,23	91	7,2
744	5 724	85	3,49	41	8,03
745	676	61	2,42	43	5,49
746	388	29	2,04	27	5,17
747	3 198	113	2,51	61	5,19
748	7 050	103	3,69	80	8,05
Total	138 176	2 948		3 004	

4.2.7 Sample size alternative 2c

The total sample size in alternative 2a must be adjusted to nearly 8 700 enterprises. This is due to the fact that a minimal sample size of 15 enterprises must be specified, in each stratum in the domains that Eurostat requires estimates on, in order to obtain a minimal sample size of 5 enterprises per stratum each month. This alternative means a total sample size of 3 004 enterprises monthly (in the domains that Eurostat requires estimates on). Table 8, column “Mutually exclusive sub samples”, presents the expected precision in the estimates obtained by this method. Among these 3 004 about 900 enterprises are large and 2 100 are small. The 900 enterprises give information on turnover each month in the quarter but the

2 100 enterprises are renewed each month by the mutually exclusive sample method.

4.3 Survey design alternative (3)

4.3.1 Stratification

In this alternative the domains that Eurostat requires estimates on are used as activity strata, see table 9 below.

Table 9 Number of enterprises and annual turnover (million SEK) in each activity strata in the frame population established in March-2003

Domain	Industry	Number of Enterprises	Annual Turnover		Domain	Industry	Number of Enterprises	Annual Turnover
501	501+503-4	4 324	211 941		620	62	111	55 489
502	502	7 109	34 297		630	63	3 109	139 093
505	505	1 671	77 095		641	641	210	32 818
511	511	2 080	43 033		642	642	265	173 388
512	512	559	20 104		720	72	9 724	118 046
513	513	2 350	159 309		741	741 exkl. 7415	20 150	82 594
514	514	6 810	201 295		742	742+743	12 767	66 098
515	515	6 686	295 187		744	744	5 724	37 910
518	518	6 716	187 952		745	745	676	9 490
519	519	242	3 027		746	746	388	7 658
550	55	15 740	75 524		747	747	3 198	17 387
600	60	20 062	124 915		748	748	7 050	34 889
610	61	455	32 072					

In this alternative large enterprises is defined the same way as in alternative (2), mainly because allocation calculations gives that fewer completely enumerated enterprises requires larger sample sizes among the smaller enterprises in order to obtain the required precision. There is also an advantage of having one definition of large enterprises because then it is possible to combine different alternatives.

The size stratification (based on annual turnover) in this alternative differs from the size stratification in alternative (2). Cut off points regarding the size groups are calculated by the $Cum\sqrt{f}$ - method in each activity strata. The cut-off points in each activity strata are presented in table 10:

Table 10 The sets of cut-off points used, annual turnover in million SEK

Activity	Size Group 1	Size Group 2	Size Group 3	Size Group 4
501	0,2- < 8,2	8,2- < 32,7	32,7- < 92,5	92,5- < CE
502	0,2- < 1,6	1,6- < 5,3	5,3- < 14,5	14,5- < CE
505	0,2- < 9,3	9,3- < 20,8	20,8- < 36,2	36,2- < CE
511	0,2- < 3,1	3,1- < 13,1	13,1- < 37,9	37,9- < CE
512	0,2- < 4,1	4,1- < 14,4	14,4- < 43,7	43,7- < CE
513	0,2- < 8,6	8,6- < 32,6	32,6- < 85,1	85,1- < CE
514	0,2- < 6,8	6,8- < 28,0	28,0- < 86,3	86,3- < CE
515	0,2- < 7,6	7,6- < 29,8	29,8- < 84,1	84,1- < CE
518	0,2- < 7,4	7,4- < 29,0	29,0- < 82,6	82,6- < CE
519	0,2- < 3,0	3,0- < 8,8	8,8- < 19,0	19,0- < CE
550	0,2- < 2,2	2,2- < 7,2	7,2- < 24,0	24,0- < CE
600	0,2- < 1,9	1,9- < 7,2	7,2- < 25,4	25,4- < CE
610	0,2- < 2,1	2,1- < 9,3	9,3- < 37,7	37,7- < CE
620	0,2- < 3,5	3,5- < 9,1	9,1- < 36,6	36,6- < CE
630	0,2- < 6,7	6,7- < 26,1	26,1- < 67,0	67,0- < CE
641	0,2- < 0,6	0,6- < 2,3	2,3- < 6,7	6,7- < CE
642	0,2- < 4,0	4,0- < 17,0	17,0- < 53,5	53,5- < CE
720	0,2- < 2,6	2,6- < 14,7	14,7- < 49,8	49,8- < CE
741	0,2- < 1,2	1,2- < 5,8	5,8- < 25,4	25,4- < CE
742	0,2- < 1,5	1,5- < 7,5	7,5- < 27,0	27,0- < CE
744	0,2- < 2,0	2,0- < 7,8	7,8- < 23,3	23,3- < CE
745	0,2- < 2,1	2,1- < 6,4	6,4- < 16,0	16,0- < CE
746	0,2- < 1,3	1,3- < 3,2	3,2- < 8,8	8,8- < CE
747	0,2- < 1,4	1,4- < 4,9	4,9- < 13,0	13,0- < CE
748	0,2- < 1,5	1,5- < 6,9	6,9- < 25,9	25,9- < CE

CE means the cut-off point for the completely enumerated size group five. This cut-off point varies within each activity strata because the cut-off point depends on the industry a specific enterprise is classified into (four- or five-digit level).

From a homogeneity point of view it could be more efficient to use a more detailed level of industry when constructing activity strata but this is not considered in this study.

4.3.2 Required sample size regarding alternative (3)

The allocation calculation in this alternative is based on the precision of 2,5 % relative standard error in each domain, see table 11. In a few domains the relative standard error is smaller than 2.5% and this is due to the specified minimal sample size of five enterprises in each stratum.

This alternative is based on questionnaires sent to a sample of enterprises in order to obtain monthly statistics to Eurostat. The quarterly statistics required by the National Accounts will be based on the same method as presently used.

Table 11 Required sample sizes to obtain reliable estimates on the domains that Eurostat requires

Domain	Number of Enterprises	Sub sample	
		Number in sample	Rel. St. Error, %
501	4 324	134	2,51
502	7 109	185	2,50
505	1 671	33	2,27
511	2 080	75	2,53
512	559	52	2,40
513	2 350	80	2,39
514	6 810	153	2,50
515	6 686	134	2,45
518	6 716	149	2,50
519	242	50	2,36
550	15 740	238	2,50
600	20 062	195	2,51
610	455	52	2,26
620	111	32	0,70
630	3 109	144	2,51
641	210	29	0,75
642	265	47	0,55
720	9 724	150	2,49
741	20 150	198	2,51
742	12 767	202	2,50
744	5 724	156	2,51
745	676	52	2,42
746	388	35	2,23
747	3 198	109	2,52
748	7 050	170	2,50
Total	138 176	2 854	