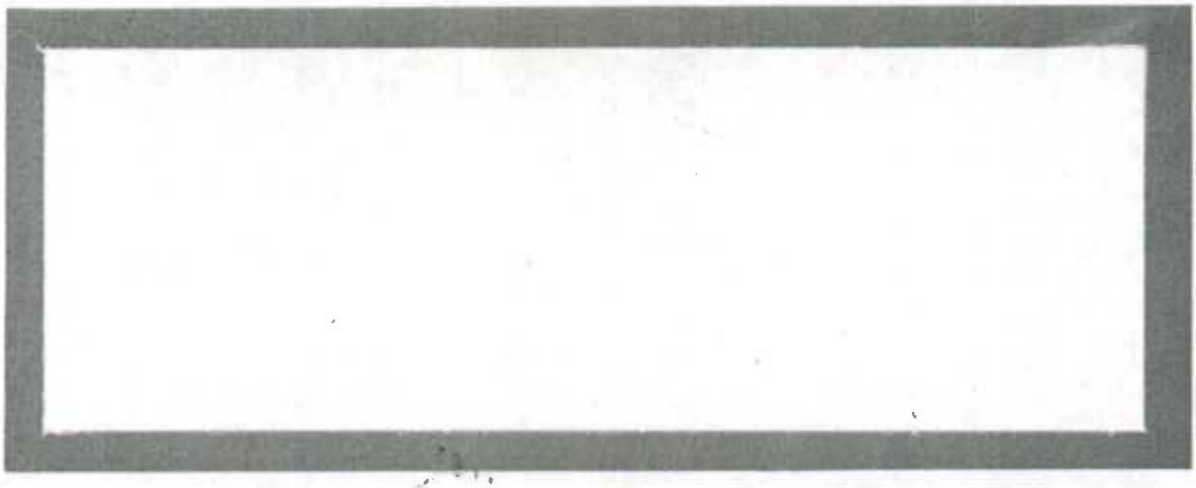
istics Statistique
nada Canada



Methodology Branch

Business Survey Methods Division

Direction de la méthodologie

Division des méthodes d'enquêtes-entreprises

Canada

WORKING PAPER NO. BSMD-90-007E

METHODOLOGY BRANCH

CAHIER DE TRAVAIL NO. BSMD-90-007E

DIRECTION DE LA MÉTHODOLOGIE

STATISTICAL METHODS USED IN THE BUSINESS SURVEYS OF STATISTICS SWEDEN

(Notes from a Visit to Statistics Sweden - November 1989)

by

M.A. Hidiroglou

July 1990

Méthodes Statistiques utilisées dans les Enquêtes-Entreprises en Suède (Notes prises lors d'une visite à Statistique Suède- novembre 1989)

M.A. Hidiroglou
Division des méthodes des enquêtes-entreprises

Lors de mes deux semaines à Statistique Suède du premier novembre jusqu'au vingt décembre 1989, j'ai fait dix présentations sur divers aspects méthodologiques sur le Projet du Remaniement des Enquêtes-Entreprises à Statistique Canada ,ainsi que la méthodologie de base utilisée pour les Systèmes Généraux. Je me suis familiarisé avec la méthodologie utilisée en Suède et j'ai discuté des problèmes méthodologiques avec les statisticiens suèdois. Ce qui suit est un résumé de mes activités, ainsi que de mes observations résultant de cette visite.

Statistical Methods used in the Business Surveys of Statistics Sweden (Notes from a Visit to Statistics Sweden - November 1989)

Summary

During my two weeks at Statistics Sweden from November 20 to December 1, 1989, I gave 10 seminars on methodological aspects of the Business Survey Redesign Project at Statistics Canada, as well as the core methodology used in the Generalized Survey Function Development, which included sampling and estimation, data capture, statistical editing and imputation. I familiarized myself with the organization of two methodology groups at Statistics Sweden and met with a number of their methodologists to discuss common statistical problems. The following notes are a summary of my activities and observations.

Organization of Methodology Groups

The two methodology groups at Statistics Sweden are the Statistical Research Unit (SRU) and the Statistical Methods Service (SMS). In terms of organization, the SRU is within the Department of Research and Development, and the SMS is within the Department of Enterprise Statistics. SRU and SMS correspond to divisions at Statistics Canada, while departments correspond to a branch. For more details on the organization chart of Statistics Sweden, please refer to the appendix.

Statistical Research Unit (SRU)

The Statistical Research Unit is strictly a research unit. It addresses the subject matter methodological problems by consulting with subject matter methodologists. Its primary function is to identify and carry out methodological research needs at Statistics Sweden. This group was formed in

1981 as a result of methodology being decentralized. In theory, it was supposed to have been staffed up to 12 methodologists. In practice, it consists of 10 persons of whom 4 are in Örebro and 6 are in Stockholm. Furthermore, only three work on a full time basis. As the group is very small, each member works alone on a number of projects. The majority of the staff have Ph D's or are of "Ph D competence". They are expected to work on any methodological problem which is considered important by the agency. They act as a link between Statistics Sweden and other government agencies and universities, by monitoring their research and development. They try to compensate for their small number by employing consultants and by inviting guest researchers from Swedish Universities and abroad. It is difficult to staff positions in the unit on account of the nature of the work and the high expected competence requirements. Furthermore, Swedish Universities seem to attract more statistical researchers on account of their working conditions as well as their salary competitiveness with the government sector.

The planning of their work is carried out in two phases. The first phase consists of a three year plan which contains a general description of the intended work during that period. The second phase is a detailed work plan which covers one year at a time. For both phases, the plans are discussed with other departments and agreed to by the Chief Statistician. Their main current areas of research focus on small area estimation, measurement errors and cognitive research, editing of data, estimation procedures for two-phase sampling methods, longitudinal studies and the use of administrative data. The results of their research appear in the form of working papers (green series), papers presented at professional statistical meetings and papers published in refereed journals. They also write books or short monographs: Särndal, Swenson and Wretman are currently finishing a book entitled "Model Assisted Sampling Strategies." The Unit also cooperates heavily with statisticians in the subject matter areas: e.g. data analysis, editing and imputation, small area estimation, time series problems, estimation procedures, etc. Finally, the Unit also helps with the editorial work of the Journal of Official Statistics (JOS). Formally, JOS is part of a new Unit known as the Professional Training Program. This Unit is within the Department of

Research and Development and it is headed by Lars Lyberg. Lars Lyberg is also the editor of JOS. The journal is allocated 2.5 person-years, resulting in one professional editor working full time on it, and a number of the Unit's members participating on a part-time basis. The professional editor's tasks include the scheduling of the accepted papers in JOS, their proper wording, grammar, as well as proofreading the mathematical expressions. The background of this editor is english literature. Similar arrangements with respect to having one professional editor could be beneficial to our own Survey Methodology Journal. It could free up the three assistant editors who are now being required on a part-time basis.

Statistical Methods Service (SMS)

The Statistical Methods Service corresponds to our Business Survey Methods Division at Statistics Canada. It basically services the methodological needs of the Department of Enterprise Statistics which is made up of 300 persons. This department is further broken down into 6 main sections which are the Register (Register of Enterprises and Establishments, Register of Enterprise Groups), Industry (Annual Industrial Census, Annual Construction, Enterprise Finance, Foreign Owned Enterprises,..) , Energy and Prices (Annual and Monthly surveys for Electric Energy Supply, Deliveries and consumption of petroleum products, Housing Construction Index,...), Services (Annual/Quarterly/Monthly surveys for Services Industries, Retail and Consumer Sales, Wholesale and Business Sales, Accommodation, Transport, Enterprise Finance,...), Economic Trends (annual/quarterly/monthly surveys for foreign trade, index of mining and manufacturing, shipments and orders, financial accounts,...) and National Accounts. The Statistical Methods Service is made up of seven methodologists. Their work roughly corresponds to what is being done in the Business Survey Methods Division at Statistics Canada. They concentrate their efforts on the sampling of some 25 annual/quarterly/monthly business surveys, the development and maintenance of their Business Register, as well as all the data processing required to publish their survey results (data capture, follow-up procedures, editing and imputation, estimation). Some of their research interests include the

estimation of change, non-response problems, the use of proportional to size (pps) sampling for business surveys, coordinated sampling methods, outlier detection and treatment, and synchronization between annual and sub-annual surveys.

The staff is split between Stockholm and Örebro, with the majority of the methodological work being carried out in Stockholm and the development and maintenance of the Business Register being carried out in Örebro.

Statistical methods used in the Business Surveys

The following is based on informal discussions with Statistics Sweden Methodologists. The five areas of discussion with Statistics Sweden methodologists included the following topics: 1) Business Registers, 2) Sampling, 3) Editing, 4) Estimation 5) Small area estimation.

1. Business Register

Swedish official statistics, including economic statistics, were centralized in Statistics Sweden in the early sixties. As a consequence, national standards, based on United Nations and other international recommendations were laid down and published for the following: 1) the classification of economic activities by industry, 2) the definition of institutional (national accounts) sectors, 3) the classification of ownership, 4) the classification by legal status, and 5) the definition of statistical enterprise and establishment units.

The Business Register of Statistics Sweden is based on administrative registers mainly obtained from the taxation authorities. The use of a common identification registration number for legal entities and the personal code for individuals makes it possible to match the various registers without duplication. It is felt that the register provides a good coverage of the target business population.

The Business Register is used as a public multi-purpose register. Since 1984,

it has the status of National Register of Enterprises and Locations. This status is quite advantageous, for it means that prompt and easy access to the updating sources is given, and that it is to the advantage of businesses to inform the Register of changes. The National Register is also known as the Central Register of Enterprises and Establishments (CFAR). It can be accessed by the public domain on a cost recovery basis. Names, addresses, size class (not the actual number of employees) and a partial industrial code are sold to private companies. This access implies that, in terms of maintenance costs, the Register is almost self-supporting.

The CFAR covers some 850,000 units at the enterprise, which includes individuals and units level with a legal and/or administrative definition. Almost 500,000 units are classified as active and operating in some 585,000 locations. There are some 10,000 multi-location enterprises (which roughly correspond to our companies). Units which have been inactive for more than two years are removed from the Register. The Register is set up on a data base which can be updated twice a month either interactively or in batch. The RAPID language developed at Statistics Canada is used to service the Register. It has been noted by Register staff that RAPID is not as well supported as it used to be.

The Register is updated using central or regional administrative registers such as those of companies, associations, and the various registers of taxation which include those of employers (for the administration of the PAYE-system and the social security contributions), the value added tax (VAT) and the business income tax registers. The first time that a legal entity is registered in one of those registers, it is attributed an official registration number by Statistics Sweden, which it retains during its lifetime and which is used whenever the entity enters into another official register. This link between registers adds to the strength of CFAR. Individuals are also recorded on CFAR (under their personal number) if they satisfy any one of the conditions of being an employer, a VAT contributor, a business income tax filer or owning a registered business firm. The register is nearly free of duplication because of this official registration number and personal code. Duplication can occur temporarily when a business is being transferred from one

owner to another, because it takes some time to deregister a business.

The basic building unit in the CFAR is the location: a unit consisting of all activity of an enterprise unit at one address/locality. For practical reasons, this geographic definition was chosen without reference to the economic activities . The location is easy to identify with a low incidence of ambiguity, and it satisfies many user needs. It is felt that the statistical establishment is much harder to define and users are left with the task of delineating it on the basis of the locations and according to their specific requirements.

There are some 10,000 enterprises (Swedish enterprise being roughly equivalent to the Canadian company) with more than one location. Each year, a Nature of Business Questionnaire is sent to all enterprises to find out their location composition. If a location moves from one enterprise to another, it retains its original identification, thereby ensuring continuity. There are also some 10,000 enterprises which have more than 20 employees: if there is any change throughout the year in any of them, they are immediately profiled (eg. send a Nature of Business Questionnaire).

Employment is an important measure of stratification on the frame. It is updated, once a year, for all active enterprises on CFAR using data from the local taxation authorities.

One of the most significant weakness in using CFAR as a sampling base is the need for surveys to sample statistical units that differ in structures from those on CFAR. In order to counter this weakness, surveys have had, up to the autumn of 1987, to define and delineate their own statistical units. This has caused discrepancies in the National Accounts estimation procedure in the form of inconsitencies between business statistics.

In order to remedy this situation, the concept of a Central Statistical Register (SR) was introduced in 1986. The CFAR would continue as the basic register. The CFAR would be supplemented by "deviation registers" of statistical units that did not coincide with CFAR units in delineation or

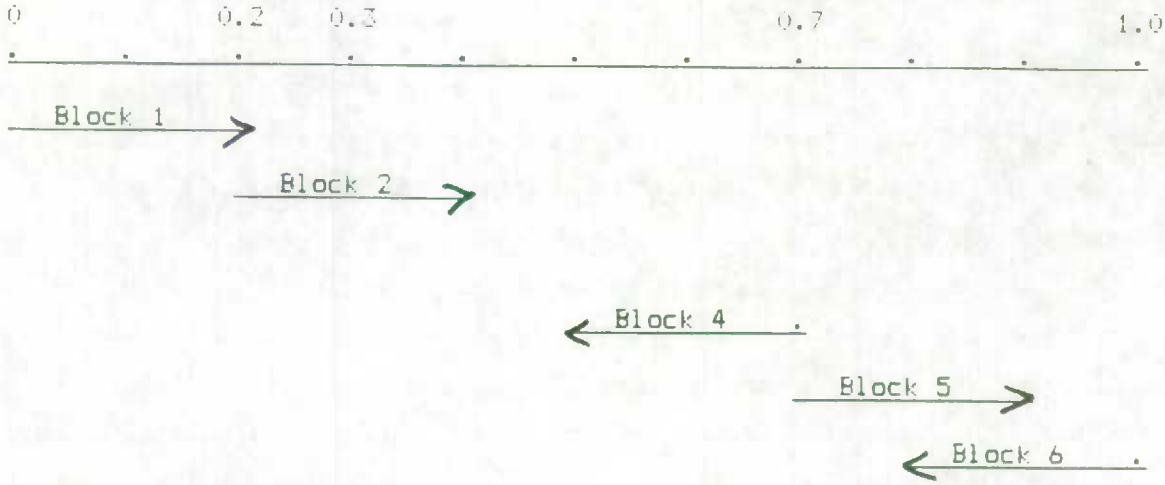
classification. The statistical register (SR) would consist of the relevant information of the CFAR and the deviation registers. The full statistical register would be derived from the CFAR through matching with the deviation registers. The first version of the SR was compiled in the autumn of 1987 to serve as a sampling frame for the 1987 annual samples and 1988 sub-annuals. The number of delineated enterprises whose statistical structure does not agree with CFAR is around 500. Structural changes such as take-overs, splits, cease of business, change of economic activity occurring to major enterprises are followed up by the SR service function with the assistance of the CFAR and survey managers. These changes are frozen for sub-annual surveys until the next year's sample selection. For annual surveys they are reflected immediately.

SR essentially mimics the Statistics Canada's Business Register statistical structures without its sophistication in terms of automation. At Statistics Sweden, the process of integrating the business surveys into one consistent system is well under way but far from complete. Its further development requires time, resources and general co-ordination.

2. Sampling

The sampling of the majority of the Business surveys (some 30 of them) at Statistics Sweden uses a single sampling system known as SAMU. This system of co-ordinated sampling is based on the principle of assigning each member of the universe a unique and permanent random number. This system was implemented in the early 70's and had not dramatically changed since its inception. The interval (0,1) is split up into 6 nearly non-overlapping blocks as shown in the diagram A.

Diagram A: Coordination Groups



Block 1

Enterprise finance statistics
Investments in machinery and buildings
Statistics on profitability
Capacity statistics (capacity utilization in industry)

Block 2

Statistics on salaries of employees

Block 4

Statistics on employment and amount of wages

Block 5

Enterprise finance statistics
Production statistics (service statistics
Wholesale and retail trade sales

Block 6

Shipments and orderbook situation in mining and manufacturing
(the shipment and orderbook survey)
Stocks survey
Inventories of mining and manufacturing

Each survey is associated with one unique block. The units which can be sampled for a survey are those whose random numbers belong to the assigned survey block. Each survey has its starting point on the line of random numbers from where its selection starts. In order to obtain a fair and just distribution of the response burden (with respect to questionnaire burden) the starting points are spread along the line. The starting and end points define the blocks. When the defined blocks do not overlap, the sample co-ordination is said to be negatively co-ordinated. When positively co-ordinated samples are required (for interrelated surveys), identical or close starting points are chosen. Once a starting point has been chosen, the sample is chosen by picking the first n (where n is the required sample size) consecutive random numbers within each stratum. This selection is done once a year, in November. Note that the effective sample size is controlled for the year's duration.

Births, deaths and classification changes are handled once a year. Some of the weaknesses of SAMU such as lack of rotation of sampled units within the blocks are being addressed currently. I believe that a combination of SAMU and the panel procedure could bring out the best of both methods. This combination would use the ideas of a permanently assigned random number and the blocks from SAMU, and apply the panel method to units within each block.

The size stratification which is used for all the surveys is based on number of employees. This variable is readily available on the Register and with a high level of precision. Take-all units are defined by subject matter: they usually are made up of units with more than 500 employees. The allocation of the sample to take-some strata (defined on the basis of employee size groups) uses Neyman allocation. It appears that only national estimates are of interest for the industrial groups of interest. Hence, there is no attempt to take into account sub-national stratification when designing the samples.

3. Editing

The editing of data has been studied intensively at Statistics Sweden for the last few years. Focus has concentrated on how much editing should be carried out in return for quality improvement of the aggregated data. Editing is an element of the statistical production process whose purpose is to ensure that the collected data meet certain quality requirements. Traditionally, this has been carried out by finding errors on the individual observations and correcting them. This type of editing is referred to as microediting. Microediting will find out errors caused as a result of negligence or misunderstandings or outliers. Negligence is the result of carelessness either on the part of the respondent or by the survey process up to the microediting phase. These errors are found through the failure of linear inequalities/equalities. If the microedits are very tight, many errors can be detected, requiring that they be corrected. The resulting danger is that this process may be too time consuming and expensive in terms of overall data quality payback. Statistics Sweden has investigated means to reduce the level of microediting in order to increase data quality payback. The approach that they have used to achieve this goal is termed macroediting. Macroediting is the editing of groups of records. Macroediting is carried out for domains of study, which include selected variables for certain subsets of the respondents. Some of the steps involved in macroediting include, i) drawing up hypotheses on possible error sources, ii) reviewing some of the individual records that fail a check for the hypothesis tested, iii) characterizing the errors as much as possible, iv) assessing the impact of the errors, and v) examining the immediate remedies to correct the important errors.

Statistics Sweden has studied the use of three macroediting techniques. These are termed the top-down method, the aggregate method and the H-B method developed at Statistics Canada by Hidiroglou and Berthelot (1986). Only the first two methods will be described since they originate from Statistics Sweden.

The top-down method is a form of selective micro-edting that studies the impact

of those observations in error which have the greatest impact on the estimates. The idea is to study this impact using one of three functions which are: i) the highest positive changes, ii) the highest negative changes and iii) the greatest contributions. For the selected function and domain of study, an interactive program will show the operator the 15 records of the input file that contribute the most to the estimate. The ranking of these records is based on the weighted observations for the field of interest. Once these top 15 records are on the screen, the operator can select any of the records, revealing all its data, and examine it to determine if an error has been committed . Once an error is identified, it is corrected interactively, and its weighted impact (as a proportion of the overall estimate) is determined. The record disappears from the top 15 list, and the next record is reviewed. The errors are corrected and their impact on the estimate is determined. The process is stopped when the impact is negligible. The top-down approach eliminates the review and correction of errors that have a small impact on the estimate.

The idea behind the aggregate method is to run the error detecting system twice through the data. The first pass is run on fixed aggregates and the suspicious ones are flagged. The second pass focuses on important records in error within the flagged aggregates. This method has been used in some of our Business Surveys at Statistics Canada where the aggregates are strata. If there are L strata that contribute to the estimation process, let w_{hi} represent the weight associated with the i-th unit of the h-th stratum, and $y_{hi}(t)$ be the value of the domain of study. For each stratum h, compute the weighted up sum of the observations at time t and t-1, $S_h(t)$ and $S_h(t-1)$. Compute the ratios $r_h=S_h(t)/S_h(t-1)$ and rank them in ascending size of magnitude $r_{(1)},r_{(2)},\ldots,r_{(L)}$. The tails of the observations $r_{(h)}$ are then flagged for further examination. Within each flagged stratum, the same process is repeated for the observations. It has been found that the aggregate method flags, more or less, the same observations flagged by the H-B method. In Sweden it has been found that the macroediting techniques cut down the formal amount of error checking by at least 50%.

4. Estimation

Statistics Sweden has a general purpose estimation program known as SMED. SMED is linked to TAB 68, an earlier program developed in the 60's. TAB68 is basically an assembler program which can summarize data in the form of two-way tables for specific domains of interest. Each dimension (row and column) can be further nested to 4 dimensions resulting in a maximum of 16 cross dimensions. Once the commands have been specified to SMED, it generates PL/1 programs that are then compiled to execute the instructions and to yield the required tables. SMED basically computes variances for the table entries given the sample design. SMED was written in the early 80's. The different types of designs that it can handle are:

1. Stratified simple random sampling

2. Post-stratification of a clustered sample design. The assumptions are that all the elements within a chosen cluster belong to the sample and that different elements in a common cluster can belong to different domains.

3. Two-phase sampling where the first phase is a stratified SRS with subsampling of non-respondents in the second phase.
   This design is quite close to the one currently used in our two-phase business tax sample.

4. Panel designs with or without rotation.

5. Stratified pps sampling with replacement.

In Statistics Sweden, imputation is only carried out for item non-response. In Sweden, imputation of total non-response is not permitted by law. In the case of total non-response, the weight associated with the unit is modified by weighting up to response homogeneity groups. These groups are subsets of the population where response is assumed to be similar. These groups can either

coincide with them exactly or be subsets of the sampling strata. The user can define the response homogeneity groups. Note that this is in contrast to the procedures used for some of our surveys at Statistics Canada, where total non-response is imputed.

The quantities that SMED can estimate are domain totals (which are user defined), and ratios between two totals which may belong to different domains. The theory behind the variance computations in SMED is available in Särndal and Swenson (1987). It is felt at Statistics Sweden that SMED needs further improvements. A new system to replace the current SMED would most likely be built from scratch, since it can no longer be hooked-up to TAB68: the programmers of TAB68 are no longer part of the group. The Swedish methodologists were quite interested in our proposed development of a Generalized Estimation System at Statistics Canada. They would like to cooperate with us to build a joint system that could be used by both agencies. Some of the requirements that they would like to see fulfilled are as follows.

1. All the present features of SMED,

2. A Generalized PC version,

3. Variances for fractiles,

4. Estimation and variances for ratios e.g.'ratio of ratios of the form $(Y_1/X_1)/(Y_2/X_2)$, differences between ratios $(Y_2/X_2-Y_1/X_1)$

etc. For example, Y_1/X_1 could be a ratio referring to year 1 while Y_2/X_2 would refer to year 2. Some or all elements could be common in the components that make up X_1, X_2, Y_1 and Y_2 so that correlation would exit between those different components. Furthermore, some or all of (X_1, X_2, Y_1, Y_2) may refer to different domains. More generally, one would require to estimate $f(t_1, t_2, t_3, \ldots)$ and its estimated variance where the t_j's are totals.

Our contacts for such a system would be Bengt Rosén, Lennart Nordberg, Claes Anderson, Tor Bengtsson and Carl-Erik Särndal.

5. Small Area Estimation

There has been a growing demand for small area estimates in Sweden. Statistics Sweden has responded to this need by investigating methods that would make the publication of such data possible. They have looked at the possibilities of combining information from their registers with their sample data.

The small area techniques investigated include expansion estimators, post-stratified estimators, asymptotically design unbiased estimators (ADU) as suggested by Särndal (1981), synthetic estimators, logit estimators and Structure Preserving Estimators (SPREE). They have studied the behavior of these estimators for a number of their surveys which include: 1) the estimation of the number of non-married cohabiting persons and the number of different sized households , 2) the number of economically active persons in each class of hours worked, and 3) the proportion of unemployment in each municipality in Sweden (some 284). The estimators which have shown promising results in terms of relative mean square efficiency (as concluded from simulations based on these data sets) are the synthetic, the logit and the SPREE estimators (when applicable). The ADU estimator which they are using is conditionally biased with respect to the observed sample size in the domain of interest and it is not as efficient as the conditionally unbiased version.

Some of the problems with purely model-dependent estimators, such as the synthetic or SPREE estimators, is that valid confidence intervals cannot be generated. This puts pressure on the methodologist, who cannot attach a confidence interval to the estimates and has to defend them to the clients by explaining that they have not shown significant bias in simulation studies. The use of very sophisticated methods is not being considered because they are more difficult to explain to the client.

Conclusion

I found this visit extremely interesting and rewarding in the professional sense. It has given me the opportunity to observe at close hand the work of a very dedicated group of statisticians. I was particularly impressed with the calibre of their work in spite of their small number. They were quite co-operative in sharing their knowledge and were highly interested in our own work at Statistics Canada.

I believe that further co-operation and exchanges between both agencies would be beneficial to both.

Papers and reports

The following is a list of papers and reports that I brought back from Statistics Sweden. They have been placed in the Business Survey Methods Division Library.

Some of the yellow series papers (10 of them) have been passed to the Corporate Metadata Project and have also been circulated amongst Informatics Branch Management.

Allman månads-statistik (1989): 7-8. Statistiska centralbyrån.

Anderson, Kevin (1989). Output Edit Study: Average Weekly Earnings. Statistical Services Branch, Australia.

CFAR (1989). Operations' manual of the Swedish Business Register.

Fastrom, Lennart (1986). The Role of a Central Statistical Office. Paper presented to the Conference of European Statisticians in Paris.

Granquist, Leopold (1984). On the Role of Editing. Statistisk tidskrift, 105-118.

Granquist, Leopold (1989). Data Editing Activities at Statistics Sweden. Report.

Granquist, Leopold (1988). On the need for Generalized Numeric and Imputation Systems. Paper presented at the conference of European Statisticians, Geneva.

Granquist, Leopold (1984). Data Editing and its Impact on the further Processing of Statistical Data. Workshop on the SCP, Budapest.

Granquist, Leopold (1989). Status report on the Swedish Data Editing Project. Report.

Granquist, Leopold (1987). Macroediting- the Top-Down Method. Report.

Granquist, Leopold. (1988). Macroediting- The Aggregate Method. Report.

Granquist, Leopold (1989). A Guide to the Print-outs from the presentation of the results from the evaluation study on the editing process of the Swedish Annual Survey on Financial Accounts. Report.

International Consulting at Statistics Sweden.

Johanson, Sten (1987). Statistics based on Administrative Records as a substitute or a valid alternative to a population census. Paper presented at the 46th session of the International Statistical Institute in Tokyo.

Johanson, Sten (1989). Some notes on Developing a system of social indicators for Zimbabwe. Report.

Karge, R. (1988). Relational Access Method (RAM). Report.

Karge, R. (1988). Metabase Management System (MMS). Report.

Lundström, Sixten (1988). Experiences on Small Domain Estimation Methods at Statistics Sweden. Report.

Lundström, Sixten (1989). Small Domain Estimation in Different Employment Classes of Hours Worked. Report.

Ohlsson, Esbjörn (1986). Asymptotic Normality of the Rao-Hartley-Cochran Estimator: An Application of the Martingale CLT. Scandinavian Journal of Statistics, 13, 17-28.

Ohlsson, Esbjörn (1989). Asymptotic Normality for Two-Stage Sampling from a Finite Population. Probability Theory and Related Fields, 81, 341-352.

Ohlsson, Esbjörn (1989). A Rotation System for SAMU.

Sundgren, Bo (1985). Outline of an Algebra of base operators for production of statistics.

Särndal, C.E. (1981). Framework for Inference in Survey Sampling with Applications to Small Area Estimation and Adjustment for Nonresponse. Bulletin of the International Institute, 49, 494-513.

Särndal, C.E., and Swenson, B. (1987). A General view of estimation for two phases of selection with applications to two-phase sampling and non-response. Int. Statist. Review 55, 279-294.

Sundgren, Bo (1986). Useroriented Systems Development at STATISTICS SWEDEN. Report.

Sundgren, Bo (1988). Coordination Proposals to Improve the Impact of SCP Software Development. Report.

TAB68 (1984). A programming language for table production. Statistiska Centralbyrån.

Reports (Green Series)

Forsman, Gösta (1989). Rapport från ett besök vid U.S. Bureau of the Census. Research and Development Report, Statistics Sweden.

Kasprzyk, Daniel (1988). The Survey of Income and Program Participation: An Overview and Discussion of Research Issues. Research-Methods and Development Report, Statistics Sweden.

Lindström, Håkan and Lundquist, Peter (1989). An Application of Generalized Precision Functions in the 1985 Swedish Family Expenditure Survey. Research-Methods and Development Report, Statistics Sweden.

Lindström, Håkan, Lindkvist, Hans and Näsholm, Hans (1989). Design and Quality of the Swedish Family Expenditure Survey. Research-Methods and Development Report, Statistics Sweden.

Nordberg, Lennart (1988). Generalized Linear Modeling of the Sample Survey Data. Research-Methods and Development Report, Statistics Sweden.

Rosén, Bengt (1989). On Evaluation of Surveys with Samples from the Revised Zimbabwe Master Sample Frame. Research-Methods and Development Report, Statistics Sweden.

Särndal, C.E., Swensson, B. and Wretman, J.H. (1988). The weighted Residual Technique for Estimating the Variance of the General Regression Estimator. Research-Methods and Development Report, Statistics Sweden. Also in Biometrika(1989), 76, 527-537.

Westlund, Anders and Öhlen Sven (1989). On Testing for Symmetry in Business Cycles. Research-Methods and Development Report, Statistics Sweden.

Reports (Yellow series)

Backlund, Sten (1988). Education and Training in the SAS System at the Central Statistical Office in Harare. Research-Methods and Development Report, Statistics Sweden.

Dalen, Jörgen (1988). Coverage Probabilities for Confidence Intervals based on Stratified Random Sampling. Research-Methods and Development Report, Statistics Sweden.

Malmborg, Erik (1988). Design of the user Interface of a Object-oriented Statistical Database. Research-Methods and Development Report, Statistics Sweden.

Malmborg, Erik (1989). On the use of Semantic Models for Specifying

Information Needs. Research-Methods and Development Report, Statistics Sweden.

Sundgren, Bo (1989). Conceptual Modeling as an Instrument for Formal Specification of Statistical Information Systems. Research -Methods and Development Report, Statistics Sweden.

Sundgren, Bo (1988). Base Operators as a Tool for Systems Development. Research-Methods and Development Report, Statistics Sweden.

Sundgren, Bo (1988). The Impact of new Technology on Methodology and organization of Statistical Data Processing. Research-Methods and Development Report, Statistics Sweden.

Sundgren, Bo (1989). Statistics Production in the 90's-Decentralization without Chaos. Research-Methods and Development Report, Statistics Sweden.

Contacts

The following is a list of the contacts that I made at Statistics Sweden.

Stockholm

Gösta Guteland - Deputy Director-General of Statistics Sweden
Äke Lönnqvist - Head of the Department of Research and Development
Carl-Erik Särndal - Visitor
Bengt Rosén - Professor, Department of Research and Development
Leopold Granquist - Department of Research and Development
Jan Wretman - Department of Research and Development Bo Sundgren - Department of Research and Development Jörgen Dalen, Tomas Garås, Anita Ullberg, Esbjörn Ohlson, Erik Esaieson, and Per Cassel - Statistical Research Methods Service

Örebro

Håkan Lindström - Head of the Statistical Research Unit, Department of Research and Development

Klas Lindström - Statistical Research Unit, Department of Research and Development

Sixten Lundström - Statistical Research Unit, Department of Research and Development

Claes Anderson - Statistical Research Unit, Department of Research and Development

Lennart Norberg - Department of Agricultural Statistics

Kent Olofsson - Department of Enterprise Statistics

Anders and Britt Wallgren - Statistical Research Unit, Department of Research and Development

Organization of Statistics Sweden,

1 January 1989

- Scientific Council
- Committees, groups of experts etc
- Office of the Director-General
- Governing Council Director General
  - JK Legal Office
  - E Budgeting and Accounting
  - P Personnel
- Director of the Örebro Office
- Supply Service

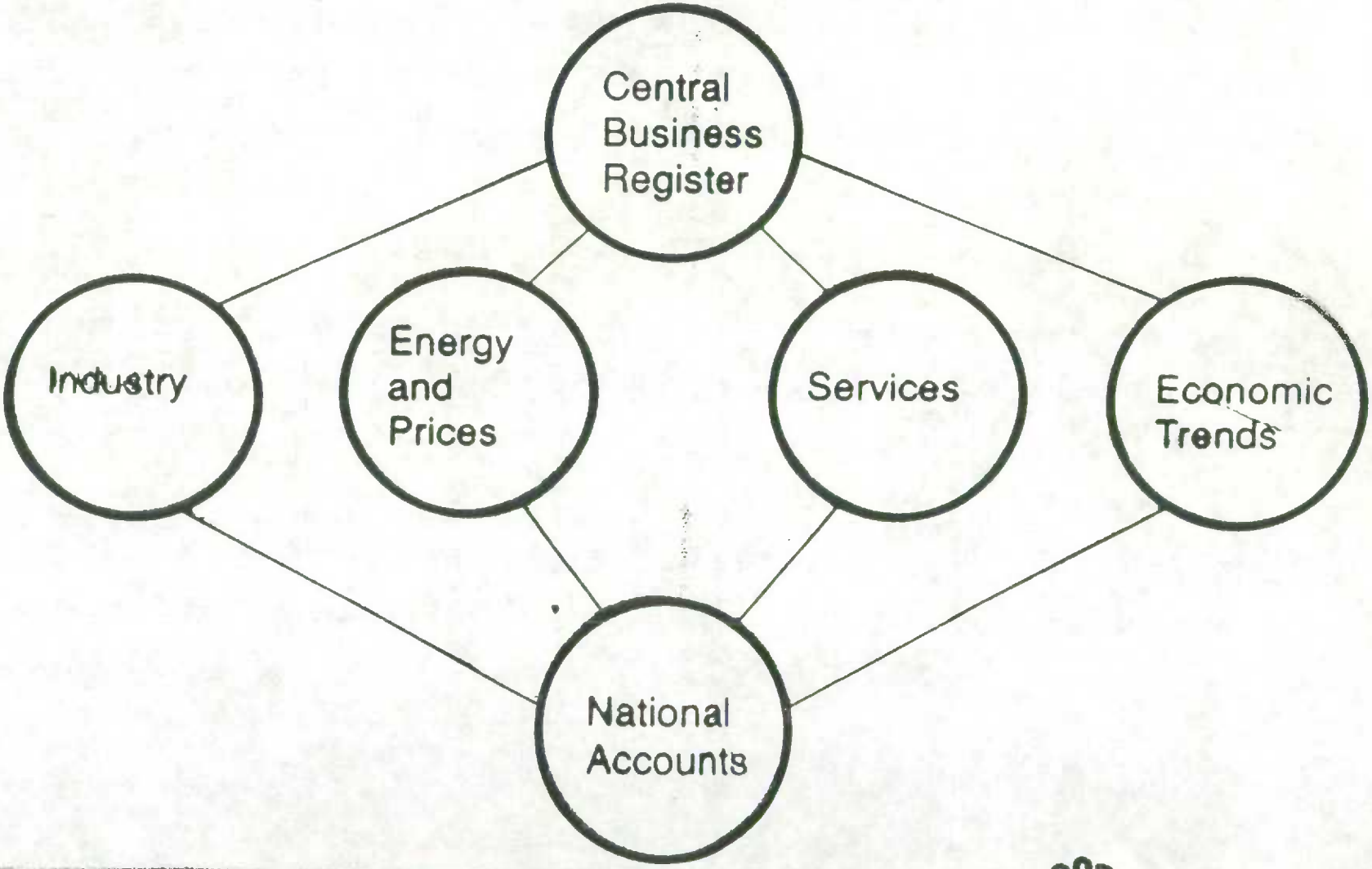
Departments	Sections/Functions	
AM Labour Statistics	~~Analyses, Publications, Methods~~	~~AM-APM~~
	EDP Service	ADB
	Forecasting Institute	PI
	Wages and Salaries, Private Sector	PL
	Wages and Salaries, Public Sector	OL
	Labour-Force Surveys	AKU
	Employment and Payrolls	SL
	~~Income Statements~~	~~KL~~
A Area Statistics	Staff	A/ST
	Agriculture	LA
	Natural Resources and the Environment	NA
	Housing and Real Property	BF
F Enterprise Statistics	~~Staff~~	~~F-ST~~
	Enterprise Registers	REG
	Mining/Manufacturing ~~and Energy~~	IND
	~~Finances~~	~~FI~~
	National Accounts	NR
	~~Foreign Trade~~ and Prices	EPR ~~UP~~
	Service Sector	SE
I Statistics on Individuals	Staff	I/ST
	Research Institute for Statistics on Living Conditions	UI
	Population	BE
	Justice and Social Welfare	RS
	Education and Culture	UK
U Research and Development	EDP Methods	U/ADB
	Statistical Methods	STM
	Special Studies	PLAN
	Professional Training Program	SKO
S Statistics Services	Staff	S/ST
	Information and Marketing	IM
	Regional Statistics Office	REK
	Equal Opportunity Statistics	JAM
	Library	BI
	Records and Archives	ARK
	Publications	PUB
	Statistical Databases	SDB
	Printing and Distribution	UTD
D Operations	Staff	D/ST
	Data Entering and Editing Office	DB
	Interviewing Centre	IE
	Computer Centre	DC
	Processing Development	UTV
ICO	**International Consulting Office**	**ICO**

Working Environment and Occupational Injuries

Regional Labour Statistics

Statistical Methods Service
EDP Service
Short-term and Foreign Trade
Energy

Department of Enterprise Statistics



STATISTICS SWEDEN
Department of Enterprise Statistics
Es

1989-08-14

ORGANIZATIONAL STRUCTURE OF DEPARTMENT

- STAFF, STM
  Statistical methods, standards, co-ordination, etc

- STAFF, ADB
  EDP systems engineering

- ENERGY STATISTICS CO-ORDINATION GROUP
  . Energy balances, annual and quarterly

- REGISTER (REG)
  . Register of Enterprises and Establishments
  . Register of Enterprise Groups

- ENERGY AND PRICES (EPR)
  . Electric Energy Supply, annual and monthly
  . Deliveries and consumption of petroleum products, quarterly and monthly

  . Consumer Price Index, monthly
  . Producer and Imports Price Index, monthly
  . Housing Construction Price Index, quarterly
  . Factor Price Indices of Construction and Repair, quarterly and monthly

- INDUSTRY (IND)
  . Industrial Census, annual
  . Construction, annual

  . Enterprise Finance, ISIC 2 - 5, annual
  . Foreign Owned Enterprises, annual
  . Semi-annual Turnover and Gross Profit of manufacturing enterprises, semiannual
  . Research and Development Expense of Enterprise, biannual

- ECONOMIC TRENDS (KONJ)
  . Foreign Trade, annual/quarterly/monthly

  . Index of Mining and Manufacturing Production, annual and monthly
  . Shipments and Orders (mining and manufacturing), monthly
  . Inventories of mining and manufacturing, quarterly
  . Capacity Utilization (mining and mfg), quarterly
  . Expected Exports, quarterly

  . Fixed Capital Formation, plans and executions, quarterly (3 quarters)

  . Financial Accounts (of National Accounts), annual/quarterly
  . Banks Statements, annual/monthly
  . Bank Deposits and Financial Institutions Lending by sector, quarterly

. Lending (new loans) of financial institutions by purpose, monthly
. Financial Enterprises and Investment Funds, annual reports and quarterly balances
. Enterprise Foreign Assets and Liabilities, quarterly
. Financial Assets and Liabilities of major enterprises, quarterly
. Quoted Shares, owners by sector, annual

- SERVICES (SE)
. Service Industries, sales and costs, annual
. Retail and Consumer Services Sales, annual/quarterly/monthly
. Wholesale and Business Services Sales, annual/quarterly
. Inventories of Wholesale and Retail Trade, quarterly

. Enterprise Finance, ISIC 6 - 9 except 81-82, annual
. New Enterprise (all industries), annual

. Accomodation, number of Beds and Guest Nights, monthly
. Passengers Arriving and Leaving (Sweden), by mode of transport, annual

. Registered Motor Vehicles, new registrations monthly, stock annually
. Goods Transports by Road and Rail, quarterly every 3rd year
. Transport in Sweden by Foreign Road Vehicles, 1987

. Merchant Fleet, quarterly (till 1990/91)
. Shipping Revenue and Expenditure, annual
. Overseas Shipping, arrivals and departures, unloading and loading, monthly (till 1990/91)
. Overseas Shipping, Revenue and Expenditure Abroad, quarterly
. Harbours, annual

. Local (and County) Government Finance, annual
. Local Government Financial Assets and Liabilities, quarterly
. Local Government Fixed Capital Formation and Wages and Salaries, plans and executions, quarterly (3 quarters)

. Yearbook of Administrative Districts of Sweden
. Tax Assessment (income and wealth), annual
. Local Government Tax Rates, annual

- NATIONAL ACCOUNTS (NR)

. National Accounts, annual and quarterly