Documentation of The Planning Survey and Related Databases

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Foreword

This document was written in the summer of 2025 at the Research Institute of Industrial Economics (IFN). It is a compilation of projects, surveys, and databases that are related to the Planning Survey, an annual survey of Swedish manufacturing industry that was conducted 1971-2001 by the Federation of Swedish Industries, and gradually taken over by IUI/IFN. The purpose is to make sure valuable data that is at the risk of being lost due to age and incomplete documentation is preserved, to compile an overview of research efforts on this statistical material, and to make the information available on a format and in sufficient detail for a possible future resumption of the Planning Survey to relate back to this historic material.

I thank professor emeritus Gunnar Eliasson at the Royal Institute of Technology for his guidance and help in writing this document. He led IFN (then IUI, the Industrial Institute for Economic and Social Research) for many of the years under which most of the research based on the Planning Survey data in this documentation took place, and has offered valuable information that gives the background of this statistical documentation. The Planning Survey was designed to be the statistical base to run the agent based macro model MOSES, two projects that were started at the Federation of Swedish Industries in 1974. The statistical requirements of the MOSES model, for Model Of the Swedish Economic System, have therefore also guided the questions asked in the Planning Survey. It was Gunnar Eliasson who originally suggested I should write this documentation, and thus the following would not have been possible without his guidance.

I am also very grateful to Jörgen Nilson at IFN for helping me access the data used in this document and for other technical support and guidance. Without him the following would also not have been possible.

Most specifications of surveys, databases, and research projects come from reading the large literature on the Planning Survey, the MOSES project and related studies accumulated over the years, and Gunnar Eliasson has been helpful in guiding me to the right sources. But technical specifications come from first-hand experience. For example, my work with the Planning Survey database has been the basis for the residual firm and database quality analysis in section 5.

Contents

1 Introduction

The Federation of Swedish Industries (today the Confederation of Swedish Enterprise) began to collect annual business cycle data from the largest Swedish manufacturing firms in 1971. This so-called Planning Survey was continued through 2001. It was designed to support the federation's twice annual business cycle analysis (see Industrikonjunkturen, 1972), but also to serve as statistical input in the micro based macro model that the federation had begun work on together with Uppsala University and IBM Sweden in 1974. This model, named MOSES, for Model Of the Swedish Economic System was up and running as a pilot project in 1976 (Eliasson, 1976b) and had to be loaded with micro data to represent what was referred to as a Sweden like industrial economy. MOSES is an economy wide model and therefore requires a complete micro to macro, stock flow consistent database scaled to the Swedish national accounts. It was one of the very first of what is today called agent-based models (Richiardi 2024). MOSES was presented together with other similar modeling projects in the first international micro simulation conference organized in 1978 by IUI (now IFN) in Stockholm (Bergmann et al., 1980).

The micro macro model has been used in several studies on Swedish industry, such as measuring the rate of diffusion of inflation through the economy (Eliasson, 1978; Genberg, 1983), estimating the social costs of the industrial support program of the 1970/80s (Carlsson et al., 1981; Carlsson, 1983), examining the role of Swedish multi-national firms as a pull factor for Swedish exports (Bergholm and Eliasson, 1985), studying the macroeconomic consequences of the emerging financial derivatives markets (Eliasson and Taymaz, 2001, 2024), or the ability of the Swedish economy to adapt to disturbances and restricted access to critical IT components and services (Eliasson and Johansson, 1999).

Besides serving as input in the model, the MOSES database and the Planning Survey augmented with special questions has also been found useful in several studies not related to the MOSES model that will be reported below, under section 4.

The MOSES model has served as a theoretical reference to obtain a complete micro (firm) to macro stock-flow consistent (SFC) statistical system. The Planning Survey provided the micro panel data on the manufacturing industry that was missing. At the time, also data on households were missing in Sweden, as were the resources needed to collect them. To begin with, the model was therefore set up with a household sector specified in macro. The ambition was, however, to expand the model with an integrated micro-specified household sector, when the lacking micro data had become available. When the Industrial Institute for Economic and Social Research (IUI, today the Research Institute of Industrial Economics (IFN)), became involved in a large statistical project funded by the Swedish Central Bank Foundation to build a parallel micro survey to Swedish households to statistically map their incomes and wealth, their consumption habits, and use of time and public services (Eliasson and Klevmarken, 1981; Klevmarken, 1984; Klevmarken and Olovsson, 1993), the opportunity was offered to design HUS (The Household Market and Nonmarket

Activities) questions such that they could be integrated into a micro-specified household MOSES sector. The latter, however, remains to be done (see Eliasson, 2024, sec.6.2).

The MOSES database thus not only represents a significant pioneering statistical effort in that it maps the development of a panel of large Swedish business entities over a long period. The difference between manufacturing, as defined by Swedish national accounts and this cohort of firms has also been determined as a synthetic residual firm entity for each of the four subindustries of the MOSES model. I will pay special attention to the empirical properties of these residual firms, not least to evaluate the quality of the MOSES database.

This paper therefore documents the Planning Survey, its usefulness in many studies, the MOSES modeling project being one, and the main reason for its existence. The Planning Survey has benefited from being the most important data set on which the economy wide agent-based MOSES model is based in that it has imposed strict micro to macro and stock-flow consistency (SFC) on all data sets, including all complementary data collections that have been related to the MOSES database and the Planning Survey specifically.

The MOSES database has been documented in many diverse reports, in different file types, and runs the risk of soon becoming technically inaccessible. Much has also happened since the Planning Survey was originally documented by Ola Virin (1976) and James W. Albrecht (1987). This paper therefore documents those sources, converts some onto a more accessible format for future uses, notably economic historical studies where micro macro relationships and the role of markets for shaping long term developments are considered important. As important has been to prepare for a possible future resumption of Planning Survey based micro macro panel statistics, and make sure that those data can be linked back to the MOSES-based database now to be documented.

The Planning Survey data have been moved from the Federation of Swedish Industries to the IUI (now IFN). The HUS data sets are available via IFN, as are the very large data sets on the global activities of Swedish multi-national firms (MNF). Some Planning Survey related databases unfortunately may already have been lost, or become inaccessible in old computers with corrupted files, or are hidden somewhere at IFN, or at other institutes like the Confederation of Swedish Enterprises. Fortunately, for this documentary paper, both the statistical ambitions of the MOSES model and future plans have been continuously reported in IUI and other publications, not least international conference reports. This paper documents what I have found.

To ensure that the core MOSES databases remain available for future studies they have been transferred to text-readable comma separated files (CSV) that are not dependent on proprietary or otherwise time-specific software. All attached documents are also available in text-readable and PDF formats. A few old SAS transfer files (SSD) and other documents could not be converted to text-readable or PDF formats because of old age. Such occurrences are documented in the database's directories.

All items in the Appendix are available in this document's GitHub repository: github.com/novrion/Planning-Survey-Documentation.

2 The Planning Survey

The Planning Survey was an annual survey the Federation of Swedish Industries collected from a large proportion of Sweden's manufacturing firms and divisions from 1971 to 2001. The first two sections of the questionnaire have not changed much over time and cover employment and wage costs, sales, purchases of raw materials and input goods, investment goods, annual percentage change in production volume, capacity utilization, orders, and inventories. The third section consists of supplementary questions that have changed significantly. Panel and cross-sectional data from 1975 to 2000 are available from the first two sections. Due to the third section's varying nature, it is only stored as cross-sections between 1975 and 2000 (the 1998 cross-section is however almost empty). The panel data for the first two sections are only from 1975 and onwards since the 1974 survey was a pilot survey and the 1971-1973 surveys do not have sufficiently comparable data that can connect to the panel data. I have not found this data set at IFN and it may be lost. The only identified documentation of the older surveys are older issues of Industrikonjunkturen, and their forms, which are attached in the Appendix.

Each Planning Survey collects historic data for two years. For example, in the 1997 Planning Survey, the first question asks for planned employment in 1997 and the number of employees in 1976 and 1975. Before 1978, the Planning Survey collected values one year back but also asked questions for one future year. Therefore, there was no Planning Survey in 1977. Hence, the panel data does not have current values for 2001 even though there was a survey in 2001. Every value for the current year t, in section one, from 1978 and onwards, are from the Planning Survey from year $t+1$. In addition to the surveys 1975-2001, the convention changed in 1975. The surveys 1971-1974 refer to the previous year's data, like the surveys from 1978 and onwards, but there were two surveys in 1975. The first includes data for 1974, and the second includes data for 1975. An overview of all Planning Surveys and how they relate to their data is found Table 1. It is noteworthy that there were several versions of the earliest surveys. These are marked 1, 2, and 3 in parentheses after the survey year.

The survey forms from 1975-1986 are available as supplement to Albrecht's documentation (Albrecht, 1987). Excluding 1977, all forms from 1971-2000, and all their versions, are also reproduced in the Appendix. Note that the Planning Survey from 2001 is missing. Some of the forms have fields with numbers that refer to the variable of that field (I.e. "3" means the field refers to the variable "X3"). The key for all variables in the compiled panel data are in Table 10 and the Appendix. For further reading, the recurring *Konjunkturen* by the Federation of Swedish Industries is a good source for time-specific information about the surveys. For example, in *Konjunkturen* (1989), it is specified that the surveys were answered before a relevant political decision, and the Planning Survey's representativeness of the industry is usually presented as shares of Sweden's labor force and value-added (*Konjunkturen*, 1996). Additionally, data specific to some years (questions in section III) are analyzed, such as in *Konjunkturen* (1997), where the appreciation of the Swedish crown's effect on

Table 1: Planning Surveys and Data Coverage 1971-2001

Survey	**Data**	**Notes**
1971 (1,2)	1970	
1972 (1,2,3)	1971	
1973	1972	
1974 (1,2,3)	1973	
1975 (1)	1974	Pilot survey
1975 (2)	1975	Planning Survey database starts
1976	1976	
–	–	No survey in 1977
1978	1977	
⋮	⋮	
2001	2000	

Parentheses () indicate the versions of surveys.
I.e. (1, 2) refers to version 1 and 2.

the Swedish industry is investigated.

The Planning Survey includes all firms with more than 1000 employees, all or most firms with more than 500 employees, a few smaller firms in the building materials industry, and a few companies of special interest (*Konjunkturen*, 1985, 1986). The database holds divisions, and firms if the firm is entirely made up of one division. There are several small divisions, with much less than 500 employees, that are apart of large firms. Approximately 200-250 divisions are recorded for each survey year, with decreasing response rates the last few survey years. In addition to the regular surveys, in 1986, an extra pilot survey was sent to 63 smaller firms within the manufacturing industry with 10-199 employees (*Konjunkturen*, 1986). The purpose of this selection of firms was to enable studying the differences between large export-heavy firms with smaller, more domestically dependent firms. It is unclear if this survey's data is included in the database at IFN.

The Planning Survey data at IFN have been compiled from a mixture of panel and cross-sectional SAS-workspaces and Excel-files, which were previously stored in APL workspaces. Only sections I and II of the 1999 Planning Survey (with values for 1998) had not been digitalized before.

Since the questions for the first two sections of the Planning Survey have differed, some questions have been inapplicable for some divisions, some divisions have sent in blank forms, and data is often missing. The panel data is not complete. For complete time-series, there is an interpolation program in the C++ library for manipulating the panel data. See the technical specification for details.

The MOSES model has four subindustries/markets. Firms and divisions are classified as belonging to the raw material (R), intermediate goods (S), Consumption goods (K), investment goods (V), and building materials (B) industries. Except for the addition of the building materials industry, this is consistent with MOSES's market-oriented industry taxonomy. The MOSES industries' classification scheme is coded by SNI69 groups in Pousette and Lindberg (1986). This is taken from *Konjunkturen* (1985) and is shown in Table 2. The key is not precise enough for a detailed conversion between SNI and the five markets, especially since the conversion is more precise than the most precise 5-digit SNI codes. Ola Virin initially derived a weighting matrix made from heavily disaggregated subindustry data on value-added to convert national accounts data into the Planning Survey industries. Unfortunately, this matrix seems to be lost. The Federation of Swedish Industries used to make updated reclassifications of the official SCB data (see *Konjunkturen*, 1988), but this no longer continues.

Table 2: SNI69 Aggregation Key

Industry	**SNI69**
Raw Materials (R)	33111, 34111, 37[a]
Intermediate Goods (S)	321[a], 3312/19, 34112, 3412, 351, 3521/9[a], 353/354, 355[a], 356[a], 36202, 37103, 37204, 3811, 38191/2, 38199, 3839
Investment Goods (V)	321[a], 3320[a], 3812, 382[a], 383[a], 384[a], 3851
Consumption Goods (K)	31, 321[a], 322/4, 3320[a], 3419, 3420, 3522/3, 355[a], 356[a], 361, 36203, 38195, 38291, 3833, 384[a], 3852, 39
Building Materials (B)	33112/9, 34113, 36209, 369, 3813, 38193/4
Manufacturing	3

[a] Part of SNI69 subindustry

The Planning Survey and the MOSES database have formed the basis for several ad hoc complementary surveys designed to support special studies at the IUI. These are here defined as "related" databases. By related it is meant that additional questions have been asked of Planning Survey firms, and the databases are on a format that allows the entire Planning Survey data set to be used in that particular study, and as well, the new data to be integrated into the Planning Survey and the MOSES database. One example of this is the added data on vocational training and human capital and internal service production in Planning Survey firms that was used in the large study *Knowledge, Information and Services* (Eliasson et al., 1986), an expanded data set that was later used in the Ballot and Taymaz (1997, 1998, 1999, 2000, 2001) studies of the macroeconomic consequences of among other things, firms' investments in internal training and their human capital. This integration was possible because the questions asked were consistent with those of the Planning Survey. Furthermore, a lot of the firms and divisions in the related databases overlap with the Planning Survey. In practice it should therefore be possible to combine the data from the related surveys with the Planning Survey and MOSES database for future studies.

2.1 Consistency Problems

2.1.1 The Floating Delimitations of Business Entities

The Federation of Swedish Industries has occasionally altered its identification codes for divisions in the Planning Survey. This reflects the fact that a firm or division of a large firm is not a stable composition of production activities but are often changed as competition makes organizational changes necessary, often in the form of spin offs or divestitures of production activities. This raises interesting problems of the nature of measurement in social sciences that must be left for later considerations. Some years, most notably from 1997 and onwards, the ids of the same divisions change. Ids primarily change in 1997 because cross-sections from 1997-2001 were not attached to the 1975-1997 panel until this summer. Strangely, the old id (old_id) is often one million less than the new id (new_id) multiplied by ten ($old\_id = new\_id \times 10 - 1000000$). To connect the newer observations from 1997 and onwards with their divisions' observations from before 1997, a program that prompts the user with potential divisions to connect the newer observation with, ranked using a pattern matching algorithm, was used. Although most observations from the same division now have the same id, there may remain observations where this is not the case. See the technical specification for details.

Even though some divisions or firms have provided data that have changed between years due to organizational restructuring (or even change in method of accounting), they still represent the same decision entity, or hierarchy, that reacts (even by changing its organization) in response to changes in the market environment. It therefore becomes interesting to ask what such behavior among many firms mean for the macro economy which was the main reason for the micro to macro modeling project to begin with. For instance, Duni moved its headquarters from Halmstad to Stockholm in 1994, because Stockholm is the financial center of Sweden and the right location for a CHQ when financial decisions are made. This organizational restructuring changed what the respondent counted as part of its division, which caused the values for that year to differ significantly from the previous year. Only some of these organizational changes, mostly before 1997, are accounted for by a new identification code. Furthermore, there are errors made by the individuals who answered the surveys and the individuals who digitalized the surveys. Such stochastic errors are however infrequent and likely to be of minimal significance.

2.1.2 Inconsistent Taxonomies Between Planning Survey and National Accounts Data

In micro to macro modeling inconsistent data is problematic since firms react to inconsistencies as real data. In selection based nonlinear systems models like MOSES, a consistent micro to macro and stock-flow consistent initial state is needed for consistent simulation results. Therefore, a considerable effort has been dedicated to put together the initial states for MOSES simulations in 1976, 1982, 1990, and 1997. If errors can be assumed to be stochastic, medium-length simulations allow markets to "shake off" errors such that initial inconsistencies do not bias simulation results (Taymaz, 1992b).

While Planning Survey data is based on firms' internal market-oriented classification system, national accounts (NA) statistics use an input classification. While firms' internal data serve the decision-making needs of firm management, NA statistics use an input classification. While large firms in MOSES are often represented by two or more divisions that operate in different markets (for instance Volvo Automotive (PV), Volvo Trucks, Volvo Marine Engines etc.), the statistical units on which NA statistics are based are production sites ("arbetsställen"). While firms' internal data serve the decision-making needs of firm management, NA statistics have largely been designed to serve the needs of policy makers.

2.1.3 Market Information Processing That Governs Economy Wide Self-Coordination Makes The Nature of Data Important

In the MOSES model firms interpret market signals to form price expectations, make up production, recruitment and investment (business) plans that they test in the market, and learn from their failure to anticipate prices correctly to improve next period price anticipations. Together all firms self-coordinate the entire model economy and does that reasonably well under normal circumstances. The policy maker may interfere in that market process but is not needed for self-coordination. The policy maker may in fact easily disturb market self-coordination by misinterpreting data, misunderstanding the dynamics of the economy and/or relying on erroneous data (Eliasson, 2023, 2024). A central part of the MOSES modeling project has been to represent markets as huge, interrelated information (or misinformation) processing mechanisms that self-coordinate the economy.

While the statistical categories of the Planning Survey were designed to be as close as possible to what firms themselves collected and used, as studied in Eliasson (1976a), to feed the firm model in the MOSES model, NA data is to a significant extent collected from firms as artificial artifacts to fit policy model analyses. In MOSES modeling the empirical reference for the Swedish economy, and its size in initial state data is defined by the NA statistics – there is no alternative way. The size of the firm and the categories that define it as a decision entity are however largely determined by market developments. Obviously, there will be plenty of inconsistencies between the two data sets, some of which will be economically relevant factors of importance in the sense that firms make up their minds of them based on the data they have access to. Policy makers on their side make their decisions based on the data they have as they are collected for and processed in the policy models. An advanced market economy is therefore characterized by an enormous complex of informational inconsistencies the consequences of which must be understood if the dynamics of economic developments is to be understood. Much of this has also been modeled as part of decision-making at firm and policy levels in the MOSES model. For high quality database design, it is however important to keep these inconsistencies apart from pure errors of measurement. The residual firm analysis in section 5 will address some of these problems.

3 Model Of the Swedish Economic System

The Model Of the Swedish Economic System (MOSES) is an agent (firm) based micro to macro simulation model of the Swedish economy. Work on the model began in 1974. A first version of the model was up and running in 1976, which also saw the first publication (Eliasson, 1976b). MOSES is one of the very first agent-based macro models (Richiardi, 2024). It has been empirically implemented on Swedish data (Eliasson, 1976b). This paper documents the database requirements for the empirical implementation of the model, and its special requirements in that respect. Novel features of the model were (and still are); (1) that the organization of market processes and firm behavior explicitly determine aggregate macro development, and (2) that firms' price anticipations determine their business plans, that are revised from period to period as firms learn from their mistaken anticipations. To implement these economy wide market dynamics empirically (a) a very high quality[1] initial state database was required, and (b) the parameters that regulate the period-to-period market reactions of firms' behavior had to be accurately determined. This paper is concerned with (a). To that end a specially designed survey to Swedish manufacturing firms had to be started. This Planning Survey conducted annually by the Federation of Swedish Industries makes up most of the micro data that was necessary to run MOSES. For a comprehensive "historical" documentation of the model, read Richiardi (2024) in the International Journal of Microsimulation.

The household sector was originally modeled in macro. The ambition was however to convert the model's household sector onto a micro platform. Lack of micro household data prevented that, even though the HUS survey's questions were largely formulated to enable the creation of a micro-specified household sector in MOSES. Another obstacle was that MOSES had been coded in APL (A Programming Language), a high level, array-based, and very compact computer language that IBM promoted. APL was however not well suited for integrating firms and households at the market level. To facilitate the micro household extension, it was suggested to convert the original array-based APL program to object code for a more modern and intuitive structure. As early as 1992, Derviz investigated the potential of converting MOSES to object code (Derviz, 1992). At that time, however, object-oriented code was very new, difficult to use, and very demanding on computer capacity. Finally, the APL project specified in "The MOSES Technical Specification Code" (Fredrik Bergholm et al., 1989), was converted to C++ (Lindstenz, 2025).

To realize a micro household sector, and to stay with the empirical ambition of MOSES the MOSES database, and thus its data sources and related databases must be properly reorganized. In addition to the datasets that have been directly integrated into the MOSES initial states, there are several related surveys that are at least partially compatible because they have questions that are identical

[1]Note (and with reference to the previous section) that quality here means accurately representing what information firms actually have access to and have used, and the nature of the information policy makers have. The Planning survey was in fact designed to reflect what statistical information firms actually collected and used as studied in Eliasson (1976a).

to those in the Planning Survey. These could in practice be integrated into the MOSES database. The data sources for MOSES (except the IT survey, see below) and their integration and use in the model are compiled in Eliasson (1992) under Chapter 4.5 and in supplement II. Read more about how the surveys complement the MOSES database in their respective subsections under section 4. Additionally, a compilation of the databases and surveys are shown in Table 3 and Table 4. It is noteworthy that this documentation does not necessarily cover all data sources, but it covers almost all of them.

Table 3: Surveys

Survey	**Years**
Planning	1971-2000, (2001)
EC 1992	1989, 1990
HUS	1982, 1984, 1986, 1988, 1991, 1993, 1996, 1998, 1993, 1996, 1998
Service Sector	1983, 2001
IT	(1997)
Multi-National Firms	1967, 1971, 1975, 1979, 1987, 1991, 1995, 1999

Parentheses () indicate the survey questionnaire has not been found.

Table 4: Databases

Database	**Data**
Planning	(1971-1974), 1975-2000
MOSES	(1974), (1976), 1982, 1990, 1997
HUS	1982, 1984, 1986, 1988, 1991, 1993, 1996, 1998, 1993, 1996, (1998)
Service Sector	(1976), (1982), (2001)
IT	(1997)
Multi-National Firms	(1960), 1965, 1970, 1974, 1978, 1986, 1990, 1994, 1998

Parentheses () indicate data has not been found at IFN.
Note that data is not necessarily from the survey year.

There are currently three complete stock-flow and micro to macro consistent MOSES initial states, which will also be converted for use in the object version of MOSES. Two carefully constructed databases in 1982 and 1997, and an anonymized synthetic database from 1990 that was made available for external use, by simulating initial state 1982 to 1990 (Taymaz, 1992a). The 1982 and 1997 initial states are partially anonymized since they do not have names and identification codes to connect their data with their respective real divisions. But it should be possible to identify the divisions and restore identification through a pattern matching program comparing the initial state data with the Planning Survey database. Additionally, there are two preliminary initial states from 1974 and 1976. The 1976 version is documented in Albrecht and Lindberg (1982), and Bergholm (1983), and was used for initial testing of the model in, among other papers, a study of multi-national Swedish firms' pull-effects on the Swedish industry (Bergholm, Eliasson, 1985). The 1982 and 1990 databases have only four industries (no building materials sector). The 1982 database was used to examine the consequences of the existence of the financial derivatives market in Eliasson and Taymaz (2001, 2024) (the financial market of MOSES is specified in Eliasson (1985a), and Eliasson and Taymaz (2001, 2024)). An extended version of this financial market, on the 1982 initial state, was used by Broström (2003) to study the reliability of the Capital Asset Pricing Model (CAPM) under difference macro-economic environments. The initial state 1997 included an additional information technology (IT) subindustry, that was broken out of divisions from the investment and service sectors and included new micro data from a separate survey to IT firms. The data gathered for the IT industry in 1997 was originally for a study on the robustness of the Swedish manufacturing industry, and its adaptability facing unexpected changes and disturbances in the supply of IT components and services (Eliasson and Johansson, 1999). This was later integrated into the MOSES database to form the initial state 1997 ("Supplement: MOSES 1997 Database – Including The C&C Industry" in Johansson, 2001). After calibration (Taymaz, 1991), any stock-flow and micro macro consistent database, preferably the latest one from 1997, can be simulated to be prepared for current studies (Eliasson, 2024, sec. 3.13.3.2).

Table 5: MOSES Initial States

Initial State	**Industries**	**Notes**
(1974)	4	Preliminary
(1976)	4	
1982	4	
1990	4	Synthetic & anonymized
1997	5	IT sector

Parentheses () indicate the initial state has not been found.

MOSES creates stock-flow consistent and complete micro macro initial states for each simulated year. This made the creation of the anonymized initial state 1990 for external use possible. It is not the simulation process itself, but the careful creation of an initial state that is time-consuming (Albrecht and Lindberg, 1982). The creation of the input-output (IO) matrix, that requires a precise aggregation of Statistics Sweden's (SCB) industry classification scheme, which changes from time to time (SNI69, SNI92, and SNI2007) is especially time-consuming (Ahlström, 1978, 1980, 1989).

The structure of the MOSES database is described in detail in "The Minimum Data Requirements to Start and Run MOSES" (Taymaz and Nilson, 1992). Each MOSES database consists of a macro and a micro database. Their structure is summarized in Table 6.

The micro database largely consists of establishment data from the Planning Survey, but some financial data (book value of fixed assets, dividends, loans, etc.) are as a rule only prepared at the firm level. Therefore, the second part of the micro database consists of financial firm data, that is disaggregated into its respective production units before simulation. These financial data had to be gathered from external sources such as financial reports from parent companies. Financial data from 1966 to 1987 is available at IFN. The micro initialization process needed before simulation experiments can begin is technically specified in detail in MOSES Handbook (Bergholm, 1989).

The macro database contains industry and national accounting aggregates, and exogenous constants and parameters. One major problem with the macro database is that the MOSES subindustries differ from the corresponding industries in SCB's national accounts. Therefore, for a few macro statistics, SCB's industry taxonomy must be converted before being compatible with MOSES market classification. This was especially troublesome for creating the IO matrices of the initial states. The transformation uses a weighting matrix constructed by Ola Virin at the Federation of Swedish Industries. The matrix is made from heavily disaggregated (5-digit level) subindustry data on value-added. Unfortunately, Virin's conversion matrix has not been found, but an unprecise key between SNI and Planning Survey industries is available in Table 2. In addition to the IO matrix, transformation is applied to market totals of wages, sales, and the number of full-time employees. (Albrecht and Lindberg, 1982; Virin, 1976). For more on the MOSES macro accounting system and the aggregation of SCB's national accounts data see Nordström (1988).

Table 6: MOSES Database Components

Macro Database	
Component	**Data Source**
National accounting statistics	SCB
Parameters	Calibration[a]
Micro Database	
Component	**Data Source**
Planning Survey divisions	Planning Survey
Financial data (firms)	Financial reports

[a]See Taymaz (1991).

4 Planning Survey and MOSES Related Databases

4.1 The IT Industry Survey

In 1996, a defense assessment made clear that the advanced Swedish manufacturing industry was at risk in situations when imports of critical IT components and services might suddenly be restricted, and that practically nothing was known about the magnitudes of those risks and the adaptive capacities of Swedish manufacturing firms facing those risks. Gunnar Eliasson, then at KTH, was asked by the Swedish Authority for Economic Defense (ÖCB) to conduct such a study on the exposure of Swedish industry to such risks and was especially asked to simulate the consequences of various import restriction scenarios on the MOSES model. Resources were made available for complementing the Planning Survey with a new computer and communications (C&C) industry, and the results were published in Eliasson and Johansson (1999), and Johansson's (2001) doctoral thesis. This project not only expanded the MOSES database and made several new empirical studies possible. It also illustrated the flexibility of the MOSES modular build in facilitating design modifications as new data becomes available.

The IT Planning Survey is documented in Johansson's chapter "Potential för snabb anpassning genom utnyttjande av outnyttjad kapacitet" in Eliasson and Johansson (1999, pp.184–197). The reason the IT Planning Survey was necessary for Johansson's study was that statistics rarely had data on capacity utilization. The survey was conducted in partnership with SCB and ÖCB and was sent to all Swedish IT companies with 200 or more employees. The questions were extensively formulated on the format of the original Planning Survey so that the new survey's divisions could be integrated into the MOSES model and so that the industry could be compared with the IT sector. The survey was sent out in November of 1997 and data collection continued until April 1998. Companies that didn't answer initially were sent the survey again, and in some cases telephone calls were made to complement incomplete answers. The reason it was difficult to get responses from the IT sector was that in the traditional industry a certain person would have answered the survey as a prioritized task, while in the competitive IT industry, other income generating operations had to be displaced to make time for the survey.

The IT Planning Survey was the basis for the creation of the MOSES initial state 1997 (Johansson, 2001). This database was used in MOSES simulation to investigate the role of C&C technologies in economic growth, the sensitivity of Swedish manufacturing growth to restricted access to C&C components and services, and the relevance of many "productivity paradoxes" circulated in literature. While computers and information technology were everywhere present, Solow (1987) wrote, none of the expected productivity increases could be seen in the statistics. On this Gunarsson et al. (2004) concluded, based on the Planning Survey data, that the reason was lacking complementary human capital.

When firms had acquired and built the requisite human capital their productivities rapidly increased. Similarly, in “Simulating the New Economy” (Eliasson et al., 2004) the absence of complementary human capital meant that the internet revolution failed to occur in the MOSES model economy.

4.2 EC 1992 Surveys

In 1985 the European Community (EC) presented 279 actions necessary for Europe's internal market, due 1992. There were concerns for how Sweden's industry, which was not part of the EC at this time, would be affected. Sweden's industry's internationalization and focus outside the country was considered to be of great importance. The Planning Survey related studies of foreign subsidiaries of Braunerhjelm (1990a, 1990b) were specially designed to address that problem. In particular, this survey also made it possible to clarify the sources of international competitiveness of Swedish manufacturing firms, emphasizing the importance of human embodied team competence (Braunerhjelm and Eliasson, 1991). Additionally, the latter survey was used to investigate startups and firms' international operations (Carlsson and Braunerhjelm, 1993; Braunerhjelm, 1993).

The complementary surveys and questionnaires are documented and attached as supplement in Braunerhjelm (1992). The complementary database consists of two parts, the first from a 1989 survey, and the second from a survey in 1990. The first survey contains data on medium and large sized firms. Its observation year is 1988 except for gross investments, for which data from 1986-1988 were collected. In addition to the first survey, Braunerhjelm also interviewed 40 of the large firms. The latter survey comprises small Swedish firms and subcontractors. The accounting data of the survey was collected for 1988-1989 and with planned values for 1990. While both surveys supplied the data for the analysis of EC 1992 and its effects on the Swedish industry, the former survey and the interviews appear in Braunerhjelm's study on larger firms from 1990 (Braunerhjelm, 1990b), while the latter enabled his study from 1991, on smaller firms and subcontractors (Braunerhjelm, 1991). In addition to the standard questions of the Planning Survey, the data sets contain firms' degree of international operations, the quality of labor force, and the nature of capital employed in the firm. Traditional fixed capital was complemented with “soft” capital like marketing, software investments, and technical competence. This additional data was used in Braunerhjelm (1991) to study the internal structure and competence of firms.

The EC 1992 surveys are related to the Planning Survey since they include the Planning Survey firms and answers to the questions of the Planning Survey. Most surveyed divisions overlap with the Planning Survey. The difference is of course that the EC 1992 surveys examine the firm and its foreign subsidiaries while the Planning Survey only includes domestic operations. The Planning Survey parts of the EC 1992 surveys were appended to the Planning Survey, but the residual questionnaire on quality of labor force, “soft” capital, etc. have not yet been integrated into MOSES (Braunerhjelm, 1992; Eliasson, 1992).

4.3 Service Sector Surveys

The rapidly growing Swedish service industry for a long time remained statistically uncharted terrain. In addition, traditional manufacturing had in large parts specialized into service production. This posed a serious structural accounting problem since the border lines between the service sector and industry had become very blurred (Eliasson, 1990). In Pousette and Lindberg (1986) an attempt was made to clarify the statistical relations between the service sector and manufacturing production and employment. For this new micro data was needed, so a complementary survey was sent in 1983 to the firms in the Planning Survey. The first questionnaire included information about firms' internal service production in 1976 and 1982. This survey is documented in detail in Pousette and Lindberg (1986), and more briefly in Pousette and Lindberg (1990).

The interesting conclusion from these new data is that as manufacturing firms have found it economical to outsource large parts of its internal service production, the employment of which had previously been registered as manufacturing employment. The manufacturing sector as recorded in NA data had thus steadily shrunk since 1950. This "deindustrialization" has not gone unnoticed and caused an inflamed political debate based on a statistical misunderstanding of what had been going on. The new statistics collected made it possible to correct NA data by redefining the manufacturing industry to include also its supporting service production that had been increasingly outsourced since 1950. The so redefined extended manufacturing industry was found to have remained roughly the same since 1950 if measured by its share of employment (Eliasson, 1990, pp. 79). A large part of the outsource service production however included skilled labor.

In 2001 Mellander and Savvidou (2000) sent out another service survey and used Planning Survey data to study the role of competence and education in firm performance. They were especially interested in examining how system of voluntary savings for developing competence (IKS) would affect personnel training. (Mellander and Savvidou, 2001).

4.4 The Household Market and Nonmarket Activities

The Household Market and Nonmarket Activities (HUS) project was a joint research project between Gothenburg University and IUI funded by the Riksbankens Jubileumsfond (Swedish Riksbank Research Foundation). The project was led by Anders Klevmarken. At the time comprehensive micro data on households' economic activities were entirely lacking. The ambition was to gather micro data that could be scaled up to macro, and that would also be useful for studying interesting relationships between households and production firms (Eliasson and Klevmarken, 1981). Cross-sectional studies are of limited interest in this respect since they do not capture the dynamics of household behavior over time and households' interrelation with other households and economic agents such as the government. To study the sources of income and wealth distributions on the MOSES model – an early ambition – HUS type household data would be needed to build a micro-specified household sector (Eliasson, 2024, sec. 6.2 and below). HUS panel data is available from studies conducted between 1984-1998.

In addition to the pilot study in 1982 (Klevmarken, 1982), full scale HUS surveys were conducted in waves starting in 1984 and continued in 1986, 1988, 1991, 1993, 1996, and 1998. The HUS project databases and surveys 1984-1991 are thoroughly documented in volumes I and II of *Household Market and Nonmarket Activities: Procedures and Codes 1984-1991* (Klevmarken and Olovsson, 1993a, 1993b). The wave from 1993 is specified in volumes III-VI of *Household Market and Nonmarket Activities* (Flood et al., 1997a, 1997b, 1997c, 1997d), the 1996 wave is described in volume VII (Flood and Olovsson, 1999), and the 1998 wave is documented in volume VIII (Flood and Olovsson, 2000). Additionally, a compilation of studies made using the HUS database are presented in *Tid och råd – Om HUShållens ekonomi* (Klevmarken, 1990). Except for the studies in 1982 and 1988, the surveys were conducted by Sifo AB.

The original idea was to create panel data on household time-use, use of subsidized public services, private consumption expenditures, and saving. The HUS database now holds a very large number of longitudinal data (i.e. wealth, saving, consumption) of randomly selected Swedish households of varying characteristics. As of the 1998 survey, the most important topics included labor market experiences, current employment, earnings, schooling, socioeconomic background, housing, childcare, incomes and taxes, wealth, and time-use. The entire HUS database excluding the 1998 survey is available at IFN.

One idea in designing the questions in HUS was to also prepare for introducing a micro-specified household sector in MOSES. The HUS survey questions were formulated to facilitate that. By simulating the MOSES economy two years ahead from the high quality 1982 initial state database (see Albrecht et al., 1992) directed by known exogenous variables a complete and empirically relevant "semi-synthetic" initial state database for 1984 would be created to be merged with the HUS database for that year. Alternatively, the initial state from 1997 could be simulated to 1998 to connect with the HUS database. The groundwork of how a micro household extension could be integrated in MOSES is already finished. Several confidentiality problems must however be solved, since micro units in HUS are anonymous. There is also the problem that while the MOSES firm database in principle covers all large firms and for some years samples of small firms the HUS data consists of representative samples of Swedish households that can be scaled up to macro. There are statistical techniques to deal with that. It should also be remembered that the residual firm calculated for each of the four MOSES markets and each year (see section 5 below) makes the MOSES database complete in that it covers hundred percent of value-added and employment as statistically recorded by the national accounts. In Ballot et al. (2006) some pilot studies on the MOSES model on venture capital firm spin offs from the (this time still macro) household sector have been conducted to demonstrate what could be done if a micro-specified household sector could be integrated within the current MOSES model. In Eliasson (2021) the idea of spin-offs of firms whose central production capital is human capital is developed. This was inspired by Ballot et al (2006).

4.5 Surveys of Multi-National Firms

During the 1960s, foreign direct investments (FDI) from Sweden and other industrial countries increased quickly, and the IUI got involved early in studying the role of foreign investments in promoting the competitiveness of Swedish multi-national firms (MNF) and Swedish exports. These studies were started before the Planning Survey and were initially not related. Since Swedish manufacturing performance cannot be understood without accounting for its international operations, the Planning Survey and the MOSES database had to be expanded to gradually also cover the MNF dimension. The IUI's many statistical studies of Swedish firms' international dimensions must be accounted for here.

The first MNF survey was a joint project by the Swedish Employers' Confederation (SAF, Svenska Arbetsgivareföreningen), Sveriges Allmänna Exportförening (today Sveriges Allmänna Utrikeshandelsförening or Business Sweden), and the Federation of Swedish Industries. A survey of the international operations of Swedish manufacturing industry was conducted in 1967, with data from 1960 and 1965 (Lund, 1967). To analyze this development further, the IUI decided to conduct a more detailed survey in 1971 (data from 1965 and 1970) (Swedenborg, 1973). Swedenborg examined the causes and effects of the increased global focus in the Swedish industry by integrating the 1967 survey with the 1971 survey, even though the surveys are not perfectly compatible. The concerns surrounding the globalization caused regulations to be put in place, especially regarding retaining trade balance and domestic employment. This IUI survey continued in 1975 (1974 data) (Swedenborg, 1979) and 1979 (1978 data) (Swedenborg, 1982) (these two surveys were additionally used to study Sweden's FDIs in machinery and buildings specifically (Bergholm, 1983)). The studies on the data collected up until 1979 are summarized in Eliasson (1984). The pull-effects of multi-nationally established Swedish firms on Swedish exports were studied with data from these surveys, with additional help from MOSES, and its 1976 database that contained the largest Swedish MNFs, as a modeling tool (Bergholm and Eliasson, 1985). Furthermore, the MNF surveys, complemented by interviews with large firms, were used in Bergholm and Jagrén (1985) to explain how Swedish firms used international investments not only to overcome trade barriers to boost exports but also to learn about and acquire new technologies. These studies concluded that the net effects of foreign direct investments were positive for exports ad domestic employment despite opposite concerns, voiced in the political debate. Finally, in the 1980s, FDI increased rapidly again, which promoted a new IUI investigation in 1987 (data 1986) (Swedenborg, 1988). It was of particular interest to examine how Sweden would be affected by the European Commission's decision to implement its internal market (see the EC 1992 survey for more details). Once again Swedenborg concluded that Sweden's international expansion would have positive effects on

Sweden's industry. The MNF database and the MOSES initial states 1976 and 1982 were additionally useful in Pousette's and Lindberg's (1990) examination of services in Swedish manufacturing.

The MNF survey continued for the years 1991, 1995, and 1999, covering the years 1990, 1994, and 1998, but with slowly decreasing response rates compared to the very high answer rates before. The 1990 survey is documented in Andersson et al. (1996), the 1994 survey in Braunerhjelm and Ekholm (1996, 1998), and the 1998 survey in Ekholm and Hesselman (2000).

The MNF survey database was used as material to test the performance of MOSES. Additionally, some preliminary work was done to connect foreign subsidiaries with the matching Planning Survey establishments. But the MNF survey started before the Planning Survey and is not adjusted to the format of the Planning Survey questionnaire. Therefore, the MNF survey is not fully compatible with the Planning Survey and MOSES databases (Eliasson, 1992; Braunerhjelm, 1992). All MNF survey datasets and forms from 1967 and onwards are available at IFN.

5 Quality Checks and Residual Firms

5.1 Response Rates and Statistical Coverage

The Planning Survey of Swedish manufacturing industry for many years had a very high response rate. Only in late years did the coverage decrease significantly. During later years a small number of firms/divisions also had to be deleted from the shown cross-sections due to blank data. Very few firms were however omitted from labor force coverage and a small number of divisions were omitted from value-added coverage. Therefore, the graphs below underestimate the Planning Survey's coverage. It is interesting to note that value added coverage is much higher than labor coverage which probably reflects the dominance of high (labor) productivity firms in their selection of firms in the Planning survey. The low response rates during later years probably depend on less effort being devoted to reminding firms to respond and by contacting them directly, as the Federation of Swedish Industries reduced their business forecasting efforts. There were also the increasing difficulties, mentioned earlier, to statistically categorize the firm in the demanding way required by the Planning Survey, or simply a growing response fatigue and unwillingness by firms at the time to respond to the growing flow of questionnaires from public authorities, consulting firms and research institutions. For example, in the IT survey in 1997, it was quite difficult to convince personnel in the IT industry to take time from income generating activities to answer the survey. In Figures 1 and 2, the statistical coverage (cross sections) of the labor force and value-added are shown.

The problems of using coverage as an estimate of response rates are illustrated by the spike of value-added in 1994, but not in employment. Although not yet confirmed statistically, the large increase in value-added as a share of the national accounts covered by the Planning Survey is likely that the large firms that dominate the Planning Survey emerged more quickly than smaller firms out of the economic recession, and were more efficient to respond to the drastic reversal of policies from 1993 in a more business friendly direction (a significant part of the large increase in value-added in 1994 in fact seems to have been driven by Volvo Trucks and its new FH-series). It is also interesting to ask whether this large firm effect depends on the large firms having hoarded labor during previous years that small firms had not. The Planning Survey includes unique data on labor hoarding that I have not yet had the time to look at.

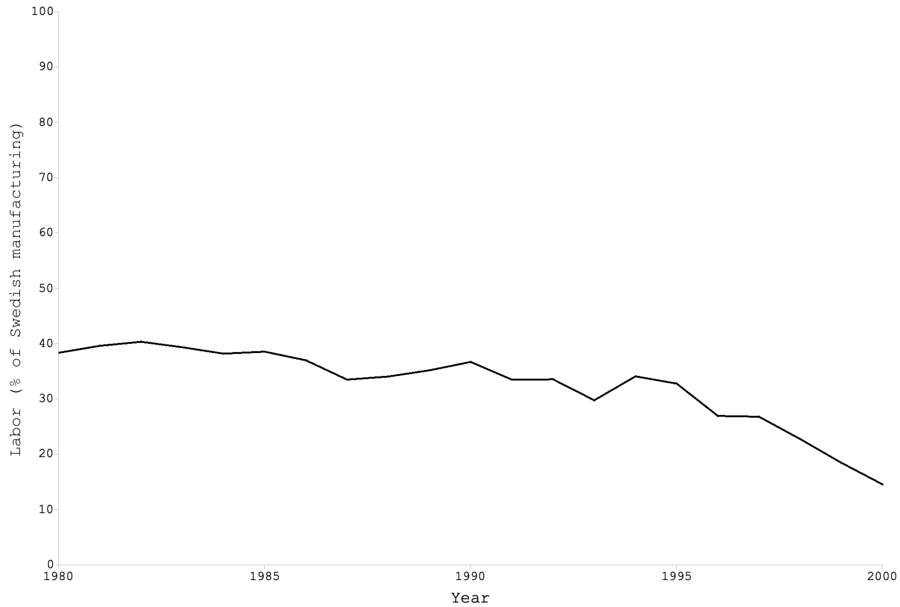

Figure 1: Planning Survey Coverage (Labor)

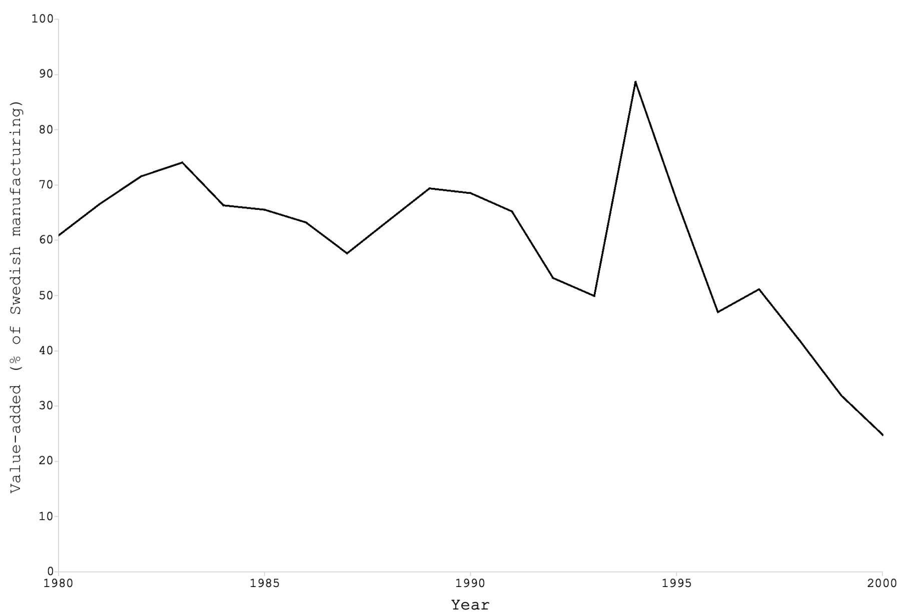

Figure 2: Planning Survey Coverage (Value-Added)

5.2 The Residual Firm Defined

As a model of the Swedish economy, the MOSES database is complete in that it contains the whole Swedish manufacturing industry. But the Planning Survey does not cover all Swedish manufacturing firms. Therefore, synthetic 'residual' firms must be created to scale data up to the national accounts (NA) level. A residual firm is simply the difference between the national accounts and the aggregate of the Planning Survey firms, and in MOSES simulations that residual firm, using different methods can be decomposed into an arbitrary number of firms to make the distributional characteristics of the initial state population of manufacturing firms as close as possible an approximation of the real population of Swedish firms. This residual contains the sum of all statistical errors within the Planning Survey, if NA data can be assumed to represent the 'truth'. From the point of view of the Planning Survey and its use in the MOSES model, however, this becomes a misrepresentation of facts, since Planning Survey data are statistics that firms themselves collect and use in their planning and decisions, as modeled in the firm modules of the MOSES model. For that use Planning Survey data should be regarded as being high quality representations of what firms really know. NA statistics, on the other hand, is collected to serve policy makers with very different decision agendas, based on a different statistical nomenclature than the market taxonomy on which the Planning Survey is based. This inconsistency of data characterization has been unavoidable and represent an interesting and very important problem of economic measurement in itself, in that data 'quality' becomes dependent on what data are supposed to be used for. These inconsistencies are different from statistical errors, and important because firms and policy makers react to them in both the MOSES model and in reality. There has, however, been no time for me to elaborate further on this interesting 'information problem' in this paper (see section 2.1 above and Eliasson, 2024 sec. 3). If the residual firm is calculated by subindustry, a real statistical error appears in that the different subindustry classifications used in the Planning survey and NA statistics, mean that firms/divisions/production plants may have been differently allocated when the data were aggregated in the Planning Survey and in NA statistics. While the first mentioned inconsistences are real facts that decision makers (in firms and policy departments) should react to, MOSES model firms, for which Planning Survey data were used, also react to these classification errors as representing market environmental facts. In selection based non-linear models of the MOSES type, small circumstances some times accumulate with time into major macroeconomic consequences ('deterministic chaos'), and thus bias simulation results. This illustrates the importance for database quality of minimizing those statistical errors in economy wide economic models that explicitly represent how decision based on data are made and how decision mistakes are made and influence next period decision. In simulations beyond the very short term this matters importantly, and explains why considerable effort has been devoted to measurement accuracy in building the MOSES database (Taymaz, 1992a, 1992b).

The national accounts statistics has been gathered from SCB between 1980 and 2023. Lacking the industry conversion matrix of Ola Virin (1976) to convert macro statistics to the Planning Survey industry taxonomy, a new conversion key from SNI2007 has been created (Table 7). The aggregation scheme uses 2-digit SNI2007 codes and is thus quite rough. Notably, 2-digit SNI2007 codes do not distinguish the pulp and paper industries (code 17). These are large industries which are separated in the Planning Survey classification scheme, as seen in Table 2 (codes 34111 and 34112). The pulp industry is in the raw materials industry and the paper industry is in the intermediate goods industry. The macro aggregation key could not be made more precise due to a lack of fine detail in the national accounting statistics from SCB. My aggregation scheme is only provisional to make a diagnosis of the database possible. The roughness of the aggregation key also only affects comparisons between industries. But it is important in that firms may have been differently classified in the Planning Survey and by the SCB when the aggregated data were compiled. Since MOSES firm dynamics depend on the diversity of production structures, simulations will be biased by such misclassifications that show up in the residual firms. This problem won't go away if you resort to macro modeling, because long term industry dynamics that depend on diversity of firms and markets may be important and therefore cannot be assumed away as in macro models. Hence the critical importance of database quality in empirical micro to macro analyses. The graphs for total Swedish manufacturing are not affected by this consistency bias.

Table 7: Rough SNI2007 Aggregation Key

Industry	**SNI2007**
Raw Materials (R)	16-17, 24
Intermediate Goods (S)	19-23, 25
Investment Goods (V)	26-33
Consumption Goods (K)	10-15, 18
Manufacturing	10-33

5.3 Salter Curves and Distributional Characteristics

Wilfred Edgar Graham Salter originally came up with the idea of what today is sometimes referred to as a Salter curve (Salter, 1960). A Salter curve distributes data horizontally according to each data points' share of all data points. For a productivity distribution, each firm's or division's y-value is its productivity. If production is used for the x-axis, the x-value width is every firm's share of all the firms' total production. Therefore, large firms take up a lot of horizontal space.

Salter curves are useful for visualizing industry distributions, to compare them over time, and to track movements within them. For example, the vertical (red) column in Figure 3 shows how one real firm is reduced from being a very productive manufacturer in 1982, to a small dot in the lower end of the distribution in 1997.

A technical inconvenience is the Salter curve's inability to display data points with negative horizontal width. It is not common, and all such instances in this document have been omitted.

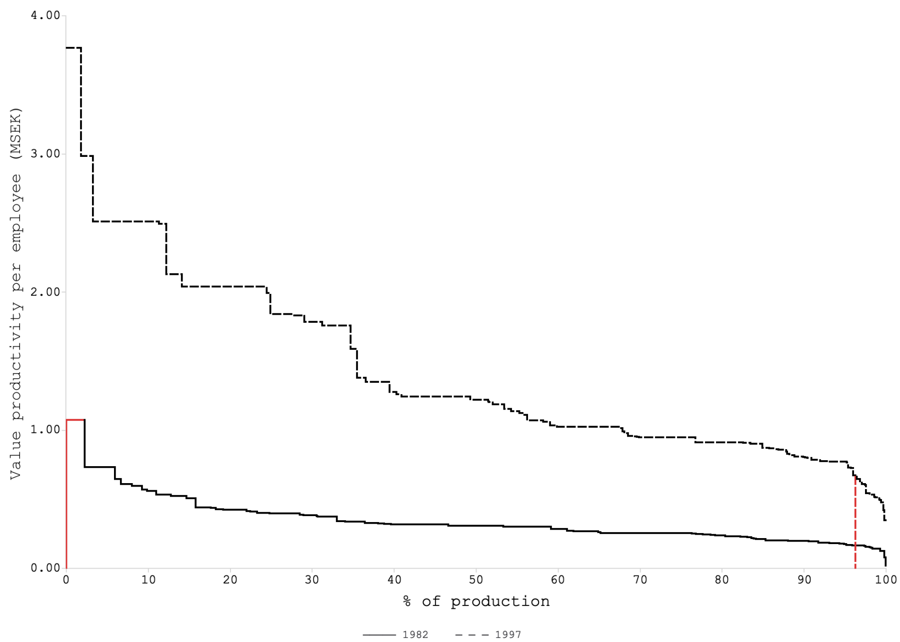

Figure 3: Tracking A Real Firm's Labor Productivity

5.4 Residual Firm Analysis - Total Manufacturing Industry

To test the database and illustrate the distributional dynamics of the manufacturing industry, the synthetic residual firms have been calculated for some years and placed among the real firms in the Planning Survey Salter curves. The labor productivity distributions of Swedish manufacturing from 1982 to 1997 are displayed in Figure 4. The wage cost distributions for the same years are displayed in Figure 5. Finally, Figures 4 and 5 are combined in Figure 6, and their firms sorted so that the productivity and wage costs for each year compare vertically. In other words, for each year, the wage cost and productivity at any x-value refer to the same firm. Therefore, the vertical difference is equal to each firm's profit per employee. In this so called cohort analysis the real firms are the same for all years, while the residual firms is the aggregate of all other firms covered by NA production statistics, including new entrant firms.

In almost all distributions, the residual firm has the lowest productivity and wage costs. This shows that the Planning Survey's selection of the largest Swedish manufacturing firms has consistently outperformed smaller firms, albeit with higher wages. In addition, this difference has grown over time. That is why the curves shift upwards and to the right while the residual firm becomes smaller as time progresses.

In Figures, 4, 5, and 6, a selection of 82 firms/divisions (a cohort) was used to enable comparisons over time. The selection is specified in section 5.6 and shown in Table 8. Regardless of the selection used, the residual firm is always near or at the end of all distributions (see Figure 16). In so far as NA statistics is a good representation of Swedish manufacturing industry this means that the residual aggregate is inferior to almost all selected Planning Survey firms in productivity and wage cost performance, and that the Planning Survey firms improve their relative performance with time compared to the residual firms. Even though the Planning Survey selection of firms is likely to include an elite group, this is still a strong result. It becomes important to ask what the reason is, and in particular what kind of firms the residual is composed of. On this Braunerhjelm's (1992) survey of small and medium sized firms in 1988, notably subcontractors should tell something. Unfortunately, time has not permitted a comparative analysis of these data, which should tell something of the Salter curve distribution of the residual firms, and perhaps even explain the differences.

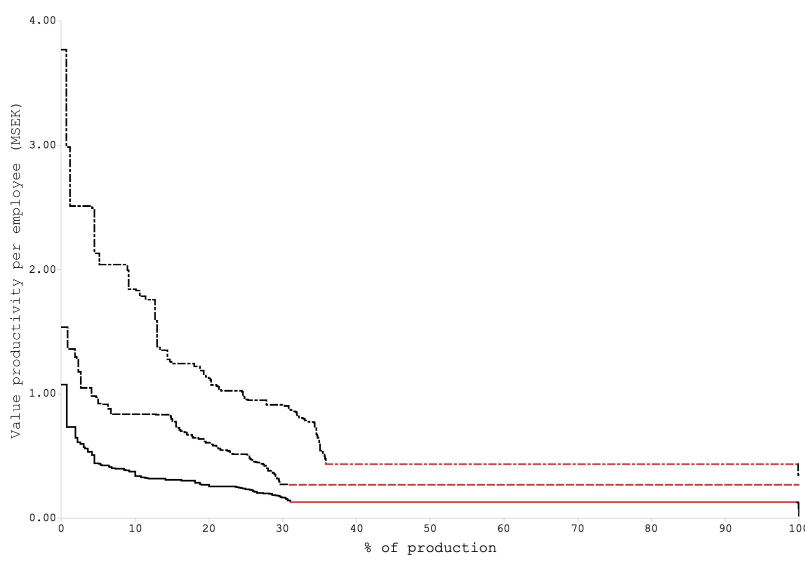

Figure 4: Labor Productivity Distributions 1982-1997

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

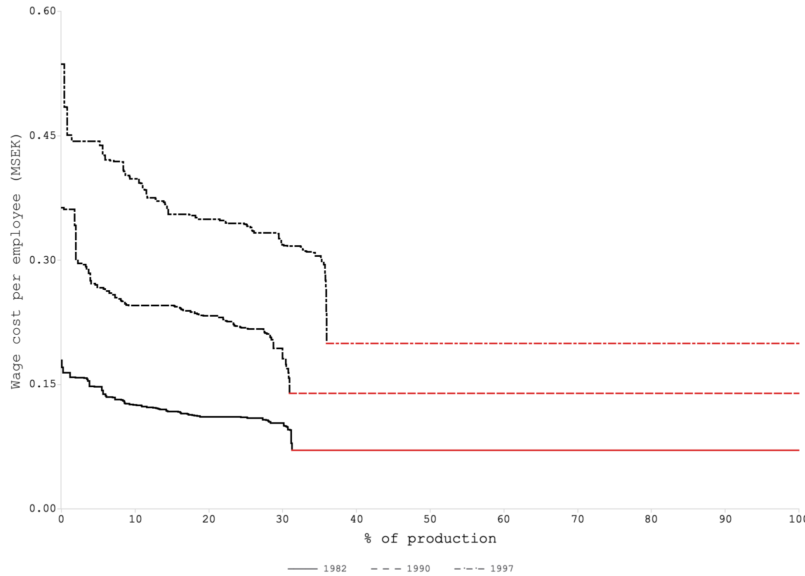

Figure 5: Wage Cost Distributions 1982-1997

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

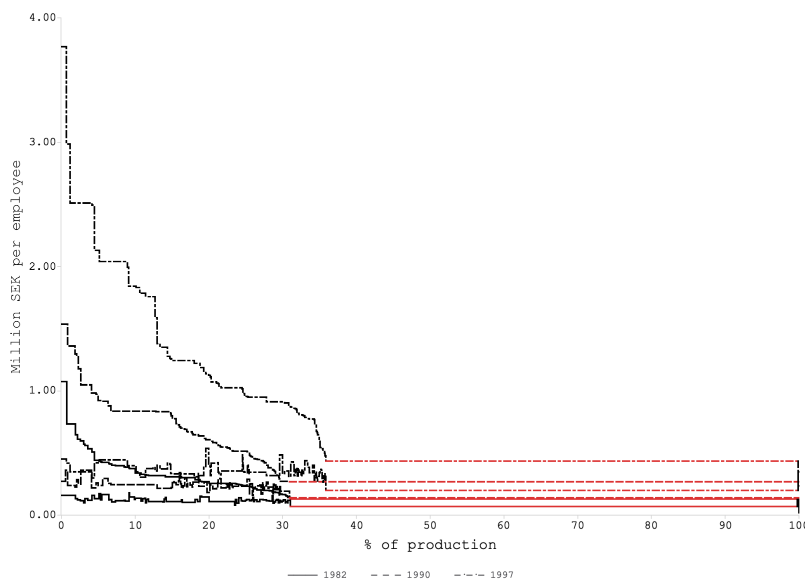

Figure 6: Labor Productivity and Wage Cost Distributions 1982-1997

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

5.5 Residual Firm Analysis - Subindustries

The residual firms have also been calculated per industry using the aggregation key in Table 7. In Figures 7-15 the distributions are shown in their disaggregated industries. The same selection of firms used in Figures 4-6 were used. As noted, negative data points cannot be shown since such points have a negative share and thus a negative horizontal length. For some graphs, a residual does not show due to this limitation. The negative residuals could be because of errors due to the unprecise industry classification used, or because the small firms of such an industry distribution just performed poorly. Note also that the building materials industry is not included in the selection of 82 firms.

The details of the subindustry Salter curves tell more about the nature of the Planning Survey industries. Like the total manufacturing industry, the residual firms are near or at the end of all distributions. The large Planning Survey firms of the recurring firms dominate the Swedish manufacturing industry's high productivity and labor costs. The residual aggregate firms do not come out well in that comparison. Especially Planning Survey firms in the consumption goods industry are generally more productive compared to those in other industries, and the consumption goods industry's residual is especially small. This residual shows exceptionally low labor productivity together with very low wages. In some distributions from 1990 and 1997, the consumption goods industry's residual even produces negative value-added (input costs > sales), which makes it invisible in the Salter curves. Either the consumption goods industry has a greater discrepancy between large and small firms, or there is a prominent problem within the industry classification used. The finer the industry classification the larger this error in the residual firm, if one large firm has been classified differently in the Planning Survey and in the corresponding NA scheme.

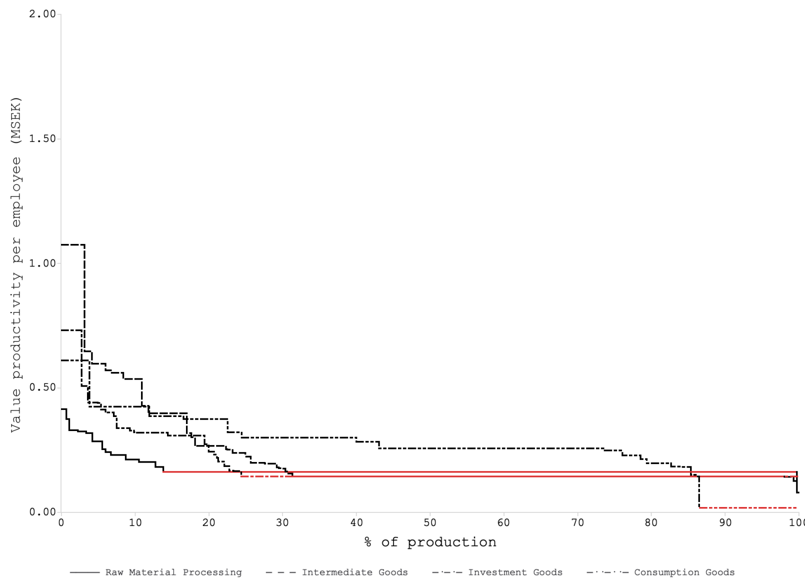

Figure 7: Labor Productivity Distributions per Industry 1982

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

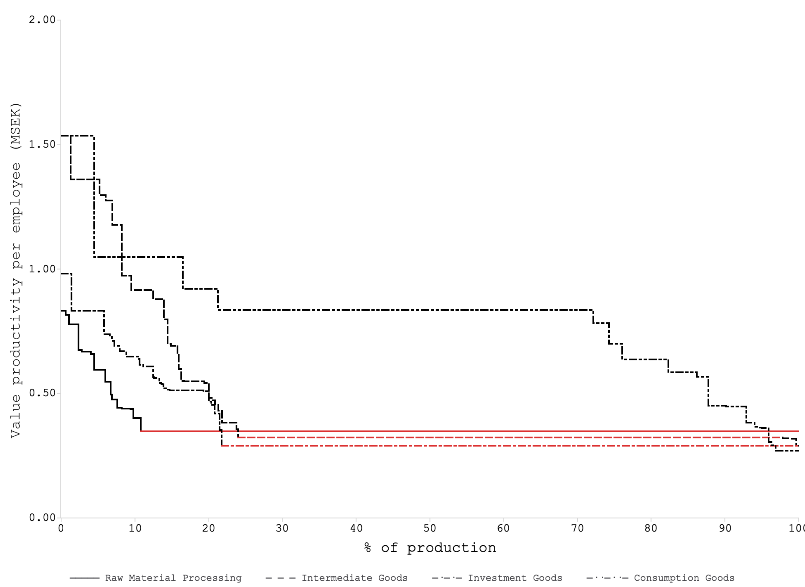

Figure 8: Labor Productivity Distributions per Industry 1990

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

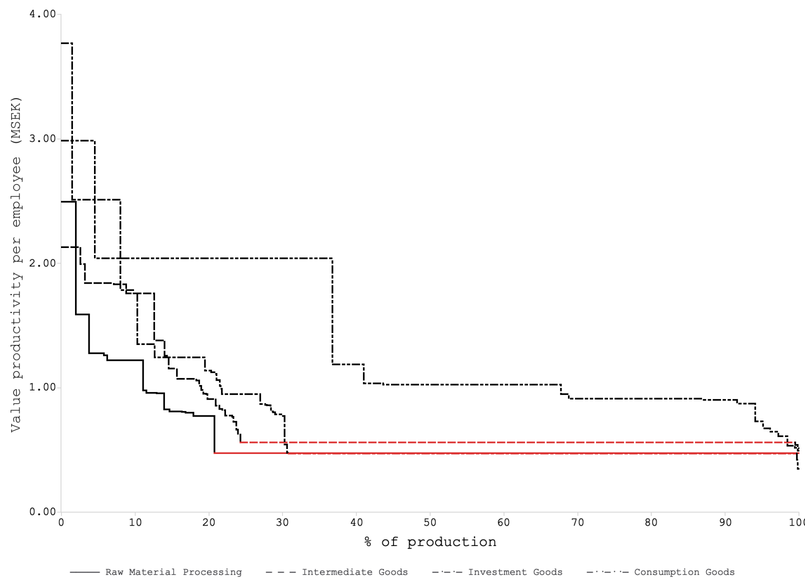

Figure 9: Labor Productivity Distributions per Industry 1997

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

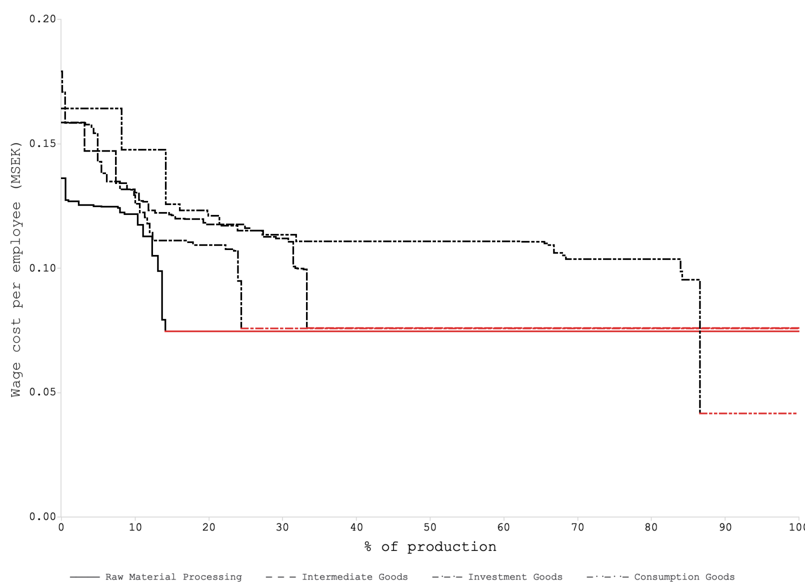

Figure 10: Wage Cost Distributions per Industry 1982

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

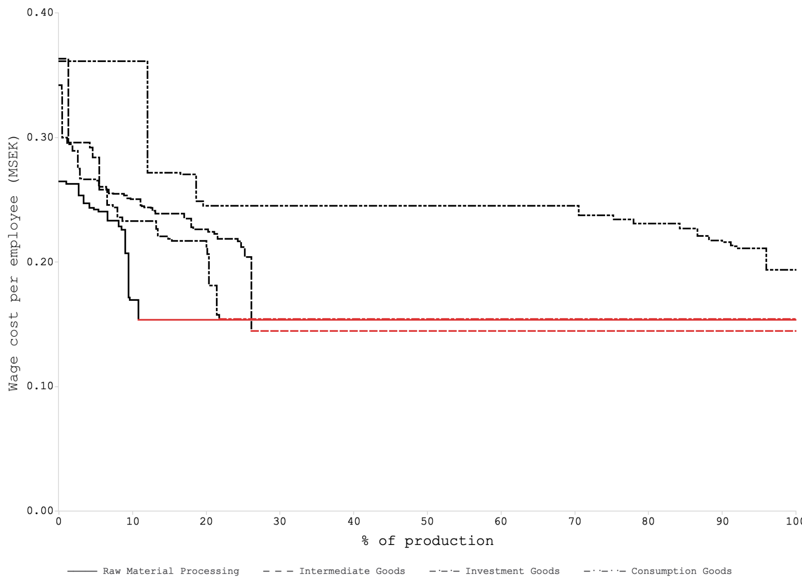

Figure 11: Wage Cost Distributions per Industry 1990

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

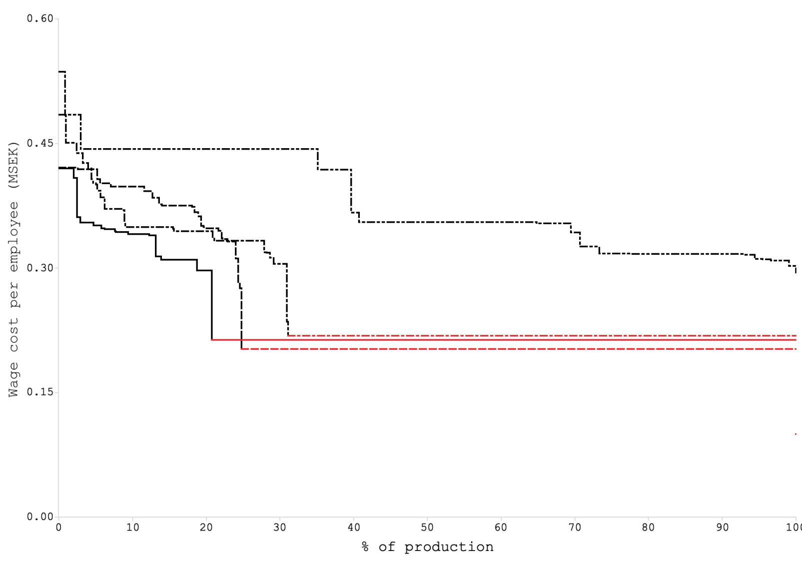

Figure 12: Wage Cost Distributions per Industry 1997

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

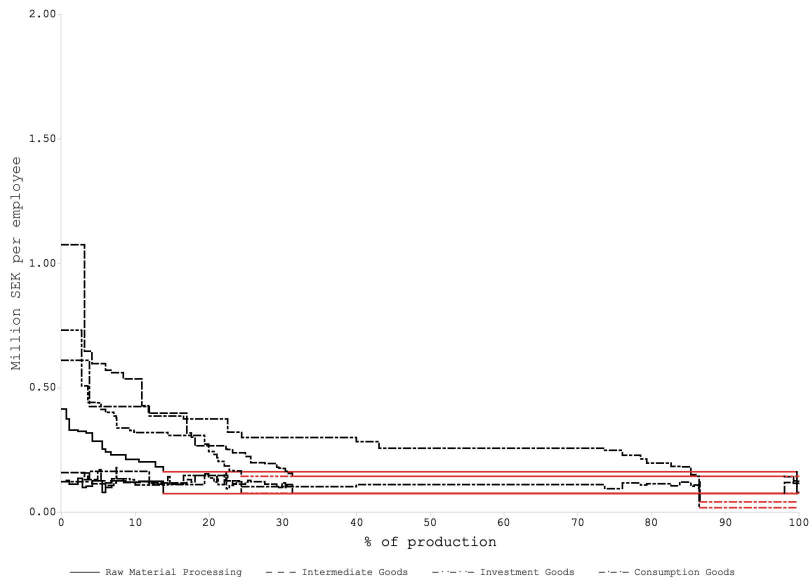

Figure 13: Labor Productivity and Wage Cost Distributions per Industry 1982

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

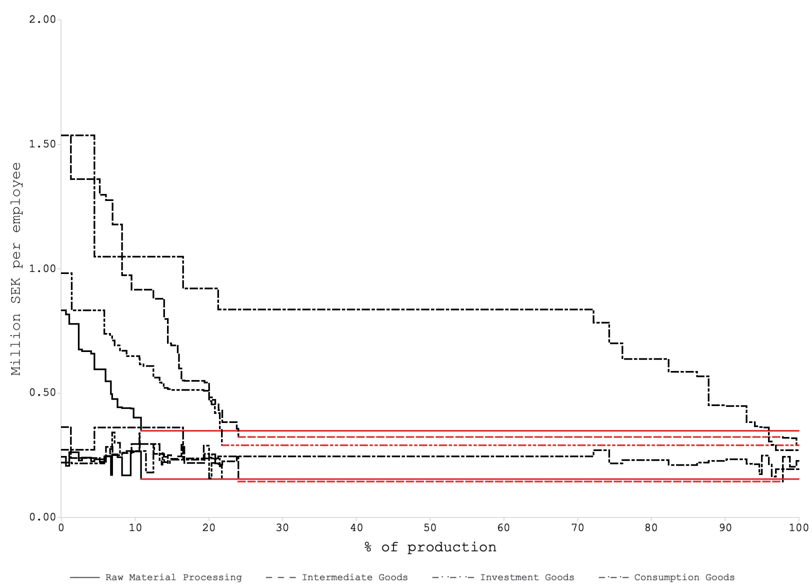

Figure 14: Labor Productivity and Wage Cost Distributions per Industry 1990

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

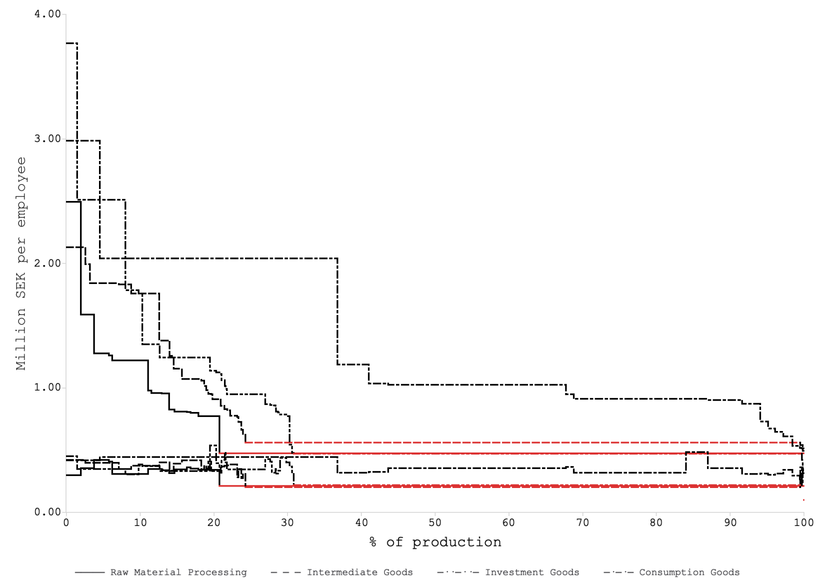

Figure 15: Labor Productivity and Wage Cost Distributions per Industry 1997

The recurrent 82 firms/divisions with interpolated data between 1982-1997.

5.6 Enhanced Selection of Recurrent Firms with Interpolation

A selection of 82 firms/divisions (a cohort) was used to enable comparisons over time in most of the above Salter curves. The selection is displayed in Table 8. Additionally, the divisions of the complete 1982 cross-section are shown in Table 11. Only a very small number of Planning Survey divisions/firms have complete longitudinal data to calculate productivity and wages in the interval 1982-1997. Therefore, least square linear interpolation was used, as specified in section 6.4, to significantly increase the number of available firms. Between 1982 and 1997, 19 firms/divisions have returned completed questionnaires for each year with value-added, labor force, and wage cost data. With interpolation this number increases to 82. Note that an 'interpolated' firm/division has real data. Only a subset of observations include interpolated values.

Using whole cross-sections for each year invalidates comparisons over time due to varying survey coverage. In fact, with complete cross-sections, the residual firm grows due to declining survey coverage. With recurrent firms, the opposite occurs because the recurrent firms have historically outperformed the industry average, as explained in section 5.3.This is displayed in Figure 16, which uses all divisions in each cross-section.

Every division with an observation in 1982 or earlier and in 1997 and later are determined interpolable divisions. This is because there may be significant issues interpolating data for years without an end data point as reference. In other words, only data points between actual data is interpolated. For example, it is problematic to interpolate data for years a division may not exist, and since interpolation is not perfect, it could result in unexpected negative values for variables such as the number of employees.

Furthermore, all firms in the building materials sector are omitted from the selection to match the industry taxonomy specified in Table 7.

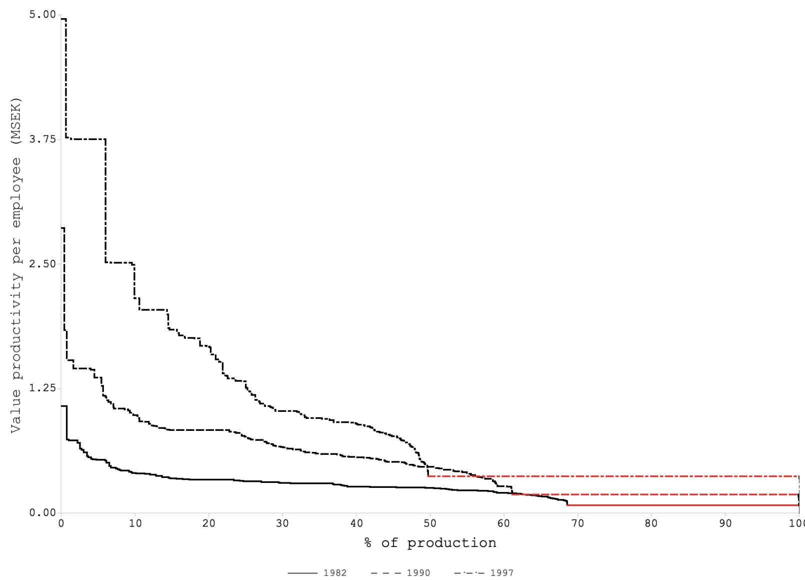

Figure 16: Labor Productivity Distributions 1982-1997 (no selection)

For each cross-section, all divisions with data are used.

Table 8: Selection of 82 Firms

Firm/Division	**Industry**
BOLIDEN MINERAL	Raw Material Processing
BOXHOLM	Raw Material Processing
FAGERSTA STAINLESS	Raw Material Processing
FUNDIA STEEL	Raw Material Processing
GRÄNGES ALUMINIUM METALL	Raw Material Processing
HÖGANÄS METALLURGI	Raw Material Processing
IGGESUNDS TIMBER	Raw Material Processing
MÄLARSKOG INDUSTRI	Raw Material Processing
OVAKO STEEL I HOFORS	Raw Material Processing
PLANNJA	Raw Material Processing

Continued on next page

Table 8 continued from previous page

Firm/Division	Industry
SKAND. ALUMINIUM PROFILER	Raw Material Processing
STORA CELL	Raw Material Processing
SÖDRA TIMBER	Raw Material Processing
UDDEHOLM TOOLING	Raw Material Processing
AGA GAS	Intermediate Goods
ASSA	Intermediate Goods
FISKEBY BOARD	Intermediate Goods
FORSHEDA	Intermediate Goods
HOLMEN PAPER	Intermediate Goods
HYDRO PLAST	Intermediate Goods
HYDRO SUPRA	Intermediate Goods
HYLTE BRUKS	Intermediate Goods
KLIPPANS FINPAPPERSBRUK	Intermediate Goods
KORRUGAL	Intermediate Goods
NCB PAPPER	Intermediate Goods
NYNÄS PETROLEUM	Intermediate Goods
PAPYRUS NYMÖLLA	Intermediate Goods
PLM	Intermediate Goods
SCA EMBALLAGE	Intermediate Goods
SCA NORDLINER	Intermediate Goods
SKF SVERIGE	Intermediate Goods
STATOIL EUROPARTS	Intermediate Goods
SURAHAMMARS BRUKS	Intermediate Goods
TAMBOX	Intermediate Goods
THORN JÄRNKONST	Intermediate Goods
TRELLEBORG INDUSTRI	Intermediate Goods
UNIROC	Intermediate Goods
VOLVO FLYGMOTOR	Intermediate Goods
ÅMOTFORS BRUK	Intermediate Goods
ASTRA	Consumption Goods
DUNI BILÅ HALMSTAD	Consumption Goods
EDSBYVERKEN	Consumption Goods
IFÖ SANITÄR	Consumption Goods
KARLSHAMNS	Consumption Goods
LUDVIG SVENSSON	Consumption Goods
MARABOU	Consumption Goods
NNP NEDRE NORRLANDS PRODUCENTFÖRENING	Consumption Goods
ORREFORS	Consumption Goods
PRIPPS BRYGGERIER	Consumption Goods
SAAB AUTOMOBILE	Consumption Goods

Continued on next page

Table 8 continued from previous page

Firm/Division	**Industry**
SKOGAHOLMS BRÖD	Consumption Goods
SOCKERBOLAGET	Consumption Goods
SVENSKA NESTLE	Consumption Goods
VIN & SPRITCENTRALEN	Consumption Goods
VOLVO PERSONVAGNAR	Consumption Goods
WASABRÖD	Consumption Goods
ÅKERLUND & RAUSING	Consumption Goods
ABB STAL	Investment Goods
AGA CRYO	Investment Goods
AGEMA INFRARED SYSTEMS	Investment Goods
ALFA LAVAL AGRI.INTERN	Investment Goods
ALFA LAVAL THERMAL	Investment Goods
ALIMAK	Investment Goods
ATLAS COPCO MCT	Investment Goods
ATLAS COPCO TOOLS	Investment Goods
BT PRODUCTS	Investment Goods
ELECTROLUX WASCATOR	Investment Goods
ERICSSON BUSINESS COMM	Investment Goods
ERICSSON COMPONENTS	Investment Goods
ERICSSON RADIO SYSTEMS	Investment Goods
ESAB	Investment Goods
FLYGT	Investment Goods
FLÄKT INDUSTRI	Investment Goods
GETINGE	Investment Goods
HIAB	Investment Goods
HUSQVARNA	Investment Goods
IREMDA NORRKÖPING	Investment Goods
SAAB-SCANIA SCANIADIV.	Investment Goods
SUNDS DEFIBR. INDUSTRIES	Investment Goods
SVEDALA-ARBRÅ	Investment Goods
VOLVO LASTVAGNAR	Investment Goods
ÅKERMANS VERKSTAD	Investment Goods

6 Technical Specification

A C++ library to manipulate the Planning Survey database is available in the Appendix as a GitHub repository. Use of the library requires basic knowledge of coding and handling a terminal. Source code is written in C++, R, and bash. The project is only tested on MacOS Sequoia version 15.5, using an ARM chip. Note that the code is not necessarily compatible with non-Unix systems like Windows. CSV-parsing has only been tested with LF line breaks, and not Window's CR LF line breaks. Due to varying file structures, the library is potentially not compatible with Linux either. Read more about this in relation to drawing graphs. Everything described in this specification, except the database, is publicly available.

All code is under the `src` directory. Every directory within, except `data` and `lib` is its own program. All programs are dependent on `lib`, which contains the main source code, like classes, constants, defines, and core methods. Therefore, the programs should be seen as example applications of the core library. Additionally, all programs are dependent on *data* for data. Due to these dependencies, should the file structure be altered, the programs will break.

Every program directory has a bash script, `run.sh`, that compiles and runs the code within the directory. These can be run in a bash terminal using the command: `bash run.sh`. Note that scripts must be executed from the directory the script is in. C++ compilation uses the `-std=c++17` and `-O2` flags. Usually, the output is stored in CSV or text files, but sometimes the results are written directly into the terminal through standard output (`stdout`). To reroute standard output, simply use the `>` operator. For example, to store the program's output in a new output.txt file write bash `run.sh > output.txt`.

Standardised C++ programs have code split into header files (.h) and source files (.cpp). The header file describes an overview of the code, which is implemented in the source file. Most programs in the library have configurable parameters. These parameters are always specified in header files. For example, to alter the target interval that should be tested for errors during interpolation, change the `LOW` and `HIGH` defines in `interpolate/clean_interpolation_output.h`. To change the variable that should be used to detect potential firm restructuring, change `VAR_IDX` in `detect_restructuring/detect_restructing.h`. The only other configuration that is easily accessible is to comment or uncomment certain function calls in each program's `main()` function. In `print_key/print_key.cpp`, there is the option to print the ids of the divisions in CSV or text format by either calling `print_key_csv()` or `print_key_beautiful()`.

6.1 The Database

The `data` directory contains the Planning Survey database and a newly prepared complementary macro database. The macro database, taken from SCB data, used to form synthetic residual firms is stored in `macrodatabase.csv`. The macro data CSV file is comma-separated, and its empty values are empty. The Planning Survey database is in `plan1975-2000.csv`, `plan1975-2000-full.csv`, and plan1975-2000-compact.csv. The first is the original semicolon-separated database. The second is a comma-separated version of the first, and the latter is the second with the cost, sni, and name columns removed. Empty cells are empty in plan1975-2000.csv. In the other two files, empty cells are coded "NA".

No value in any CSV file has a comma. The CSV parser breaks if there is a field with a comma in a comma-separated file. For instance, if a name requires a comma, use semicolons as the separator so that the data does not become ambiguous. Usually, CSV file handlers put values with commas inside quotation marks (...,"Firm A, Stockholm",...). The current implementation is simple and does not have this functionality. Therefore, be careful to avoid unnecessary bugs.

The Planning Survey database holds columns for the variables id, code, industry, sni, year, name, and X1-X65. A key for all variables is in Table 10 (and planning_key.txt and plan_nyckel.txt in Swedish). Each row is an observation. The variable id connects observations that refer to the same division. Every observation must have a non-empty id and year. The database is not very sparse, but the sni column and certain variables that were not gathered for most Planning Surveys, such as X58 and X59 have a lot of empty values. Furthermore, interpolated.csv holds the Planning Survey database with certain interpolated variables (X2, X4, X7, X10, X16, X19, X22, and X25) that were necessary to increase the number of Planning Survey divisions that were used to form synthetic residual firms. Variables have only been interpolated between each division's first and last observation, and not necessarily the entire interval 1975-2000. More on interpolation later.

The macro database has columns for the variables industry, year, sales, input_cost, wage_sum, value_added, employees, manhours, and gross_investment. A key for all variables is in Table 9 (and macro_key.txt). The database holds industry aggregates for these variables from 1980 to 2023. Each row is an observation. The data is taken from aggregated SCB data. Due to a lack of precise data and not having Ola Virin's original matrix for converting 5-digit level SNI coded data into the MOSES classification scheme, a rough aggregation of 2-digit SNI2007 codes, based on the aggregation key specified in Table 2, was used. The SNI2007 aggregation key is shown in Table 7.

6.2 The Core Library

The core Planning Survey database C++ library is under lib. The core library is a collection of classes and methods that can be used to manipulate the Planning Survey database. It condenses the database into a format that is easy to manipulate in code and can be used to read and write CSV files, draw Salter curves, and create synthetic residual firms using macro data, for instance. For a description of classes, methods, and how object-oriented programming languages like C++ are structured, read Lindstenz (2025a, 2025b). By standard, every header and source file pair refer to one class. This is true except for the csv and utility files, which only hold functions. All programs under src are applications of the core library. The biggest platform specific problem with the library is related to drawing graphs. If this functionality is not needed, the `graph.cpp` file can simply be omitted during compilation. Only include the files that are necessary in compilation. A program that only manipulates the Planning Survey database, and that ignores the macro database, the Firm class, and drawing graphs only needs the csv, division, plandata, and utility files for instance.

`csv.cpp & csv.h`
: Holds functions to read and write CSV files.

`db.cpp & db.h`
: Holds a simple `Database` class to store the Planning Survey and macro databases.

`plandata.cpp & plandata.h`
: Holds the `PlanData` class and its methods. Every `PlanData` instance has a list of divisions (`divs`) of the `Division` class type. The `PlanData` class has methods to sort and filter divisions by market and interval. Additionally, there are methods that are dependent on `csv.cpp` and `csv.h`, that read and write the `PlanData` instance's division data from and to CSV files.

`division.cpp & division.h`
: Holds the `Division` class and its methods. Every `Division` has an `id` and a list of observations (`obs`). Every observation has a `year`, `sni`, `industry`, `code`, and `name` variable in addition to a list of variables, vars, that stores the `X1-X65` variables. The class holds methods to parse CSV file data into observations and sort observations. Additionally, the method `in_interval()` checks if a division has observations that span a certain interval. Either the condition is to have an observation before or at the lower bound of the interval and an observation after or at the upper bound of the interval, a so-called "easy" evaluation. Or the condition is to have observations for every consecutive year within the interval, which is a "hard" evaluation. The former condition is useful in relation to only interpolating between data points.

`macro.cpp & macro.h`
: Holds the `MacroData` class and its methods. Every `MacroData` instance has a list of observations (`obs`). Each observation has a `year`, `mkt_id`, `sales`, `input_cost`, `wage`, `wage_sum`, `value_added`, `employees`, `manhours`, and `gross_investments` field. Every observation refers to the industry aggregates for a specific year. The class holds methods to sort and filter observations by market and interval, and parsing and writing macro data CSV files, which is dependent on the `csv.cpp` and `csv.h` files.

`utility.cpp & utility.h`
: Holds commonly used helper functions and constants.

`firm.cpp & firm.h`

Holds the `Firm` class and its methods. Every `Firm` instance, not to be confused with MOSES `Firm` instances as specified in Lindstenz (2025a, 2025b), have an `id`, `mkt_id`, and a list of observations (`obs`). The id refers to the division id the `Firm` instance was created from, if it is not a synthetic firm created from the residual of macro and aggregate Planning Survey data. The `mkt_id` refers to the market (industry) the firm belongs to. Read `utility.h` for details. Every observation has a `year`, `employees`, `sales`, `input_cost`, `wage_sum`, and `wage` variable. The class holds methods to initialize a firm from a division or from a list of firms and macro data. The latter conversion creates a synthetic firm that consists of the market residual from macro statistics and aggregate divisions data. In addition to the initialization, the class has functions that convert Planning Survey data and macro data into its respective real and synthetic firms, aggregate variables from firms in the same market, and that filter a list of firms by industry.

`graph.cpp & graph.h`

Holds the `Graph` class and its methods. Every `Graph` instance has a `title`, `x_label`, `y_label`, and a list of series. Each `Serie` holds a `style_id`, `name`, and a list of data points. Each `Point` has an x-value (`x`), y-value (`y`), and `is_marked` variable. In the case of drawing a Salter curve, the x-value refers to that data point's horizontal width, calculated as the share of the aggregate of all x-values.

The `Graph` class is for drawing Salter curves and other standard series. The implementation is dependent on the `Qt6` graphical C++ library (qt.io, formulae.brew.sh/formula/qt). Use of the class is dependent on MacOS's and brew's (a MacOS terminal package manager) current file structure since `Qt6` has been installed using brew. If compilation in the `run.sh` script is modified, the program should work on other operating systems with a different `Qt6` installation.

6.3 The Tools

In addition to the core library, there are several programs that should be regarded as example applications of the core library.

`connect_ids`

A program to connect newer observations with their respective divisions. Due to the altering identification conventions of the Federation of Swedish Industries over the timespan of the Planning Survey, the divisions from 1997 and onwards were coded differently from the plan data between 1975-1996. This program was used to connect the observations with newer ids with their original divisions. The program scores older observations based on their values', names', and ids' similarity with the newer observation and ranks them accordingly. An interface prompts the user with potential matches. The implementation details are in `connect_ids.cpp`.

`cross_sections`
: A program to divide the panel data into its cross-sections and write them to separate CSV files. The implementation details are in `cross_sections.cpp`.

`detect_restructuring`
: A program to detect organizational restructuring within a division. The algorithm simply checks for one variable if it changes drastically between years. The implementation details are in `detect_restructuring.cpp`.

`diagnose_db`
: Two programs to visualize the sparsity of the database and a program to graph the coverage of the Planning Survey. One program shows how many divisions span the possible intervals between 1975-2000. The second program shows the number of missing observations between 1975 and 2000 for each division. The implementation details are in `visualise_intervals.cpp` and `print_division_occurences.cpp`. The third program, that visualizes the survey's coverage, is implemented in `draw_coverage.cpp`. Graphing the survey's coverage is dependent on the `Qt6` library.

`interpolate`
: A program to interpolate missing values and observations for every division. The implementation details are in `prepare_interpolation_input.cpp`, `interpolate.R`, and `clean_interpolation_output.cpp`. More on this later.

`print_industries`
: A program to view divisions divided into their respective industries, for a specific interval. The implementation details are in `print_industries.cpp`.

`print_key`
: A program to output the ids of all divisions in CSV or text format. The implementation details are in `print_key.cpp`.

`salter_curves`
: A program to draw Salter curves comparing industries and Planning Survey data with synthetic firms derived from the difference between Planning Survey divisions and the national accounts. The implementation details are in `draw_salter.cpp`.

`draw_series`
: A program to draw time-series, displaying different variables of the Planning Survey aggregate develop relative to the national accounts. The implementation details are in `draw_series.cpp`.

6.4 Interpolation

The core Planning Survey database is not very sparse, yet a few missing years from divisions in any chosen interval make time-series incomplete. Interpolation can significantly increase the number of firms/divisions with complete longitudinal data for most variables. In the interval 1982-1997, only 15 Planning Survey divisions have complete longitudinal data to calculate value-added, labour force, and wage costs. With interpolation there are 87 firms[2]. While interpolation may be viable for industry and national aggregates, the simple linear interpolation, and optional spline interpolation, are not recommended for micro analysis. A fixed effects interpolation model was tested with time effects and year effects, which is standard for panel data interpolation. Due to its poor results, it was substituted with linear interpolation, which gives much more consistent data at the micro-level.

For details on the interpolation implementation, refer to the source code under `interpolate`. Interpolation is executed in three steps.

First, a Planning Survey data file undergoes preliminary interpolation. This is specified in `prepare_interpolation_input.cpp`. First, empty observations are added for the missing years in the desired interval. Some divisions change industry. Thus, the second step is to forward fill all observations with the first observation's industry. Third, some variables, specifically those in the survey's first section, have historic values, and these are used to fill the current values of missing observations from previous years. Additionally, missing historic values are filled with the current values from previous years. Fourth, division names are forward filled through empty observations. Lastly, variables with totals are derived if all but one component are present. For example, if three component values are filled, but not the total, the total is derived by the components' sum.

Secondly, the prepared interpolation input is fed into an R-script, `interpolate.R`, that does a basic least square linear interpolation for each division and variable, filling missing values longitudinally. Note that interpolation assumes divisions and variables are independent, which is obviously false. The R-script is modular, and its interpolation method can easily be replaced if necessary.

Finally, the interpolated data is used to overwrite a selection of variables in a Planning Survey data file. This is specified in `clean_interpolation_output.cpp`. Additionally, values of employees are rounded down to the nearest integer. The result is written to `interpolated.csv`.

Despite being a simple method of interpolation, it is quite effective at improving the number of divisions available for comparison over time. In Figure 17 the labor productivity distribution of the Swedish manufacturing industry is shown over time. The graph is identical to Figure 16, which draws the complete cross-sections of the Planning Survey database, but with interpolated observations to increase the number of available firms. The interpolation effectively increases the Planning Survey's coverage without distorting its distribution.

[2]Note that only 82 firms/divisions are part of the selection drawn in the Salter curves of this documentation due to the omission of the building materials industry.

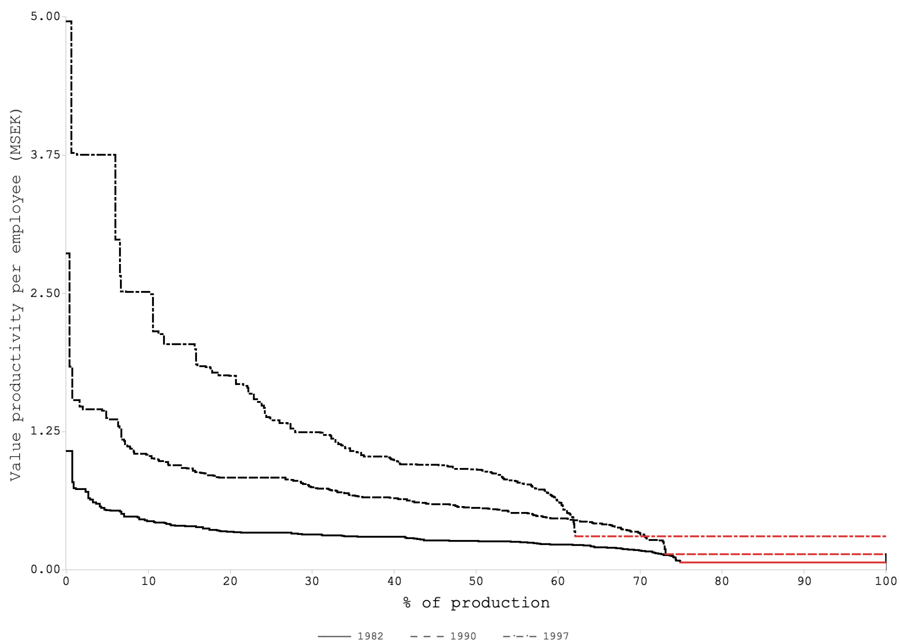

Figure 17: Labor Productivity Distributions 1982-1997 (interpolated)

For each cross-section, all divisions with real and interpolated data are used.

Figure 18: C++ Library Core File Structure

```
src
├── data
│   ├── interpolated.csv
│   ├── macrodatabase.csv
│   ├── plan1975-2000-compact.csv
│   ├── plan1975-2000-full.csv
│   └── plan1975-2000.csv
└── lib
    ├── csv.cpp
    ├── csv.h
    ├── db.cpp
    ├── db.h
    ├── division.cpp
    ├── division.h
    ├── firm.cpp
    ├── firm.h
    ├── graph.cpp
    ├── graph.h
    ├── macro.cpp
    ├── macro.h
    ├── plandata.cpp
    ├── plandata.h
    ├── utility.cpp
    └── utility.h
```

Figure 19: C++ Library Tools File Structure

```
src
├── connect_ids
│   ├── connect_ids.cpp
│   ├── connect_ids.h
│   └── run.sh
├── cross_sections
│   ├── cross_sections
│   ├── cross_sections.cpp
│   └── run.sh
├── detect_restructuring
│   ├── detect_restructuring.cpp
│   ├── detect_restructuring.h
│   └── run.sh
├── diagnose_db
│   ├── draw_coverage.cpp
│   ├── draw_coverage.h
│   ├── print_division_occurences.cpp
│   ├── print_division_occurences.h
│   ├── run.sh
│   ├── visualise_intervals.cpp
│   └── visualise_intervals.h
├── interpolate
│   ├── clean_interpolation_output.cpp
│   └── clean_interpolation_output.h
├── draw_series
│   ├── draw_series.cpp
│   ├── draw_series.h
│   ├── run.sh
│   ├── interpolate.R
│   ├── prepare_interpolation_input.cpp
│   ├── prepare_interpolation_input.h
│   └── run.sh
├── print_industries
│   ├── print_industries.cpp
│   ├── print_industries.h
│   └── run.sh
├── print_key
│   ├── print_key.cpp
│   ├── print_key.h
│   └── run.sh
└── salter_curves
    ├── draw_salter.cpp
    ├── draw_salter.h
    └── run.sh
```

Table 9: Macro Database Variable Key

Variable	**Description**
industry	Planning Survey industry classification: • S: Intermediate goods • K: Consumption goods • V: Investment goods • R: Raw materials • B: Building materials
year	The year the data refers to
sales	Sales (taken as production in basic price), million SEK
input_cost	Input cost (taken as intermediate goods consumption in purchaser's price), million SEK
wage_sum	Wage sum, million SEK
value_added	Value added (taken as value-added in basic price), million SEK
employees	Average number of employees (thousands)
manhours	Manhours, millions
gross_investment	Gross investments (taken as gross fixed capital formation), million SEK

Table 10: Planning Survey Database Variable Key

Variable	Description
id	Identification code of the observation's division
industry	Planning Survey industry classification: • S: Intermediate goods • K: Consumption goods • V: Investment goods • R: Raw materials • B: Building materials
sni	SCB's Swedish Standard Industrial Classification
year	The year the data refers to
name	Name of the division at this time
X1	Number of employees (Sweden) last year
X2	Number of employees (Sweden) this year
X3	Number of employees (Sweden) next year (plan)
X4	Total manhours (thousands) last year
X5	Total manhours (thousands) this year
X6	Total manhours (thousands) next year (plan)
X7	Sales abroad (excluding indirect taxes), million SEK last year
X8	Sales abroad (excluding indirect taxes), million SEK this year
X9	Sales abroad (excluding indirect taxes), million SEK next year (plan)
X10	Domestic sales, including to affiliates (excluding indirect taxes), million SEK last year
X11	Domestic sales, including to affiliates (excluding indirect taxes), million SEK this year
X12	Domestic sales, including to affiliates (excluding indirect taxes), million SEK next year (plan)
X13	Total sales (excluding indirect taxes), million SEK last year
X14	Total sales (excluding indirect taxes), million SEK this year
X15	Total sales (excluding indirect taxes), million SEK next year (plan)
X16	Raw material and input goods purchases (excluding fuel), million SEK last year
X17	Raw material and input goods purchases (excluding fuel), million SEK this year
X18	Raw material and input goods purchases (excluding fuel), million SEK next year (plan)

Continued on next page

Table 10 continued from previous page

Variable	Description
X19	Electrical energy costs (including internally generated), million SEK last year
X20	Electrical energy costs (including internally generated), million SEK this year
X21	Electrical energy costs (including internally generated), million SEK next year (plan)
X22	Fuel costs (oil, coal, etc.), million SEK last year
X23	Fuel costs (oil, coal, etc.), million SEK this year
X24	Fuel costs (oil, coal, etc.), million SEK next year (plan)
X25	Total wage bill (including social fees), million SEK last year
X26	Total wage bill (including social fees), million SEK this year
X27	Total wage bill (including social fees), million SEK next year (plan)
X28	Other costs, million SEK last year
X29	Other costs, million SEK this year
X30	Gross investments building and plant (including air conditioning, sanitation, etc.), million SEK last year
X31	Gross investments building and plant (including air conditioning, sanitation, etc.), million SEK this year
X32	Gross investments building and plant (including air conditioning, sanitation, etc.), million SEK next year (plan)
X33	Gross investments machinery and equipment (including transport equipment), million SEK last year
X34	Gross investments machinery and equipment (including transport equipment), million SEK this year
X35	Gross investments machinery and equipment (including transport equipment), million SEK next year (plan)
X36	Total gross investments, million SEK last year
X37	Total gross investments, million SEK this year
X38	Total gross investments, million SEK next year (plan)
X39	Production volume this year compared to last year: Increased more than ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, namely ca ___%, Been approximately unchanged ☐ ±2.5%, Decreased more than ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, namely ca ___%
X40	Production volume planned next year compared to this year:

Continued on next page

Table 10 continued from previous page

Variable	Description
	Increased more than ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, namely ca ___%, Been approximately unchanged ☐ ±2.5%, Decreased more than ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, namely ca ___%
X41	By what percent could this year's production volume have increased assuming labor supply and product demand imposed no restraint? It could have increased more than ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20% namely ca ___%, ☐ not at all (0 ±2.5%)
X42	By what percent could this year's production volume have increased assuming product demand available but with the existing labor force? It could have increased more than ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20% namely ca ___%, ☐ not at all (0 ±2.5%)
X43	What percent increase in employment would have been required to reach full capacity? It would have had to increase more than ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20% namely ca ___%, ☐ not at all (0 ±2.5%)
X44	Could this year's production level have been achieved with less employment? It could have been reduced more than ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20% namely ca ___%, ☐ not at all (0 ±2.5%)
X45	By what percent can this year's production volume increase given decided-upon capacity increases? It could have increased more than ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20% namely ca ___%, ☐ not at all (0 ±2.5%)
X46	How high is production activity now (first quarter next year) as a percent of practically achievable capacity? ☐ 100%, ☐ 95-100%, ☐ 90-95%, ☐ 80-90%, ☐ less than 80%, namely ca ___%
X47	How many months would be required to increase capacity utilization to 100%? Up to ☐ 1 month, ☐ 2 months, ☐ 4 months, ☐ 6 months, ☐ more than 6 months namely ca ______
X48	How large an increase in employment would be required to reach full capacity utilization? ☐ 0%, ☐ up to 2%, ☐ up to 5%, ☐ more than 5% namely ca ___%

Continued on next page

Table 10 continued from previous page

Variable	Description
X49	Percent increase or decrease in total volume of orders (31st December this year vs. last year): More than ☐ 2.5% higher, ☐ 5% higher, ☐ 10% higher, ☐ 15% higher, ☐ 20% higher, namely ca ___%, Been approximately unchanged ☐ ±2.5%, More than ☐ 2.5% lower, ☐ 5% lower, ☐ 10% lower, ☐ 15% lower, ☐ 20% lower, namely ca ___%
X50	Percent of planned production (31st December next year) covered by existing orders: Up to ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, ☐ 25%, ☐ 50%, ☐ 75%, ☐ 100%, ☐ completely, ☐ no orders
X51	Order coverage next year is: ☐ greater than normal, ☐ normal, ☐ less than normal
X52	Expected percent change in average product price in Sweden next year compared to this year: Increase up to ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, more than 20% namely ___%, Be approximately unchanged ☐ ±0%, Decrease up to ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, more than 20% namely ___%
X53	Expected percent change in average product price abroad next year compared to this year: Increase up to ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, more than 20% namely ___%, Be approximately unchanged ☐ ±0%, Decrease up to ☐ 2.5%, ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, more than 20% namely ___%
X54	Raw materials and input goods inventories (31st December this year) as percent of purchases: Up to ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, ☐ 25%, ☐ 50%, ☐ 75%, ☐ 100%, ☐ no inventory at all
X55	Normal ratio of raw material and input goods inventories to purchases: Up to ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, ☐ 25%, ☐ 50%, ☐ 75%, ☐ 100%, ☐ no inventory at all
X56	Product inventories as of 31st December this year as percent of total sales: Up to ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, ☐ 25%, ☐ 50%, ☐ 75%, ☐ 100%, ☐ no inventory at all

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Table 10 continued from previous page

Variable	Description
X57	Normal ratio of product inventories to sales: Up to ☐ 5%, ☐ 10%, ☐ 15%, ☐ 20%, ☐ 25%, ☐ 50%, ☐ 75%, ☐ 100%, ☐ no inventory at all
X58	Has the share of value of purchased raw materials from foreign subcontractors this year: ☐ increased, ☐ been approximately unchanged, ☐ decreased
X59	Will the share of value of planned purchases from foreign subcontractors next year: ☐ increase, ☐ be approximately unchanged, ☐ decrease
X60	Sales to foreign subsidiaries (excluding indirect taxes), million SEK last year
X61	Sales to foreign subsidiaries (excluding indirect taxes), million SEK this year
X62	Sales to foreign subsidiaries (excluding indirect taxes), million SEK next year (plan)
X63	R&D costs, million SEK last year
X64	R&D costs, million SEK this year
X65	R&D costs, million SEK next year (plan)

Table 11: Divisions of The 1982 Cross-Section

Firm/Division	Industry
ASSI TIMBER	Raw Material Processing
AVESTA	Raw Material Processing
BOLIDEN MINERAL	Raw Material Processing
FAGERSTA STAINLESS	Raw Material Processing
FUNDIA BYGG	Raw Material Processing
FUNDIA STEEL	Raw Material Processing
FUNDO ALUMINIUM	Raw Material Processing
GOTTHARD ALUMINUM	Raw Material Processing
GRÄNGES ALUMINIUM METALL	Raw Material Processing
HÖGANÄS METALLURGI	Raw Material Processing
IGGESUNDS BRUK MASSATILLV	Raw Material Processing
IGGESUNDS TIMBER	Raw Material Processing
KOPPARFORS	Raw Material Processing
KORSNÄS MASSA	Raw Material Processing
KORSNÄS SÅGVERK	Raw Material Processing
MODO PAPER CELLKRAFT	Raw Material Processing
MODO PAPER DOMSJÖ SÅGVERK	Raw Material Processing
MOELVEN DALATRÄ	Raw Material Processing
MÄLARSKOG INDUSTRI	Raw Material Processing
NCB	Raw Material Processing
NYBY UDDEHOLM	Raw Material Processing
PLANNJA	Raw Material Processing
SANDVIK STEEL	Raw Material Processing
SCA PULP	Raw Material Processing
SKAND. ALUMINIUM PROFILER	Raw Material Processing
SKF STEEL HOFORS OCH HELLEF	Raw Material Processing
SSAB SVENSKT STÅL	Raw Material Processing
STORA KOPPARBERG BERGVIK TRÄ	Raw Material Processing
SÖDRA CELL MÖNSTERÅS	Raw Material Processing
SÖDRA CELL MÖRRUM	Raw Material Processing
UDDEHOLM STRIP STEEL	Raw Material Processing
UDDEHOLM TOOLING	Raw Material Processing
AGA GAS	Intermediate Goods
ASSA	Intermediate Goods
ASSI KARLSBORG	Intermediate Goods
ASSI KRAFTLINER	Intermediate Goods
BAHCO VERKTYG	Intermediate Goods

Continued on next page

Table 11 continued from previous page

Firm/Division	Industry
BEROL NOBEL STENUNGSUND	Intermediate Goods
BILLERUD UDDEHOLM KEMI	Intermediate Goods
BULTEN STAINLESS	Intermediate Goods
BÄCKHAMMARS BRUK	Intermediate Goods
CASCO NOBEL MALMÖ	Intermediate Goods
EDET MÖLNLYCKE TISSUE	Intermediate Goods
ELECTROLUX CONSTRUCTOR	Intermediate Goods
ESKILSTUNA FABRIK	Intermediate Goods
ESSELTE WELL ÖREBRO	Intermediate Goods
ESSEM PLAST	Intermediate Goods
FISKEBY BOARD	Intermediate Goods
FORSHEDA	Intermediate Goods
FRIDAFORS BRUK	Intermediate Goods
GISLAVED	Intermediate Goods
GRÄNGES FORAL	Intermediate Goods
GUNNEBO	Intermediate Goods
HOLMEN PAPER	Intermediate Goods
HYDRO PLAST	Intermediate Goods
HYDRO SUPRA	Intermediate Goods
HÖGANÄS ELDFAST	Intermediate Goods
IGGESUNDS BRUK KARTONG	Intermediate Goods
JOHNSON METALL	Intermediate Goods
KANTHAL	Intermediate Goods
KEMA NORD BLEKKEMI	Intermediate Goods
KEMA NORD INDUSTRIKEMI	Intermediate Goods
KEMIRA KEMI	Intermediate Goods
KLIPPANS FINPAPPERSBRUK	Intermediate Goods
KOCKUMS JERNVERK	Intermediate Goods
KORRUGAL	Intermediate Goods
KORSNÄS PAPPER	Intermediate Goods
LJUSNE KÄTTING	Intermediate Goods
METALLVERKEN	Intermediate Goods
NITRO NOBEL	Intermediate Goods
NOBEL CHEMICALS	Intermediate Goods
NYNÄS PETROLEUM	Intermediate Goods
PAPYRUS NYMÖLLA	Intermediate Goods
PERSTORP	Intermediate Goods
PLM	Intermediate Goods
RAMNÄS	Intermediate Goods
SCA EMBALLAGE	Intermediate Goods
SCA NORDLINER	Intermediate Goods

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Table 11 continued from previous page

Firm/Division	Industry
SKF SVERIGE	Intermediate Goods
STATOIL EUROPARTS	Intermediate Goods
STATOIL PETROKEMI	Intermediate Goods
STORA BILLERUD	Intermediate Goods
STORA LENE	Intermediate Goods
SURAHAMMARS BRUKS	Intermediate Goods
SVENSKA RAYON	Intermediate Goods
TAMBOX	Intermediate Goods
TENO	Intermediate Goods
THORN JÄRNKONST	Intermediate Goods
TRELLEBORG INDUSTRI	Intermediate Goods
TRUSTOR PRECISION COMP.	Intermediate Goods
UNIROC	Intermediate Goods
VISKAFORS	Intermediate Goods
VOLVO FLYGMOTOR	Intermediate Goods
Å&R CARTON	Intermediate Goods
ÅMOTFORS BRUK	Intermediate Goods
ÖREBRO PAPPERSBRUK	Intermediate Goods
ABBA	Consumption Goods
ALMEDAHL	Consumption Goods
ASTRA	Consumption Goods
BORÅS WÄFVERI	Consumption Goods
CEWILCO	Consumption Goods
CLOETTA	Consumption Goods
DUNI BILÅ HALMSTAD	Consumption Goods
DUNI BILÅ SKÅPAFORS	Consumption Goods
E-LUX MAJOR APPLIANCES	Consumption Goods
EDSBYVERKEN	Consumption Goods
EISER JERSEY	Consumption Goods
ESSELTE PRINT	Consumption Goods
FELIX	Consumption Goods
FOODIA	Consumption Goods
GUSTAVSBERGS DIV PORSLIN	Consumption Goods
GUSTAVSBERGS VVS	Consumption Goods
HUSQVARNA (K)	Consumption Goods
IFÖ SANITÄR	Consumption Goods
JÖNKÖPING-VULCAN	Consumption Goods
KABI VITRUM	Consumption Goods
KARLSHAMNS	Consumption Goods
KRISTIANSTAD SLAKTERIFÖR.	Consumption Goods
LUDVIG SVENSSON	Consumption Goods

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Table 11 continued from previous page

Firm/Division	Industry
MALMÖ STRUMPFABRIK	Consumption Goods
MARABOU	Consumption Goods
MONARK-CRESCENT	Consumption Goods
MÖLNLYCKE	Consumption Goods
NNP NEDRE NORRLANDS PRODUCENTFÖRENING	Consumption Goods
ORREFORS	Consumption Goods
OSCAR JACOBSON	Consumption Goods
OVERMAN MÖBEL	Consumption Goods
PHARMACIA	Consumption Goods
PHARMACIA LEO THERAPEUTICS	Consumption Goods
PRIPPS BRYGGERIER	Consumption Goods
SAAB AUTOMOBILE	Consumption Goods
SAMFOD	Consumption Goods
SAXYLLE KILSUND	Consumption Goods
SKANEK	Consumption Goods
SKOGAHOLMS BRÖD	Consumption Goods
SKULTUNA FOLIE	Consumption Goods
SKULTUNA MESSINGSBRUK	Consumption Goods
SOCKERBOLAGET	Consumption Goods
STURE LJUNGDAHL	Consumption Goods
SVENSKA NESTLE	Consumption Goods
SVENSKA TOBAKSBOLAGET	Consumption Goods
TIGER RANG	Consumption Goods
ULFERTS	Consumption Goods
VICT TH ENGWALL & CO	Consumption Goods
VIN & SPRITCENTRALEN	Consumption Goods
VOLVO KOMPONENTER PV-DELEN	Consumption Goods
VOLVO PERSONVAGNAR	Consumption Goods
WASABRÖD	Consumption Goods
WERNER & CO	Consumption Goods
WILH BECKER	Consumption Goods
ÅKERLUND & RAUSING	Consumption Goods
ABB CABLES	Investment Goods
ABB STAL	Investment Goods
AGA CRYO	Investment Goods
AGA CTC VÄRMEVÄXLARE	Investment Goods
AGA WELDING	Investment Goods
AGEMA INFRARED SYSTEMS	Investment Goods

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Table 11 continued from previous page

Firm/Division	Industry
ALFA LAVAL AGRI.INTERN	Investment Goods
ALFA LAVAL MEJERI O LIVS	Investment Goods
ALFA LAVAL SEPARATION	Investment Goods
ARENCO MATCH MACHINERY	Investment Goods
ASEA	Investment Goods
ATLAS COPCO TOOLS	Investment Goods
BOFORS	Investment Goods
BT PRODUCTS	Investment Goods
CTC LJUNGBY	Investment Goods
CTC OSBY	Investment Goods
DYNAPAC MASKIN	Investment Goods
ELDON	Investment Goods
ELECTROLUC ENVIROPAC	Investment Goods
ELECTROLUX STORKÖK	Investment Goods
ELECTROLUX WASCATOR	Investment Goods
ERICSSON BUSINESS COMM	Investment Goods
ERICSSON COMPONENTS	Investment Goods
ERICSSON INFORMATION MÖBEL	Investment Goods
ERICSSON RADIO SYSTEMS	Investment Goods
ERICSSON TELECOM	Investment Goods
ESAB	Investment Goods
ESSELTE DYMO	Investment Goods
FFV AEROTECH	Investment Goods
FFV ELEKTRONIK	Investment Goods
FFV ORDNANCE	Investment Goods
FINNBODA VARF	Investment Goods
FLYGT	Investment Goods
FLÄKT INDUSTRI	Investment Goods
GEOTRONICS	Investment Goods
GETINGE	Investment Goods
HIAB	Investment Goods
HUSQVARNA	Investment Goods
HUSQVARNA MOTORCYKLAR	Investment Goods
HÄGGLUND & SÖNER	Investment Goods
IBM SVENSKA	Investment Goods
IREMDA NORRKÖPING	Investment Goods
KARLSKRONAVARVET	Investment Goods
KARLSTADS MEKANISKA WERKSTAD	Investment Goods
KOCKUMS (GAMLA)	Investment Goods
KOCKUMS INDUSTRI	Investment Goods

Continued on next page

Table 11 continued from previous page

Firm/Division	Industry
NAF	Investment Goods
NOBELTECH SYSTEMS	Investment Goods
PARCA GJUTERI	Investment Goods
SAAB-SCANIA FLYG	Investment Goods
SAAB-SCANIA SCANIADIV.	Investment Goods
SAB NIFE	Investment Goods
SATTCONTROL INSTRUMENTS	Investment Goods
SCANIA-BUSSAR	Investment Goods
SECO TOOLS	Investment Goods
STANDARD RADIO & TELEFON	Investment Goods
STRATOS VENTILAT. PROD	Investment Goods
SUNDS DEFIBR. INDUSTRIES	Investment Goods
UDDEVALLAVARVET	Investment Goods
VME INDUSTRIES SWEDEN	Investment Goods
VOLVO LASTVAGNAR	Investment Goods
ÅKERMANS VERKSTAD	Investment Goods
A-BETONG	Building Materials
BETONGINDUSTRI	Building Materials
CEMENTA	Building Materials
ELEMENTHUS	Building Materials
FLÄKT KLIMATPRODUKTER	Building Materials
GULLFIBER	Building Materials
GULLRINGSHUS	Building Materials
GÖTENEHUS	Building Materials
IFÖ ELECTRIC HÖGSPÄNNING	Building Materials
MARBODAL	Building Materials
PARTEK HÖGANÄS BYGGKERAMIK	Building Materials
ROCKWOOL	Building Materials
SIPOREX	Building Materials
STORA LJUSNE TRÄ	Building Materials
STRÄNGBETONG	Building Materials
SÖDRA TIMBER	Building Materials
TARKETT PLASTGOLV	Building Materials
TARKETT TEXTIL	Building Materials
TARKETT TRÄGOLV	Building Materials
TOUR & ANDERSSON	Building Materials
TOUR & ANDERSSON REGLAR	Building Materials
YXHULT MINERAL	Building Materials

References

Ahlström, L. (1978) "The Market Oriented Inter-Industry Stock and Flow Data Aggregation Scheme used in the Swedish Model", in Eliasson, G. (ed.) *A Micro-to-Macro Model of the Swedish Economy: Papers on the Swedish Model from the Symposium on Micro Simulation Methods in Stockholm, Sept. 19-22, 1977*, IUI Conference Reports. Stockholm: IUI and Almqvist & Wiksell International, Stockholm, pp. 165–174.

Ahlström, L. (1980) "The Market Aggregation Scheme Used in the Swedish Model", in Bergmann, B., Eliasson, G. and Orcutt G. (eds.) *Microsimulation – Models, Methods and Applications: Proceedings of a Symposium on Micro Simulation Methods in Stockholm, September 19–22, 1977.* IUI Conference Reports. IUI, Stockholm, pp. 335–345.

Ahlström, L. (1989) "A micro-to-Macro Data Base", supplement to Bergholm, F. (1989), *MOSES Handbook*, Research Report no. 35, IUI, Stockholm.

Albrecht, J.W. (1987) *Documentation of the Planning Survey Data: Cross-Section and Panel*, IFN Working Paper no. 178, Research Institute of Industrial Economics (IFN), Stockholm.

Albrecht, J.W. et al. (1989) *Moses Code*, Research Report no. 36, IUI, Stockholm.

Albrecht, J.W. et al. (1992) *MOSES Database*, Research Report no. 40, IUI, Stockholm.

Albrecht, J.W. and Lindberg, T. (1982) *The Micro Initialization of MOSES*, Working Paper no. 72, Research Institute of Industrial Economics (IFN), Stockholm.

Andersson, T., Fredriksson, T. and Svensson R. (1996) *Multinational Restructuring, Internationalization and Small Economies: The Swedish Case*, Routledge, London.

Ballot, G., Eliasson, G. and Taymaz, E. (2006) "The Role of Commercialization Competence in Endogenous Economic Growth", paper presented to the International J.A. Schumpeter Society 11th ISS Conference, Nice-Sophia Antipolis, 21-24 June 2006.

Bergholm, F. (1983) *Svenska företags investeringar i maskiner och byggnader i utlandet 1974–1978*, Research Report no. 19, IUI, Stockholm.

Bergholm, F. (1983) *The MOSES Manual, Part 2, The Initialization Process*, Working Paper no. 118, Research Institute of Industrial Economics (IFN), Stockholm.

Bergholm, F. (1989) *MOSES Handbook*, Research Report no. 35, IUI, Stockholm.

Bergholm, F. and Eliasson, G. (1985) "De utlandsetablerade företagens drageffekter på svensk ekonomi – några simuleringar", in Eliasson, G., Bergholm, F., Horwitz, E.C. and Jagrén, L. *De svenska storföretagen – en studie av internationaliseringens konsekvenser för den svenska ekonomin*, IUI, Stockholm.

Bergholm, F. et al. (1989) "The MOSES Technical Specification Code", in *MOSES Code*, Research Report no. 36, IUI, Stockholm.

Bergmann, B., Eliasson, G., Orcutt, G. (eds.) (1980) *Micro Simulation Models, Methods and Applications*, Conference reports 1980:1, IUI, Stockholm.

Braunerhjelm, P. (1990a) *Effekter på den Svenska industristrukturen av EG 1992*, Working Paper no. 290, Research Institute of Industrial Economics (IFN), Stockholm.

Braunerhjelm, P. (1990b) *Svenska industriföretag inför EG 1992 – förväntningar och planer*, IUI and Överstyrelsen för civil beredskap, Stockholm.

Braunerhjelm, P. (1991) *Svenska underleverantörer och småföretag i det nya Europa – Struktur, kompetens och internationalisering*, Research Report no. 38, IUI, Stockholm.

Braunerhjelm, P. (1992) "Competence, Capacity and Capital: A Description of a Complementary IUI Firm Survey of Small and Large Firms and of Subcontractors", in Albrecht, J.W. et al. (eds.) *Moses Database*, IUI, Stockholm, pp. 229–274.

Braunerhjelm, P. (1993) "Nyetablering och småföretagande I svensk industri", in Andersson, T. et al. (eds.) *Den långa vägen: Den ekonomiska politikens begränsningar och möjligheter att föra Sverige ur 1990-talets kris*, IUI, Stockholm, pp. 91–118.

Braunerhjelm, P. and Ekholm, K. (ed.) (1998) *The Geography of Multinational Firms*, Kluwer, Boston, Dordrecht and London. doi:10.1007/978-1-4615-5675-6

Braunerhjelm, P. Ekholm, K., Grundberg, L. and Karpaty P. (1996) *Swedish Multinational Corporations: Recent Trends in Foreign Activities*, Working Paper no. 462, Research Institute of Industrial Economics (IFN), Stockholm.

Broström, A. (2003) *The reliability of the CAPM in different macro economic environments*, LiTH IPE Ex arb 2003:672, Master's thesis, Linköping Institute of Technology and Royal Institute of Technology, Linköping/Stockholm.

Carlsson, B. (1983) "Industrial Subsidies in Sweden: Macro-Economic Effects and an International Comparison", *Journal of Industrial Economics*, XXXII, vol. 1 (September), pp. 9–14.

Carlsson, B., Bergholm, F. and Lindberg, T. (1981) *Industristöds-politiken och dess inverkan på samhällsekonomin*, IUI, Stockholm.

Carlsson, B. and Braunerhjelm, P. (1993) *Entreprenörskap, småföretag och industriell förnyelse 1968–1991*, Working Paper no. 372, Research Institute of Industrial Economics (IFN), Stockholm.

Derviz, A. (1992) *Investment and Knowledge Transfer in a MOSES Economy – An approach Based on Net Theory and Object Oriented Programming*, Institute of Information Theory and Automation, Prague, and IUI Working Paper.

Ekholm, K. and Hesselman, M. (2000) *The Foreign Operations of Swedish Manufacturing Firms: Evidence from a Survey of Swedish Multinationals 1998*, Working paper no. 540, Research Institute of Industrial Economics (IFN), Stockholm.

Eliasson, G. (1976a) *Business Economic Planning Theory, Practice and Comparison*, John Wiley & Sons, London.

Eliasson, G. (1976b) *A Micro to Macro Model of the Swedish Economy, Preliminary Documentation*, Economic Research Report B15, Federation of Swedish Industries, Stockholm. Reprinted in *International Journal of Microsimulation*, vol. 17, no. 2, 2024.

Eliasson, G. (1978) "How Does Inflation Affect Growth? – Experiments on the Swedish Micro-to-Macro Model", in Eliasson, G. (ed.) (1977) *A Micro-to-Macro Model of the Swedish Economy. Papers on the Swedish Model from the Symposium on Micro Simulation Methods in Stockholm, Sept. 19-22, 1977*, IUI Conference Reports, IUI and Almqvist & Wiksell International, Stockholm, pp. 105–126.

Eliasson, G. (1984) *De utlandsetablerade företagen och den svenska ekonomin*, Research Report no. 26, IUI, Stockholm.

Eliasson, G. (1985a) *The Firm and Financial Markets in the Swedish Micro-to-Macro Model – Model, Theory and Verification*, IUI and Almqvist & Wiksell, Stockholm.

Eliasson, G. (1985b) "De svenska storföretagen", chapter I in Eliasson, G., Bergholm, F., Horwitz, E.C. and Jagrén, L. *De svenska storföretagen – en studie av internationaliseringens konsekvenser för den svenska ekonomin*, IUI, Stockholm, pp. 53.

Eliasson, G. (1990) "The Knowledge-Based Information Economy", in Eliasson, G., Fölster, S., Lindberg, T., Pousette, T. and Taymaz, E. (eds.) *The Knowledge Based Information Economy*, IUI and Telekon, Stockholm, pp. 9–87.

Eliasson, G. (1992) "The MOSES Model – Database and Applications", in Albrecht, J.W. et al. (eds.) *MOSES Database*, IUI, Stockholm, pp. 5–135.

Eliasson, G. (2021) "The theory of the firm revisited – A human capital perspective", revised paper presented at the 2020 ISS International Schumpeter Society Conference, July 2021 at LUISS University, Rome.

Eliasson, G. (2023) "Bringing markets back into economics: on economy wide self-coordination by boundedly rational market agents", *Journal of Economic Behavior & Organization*, vol. 216, pp. 686–710. doi:10.1016/j.jebo.2023.10.001

Eliasson, G. (2024) "Modelling the Experimentally Organized Economy (II)", *International Journal of Microsimulation*, vol. 17, no. 2, pp. 1–59. doi:10.34196/IJM.00291

Eliasson, G. and Johansson, D. (1999) *Dynamik och flexibilitet i svensk IT-industri*, City University Press, Stockholm.

Eliasson, G. and Klevmarken, A. (1981) *Household Market and Non-Market Activities. Research Program and Proposal*, Research Report no. 12, IUI, Stockholm.

Eliasson, G. and Taymaz, E. (2001) *Modelling Financial Derivatives in a Firm Based Evolutionary Macro Model (MOSES) – The integration of computing, communications and financial services*, mimeo, KTH, Stockholm.

Eliasson, G. and Taymaz, E. (2024) “Modelling Financial Derivatives Markets in a Firm Based Evolutionary Macro Model (MOSES) – On the market integration of computing, communications, and financial services”, *International Journal of Microsimulation*, vol. 17, no. 2, pp. 233–278. doi:10.34196/IJM.00298

Eliasson, G., Carlsson, B., Deiaco, E., Lindberg, T. and Pousette, T. (1986) *Kunskap, information och tjänster – en studie av svenska industriföretag*, IUI, Stockholm, pp. 17, and Chapter IV (Pousette, T. and Lindberg, T.).

Eliasson, G., Fölster, S., Lindberg, T., Pousette, T. and Taymaz, E. (1990) *The Knowledge Based Information Economy*, IUI and Telekon, Stockholm.

Eliasson, G., Johansson, D. and Taymaz, E. (2004) “Simulating the New Economy”, *Structural Change and Economic Dynamics*, vol. 15, pp. 289–314.

Federation of Swedish Industries (1972), *Industrikonjunkturen*, Autumn issue.

Federation of Swedish Industries (1985), *Konjunkturen*, no 1.

Federation of Swedish Industries (1986), *Konjunkturen*, no 1.

Federation of Swedish Industries (1988), *Konjunkturen*, no 1.

Federation of Swedish Industries (1989), *Konjunkturen*, no 2.

Federation of Swedish Industries (1996), *Konjunkturen*, no 3.

Federation of Swedish Industries (1997), *Konjunkturen*, no 3.

Flood, L. and Olovsson, P. (1997d) *Household market and nonmarket Activities (HUS). Procedures and Codes for 1993 Time-use Survey*, vol. VI, Department of Economics, Uppsala.

Flood, L. and Olovsson, P. (1999) *Household market and nonmarket Activities (HUS). Survey description. 1996 Panel survey*, vol. VII, Department of Economics, Gothenburg.

Flood, L. and Olovsson, P. (2000) *Household market and nonmarket Activities (HUS). Survey description. 1998 Panel survey*, vol. VIII, Department of Economics, Gothenburg.

Flood, L., Klevmarken, A. and Olovsson, P. (1997a) *Household market and nonmarket Activities (HUS). Survey Description. 1993 Panel survey*, vol. III, Department of Economics, Uppsala.

Flood, L., Klevmarken, A. and Olovsson, P. (1997b) *Household market and nonmarket Activities (HUS). Survey Description. 1993 Nonresponse Study*, vol. IV, Department of Economics, Uppsala.

Flood, L., Klevmarken, A. and Olovsson, P. (1997c) *Household market and nonmarket Activities (HUS). Survey Description. 1993 Supplementary survey*, vol. V, Department of Economics, Uppsala.

Gunnarsson, G., Mellander, E. and Savvidou, E. (2004) “Effekter av IT i svensk industri”, *Ekonomisk Debatt*, vol. 33, no. 1, pp. 45–57. Report 2004:11, IFAU, Uppsala.

Johansson, D. (2001) *The Dynamics of Firm and Industry Growth – The Swedish Computing and Communications Industry*, Doctoral Thesis, KTH, Stockholm.

Klevmarken, A. (1982) *Household Market and Nonmarket Activities (HUS) – A Pilot Study*, Working Paper no. 77, Research Institute of Industrial Economics (IFN), Stockholm.

Klevmarken, A. (1984) *Household Market and Nonmarket Activities. The First Year of a Swedish Panel Study*, IUI, Stockholm.

Klevmarken, A. (ed.) (1990) *Tid och råd – Om HUShållens ekonomi*, IUI and Byggforskningsrådet, Stockholm.

Klevmarken A. and Olovsson, P. (1993a) *Household Market and Nonmarket Activities: Procedures and Codes 1984-1991*, vol. 1, IUI, Stockholm.

Klevmarken A. and Olovsson, P. (1993b) *Household Market and Nonmarket Activities: Procedures and Codes 1984-1991*, vol. 2, IUI, Stockholm.

Lindstenz, E. (2025a) *MOSES Conversion to Object Code*, mimeo.

Lindstenz, E. (2025b) *MOSES C++ Technical Specification*, mimeo.

Lund, H. (1967) *Svenska företags investeringar i utlandet*, Federation of Swedish Industries, Stockholm.

Mellander, E. and Savvidou, E. (2000) *Företagens syn på individuella kompetenskonton*, report prepared on behalf of Utredningen om individuellt kompetenssparande, SOU 2000:107, Ministry of Enterprise and Innovation, Stockholm.

Mellander, E. and Savvidou, E. (2001) "Företagens kunskapsförsörjning och syn på individuella kompetenskonton", *Ekonomisk Debatt*, vol. 29, no. 5, pp. 333–345.

Nordström, T. (1988) *MOSES Macro Accounting System: Updating Procedures*, Working Paper no. 196, Research Institute of Industrial Economics (IFN), Stockholm.

Pousette, T. and Lindberg, T. (1986) "Tjänster i produktionen och produktionen av tjänster i industriföretag", in Lindberg, T. and Eliasson, G. (eds.) *Kunskap, information och tjänster. En studie av svenska industriföretag*, IUI and Liber, Stockholm, pp. 165–213.

Pousette, T. and Lindberg, T. (1990) "Services in Production and Production of Services in Swedish Manufacturing", in Eliasson, G., Fölster, S., Lindberg, T., Pousette, T. and Taymaz, E. (1990) *The Knowledge Based Information Economy*. Also IUI Working Paper no. 148, 1985.

Richiardi, M. (2024) "Editorial", *International Journal of Microsimulation*, vol. 17, no.2, 2024, pp I–III.

Salter, W.E.G (1960) *Productivity and Technical Change*, Cambridge University Press, Cambridge.

Solow, R.M. (1987) "We'd Better Watch Out", *New York Times Book Review*, July 12.

Swedenborg, B. (1973) *Den svenska industrins investeringar i utlandet*, IUI and Almqvist & Wiksell, Stockholm.

Swedenborg, B. (1979) *The Multinational Operations of Swedish Firms. An Analysis of Determinants and Effects*, Doctoral Dissertation, Department of Economics, University of California, Los Angeles.

Swedenborg, B. (1982) *Svensk industri i utlandet: En analys av drivkrafter och effekter*, IUI, Stockholm.

Swedenborg, B., Johansson-Grahn, G. and Kinnwall, M. (1988) *Den Svenska Industrins utlandsinvesteringar 1960–1986*, IUI, Stockholm.

Taymaz, E. (1991) *MOSES on PC: Manual, Initialization, and Calibration*, Research Report no. 39, IUI, Stockholm.

Taymaz, E. (1992a) "A Description of the Initial 1982 and the Synthetic 1990 Database", in *MOSES Database*, Research Report no. 40, IUI, Stockholm.

Taymaz, E. (1992b) "Initial State Dependency – Sensitivity Analyses on MOSES", Chapter VI in Albrecht, J.W. et al. (1992) *MOSES Database*, IUI, Stockholm.

Taymaz, E. and Nilson, J. (1992) "The Minimum Data Requirements to Start and Run MOSES", in *MOSES Database*, Research Report no. 40, IUI, Stockholm.

Virin, O. (1976) "Industrings Utveckling 1974–76, Enligt Industriförbundets Planenkät 1975/76", in *Industrikonjunkturen Våren 1976*, Federation of Swedish Industries, Stockholm.

Appendix

This documents Appendix is in the format of a GitHub repository. All source code, keys, and survey forms are available at: github.com/novrion/Planning-Survey-Documentation.