THE INDUSTRIAL
INSTITUTE
FOR ECONOMIC
AND SOCIAL RESEARCH
STOCKHOLM
IUI 40 YEARS 1939–1979

THE FIRMS
IN THE
MARKET
ECONOMY

IUI RESEARCH
PROGRAM
1979/1980

The Industrial Institute for Economic and Social Research
Stockholm

Industrien utredningsinstitut

IUI 40 years
1939 — 1979

The Firms in the Market Economy

IUI Research Program
1979—1980
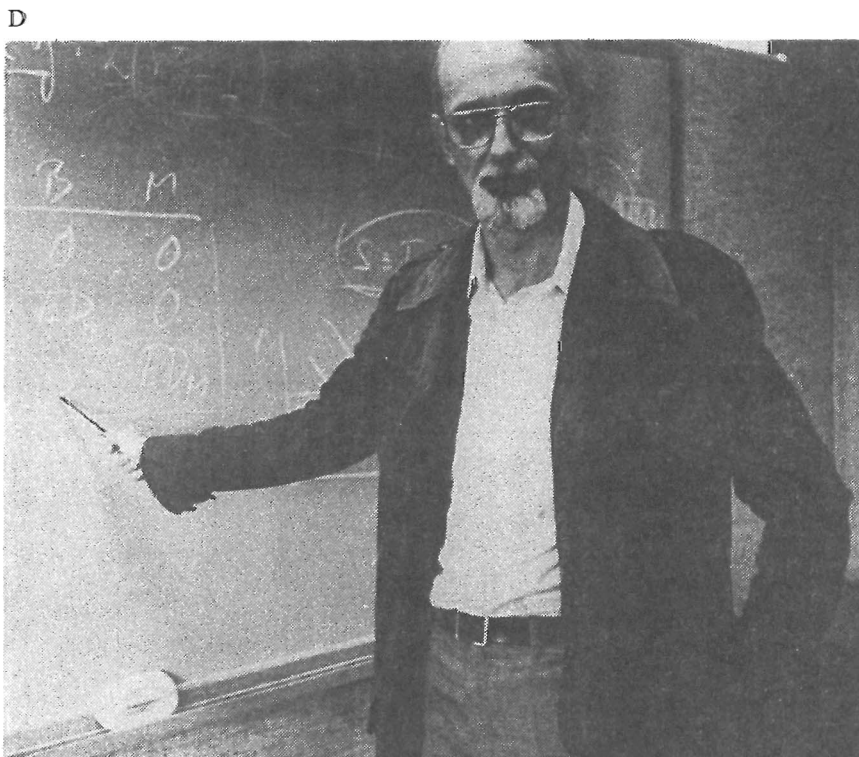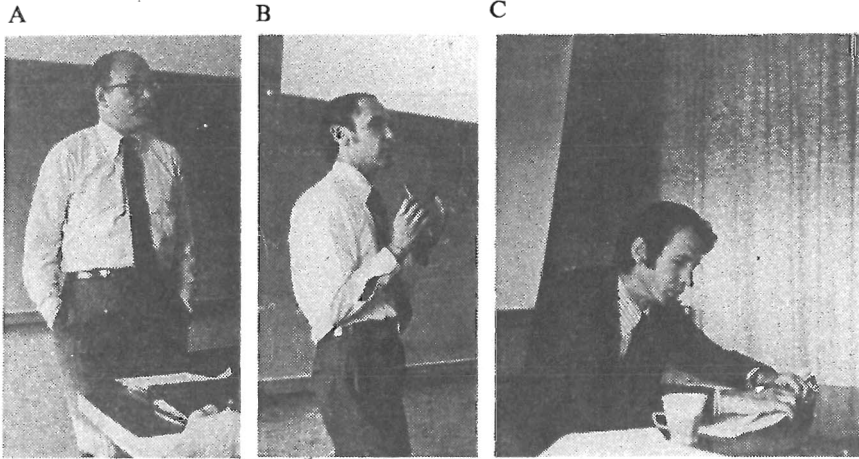
The IUI guest researchers program has been very active during the last few years, thanks to a grant from the Marianne and Marcus Wallenbergs Foundation. In August 1978 the Institute organized an international seminar in corporate income taxation and finance. Above, (from the left) Professor Martin Feldstein, President NBER, Cambridge (A), Professor Charles McLure, NBER (B) and Gary Hufbauer, U.S. Treasury (C). During 1978 Professor Axel Leijonhufvud, UCLA, gave two very well attended lectures at the Institute (D).
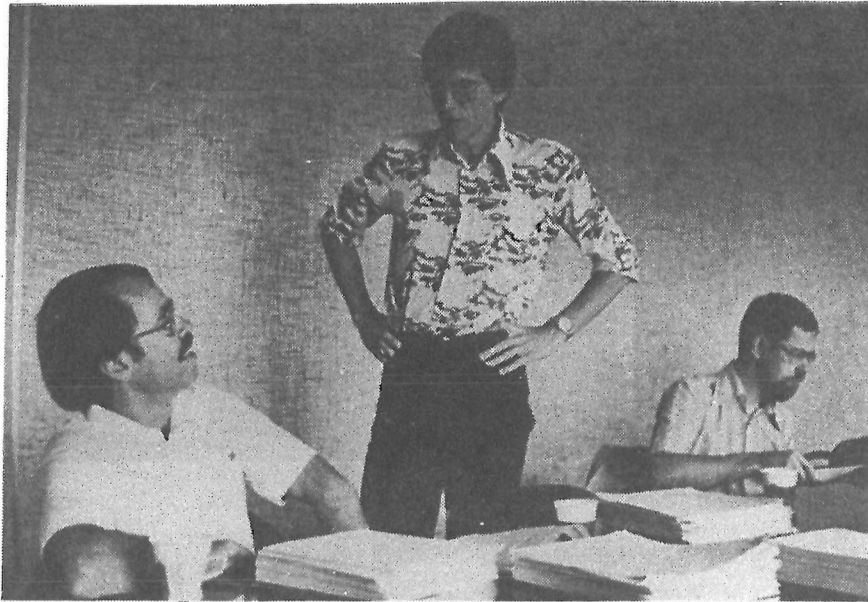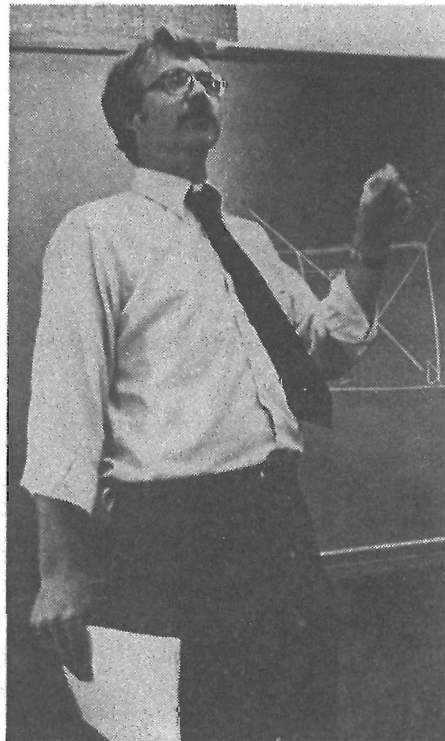
In the summer of 1979 an international seminar in labor market economics was organized. The pictures show Frank Stafford, Univ. of Michigan, Bertil Holmlund, IUI, and Anders Klevmarken, Univ. of Gothenburg and IUI (A), Professor Ned Gramlich, Univ. of Michigan (B).
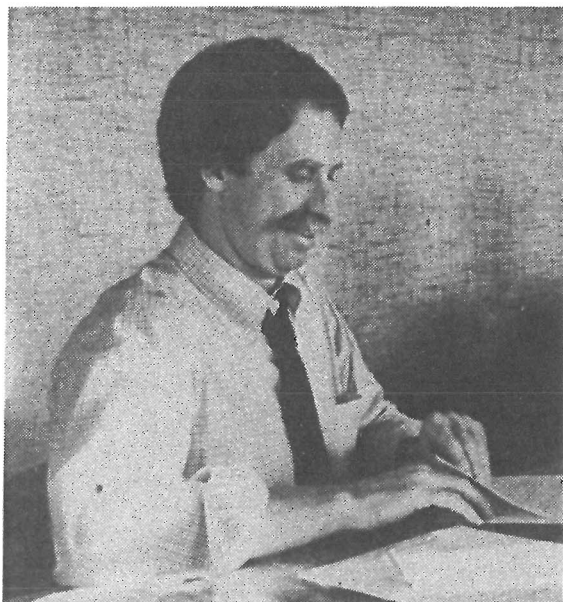
Professor Mark Sharefkin, Resources for the Future, has been actively engaged in the large energy study at the Institute.

In 1979 the Institute was also visited by Dr. Nicolai Petrakov, Deputy Director of the Mathematical Economic Institute (CEMI) in Moscow and Dr. Seva Altaev, also from CEMI.

1979 witnessed the completion of the medium term assessment of the Swedish Economy. The project was headed by Dr. Gunnar Eliasson, President of the Institute (left). Dr. Bengt-Christer Ysander (center) headed the analysis of the public sector and the macro model development and Dr. B Carlsson (right) was in charge of the industrial analysis. On the whole 11 researchers at the Institute were engaged at various stages of the project.

The macro modelling group of the medium term survey was headed by Dr. Bengt-Christer Ysander (center). From the left Leif Jansson and Kerstin Wennberg and right Tomas Nordström.

*The first phase of the micro-to-macro modelling project together with IBM Sweden was comple-
ted in 1979. The project group consisted of (from the left) Gösta Olavi (IBM Sweden), Louise
Ahlström (IUI), Gunnar Eliasson (project leader, IUI), Jim Albrecht (Columbia University) and
Thomas Lindberg (IUI).*

*The joint project on technical change and industrial structure together with the Swedish Academy
of Engineering Sciences was also concluded in 1979. The project was headed by Bo Carlsson and
Erik Dahmén (see picture on p 130). Other researchers on the project were Johan Örtengren and
Märtha Josefsson (left) and Anders Grufman (right).*

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Introduction

The firms in the market economy—40 years of research at IUI

by Gunnar Eliasson

"Now suppose that the capitalist engine keeps on producing at that rate of increase for another half century starting from 1928 . . . the depression that ran its course from the last quarter of 1929 to the third quarter of 1932 does not prove that a secular break has occurred . . . because depressions of such severity have repeatedly occurred".

"One way of expressing our result is that, if capitalism repeated its past performance for another half century starting with 1928 this would do away with anything that according to present standards could be called poverty, even in the lowest strata of the population, pathological cases alone excepted".

<div align="right">Joseph Schumpeter</div>

A similarly accurate prediction was made already in 1930 by Lord Keynes in his essay *Economic Possibilities for our Grandchildren*. During the 50 years that have passed, the capitalist engine in the advanced industrial nations accomplished even more than predicted by Schumpeter and Keynes, despite an intervening world war.

These scenarios were formulated during and just after the Great Depression to counter the prevailing mood. They illustrate the possibility—and necessity!—of looking beyond short-run problems in making long-run forecasts.

The economic situation at the end of the 1970's is highly reminiscent of that 50 years earlier. The risk of misinterpreting the situation is as large as it was 50 years ago. Economic indicators generally point down and the task of the forecaster is as difficult now as it was then.

The industrialized countries have been through the backwater of the oil crisis after a long period of high and stable growth, but they are now facing renewed problems.

The future demands large adjustments economically for individuals, institutionally and culturally. To a large extent the story is about the capability of the *market technology*—or to use Schumpeter's term "the capitalist engine"—to support a return to high and stable economic growth in the 80's. What adjustments are needed on the part of business and individuals to achieve that? Many people are worried about the problems arising from a sudden slow-down in economic growth in a society that has been attuned for decades to a steady growth in prosperity. On the other hand, some people

<div align="right">13</div>

have even advocated "zero growth" during the recent green wave of economic romanticism that now seems to have come to an end. However, nobody seems to be able to visualize such a new society or know what to do about the situation.

A historical resumé seems appropriate the year IUI (The Industrial Institute for Economic and Social Research) celebrates its 40th birthday as a research institution. It was founded in 1939 for the simple reason that business leaders regarded prevailing knowledge about industrial economic life to be of insufficient depth and quality, particularly among political decision makers in society. Few would want to change that assessment today after some 5 years of economic-political blundering in almost every Western economy, even though everything is now staged at a higher level of sophistication. The 40-year history of IUI as a research institution naturally illustrates the problems formulated some 40 years ago by Joseph Schumpeter. A pertinent question, however, is whether the blunders should be blamed on the politicians or the economics profession.

1. Choosing the 80's

Schumpeter saw no apparent obstacles to a continuation of the preceding 50 years of economic growth in the United States—despite the then current economic disaster—provided the capitalist market economy was allowed to operate rather freely. *Individualism and democracy*—two inherent qualities of Western life—are closely linked to the philosophy behind the *market economy* and its efficient operation, its ability to generate and distribute fairly a growing product of desired composition and to offer a spectrum of choices and opportunities.

However, Schumpeter voiced pessimism for the long run future. The inherent nature of capitalism was to undermine its own existence through its very efficiency and success. Success in the materialistic dimension would lead to the creation of institutions with interests contrary to rugged individualism and market competition and would permit interests and talent to turn to non-material pursuits. Large scale production technologies at the same time would make the single entrepreneur and innovator superfluous. Eventually both democracy and economic prosperity would languish. This dismal development foreseen by Schumpeter still lies in the future but the direction of change has been as Schumpeter predicted. The problems he formulated have unavoidably become central ones in the current economic debate and therefore also in the IUI economic assessment of the 80's.

What, then, are the economic prospects for the 80's? Is the exceptional Swedish performance during the last 100 years relative to other countries in Figure 1 about to be changed for the worse? If so, why? Is the growing public sector the villain in Schumpeter's scenario? To what extent do the politicians have a "choice of the 80's" as indicated by the title of the recent

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Figure 1. *GNP per capita in different countries, 1890—1975*
          Index UK = 100

Index

240
220   Sweden
210   Switzerland
200   U.S.
180   Germany
160   France
140
120
100 ─────────────────────────────────── UK
80   Italy
60
40
20

1890 1900 10   20   30   40   50   60   70   80
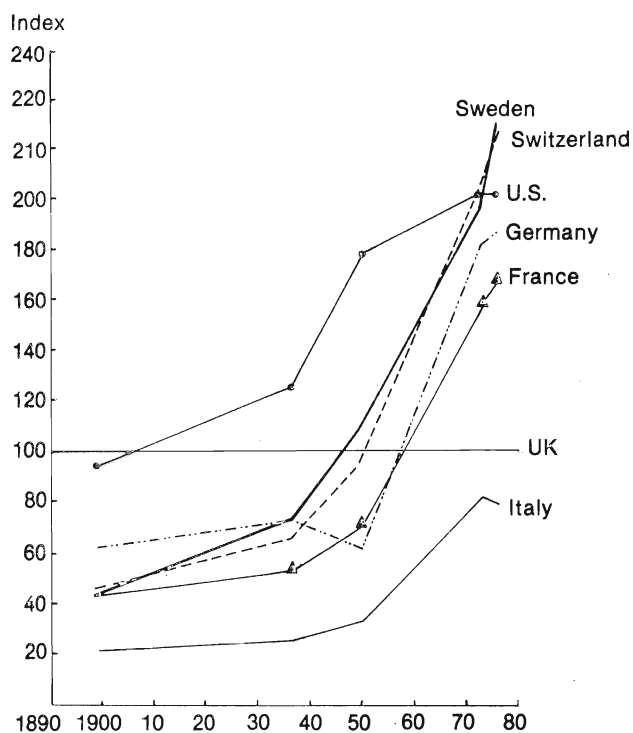
IUI medium term assessment? This question in turn opens up a second one: What will be the relevant domain of IUI research during the 80's? Relevance in matters of the long term economic and political choice has always been a crucial factor in allocating resources for research within the Institute.

2. Industrial Economics

The Industrial Institute for Economic and Social Research (IUI) is a unique institution in at least four respects. IUI is the only privately financed research institute in social science in the Swedish academic environment. It is almost 100 percent privately financed. In this sense IUI research is very much like research at the private universities in the U.S.

The board of directors of IUI has always been composed of top executives in Swedish industry. They authorize research projects that have been initiated within the Institute, within the Board or elsewhere. From then on the completion of the research project and final publishing is at the sole discretion of the researchers and the Managing Director of the Institute, who decides on the publishing.

Over the years the IUI has produced the largest number of dissertations of

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any research institute in economics in Sweden—two during 1979.

For a long time the IUI was the only research institute in social sciences engaged in applied economics in a broad spectrum of areas.

This year the Institute celebrates a 40 year research tradition. Over the years IUI has grown to be one of the largest research institutions in economics in Sweden.

3. IUI—the Beginning

The need filled by IUI is as acute today as it was considered to be towards the end of the 30's, namely the need for accurate and operational information on the mechanics of our industrialized economy. The idea to start an independent, non-profit research institution supported by private sources was formulated by the president of the ASEA corporation, Sigfrid Edström, after a discussion with the prime minister of Sweden, Per Albin Hansson. To begin with, the charter of the Institute was not very clearly formulated. However, it soon became clear that professional economists could only be recruited and do a high quality research job in an environment with strict scientific requirements. The scientific and independent character of the Institute was further enhanced by its organization separately from other industry organizations and with its own board of directors.

4. Research Orientation

During the first years of war and regulated economy the activities of the Institute were dominated by gathering statistical information, rendering services to companies and public bodies, participating in Government committees and helping companies to cope with regulations.

Under the direction of Ingvar Svennilson (president 1942-49) research gradually moved in the direction of more comprehensive and complex research ventures that have been characteristic of IUI research ever since. Svennilson especially initiated research on industrial structure along the lines that have later come to be termed "Salter analysis". During this formative period the principle was established that the results of all research projects authorized by the board of directors should be published and individually signed.

Over the years, the Institute has conducted research in most areas within the domain of applied economics. Not infrequently the borders have been crossed to other academic disciplines, such as economic history, business administration, fiscal law, sociology and engineering.

The studies on sectors of industry gradually became systematized within the framework of the Government's medium term surveys in which the Institute participated for many years. These surveys were initiated after the war as a condition for Sweden to become eligible for Marshall aid, which Sweden eventually decided to decline. Ingvar Svennilson—and between 1948

and 1950 Jonas Nordenson—headed the Institute during these years. To begin with measurement of production structure and change took a large share of research inputs. The first Swedish input-output project was conducted within the Institute, as well as extensive productivity measurements. Later, during the 60's, Lars Nabseth (president 1966-72) extended research to the diffusion of innovations, technical change and economic growth, and during the 70's research in this area has also taken up energy problems.

During the last few years studies on industrial structure and change have been further updated and reorganized. Thanks to new statistical data bases coupled with new mathematical techniques we have been able to link such studies back to the pioneering micro oriented studies that Erik Dahmén concluded in the early 50's. The broad historical approach in Dahmén's study has again been applied in a recent study on technical change together with the Royal Swedish Academy of Engineering Sciences and in the recent medium term assessment, *Choosing the 80's*, both published in 1979. The trend is clearly away from traditional sector analysis towards micro based studies, where decision units are the objects of observation. Here technical problems of measurement as well as inadequate theory have earlier constituted stumbling blocks.

If we look at the economy from the production side, IUI research can be said to have covered almost the entire economy over the years. Besides mining and manufacturing, *agriculture* has been the subject of two extensive inquiries together with the *transport* and the *service* sectors. The *construction* sector as well as the problems associated with the *housing* market have been investigated several times.

It is interesting to note in this context that more resources have been devoted at IUI than in any other research institution in Sweden to the study of the *public sector* (for instance the pioneering work by Erik Höök (1962)). In this field as well as in *fiscal policy and taxation*, several well-known studies have been produced during the 70's.

This orientation may seem somewhat odd for a research institute bearing the name: the *Industrial* Institute for Social and Economic Research. However, it is characteristic of the wide spectrum and continuous change that have become hallmarks of IUI research.

The *demand* side of the economy has been as extensively covered, in particular in a series of studies during the 50's under the direction of Ragnar Bentzel (later president of the institute, 1961-66) on *private consumption* and the determinants of *income distribution*. These studies were later continued in more specialized forms by Jan Wallander (president 1953-61).

Determinants of *investment*, investment finance, rate of return measurements, and *capital and credit market* analysis have, of course, always been an important area of IUI research.

Traditionally IUI research has been organized around a number of individuals occupied with their own projects carried out relatively in-

Figure 2. *External balance of Sweden, 1950—1985*
Percent of GNP at factor cost
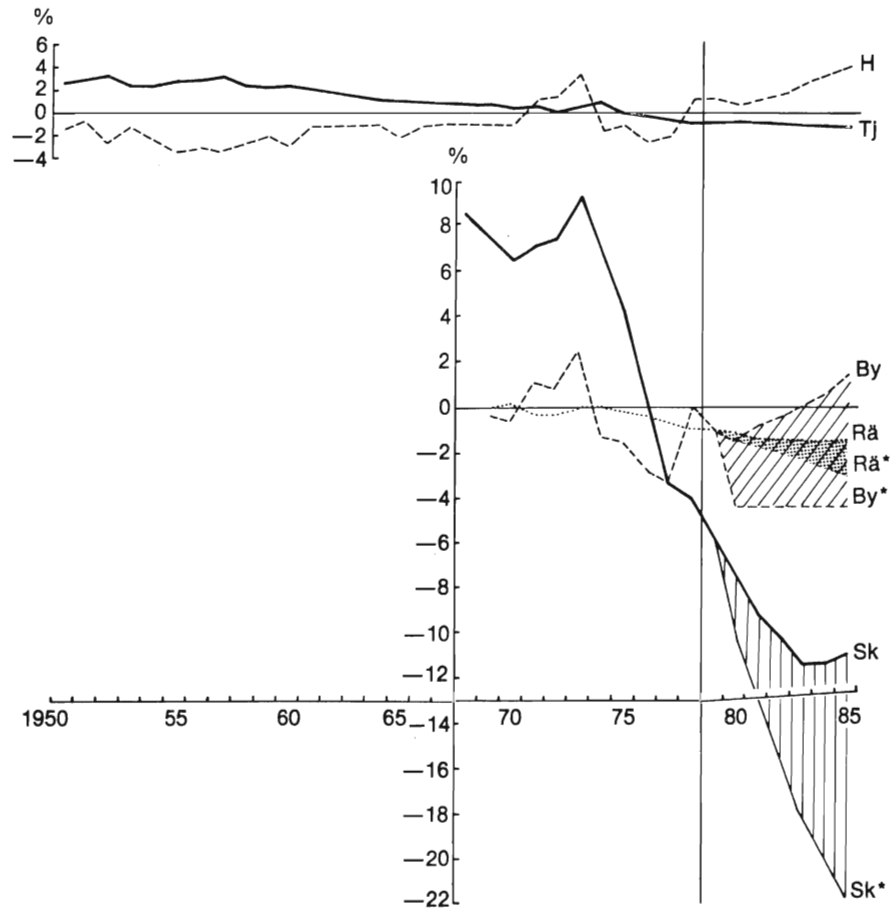
H = Trade Balance
Tj = Service balance excl. capital services
By = Current account balance excluding net
interest payments
Rä = Net interest payments
Sk = Net debt position vis à vis the rest
of the world including trade credits

Note: By is the current balance from the main reference projection in the long
term survey. The actual current balance for 1980 will turn out considerab-
ly worse than calculated, as illustrated by By*. Rä* and SK* are simple
illustrations of what will happen if policy authorities are unable to impro-
ve the current balance from the 1980 position for 5 years — a situation
that has certain similarities with the Danish development during the se-
cond half of the 70ies.

dependently of other projects. Larger problem areas that concern the entire economic system and its place in an international market environment have emerged as important during recent years. Such problems cannot be handled by one individual alone. The first step towards systems research was taken when IUI (headed by Lars Wohlin 1972-76) in 1976 published the first medium term assessment in direct competition with the Government medium term survey. A continuation along these lines seemed natural as the world economic system moved into a state of serious disequilibrium. Inflation—a typical economic systems problem—took on ominous proportions both internationally and in Sweden. Also, the role of the industry sector was rapidly changing in a world characterized not only by inflation but also by rapidly growing public resource use and a political orientation towards far-reaching ambitions concerning the equalization of incomes and control of production. On this situation was superimposed a growing external balance problem in the wake of the 1973-74 oil crisis (see Figure 2).

It suddenly became critical not only to understand what was going on and

Figure 3.   *Business cycles, growth and economic policy*
            Annual percentage change of GNP
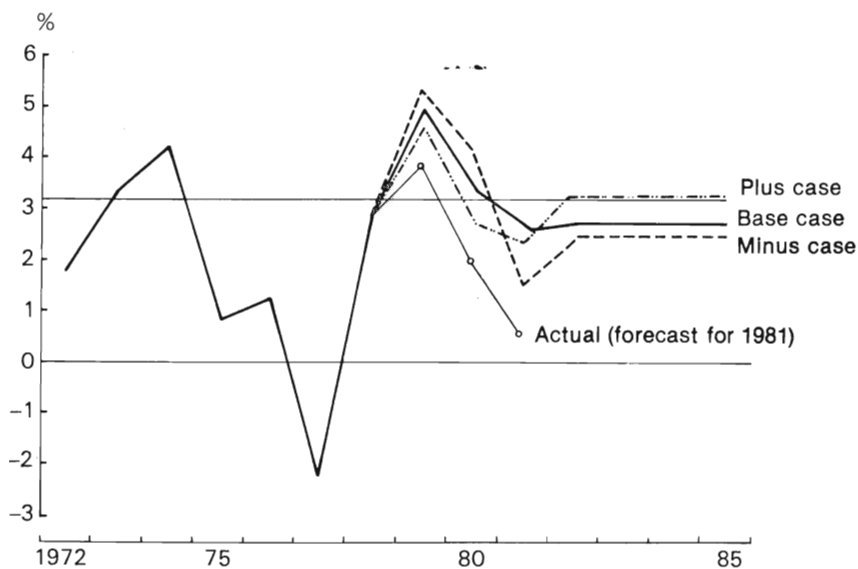
Note: The *plus case* represents a recommended policy with very restrictive fis-
         cal and monetary measures, including substantial withdrawals of subsi-
         dies to industry during the business upswing 1979/80. The inflationary
         wave would be partly curbed through a consequent upward drift of the
         exchange rate. The *minus case* consisted of a lax "inflationary" policy
         package. Actual development has in fact been even worse than the mi-
         nus case.

what it meant for the future, but also what it implied for the market environment of the traditional business unit during the 80's.

During the last four years the Institute has moved in the direction of studying these types of problems more intensively. The problems addressed can be summarized with Schumpeter's old question: What kind of future does the capitalist market system have, being based on private ownership and individually acting institutions? To what degree does the level of wealth and its distribution generated by such an economic system satisfy the median voter that impresses his will on the parliamentary decision process? The comprehensiveness and complexity of such research necessitate organization of research in teams.

Not only economic theory but also mathematical and numerical techniques linked to computer technology are required. No single individual has the necessary competence in all these fields. The theoretical and conceptual framework must be further developed. Some of this work has begun within the micro (firm) to macro modeling project and has been applied also in the Institute's medium term assessment.

5. The Medium Term Economic Assessment (Choosing the 80's)—A Teamwork

a) Policy making in the mature welfare state

The lack of relevant facts about the machinery of the entire national economy is even more pressing today than it was in 1939 when the IUI was started. At that time new legislation appeared at a much slower pace. Before the war, the rules and laws constituting the economic environment were more stable and reliable, the public sector was small both relatively and absolutely and policy making at the top was quite different and less ambitious. Economic regulations during the war, however, changed the situation drastically. Today the decision makers have to cope with nominal business risks as well as growing uncertainties about the political side of their economic environment. Some war-time legislation, such as exchange controls, still remain in operation. New political signals about which future principles should apply to an economic system began to be heard during the second half of the 60's—not only in Sweden but also in many other mature industrial economies. The ambitions to guide and manipulate economic development in great detail on the part of central authorities have increased strongly, but the knowledge of the economic system required to accomplish this has increased even faster; the state of economic art and knowledge have simply not been able to keep pace. The problems we had to cope with in the medium term economic assessment thus indicate areas where further research is needed and hence the orientation of future research at the IUI.

One of the main problems that had to be faced in the study had to do with the limits of central administrative control in a national economy of the ad-

vanced and highly differentiated Swedish type. In fact, our apparent inability to guide even our own economic models to desired ends offers food for thought. One conclusion is that too high an ambition in this regard during the past 10 years may explain a large part of the economic mess of today. To some extent this problem is common to all industrial nations. The conditions for economic growth worsened throughout the industrial world during the 70's. Political ambitions regarding the supply of low-priced welfare services have been lagging in the downward adjustment to economic reality. Therefore, this adjustment is now forced upon the economies in a less predictable fashion through inflation, instabilities and uncoordinated, reluctant policy making that further aggravates the inefficient utilization of capital and human resources.

b) Supply side economics—a forgotten art?

Whether a severely shaken (unbalanced) economy could be reined in and rapidly growing social economic tension released without shifting the economic system toward a more centrally planned economy has been a matter of discussion not only in Sweden. Such a change of the rules of the economic game would mean abandoning the "Swedish model" that has been so successful in the past. This type of scenario had to be analyzed since it constituted the prime political choice for the 80's. The medium term assessment was, however, constructed around a set of much more optimistic assumptions.

Roughly speaking, the main scenario worked out was a slow growth period well into the 80's, with a gradual upward adjustment towards a long term trend slightly below the long term trend from the late 19th century (see Figure 1), but far below the extreme growth rates of the 60's. This was a relatively optimistic scenario in international comparison. There were, however, two preconditions. First, the relatively open Swedish free market system with a high degree of foreign competition and strongly reduced ambitions on the part of authorities to manipulate the production system and reallocate the fruits of production was a must. Second, a rapid and substantial structural adjustment during the initial business upswing was required, necessitating a very tight policy forcing inferior production plants to close down earlier than otherwise. How to realize this economic adjustment socially and politically is, however, still very much an open question. For example, according to a recent Government proposal, each average Swedish family will be required to pay more than $ 400 per year for 3 years to 15,000 shipyard employees for them to retain their jobs. This represents the same number of people as were transferred out of Swedish agriculture *annually* during the past 30 years!

c) The "old Swedish model"—the efficient industrial policy model?

Success in choosing the 80's as suggested in the IUI study hence demands a

return to the old "Swedish model" formulated in a number of studies within the Swedish labor union movement after the war and enacted by a continuum of Social Democratic regimes until the late 60's—thus postponing the dismal Schumpeterian vision discussed earlier. This return would involve an extensive and immediate dismantling of the heavy subsidies to bankrupt industrial plants aimed at short-term protection of employment. In fact, simulation experiments on the micro-to- macro model developed at the Institute (see p. 104) suggest that it is not so much the waste of investment money in maintaining the plants that reduces economic performance as the subsidized maintenance of production for a long time at no or negative returns to invested capital. Such subsidies keep people in the wrong jobs and prop up the average wage at an artificially high level and reduce growth incentives in other sectors. The simulation experiments indicate that there are no grounds for the argument that because of a seemingly stagnant economy there is insufficient expansion to absorb labor released from firms "on welfare". The malady, stagnation, so to speak depends on the cure. There is an enormous social waste of resources for the benefit of a select few. Even if these subsidization policies were immediately reversed—except in a brutal alternative adjustment scenario—Swedish manufacturing would enter the mid-80's with an obsolete production structure compared to earlier days. From this follows a slower growth rate than earlier during the postwar period.

These conclusions give rise to the following questions:

1) How will firms adjust to slower growth—perhaps even slower than we have projected?

2) What exactly is happening to the Swedish mixed market economy, one of the most successful industrial engines for the last 100 years?

It is clear from the IUI medium term assessment that the dramatic worsening of our external balance during the 70's (see Figure 2), combined with an industrial structure, were suddenly and unexpectedly made economically obsolete by strong relative price changes, presents a difficult set of adjustment problems. Only if the general public, stimulated by the politicians, is willing to absorb the costs, can the adjustment be made. So far, this has not been demonstrated and the public budget has been cumulating deficits of a relative magnitude never seen before. One could say that the sophisticated part of our (internationally oriented) industry is too small today to support our present standard of living. Since spring 1979 the Swedish inflation rate has also exceeded the assumptions made in the basic case of the medium term assessment.

6. The Firm in a Slow Growth Economy

A characteristic but paradoxical feature of modern economic theory is that it does not contain firms in the sense of decision makers and that markets do not exist in the form of a dynamic adjustment process. General equilibrium

theory has been predominantly concerned with the conditions prevailing when micro units are in a market equlibrium situation. When relative price changes and supply responses to price changes are not explicit and endogenous in theory and analysis, the firm or the producer can play no important role in the economy. He has been assumed away and the moving force of the economy is transferred, as in most macro economic theory, to the state who controls total demand. This is of course an appealing economic doctrine for the central bureaucrate, although not well supported by empirical evidence. How could such a one-sided view gain such terrain in Academia? How could the firm simply be disregarded for such a long time? Analysis on the micro-to-macro model of the Swedish economy developed at the Institute suggests strongly that the organization of the dynamic market process and the endogenous long and short run supply decisions of firms are decisive for the performance properties of the entire economic system. Disruptions of the market pricing mechanisms caused by events in the world economy or by domestic policies too easily lead to the development of a mismatch of the supply and demand mixes, instabilities, misallocation of resources and inefficient utilization of existing human and capital resources. Economic developments both in the OECD area as a whole and in Sweden during the 70's do not seem to contradict these so far "theoretical" conclusions. The results in fact strongly underline the notions implicit in the publications by both Schumpeter and Keynes quoted above, namely that one should not unduly base one's views about the future on mechanistic reasoning from the supply side. As Keynes expressed it, the growth problem is an economic one. Where the economic machinery is properly organized and incentives and creativity are sufficient to produce the maximum total to everybody's desires we need not be overly concerned about seemingly prohibitive supply obstacles. To both Keynes and Schumpeter and some 150 years earlier Adam Smith this meant a policy application of what we have termed the *market technology*. Paradoxes abound, however. While the Swedish policy orientation during the successful postwar period was clearly a market one, most of the remedies suggested for the afflicted economies of the 70's are of an entirely opposite kind. Whichever road we opt for we have too little useful economic theory to bring coherence and relevant information to guide us. Theoretical research at the Institute should therefore be concerned with the micro decision units in the market processes of the economy, and empirical research will have to be oriented in the direction of micro-based information.

7. Can the Swedish Policy Model Really Be Abandoned?

The Swedish policy model started from the assumption that a decentralized market organization of the production system is efficient. The market forces, hence, should be stimulated through the design of the policy system.

This was the idea of industrial policy making in Sweden during the 50's. There should be no central bureaucratic meddling with the decisions at the investment and production levels. This principle also presumes that inferior firms are in the wrong market or are badly managed and should be allowed to go bankrupt or be purchased by somebody else on commercial grounds. The criterion for success should be the attainment of some internationally determined profitability target (cf. Figure 4). The Swedish economy was guided by these principles until the middle of the 70's. Regional policy ambitions around the middle of the 60's represented the first instance of side stepping the Swedish policy model.

Figure 4. *Real returns to total assets, before tax in U.S, U.K.*
and Swedish manufacturing
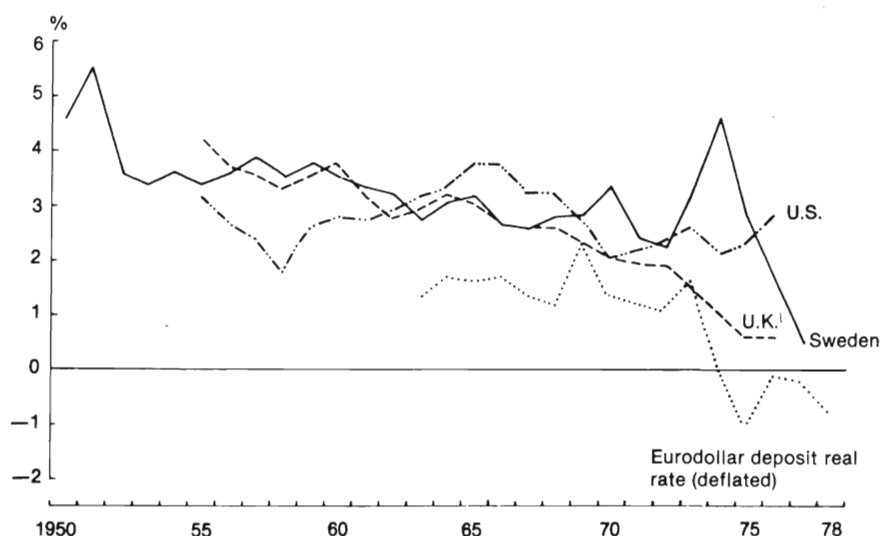
Deviations increased in number from then on as the economy began to lose momentum and vitality. Fortunately for Sweden, most industrial countries participated in this downward slide.

As pointed out earlier, the basic philosophy behind the Swedish policy model was formulated in the early 50's within the Swedish labor union movement. This philosophy formed the backbone of the economic policy of the Social Democrats through most of the 60's. There was no reason to socialize the means of production and to abstain from the benefits of an efficient market organization of the production system for reasons of doctrine.

With a high performance production system (''a capitalist engine'' to use

Schumpeter's term), ambitions of the policy authorities could be oriented towards the distribution of the total output produced.

a) A dual economy

Until the last few years a very small share of manufacturing output and assets was publicly owned. However, if one looks at the share of output in the economy that is protected from direct competitive pressure from foreign and domestic firms it is large by international standards. To this sector protected from market competition belongs almost the entire public sector that today employs more people than manufacturing industry in Sweden.

This does not imply that the Swedish people do not demand the services produced in the public sector. On the contrary. Health care, education and retirement schemes are demanded to an increasing extent with general economic wealth. This is well known from international comparisons. Nor is the concern about who runs the production of such services. The problem is how it is organized, namely under centralized authority within the public sector, production being effectively shielded from outside competition and hence likely to be less efficient than if organized on a more decentralized basis.

In this regard, the following conclusions may be drawn from the medium term economic assessment of the IUI:

First there exist better production solutions to the above problem than the highly centralized production organization within the public sector. The size itself of the public sector relative to the entire economy makes this problem critical. These solutions do not necessarily violate the ambitions concerning welfare and distribution set by Swedish Governments during the 70's. One reason for this is that a major share of income distribution policies in Sweden involves a reshuffling of benefits over the life cycle of the individual rather than between different individuals. This makes public financing alternatives based on individually based insurance principles adequate and efficient. Another reason is that a deteriorating macroeconomic situation is not a good basis for ambitious welfare and distribution policies.

Second, during the postwar period international competition directed towards Swedish goods production has increased strongly.

Third, financial systems of the industrial countries including Sweden have become increasingly integrated and efficient through the growth of an international credit system. This means, among other things, that the international interest rate has become a norm for investment calculations throughout the world and also in Sweden, to an unprecedented extent.

Fourth, the rapid growth of the public sector, sheltered from both domestic and foreign competition, has forced up wages throughout the system and reduced the relative size of the industry sector that has to absorb a growing structural adjustment burden that relates to the entire economy. The conflict between distributional ambitions and growth has finally led to

an economic impasse in the late 70's, the breaking of which may be critical for the future economic success of the Swedish economic system.

This points to three areas of public policy research that have emerged as critically important, namely:

— The economics of local government—by far the most expansive part of the public sector in most industrialized countries,

— the effects of taxation on the supply of labor, and

— instabilities created by positive and negative taxation and regulation in the market price determination process.

The public sector of advanced welfare economies can be characterized as a huge body for incomes policies. About the potential effects of such policies economic theory and empirical analysis until now provide little guidance. This is one reason why IUI research is moving in the direction of remedying this situation.

b) How to make public production more market oriented?

Guaranteed output and employment levels pose part of the problem of insufficient market guidance of the economy. Well into the 70's the demand for labor largely determined the level of employment in private industry. The Swedish policy model involved helping labor to move through labor market policies to jobs where they were most needed and obtained the largest marginal product in a market sense. Thus, employment in the agricultural sector was reduced from more than 600 000 employed in 1950 to just above 200 000 at the end of the 70's, labor migration on a scale far larger than the more modest adjustments necessary within industry today.

The so called "solidaric" wage policy on the part of unions-combined with a highly progressive income tax and rising payroll taxes—increased the speed of structural change. Those industries that were unable to maintain profitability through higher prices or increased labor productivity were simply forced to fade away.

Despite hardening international competition for a relatively shrinking export sector the adjustment burden was shared fairly equally between labor (unemployment, job change) and capital owners (losses) until the middle of the 70's.

The 70's signifies a break with this tradition in so far as labor began to be increasingly protected by legislation from being forced to move. Probably as important, however, were the extremely erroneous expectations about future labor needs and ability to pay high wages on the part of firm managers during the first round of extreme inflation in 1973/75. Add a new mood of "social responsibility" among business leaders when it comes to laying off workers and it is easy to see that almost the entire adjustment forced on the Swedish economy during the past oil crisis years has been absorbed by business profits, especially in the export sector.

An implicit "employment guarantee" of the Swedish type suggests that

exaggerated wage demands on the part of wage and salary earners involve smaller risks than before of losing a job. While the total adjustment pressure on the economic structure has increased, the sector that has to make the adjustment has shrunk relatively. Therefore, a new element of instability and tension has crept into the Swedish economic system. Of course, a situation like this is incompatible with as high and stable a long term growth rate as that prevailing during the 60's.

c) Socialization through the back door?

As a consequence many large corporations for the first time have come close to bankruptcy. The government has stepped in with subsidies to prevent large, concentrated shutdowns. (Shipbuilding is the prime example). A number of industrial companies have been "taken over" by the government in recent years for the same reason. Without a clear demonstration case where a large plant is allowed to close down on commercial grounds in the near future, it will become increasingly difficult politically to let inferior production plants die. Then managers and capital owners will probably interpret the relief from market pressure as a political insurance of their assets. Unpleasant internal rationalizations then will not be as immediately pressing. Sooner or later political pressure will build up for a public take-over of control of decisions regarding when and where to invest, since the Government is anyhow footing the bill. This will mean a development towards a new and inefficient organization of the economic side of society—away from the Swedish policy model. Perhaps this is part of the future vision of the semi-planned economy that Joseph Schumpeter once had for the efficient capitalistic system. Some of the West European industrial countries are already close to this scenario. The process began in Sweden by the government making individual business firms responsible for employment, a task earlier vested in the central government. This has in turn forced the government to step in and take over managerial responsibility in a growing number of companies—an absurd mismatch of competence and task.

Schumpeter viewed *capitalism, individualism and democracy* as interlinked concepts. Those who worried about the future of the market economy had equally good reasons to worry about the future of individual freedom and democratic processes—or in short, about the future of western industrial society.

Nobody knows much about the "workings" of such a "new" economy. Experience from countries close to it suggests, however, that it will not solve the current stability problems better than the capitalistic organization of the economy and that it is not likely to lead to a return to a higher and more stable growth rate.

d) What is the optimal degree of control?

This is not the end of the problem. Ambitions to regulate income and wealth

mean that the proceeds of the economic process are increasingly routed through the public sector at the expense of individual saving and wealth formation. The prime target has been to contain wealth accumulation in the stock market, while allowing and even enlarging limited household wealth accumulation elsewhere. As a consequence, pricing in the stock market has become erratic. The performance control function of the market has virtually disappeared, and sometimes the control of large and profitable corporate entities has been for sale at ridiculously low prices. The corporate tax system tends to lock up both investment resources and labor in firms that made high profits in the past, which often means a missallocation of resources when the competitive situation among firms is changing. Figure 5 indicates that the raw material producing sector in Sweden in fact has been attracting too large a proportion of total resources for years. At the same time, increasing inflation in combination with the high marginal tax rates and a high levered gearing rate have made it very profitable to divert resources from industry to private property investments. It is obvious that such a development aggravates the stability problems of the Swedish economy. Part of this problem complex will be studied in the joint taxation project between IUI and the National Bureau of Economic Research (NBER, Cambridge, Mass.), the Ifo Institute in Munich and the University of Birmingham recently started (see p. 00 and article by Bradford and Södersten on p. 00).

All these problems belong to the category of politically sensitive issues that economists have tended to shun but that they now have to deal with when the economic systems get jittery. Very large social values are at stake when fundamental systems changes are undertaken. One can safely say (1) that economists do not have the knowledge today to predict their economic effects and (2) that a fundamental reorganization of research in economics is needed to make this possible.

One can liken the new Swedish policy model of today (public sector and tax system in combination) with a huge income and price regulation system. It is still wrong to say that the market economy is now efficiently checked. Markets are everywhere present in some form: open, grey or black. The interesting question is under what conditions central government interference in the market process improves or worsens economic performance, when high economic growth and a limited skewness of the income and wealth distribution are the prime targets. What is the optimal degree of central interference in the market system?

The IUI medium term survey considered only the case when the existing market organization of the Swedish economy would be the prevailing system in the future. The time horizon for any other alternative to be instituted was too short. However, it discussed the economic consequences of and the likelihood that the Swedish economic political system by accident would slide into a bad version of a semi-planned economy, because of the apparent inability of the political decision makers throughout the spectrum to reach

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Figure 5. *Shares of the Engineering Industry and the Raw Material Based Industries in investment, employment, output and profits in Swedish Manufacturing 1954—1977*
Percent, moving 5 year averages

Raw material based industries (mines, steel and forest industries).

---- Engineering
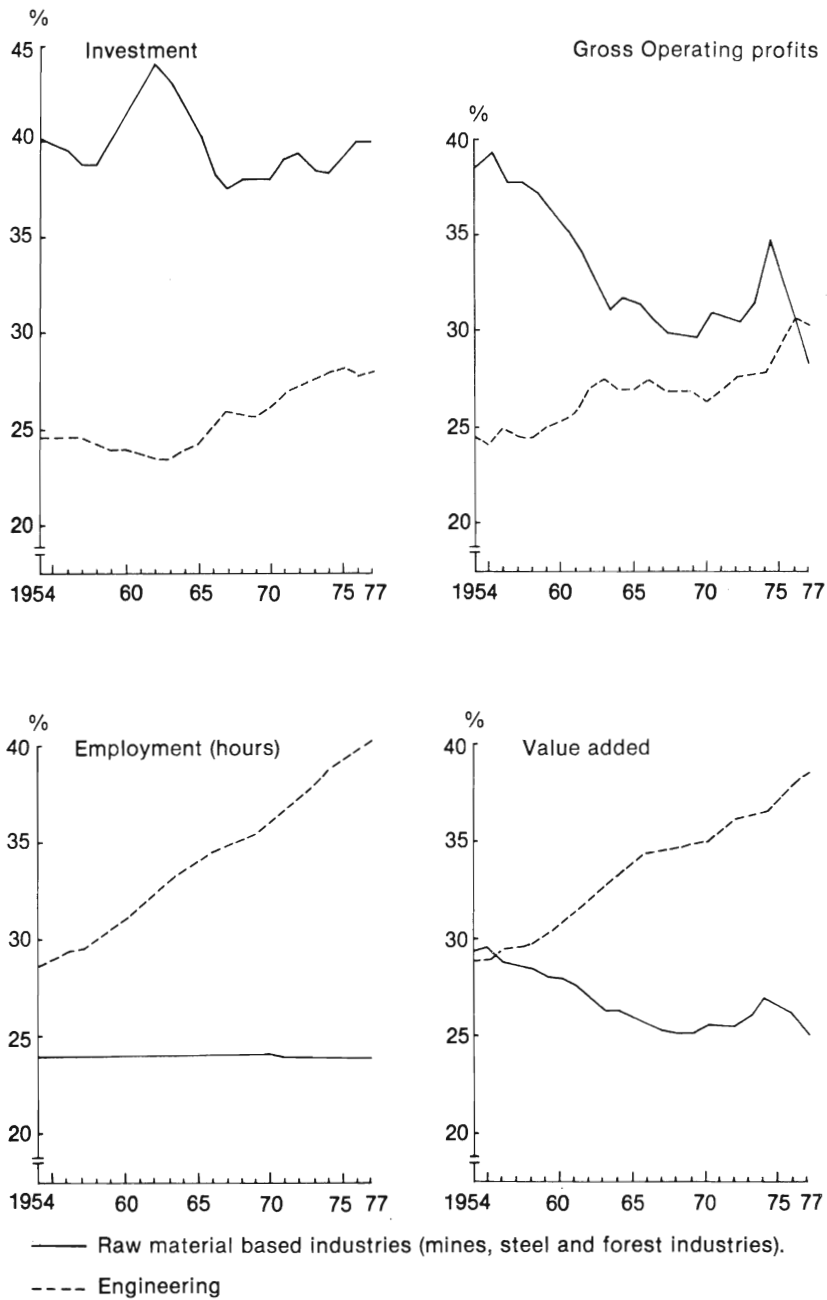
operational consensus on the unpleasant adjustments to be made. Three problems were analyzed in particular:
— What means are available to force more productive efficiency into the public sector? Is a disaggregation into competitive market units a solution?
— In what ways does inflation disturb the efficiency of the market allocation process?
— In what ways do taxes, subsidies and regulations affect the total resource allocation in the economy?

We have referred frequently to the "market technology". The word is perhaps a misleading one. Market forces are always at work, openly or not, depending on the legal and regulative system employed to contain them. We are talking of the efficient use of competitive forces in a decentralized economy and the systems organization that most efficiently reins in all egocentric decision makers to maximize everybody's well being: the "invisible hand" so to speak. The proposition is that there is a better solution than an explicit, central, visible hand.

The perfect market fiction of economics is of very little help in such endeavors. It says very little about the real, dynamic market process. For some peculiar reason, this seldom seems to have bothered the theoreticians. This means that the long term survey had to develop its own mode of analysis to come to grips with the market instabilities associated with the economic development in the industrialized countries since the end of the 60's. A theoretical framework of a market economy incorporates legal structures, tax rules, cultural patterns, individual desires and preferences, etc—all things that contain and regulate market forces. The conclusion is that such institutional factors have increasingly become the guiding forces of the economy at the expense of individual desires expressed through the market. There is no way, except through the political process, to tell whether this is a desirable development. Nor is there a coherent theoretical structure to analyze such problems. The contention is rather that developments during the 70's indicate that the distortive influences of Government interference in the market process are getting out of hand. New research techniques are needed to assess how the optimal market regulatory system should be organized and also to figure out what kind of economic well being is desired. For the time being at least, economics is methodically far removed from such pressing decision problems.

8. The Orientation of Future IUI Research

a) Education

The vitality and transformation that characterize the 40 year history of IUI reflect the competitive environment of the Institute. The research problems chosen have always been close to real world problems. This is the result of an

interested and understanding Board of Directors, competent presidents and a careful hiring policy. The entrepreneurial spirit and the willingness to "innovate" which often arise where people from different backgrounds mix have always permeated the Institute. The policy has been not to create a homogeneous research environment. No one sided way of looking at problems has had a chance to take roots. The reason is that for researchers and presidents alike the Institute has been an institution for education and investment in human capital for people en route to quite varied careers in business firms, organizations, bureaucracies and universities.

b) Internationalization

In recent years, IUI research has become internationalized. This has been considered necessary for the continued high quality and relevance of IUI research. A donation from the Marianne and Marcus Wallenberg Foundation in 1975 has made such a reorientation possible. The international contacts of the Institute have increased considerably. A number of economists —mostly from the U.S.—have spent periods of varying length at the Institute. The program has included: a) lectures and consultation, b) participation in IUI conferences, and c) direct engagements in IUI projects or own research at the IUI. It has been considered important to maintain flexibility as regards the practical arrrangements for each visit and to select persons who can make contributions to IUI's ongoing research.

With this activity several advantages follow. The Institute has acquired an international quality gauge which improves research performance. Personal and professional contacts are established. The international research frontier can be located, and "home grown" research that is not up to standards can be avoided. Finally, IUI research has acquired an indirect vehicle for dissemination. The new conference series of publications is one example. In fact, a growing part of IUI research is currently reported in international professional journals, and 20 percent of IUI books were sold abroad in 1979, representing a sharp increase.

c) Future research

The 80's will require IUI research to reach beyond the traditional domains of economic research. To preserve relevance at least two new areas have to be covered.

First, the dynamics of entire economic systems is an area of theoretical and empirical inquiry high on the list of demands for information from political decision makers.

Second, problems connected with the optimal hierarchial ordering of decisions in the economy are unavoidably on the menu of IUI research in the 80's, irrespective of the controversial nature of such problems.

It is paradoxical that so little attention has been paid to the dynamics of

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market processes in economics and the behavioral patterns of interacting institutions and individuals. Any attempts in that direction, advocated among others by Joseph Schumpeter, were quelched by the Keynesian revolution in ways that Lord Keynes himself would probably not have subscribed to.

The Institute has also followed the international fashion of research during the past 20 to 30 years. This is currently manifested in a relatively large proportion of traditional macro economic research. The demands to develop new techniques to analyze the micro to macro behavior of entire economic systems will mean a return to the kind of individual firm based research manifest in Dahmén's and Svennilson's scientific work in an early phase of IUI history. The micro-to-macro model developed at the Institute will be a necessary consistent framework for such analysis.

Systems research is a difficult and novel research activity at the level of an entire economy. A high level of risk taking ought, however, to be a guide line for research that, by definition, aims at the unknown. Such is at least research policy at the IUI. In other words, high quality is not synonymous with successful conclusion of all projects.

Fragmentary research as well as macro economics will be on the agenda for the future as well. While partial analysis can be justified in its restricted context, conclusions of a partial nature, however elegant and deep, may be entirely wrong when generalized uncritically to the national level. Rough macro relationships on the other hand conceal the dynamic features of an economic system and have been demonstrated not to be very useful when rare events occur. However, a wealth of fragmentary evidence on the operation of a national economy exists. The techniques and the efforts to synthesize such fragmentary evidence to reveal the broad overall patterns are missing. The depth of the analysis will have to be concerned with these interactive forces, not with further penetration into even tinier detail. This is difficult and it may not always be considered worthy of academic merit. The economics profession, however, cannot afford to hide behind the protective shields of academia. Economists have to come to grips with the new, difficult and challenging tasks that the policy makers have been facing for years with very little useful guidance.

Articles

The Content of Productivity Growth in Swedish Manufacturing
by Bo Carlsson

What role has technical change played in economic growth in Sweden? What are the major components of technical change? These are two of the main questions which motivated a study on the origin of the economic crisis of the 1970's which IUI conducted in collaboration with the Royal Swedish Academy of Engineering Sciences (IVA) with financial support from IVA and the State Board for Technical Development (STU). In this paper, an attempt will be made to summarize the results of this study with regard to the role and composition of productivity change in industrial growth in Sweden.

The Role of Technical Change in Industrial Growth

In a traditional production function approach to the measurement of economic growth it was found that increased inputs of labor (measured in man-hours) and capital (the stock of plant and equipment) account for only 57 % of the increase in Swedish non-residential business output over the period 1870-1964.[1] In this measurement, no adjustment was made for quality changes in inputs such as those associated with increased education of the labor force or improvements in capital equipment. Instead, such changes are included in the unexplained residual, often referred to as total factor productivity. By definition, the residual includes all changes in the volume of output which cannot be attributed to changes in the quantity of labor and capital. Thus, for the period 1870-1964, total factor productivity growth accounted for 43 % of the increase in non-residential business output in Sweden.

Åberg's calculations show that the contribution of total factor productivity growth to output growth has increased over time, namely from 42 % 1870-1913 to 59 % 1946-64. Table 1 shows the corresponding development during the postwar period for the manufacturing sector only. The rate of growth of total factor productivity reached a historical peak during the first half of the 1960's. The same is true for the rate of growth of industrial output. Since then the growth rates of both volume of output and total factor productivity have declined, but the *relative* contribution of total factor productivity growth has increased. During the last decade, almost the entire in-

crease (over 90 %) in the production volume can be attributed to total factor productivity growth. The increase in capital stock has been roughly sufficient to compensate for the decline in labor inputs (still measured in man-hours). Over the whole period 1950-76, 3/4 of the growth of output can be attributed to total factor productivity growth.

Table 1. *Production, factor inputs and total factor productivity in Swedish industry 1950-1976*

Period	Pro-duction	No. of hours worked	Capital stock	Total factor produc-tivity	Percentage of output growth attributable to total factor productivity growth
	Annual percentage				
	(1)	(2)	(3)	(4)	(5)
1950-55	2.5	0	5.5	0.9	36
1955-60	4.8	—0.2	4.6	3.6	75
1960-65	6.9	0	5.4	5.3	77
1965-70	5.1	—1.8	4.8	4.9	96
1979-75	2.4	—1.8	4.6	2.2	92
1950-76	4.2	—0.8	5.0	3.2	76
United States non-residential business sector					
1948-73	*3.6*	*1.0*	*2.9*	*2.2*	*61*

Sources: B. Carlsson *et al.*, *Teknik och industristruktur—70-talets ekonomiska kris i historisk belysning* (Technology and Industrial Structure—the Economic Crisis of the 70's in Historical Perspective). IUI, IVA, Stockholm 1979, p. 111.
The U.S. data have been computed from data presented by E. F. Denison, *Accounting for Slower Economic Growth, The United States in the 70's*. The Brookings Institution, Washington, D.C., 1979, esp. pp. 62-3.

For comparison, similar figures for the United States non-residential business sector 1947-73 are presented in Table 1. In this case, too, total factor productivity growth accounts for most of the increase in output, namely 61 %.

The Content of Total Factor Productivity Growth

What, then, are the major components of total factor productivity growth? The traditional methodology of growth accounting developed by Denison and others involves an attempt to break down the residual by taking into account changes at the macro level in labor force characteristics (age and sex composition and education), improved allocation of resources, changes in the legal and human environment, and economies of scale resulting from

larger markets. The remaining residual is then attributed mainly to advances in knowledge.[1]

It is worth noting, however, that even after taking account of these factors, a very significant portion of total factor productivity change remains unexplained. Another drawback of this method of productivity accounting is that it focuses almost entirely on the macro level, ignoring changes that take place at lower levels of aggregation, i.e. within branches of industry, within firms, etc. More specifically, the method offers no possibility of analyzing the impact at the macro level of specific technical changes that occur at the micro level. If one believes (as I do) that a thorough understanding of productivity change must encompass the whole micro-to-macro chain, a different approach is called for. In what follows, an attempt will be made to outline a more micro-based approach and to report some preliminary measurements.

In a completely static world, i.e. a world without technical change, any increase in production would be explained by increases in inputs of labor and capital, assuming that no other factors are relevant and that there are no measurement errors. In such a world, total factor productivity growth would be zero. But as soon as any change occurs, e.g. in the form of a new product or a new production process, the output volume which can be obtained with given resources increases, i.e. productivity is raised.[1]

The same result can be obtained if a better way to organize production is found, in which case production rises as a result of better utilization of the available resources.

Thus, total factor productivity growth includes new and improved production processes, rationalization of existing production facilities, organizational changes in production, materials handling, etc., closing of old plants whose productivity is below average, and opening up new plants with higher than average productivity. Changes in product mix, improved marketing and storage systems, etc., are also important components.

Therefore, at the bottom of total factor productivity growth there is some kind of technical change. But it is apparent that "technical" here refers to a much wider concept than is normally understood by that word. It includes a

[1]See e.g. E. F. Denison, *op.cit.*, pp. 2—3.

[1]Ideally, new products should be included in productivity growth, but this is not usually done due to practical problems of valuation. In practice, therefore, entirely new products do not enter in at all; inputs devoted to their production are treated as if they were used in the production of already existing products. Quality improvements in existing products are included in the measure of production only to the extent that they are reflected in increased resource use. Thus, they do not influence measured productivity in the producing activity but may, of course, do so at the aggregate level if they lower resource use in other lines of production or change consumer tastes so that production expands in activities with high or rapidly increasing productivity. For further discussion, see e.g. E.F. Denison, *op.cit.*, pp 10—11 and 124.

large spectrum of activities which may more appropriately be referred to as "entrepreneurial activity" in a wide sense.[1]

In order to capture the role of technical change in productivity growth, a disaggregation procedure has been used, the essence of which is shown in Figure 6.

Part of total factor productivity growth is attributable to changes in the composition of output. If, for example, industries with high or rapidly growing total factor productivity grow faster than other industries, total factor productivity at the aggregate level (all manufacturing) is raised. The same is true at lower levels of aggregation, i.e. the sector composition of output within branches of industry and the commodity composition of output within firms, etc, influence total factor productivity. By sorting out such structural changes, it is possible in principle to capture "purely technical change" at the micro level, i.e. changes which cannot be attributed to changes in composition of output. "Purely technical change" in turn may be sub-divided into new or improved products and new or improved production processes.

Breakdown of Total Factor Productivity Growth: Methodology and Some Quantitative Results

An attempt has been made to quantify the relationships outlined in Figure 6. As indicated in the figure, about 1/3 of total factor productivity growth at the aggregate (manufacturing) level and at the branch level turned out in our measurements to be attributable to structural changes in output. In measurement at the firm level and below, approximately one-half of total factor productivity change was found to be due to structural changes.

The breakdown of the residual (total factor productivity growth) at the aggregate level (i.e. all manufacturing) was done in the following way. The Swedish manufacturing sector was broken down into 13 industries. A production function of the Cobb-Douglas type but with variable elasticity of substitution was fitted to each industry, using data for the period 1950-74.[2] First, a hypothetical calculation was made in which the actual inputs of labor and capital in 1950 were augmented in each industry according to the actual rate of increase for each factor, respectively, in the entire manufacturing sector. Then these hypothetical values of labor and capital inputs were in-

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[1] What is referred to here is the concept developed more fully in E. Dahmén, *Svensk industriell företagarverksamhet* (Entrepreneurial Activity in Swedish Industry in the Period 1919—1939). IUI, Stockholm 1950.

[2] For a more detailed description, see G. Eriksson, U. Jakobsson and L. Jansson, "Produktionsfunktioner och strukturomvandlingsanalys" (Production Functions and Analysis of Structural Change) in *IUI:s långtidsbedömning 1976, Bilagor* (Supplement to IUI's Medium-Term Survey 1976). IUI, Stockholm 1977.

troduced into the production function and the rates of change of the production volume, total factor productivity, and the contributions of capital and labor were computed and finally weighted together (using the shares of total output of each industry).

Figure 6. *Composition of the residual total factor productivity growth at various levels of aggregation*
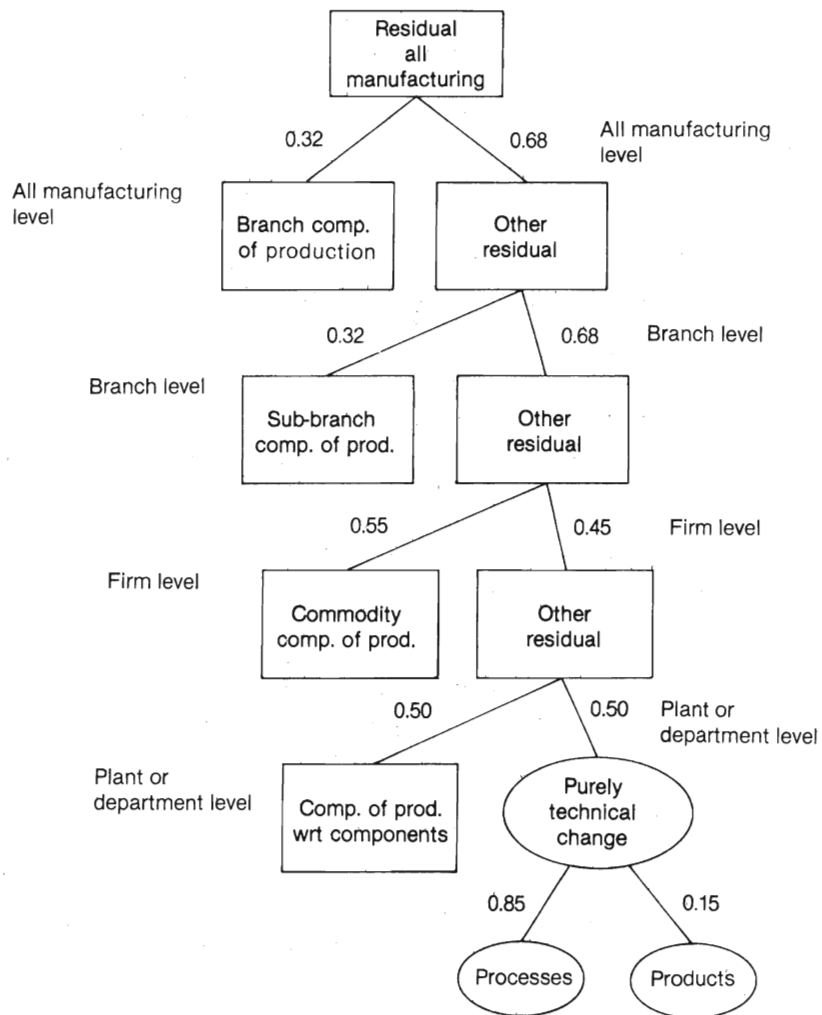
The difference between the actual rate of growth of industrial production and that computed as described here (i.e. holding the relative shares of total inputs constant for each industry) reflects that part of the production increase which is attributable to changing resource allocation among industries. The actual rate of growth of output turned out to be considerably higher than the hypothetical one. The contribution of total factor productivity growth was also much lower in the hypothetical case. The difference between the hypothetical and actual total factor productivity growth, divided by the actual rate of growth of output, turned out to be 32 %. This is the figure used in Figure 6 as a measure of the part of the residual in total manufacturing industry attributable to changing allocation of resources among sectors.

It is obvious that if a further disaggregation of the entire manufacturing sector had been done (comprising, say, a hundred sub-sectors rather than 13), an even larger share of the residual at the macro level would have been accounted for. The figure given (32 %) is therefore somewhat arbitrary, and this should be borne in mind when interpreting the results. This point is amply illustrated as we proceed down through the lower levels in Figure 6. As we leave the total manufacturing level, the figures given represent only examples. For obvious reasons, it is not possible to calculate the total contribution from structural changes at all levels of the economy.

At the branch level we have chosen to study the production of town gas in Sweden 1960-73.[1] During this period, some gas works were closed, while the remaining ones changed from coal to oil based gas production (i.e. coke was eliminated as a by-product). It was found that 32 % of the change in labor productivity (used here as a proxy for total factor productivity) was attributable to the transition to the new process and to the closing down of old plants, while the remaining 68 % was due to rationalization of plants with given basic technology.

The estimates at the firm level in Figure 6 refer to a particular Swedish multinational firm, but the general order of magnitude of the estimates has been confirmed in investigations of other firms as well. In the particular firm studied here, the trade liberalization in Western Europe, reflected i.a. in the elimination of tariffs, necessitated a re-organization of production within the firm in order to take advantage of economies of scale. Rather than having several plants around Europe, each producing roughly the same assortment of products, it was found advantageous to reduce the number of plants and to specialize production in each plant on a narrower assortment. In the Swedish part of the firm, this change is roughly approximated by the transition from batch oriented (functional) organization to product oriented (line) organization. The latter turned out to have considerably higher productivity

[1]See A. Grufman, *Teknisk utveckling och produktivitet i energiomvandlingssektorn* (Technical Change and Productivity in the Energy Conversion Sector). IUI, Stockholm 1978, pp. 32—46.

than the batch technology, and this fact in combination with the increased share of line-oriented production explained 55 % of the total productivity change 1974-78. The remaining 45 % would be attributable to other productivity changes ("everyday productivity change") in both old and new plants.

Turning now to the lowest level of aggregation, the plant or department level, our results are based on detailed studies of several departments in a particular firm. For the departments concerned, we have obtained information on all changes affecting productivity during one year, namely 1977. A summary of the information given for one of these departments is provided in Table 2. It can be seen that in this case, about half of the productivity change was directly associated with the introduction of automatic machines as opposed to manually operated ones. However, the introduction of these machines also triggered a number of other changes which may be regarded as organizational but which were ultimately dependent on the new machines.

However, productivity changes need not depend on investments. In a classic example, provided by Erik Lundberg, labor productivity in the steelworks of Horndal was found to increase by almost 2 % per year for 15 years without any investment other than replacement of worn-out equipment.[1] Although Lundberg did not study the reasons for this increase in

Table 2. *Labor productivity change in one department of a Swedish multinational firm, 1977*

	Man-years saved on yearly basis	Labor productivity change %
Introduction of automatic lathes	8.4	4.6
Integration of earlier separate lathing operation with new machines	2.1	1.1
Elimination of control function	1.0	0.9
Integration of earlier separate stamping operation with new machines	1.4	0.9
Transfer of control function to operator	0.8	0.5
Increased No. of machines for maintenance personnel	0.9	0.5
Simplified routines for machine adjustment	1.0	0.5
Total	15.6	9.0

Source: B. Carlsson *et al.*, p. 126.

[1]E. Lundberg, *Produktivitet och räntabilitet* (Productivity and Profitability). Studieförbundet Näringsliv och Samhälle, Stockholm 1961, pp. 130—1.

detail, he attributed it in general terms to technical change, increased education of the labor force, increased willingness, interest, and ability to work thanks to improved working conditions, improved organization, possible effects of increased scale of production, better adjustment of production and sales to changing prices, etc. In other words, the "Horndal effect" is synonymous with total factor productivity growth.

More recently, the IUI has obtained access to detailed information on a similar case, also involving an iron works. The plant was built in 1952, and our data cover the period up to 1978. During this period, no net investment was made, only replacement of worn-out equipment. In spite of this, labor productivity increased by 3.7 % per year, i.e. production per man-hour more than doubled over the 26-year period. The reasons for this increase turned out to be the following. Through increased demand for the firm's products (probably due partly to the firm's own sales efforts) it became possible to utilize the installed capacity of the plant more fully without hiring more labor. The increased production facilitated an increase in the batch size for each product, the labor saving effect of which was further enhanced by a certain reduction in the product assortment (i.e. increased specialization) and by increased standardization of the products. Thus, in this case the Horndal effect is dissolved into increased economies of scale, better organization and "learning by doing".[1]

As pointed out earlier (see p. 35 above) new or improved products are not usually counted in our output measures. This means that insofar as measured productivity change involves "purely technical change", it reflects changes in production processes primarily and changes in products only in a very minor way. It is an open—and highly interesting—question to what extent the "true" productivity development is distorted by this. In our research on technical change and productivity at the Institute we have tried in at least one case to measure the relative contributions of product and process changes to productivity growth. In doing this, the measure of output is extended to include the value to the user of product improvement (which ideally should not be deflated away in measuring output). The activity studied involves the production of a certain type of machinery from 1950 to 1977. Through economies of scale involved in increasing the size of the machine and in the size of each order and increasing the speed (measured in R.P.M.) at which the machine operates (implying smaller physical dimensions for the machine with a given capacity), labor productivity increased by 6.5 % per year. At the same time, certain changes in product design led to an increase of machine capacity of approximately 1 % per year. Thus, if output is measured in terms of the capacity of machines produced, (rather than simply the number of units), labor productivity increased by 7.5 % per year. Thus, 1/7.5 or about 85 % of this was attributable to changes in the production

[1] An in-depth study of this material is in progress within the IUI.

process and the remaining 15 %, to improvements in product quality.

It is impossible to know whether or not this quantitative relationship between product and process technical change is representative for manufacturing in general. The same difficulty applies to most of the other measurements presented here as well. It is obvious, therefore, that this approach does not immediately offer an alternative to the conventional macro-oriented growth accounting method. However, it does seem to offer new insights, for example concerning the importance of structural change in productivity growth. The impression one gets from the results presented here is that about half of measured productivity growth at the firm level consists of changes in output mix in connection with increased specialization and increased utilization of scale economies. This implies that more than half of the measured productivity change at the sector level must be attributed to such structural changes, and at the macro level even more. Thus, the resource allocation aspect is heavily emphasized.

Another advantage of the method suggested here is that it indicates a way to conceptualize technical change at the micro level in a macro context. It shows that it is possible, at least in principle, to obtain a more thorough understanding of total factor productivity growth at all levels of aggregation. The Horndal effect need not remain a mystery.

However, a serious problem that still remains is that of developing a framework or model for analyzing technical change at the micro level *quantitatively* (not only qualitatively) in a macro context. Some considerable steps in this direction have already been taken in the Institute's micro-to-macro model.[1] In the next section, an attempt will be made to outline how this is done.

Micro-to Macro Analysis of Productivity Change

The micro-to-macro model uses individual firms as units of observation. Firms interact with each other in both factor and product markets. The productivity concept used at the firm level is that of labor productivity, rather than total factor productivity. Labor productivity in the firm is raised in connection with new investments. The size and allocation of investment at the firm level (as determined endogenously by the market mechanism in the model) influence aggregate productivity growth. Thus, to calculate labor productivity change at the macro level, one needs observations on labor productivity of new plant and equipment relative to old. This requires data on labor productivity in new (best practice) plants over time.

[1] See G. Eliasson (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 1978:1. Stockholm 1978. See also G. Eliasson, *Technical Change, Employment and Growth—Experiments on a Micro-to-Macro Simulation Model of the Swedish Economy,* IUI Research Report No. 7 1979.

In connection with the IUI-IVA study, such information was collected. A questionnaire was sent out to a number of persons (mostly engineers and members of the Royal Swedish Academy of Engineering Sciences, IVA), each with a great deal of experience of a particular technical field, covering at least the period since 1955.[1] Among other things, these persons were asked to supply data on the development of labor productivity in best-practice plants in their own field over time. The results are shown in Table 3.

The table provides a number of examples of the labor productivity change that took place between plants built in 1955 and plants built in 1965, in the first column, and in the second column between plants built in 1965 and plants built in 1975. In all cases the figures refer to newly built plants after debugging. The table indicates, for instance, that in ethylene production in the petrochemical industry, labor productivity in a new plant built in 1965 was almost three times as high as in plants built in 1955, implying a 14.5 % annual change in best practice labor productivity. However, an ethylene plant built in 1975 had only 80 % higher labor productivity than one built in 1965, i.e. best practice labor productivity increased by a more modest 6 % annually. An inspection of the table shows that the figures in the first column are higher in most cases than those in the second column.[2] The table shows, therefore, that the rate of labor productivity change measured in these terms has slowed down in many areas in the last decade relative to the earlier decade.

In the table, the examples have been grouped according to the industrial classification used in the Swedish micro-to-macro simulation model. Thus, it would appear that the rate of technical progress was higher in the extractive and raw material processing industries than in other industries in the period 1955-65. For the 1965-75 period it is more difficult to distinguish any such differences among industries. The information is simply too scanty to draw any firm conclusions in this regard.

Simulations carried out on the model indicate that the rate of increase of labor productivity in best-practice plants 1955-75 must have been considerably higher in the raw material processing industries than in other industries; otherwise it is not possible to reconcile observed data on investment with the observed average labor productivity increases in each industry.[3] The figures obtained in these simulations are given in parentheses in column 3 in Table 3. For all manufacturing the estimated rate of increase (a weighted

[1] The questionnaire was sent to 58 persons out of which 47 responded. However, 10 persons answered only part of the questions or referred to other persons.

[2] In one area, marine turbines, labor productivity actually fell between 1965 and 1975. This is due to shorter production runs during the crisis in the world shipping and shipbuilding industries from 1974 on. It is somewhat doubtful, however, if the figures given can be said to represent current best practice, since there has been no new plant built in recent years.

[3] B. Carlsson and G. Olavi, *op cit.*

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Table 3. *Examples of labor productivity change in new plants 1955-1975*

Industry	Productivity Measure	Annual percentage change		
		1955-1965 (1)	1965-1975 (2)	1955-1975 (3)
Extractive industries				
Iron ore industry	Tons of rock/man hour	7.9	3.4	5.6
Forestry (logging)	M³/working day	7.2	11.6	9.4
Raw material processing				(5.9)
Pulp and paper industry	Tons/man hour	11.6	0— 3.4	5.6 7.4
Ethylene production	Tons of ethylene /man hour	14.5	6.0	10.2
Intermediate goods				(3 0)
Commercial steel	Tons of crude steel/ man hour	6.0	4.8	5.4
Steel pipes	Tons/man hour	3.6	5.8	4.7
Steel forging	Tons/man hour	6.5	2.5	4.5
Investment goods				(2.6)
Heat exchangers	m² of heat absorbing surface/man hour	7.2	7.2	7.2
Hydro-power generators	MVA/man hour	1.0	3.6	2.2
Marine turbines	kW/man hour	7.2	—4.5	1.2
Shipbuilding	Tons of steel/man hour	7.2	1.0	4.1
Consumer goods				(0.4)
Pharmaceuticals	Tons/man hour	1.4	2.5	1.9
Food industry				
Canning and freezing	Tons of finished goods/man hour	13.1[a]	4.3	5.4
Sugar industry	Tons of beets/man hour	2.7[b]	4.1	3.4

[a]Refers to 1960. [b]Refers to 1960—1970.

Sources: B. Carlsson *et al*, p. 141.
B. Carlsson and G. Olavi, "Technical Change and Longevity of Capital in a Swedish Simulation Model", in G. Eliasson (ed), *A Micro-to-Macro Model of the Swedish Economy*. IUI Conference Report 1978:1, IUI, Stockholm 1978.

average) amounts to 2.5 % per annum. The figure for the raw material processing industry (5.9 % per year 1955-75) coincides fairly well with the figures for the paper and pulp industry. This industry makes up a very large part of the whole raw material processing sector. But otherwise there seems to be little correspondence. The labor productivity growth rates do seem to be somewhat higher in the intermediate goods industries listed in the table

than in investment goods, in keeping with the simulation results. But the discrepancies seem fairly large for the consumer goods industries.

Of course, we are dealing here with only a small sample of activities in each industry. It is impossible to know how representative they are. But as far as we know, this is the first attempt that has ever been made to measure technical progress in best-practice plants over a wide spectrum of activities. Thus, even though it is not yet clear what conclusions may be drawn, this is a line of inquiry which we intend to pursue in our further research.

Some Thoughts on the Slowdown in Productivity

In interpreting the table, several more things should be borne in mind. The technologies listed are relatively old and well-established. If a new technology follows an s-shaped pattern over time (that is, if the rate of technical progress as reflected in labor productivity is slow in the beginning, fast during a certain period, and again slower as the technology matures) the slowing of technical progress in the last decade indicated in the table is only to be expected; it is, therefore, not necessarily true that *overall* technological change has slowed down in the last ten years. It may well be rapid in other areas not listed in the table. e.g. in electronics.

Another thing that should be kept in mind is that the economic growth rates in most industries have been generally lower after 1965 than before. This is true not only for Sweden but also for other industrial countries. It is argued in Carlsson-Waldenström (1980)[1] that for a number of reasons the major benefits of certain basic innovations introduced on a large scale after the Second World War had been reaped by the mid-1960's. In addition, the lion's share of the resource re-allocation resulting from the opening up of trade and factor markets after the War had also been exhausted during the 1960's, along with cheap energy supplies. This led to a decline in economic growth in the industrialized countries in general.

One implication of this slowdown in economic growth is that the rate of introduction of new technologies (i.e. innovation) has slowed down even if the rate of invention has not. The considerable fall in the investment rates in most industrial countries after 1973 would indicate that this has been true. But in addition to this, some of the findings in this paper suggest that many productivity changes are not linked directly to investment but are only indirectly triggered by them—e.g. organizational changes necessitated or facilitated by new investments. This would mean that the slowdown in investment may have led to a slowdown in other productivity increasing activities as well.

Also, the slowdown in economic growth may imply that it has not been

[1] B. Carlsson and E. Waldenström, "Technology, Structural Change, and Economic Growth in Sweden—A 100-Year Perspective", IUI, Stockholm 1980. (Paper presented to the OECD conference on Industrial Politics for the 80's. Madrid, Spain, May 1980).

possible to increase the scale of new plants at the same rate as earlier. A detailed investigation of some of the technical fields listed in Table 3 showed that economies of scale have increased at a much higher rate than domestic or even world demand for the products involved.[1] It seems to be true at least for many Swedish firms that while in the 1960's domestic demand was large enough to accomodate at least one plant of internationally competitive scale, that is often no longer the case.

Therefore, many Swedish firms have found it difficult to expand their production facilities to take advantage of increasing economies of scale. This has significantly reduced productivity growth. In addition, it appears that the lure of large scale economies in combination with overly optimistic demand forecasts in the early 1970's led to overinvestment and global overcapacity in several heavy industries—industries whose rates of productivity change appear to have been relatively high previously.

Conclusion

In his recent book *Accounting for Slower Economic Growth—The United States in the 1970's*, E. F. Denison came to the startling result that even after adjustments for input quality changes, economies of scale from larger markets, etc., the remaining unexplained residual ("Advances in knowledge and n. e. c.") for the period 1973-76 was not only smaller (by 2.1 percentage points) than during 1948-73 but was actually negative (-0.7). Having considered some seventeen hypotheses concerning the causes of this reversal he confessed that "what happened is, to be blunt, a mystery" (p. 4).

It would be misleading to suggest that the present paper offers a fully developed alternative to the conventional approach to productivity measurement. Nevertheless, in this paper I have tried to take a step in that direction by outlining a methodology which can at least complement the conventional approach and which is especially designed to open the way for micro analysis of productivity change without losing sight of the macro side.

Practical considerations concerning data availability constitute sufficient reason to start productivity analysis at the macro end and then try to reduce or eliminate the unexplained residual through various adjustments. However, in order to really understand the components of and forces behind productivity change, one needs to start at the micro end, even though this creates difficult data problems.

The first part of the paper is concerned with breaking down total factor productivity growth through disaggregation to lower and lower units of observation in order to separate out structural from "purely technical" changes. Some preliminary measurements indicate that more than half of the total factor productivity growth at the macro level is attributable to changes

[1]B. Carlsson, "Technical Change and Productivity in Swedish Industry in the Post-War Period", IUI Research Report No. 8. IUI, Stockholm 1980.

in composition of output at lower levels. In a few case studies the components of "purely technical" changes at the micro level are analyzed.

The second part of the paper is devoted to a framework for analyzing how productivity changes at the micro level can be aggregated to the macro level, using a micro-(firm-) based macro simulation model of the Swedish economy. The results emphasize the importance of economies of scale and suggest that one reason for the slowdown in productivity advance in the last decade is that scale economies have far outpaced the growth of firms' markets and made it difficult for them fully to take advantage of scale economies.

Thus, the approach presented here emphasizes the role of resource allocation in determining productivity and economic growth. A large part of the rapid productivity gains in the 1960's are attributable to large investments in connection with a re-orientation of the economy to international markets. To what extent the decline in productivity growth in the 1970's may be attributed to a relative exhaustion of the re-allocation potential or to interference with the market mechanisms influencing resource allocation still remains an open question, however.

Local Government and Economic Growth[1]

by *Bengt-Christer Ysander*

One of the most striking features of the Swedish economy today is the growing dominance of the local government sector. Out of the national income almost one third is channelled through the budgets of local governments, who employ one fifth of the labor force. Local government spending has been outrunning the GNP with a growing margin, doubling its share over the last twenty years.

Organizational power has grown with the money. In the postwar period there has been a gradual concentration of the decision-making process. While the number of local government has decreased to about one-fourth in the last fifteen years—24 counties and 277 municipalities right now—some of the most expansive areas of service production, like mental health care and secondary schools, have been taken over from the state by local government.

The sphere of responsibility of local governments has, therefore, widened significantly both in form and in content. Individual counties and municipalities today have much greater possibilities of independent long-term planning and procurement and of negotiating with the central government and with large corporations. Along with the successive diversification of the services supplied there has also been a widening of their area of responsibility through their increased participation in distribution and stabilization policies.

Throughout this expansion the local governments have retained a degree of financial independence of central government, which is rather high by West European standards. Of their total gross expenditures only about one-fourth is paid by state grants, while local taxes make up for 45 %, fees and user charges 20 %, with loans and capital income making up the remaining 10 %. For high-lighting the degree of tax-financing of the local services, another way of calculating may however be more relevant. If one includes only net profits—or losses—of public utilities, net new borrowing and net transfers from the state (i.e. subtracting taxes and fees paid by local governments to central government) another financial picture emerges. Of the total local government spending directed toward the private sector about 90 % was paid by taxes of which only one sixth was channeled through the state budget. The remaining 10 % was made up of some 7 % for fees and only about 3 % of new loans.

The growing importance of local governments as an independent force in

the Swedish economy has motivated an econometric study within IUI, from which the historical data and perspectives presented in the following are extracted.

A Long-Term Perspective

Figure 7 represents total local government expenditure as a percentage of GNP at factor prices. The figure shows how a relatively slow rate of growth during the 1920's, 30's and 40's was replaced, from the beginning of the 1950's, by a dramatic expansion that is still continuing.

Figure 8 shows how local government expenditures were distributed among spheres of activity in the years 1913, 1953 and 1977. The relative development pattern changed from the period between the two world wars to the postwar period. While, for example, in the earlier period education and industrial activities tended to increase their share of total local government expenditure, they now account for a successively smaller part of the budget. Provision for housing, however, shows a development in the opposite direction, while medical and health care has, during the entire period, increased its share of total expenditure.

Figure 9 represents the three largest and fastest growing categories of local government expenditure—education, medical and health services and social services. The latter two categories are the only ones that, in terms of averages for the whole period, have expanded faster than total expenditure.

Medical and health services have been growing fast since the 1930's, while the growth rate of social service expenditures has substantially exceeded that of total expenditure only during the beginning of the 1930's (the years of the Great Depression) and the 1970's. Expenditures on education have throughout followed the same pattern of growth as total expenditure.

Figure 10 presents in a corresponding manner the development of local government expenditures on those spheres of activity that are, in a wider sense, inter-connected with physical planning. During the inter-war period, expenditure on housing increased at a rate slower than that of total expenditure but has made up for this by growing faster after World War II.

Expenditures on roads and highways showed similar development until the beginning of the 1970's but have since been given a low priority both by central and local government. Finally, expenditures on justice and law enforcement, municipal planning and general administration show a relatively irregular development where, for example, stagnation during the latter part of the 60's gave way to an accelerated expansion during the 70's, particularly marked in the case of expenditure on general administration. Part of the accelerated increase of this group of expenditures is probably explained by the numerous mergers between municipalities in the early 70's.

Figure 7. *Local government expenditure as percentage of GNP, 1913—1980*
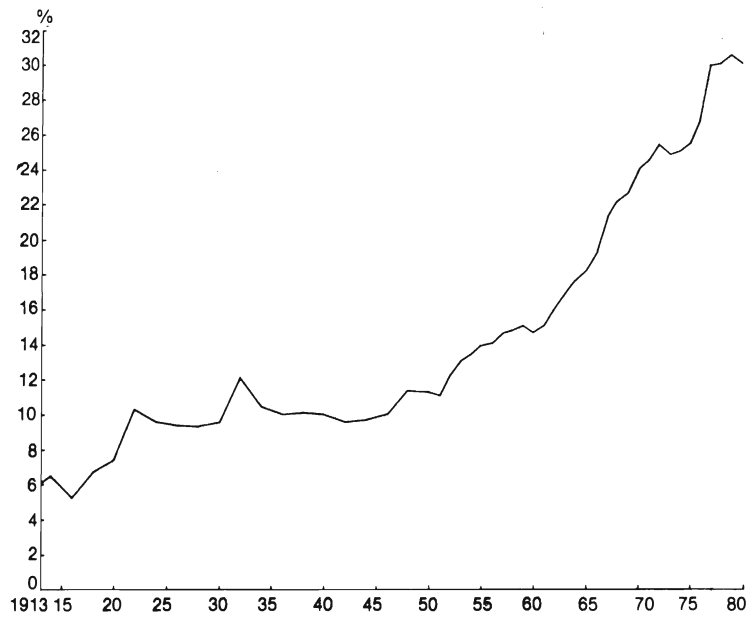
Figure 8. *Distribution of local government expenditures on types of activity, 1913, 1953 and 1979*

1. Education	5. Roads
2. Medical care	6. Housing
3. Social welfare	7. Fire protection
4. Justice, administration and municipal planning	8. Churches
	9. Industrial activities
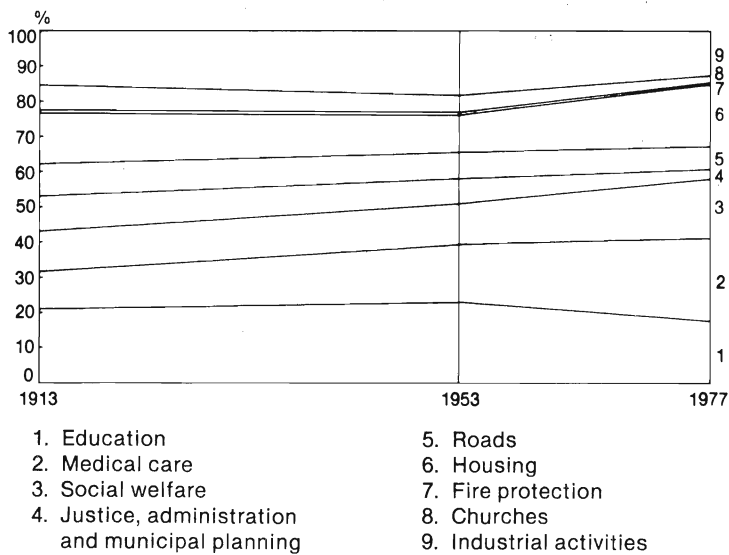
Figure 9.   *Local government expenditure for education, medical care
and social services, 1913—1977*
Index 1913 = 100

Index
100 000

50 000

25 000

10 000

5 000

2 500

1 000

500

250

100

1913 15   25   35   45   55   65   75 77

——— Total expenditures
—·—·· Medical care
———— Social welfare
·········· Education
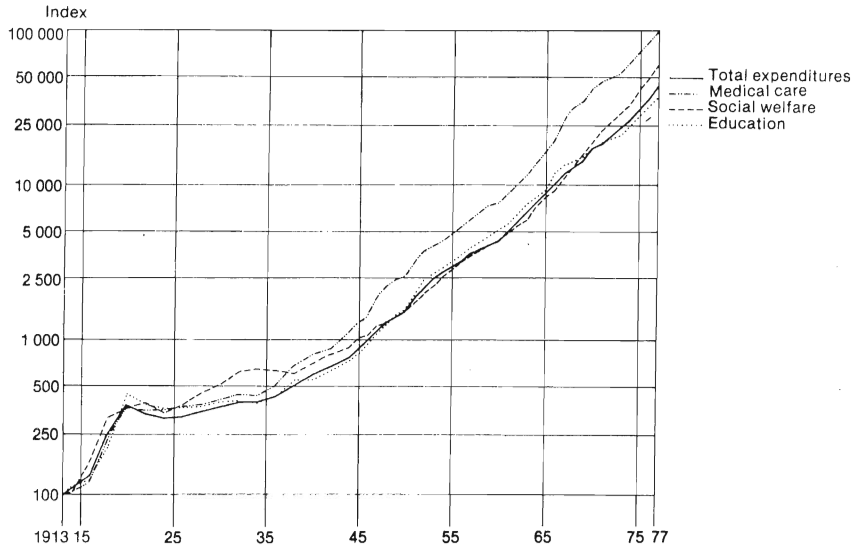
Figure 10.   *Local government expenditure for justice and law enforcement,
general administration and municipal planning, road services and
housing, 1913—1977*
Index
100 000

50 000

25 000

10 000

5 000

2 500

1 000

500

250

100

1913 15   25   35   45   55   65   75 77

——— Total expenditures
———— Housing
—·—·· Roads
·········· Justice, administration
and municipal planning

50
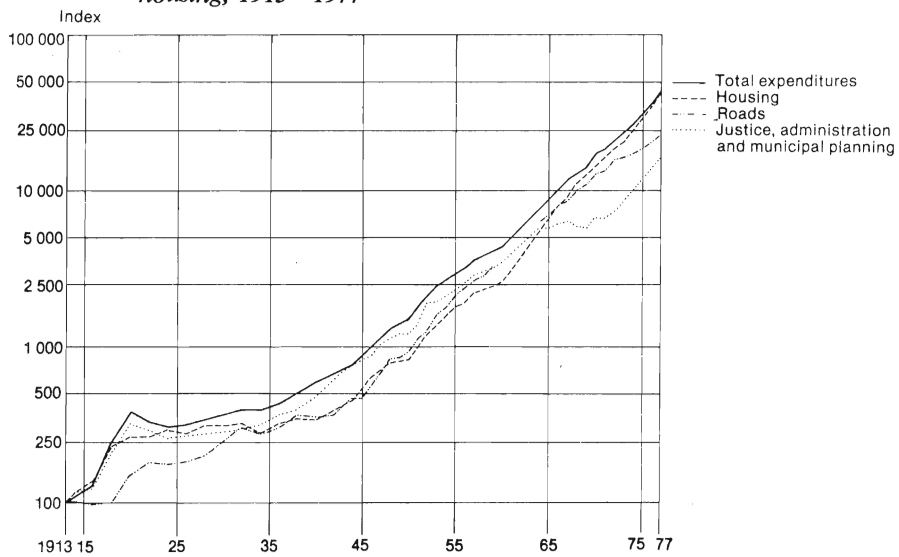
The Swedish Welfare Strategy

The restructuring of the Swedish economy in postwar years has been rapid although not exceptional compared to other western countries. Over the thirty years since 1950 agricultural employment has been drastically reduced and corresponds today to less than 5 % of the total labor force. The matching increase has occurred in the services, particularly in the public services, which doubled their share of GNP and trebled their employment share. The major part of this expansion took place within the local government sphere—in education, medical care and social welfare. Manufacturing industry meanwhile kept its share both of GNP and employment relatively unchanged. The enlarged public service provision was almost entirely paid for by taxes, which trebled relative to GNP. It was again local governments that were responsible for the major part of the tax increases.

What has given the Swedish welfare state a characteristic profile of its own is not only the size of the public budgets, although it tops the list of international statistics in this respect, with roughly two-thirds of all income being channeled through public budgets. There also is what could be called a characteristic Swedish welfare strategy concerned with the ways of using public budgets for redistribution purposes.

On the spending side there are two major alternatives as to how to make social services freely available. Government can do it by subsidized insurance schemes or by direct income transfers to cover the necessary costs, leaving at least part of actual choice of service procurement and use with the individual. Alternatively, the government may assume monopolistic responsibility for service supply and distribute the service free of charge but constrain and regulate the access. Sweden has in postwar years very decisively chosen the latter course. Compared with major West European countries like Italy and France both the postwar growth and the level reached of public transfers relative to total income have been rather moderate in Sweden. It is instead the public price subsidies, in particular the tax-financing of the social services, that have grown exceptionally fast and now dominate the public budgets. This choice of strategy has at least partly been induced by the prevalent notion of free medical care and social welfare services having a more substantial redistributive impact than any alternative payment schemes.

The importance in Swedish public budgets of price subsidies in this general sense is demonstrated by Figure 11, where total public spending has been divided according to the "mode of distribution" into expenditures for traditional collective goods like defense, justice and central administration, price subsidies dominated by local government provisions and finally income transfers of which a major part are social insurance payments from central government.

A marked concern for redistribution also characterizes the Swedish "taxing strategy". In all countries the importance of indirect taxation has grown

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in the postwar period along with income transfers—partly due to the enlarged coverage of social insurance. As shown in Figure 12 the personal income tax in Sweden, however, has increased in step with total taxes—in contrast to the changing tax structure of i.a. France, Italy and West Germany. The central government part of the income is highly progressive, although it is hard to know how much of actual redistribution that is effected. We can also see from the figure that the households nowadays receive almost as much transfer money from government as they pay out in income taxes.

Figure 11. *Mode of distribution of public spending in Sweden 1950—1980*

% of GNP
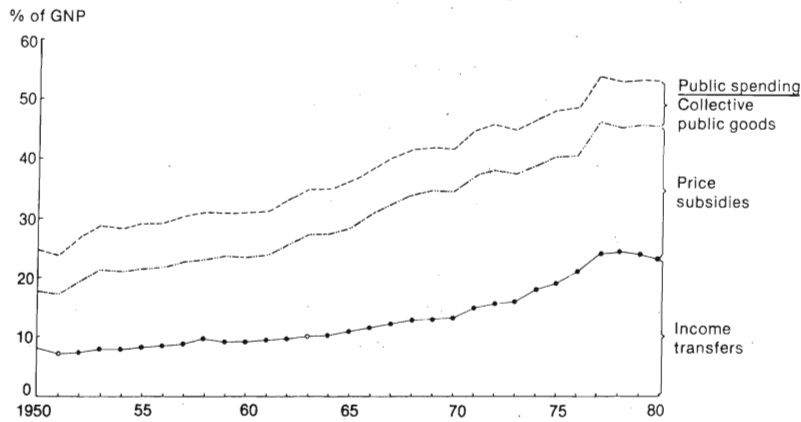
Figure 12. *The taxing strategy*

% of GNP

- - - - Total taxes
- · - · - Personal income tax
●——● Personal transfers
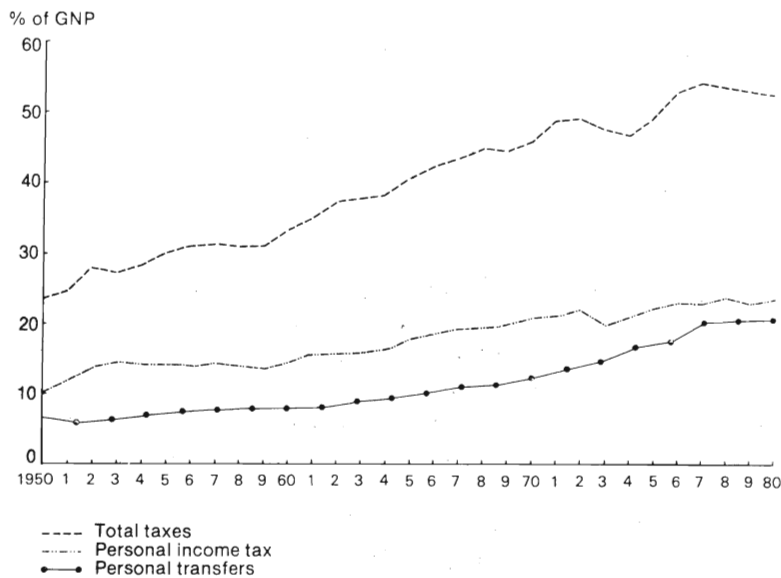
Is Local Government Spending Out of Control?

In recent years there has been a rising concern in Sweden about the development of local government expenditures. The rapid expansion of local government services has often been blamed not only for pushing up the tax scales and with that inducing various disruptive tendencies towards tax evasion and tax adjustment. It has also been suggested that local government competition in the labor market has contributed significantly to wage inflation and recruitment problems within Swedish industry. The accelerating cost increases in the social services during the latter part of the 70's have been interpreted by many as signs of a falling productivity due to agencies creating too many new service jobs as part of the efforts to keep down open unemployment.

Looking ahead into the 80's one of the few things we can be fairly certain about is that local government expansion cannot be allowed to continue at the rate established during the 60's and 70's. We have neither the goods nor the people to sustain that kind of growth. Even in absolute amounts the annual increases in local government resources will have to be somewhat reduced if we want to get rid of our external payment problems before the 90's and avoid having in the meantime to lower real net wages and private standards. However, making the municipalities change fast enough into a slower growth-track in spite of good liquidity and rather rigid long-term plans may well prove to be one of the crucial economic problems in the next few years.

Researching the Problems

It is against this background that IUI has started an econometric study of local government behavior in Sweden. An explanatory model of local government spending—split up into 16 different categories—and taxing decisions has been estimated on data from the 60's and 70's. Based on this model, various specific problems are now being researched. Service production data are tested to detect possible changes in production "techniques". The effectiveness of central government grant policy in various areas of service production will be measured.[1] By integrating the local government model into a large growth model for the total economy we are able to study interactions between local government expansion and growth in other sectors.[2] Finally the model has been used for projection of actual local government spending and taxing into the 80's.[3]

[1] A first attempt of a closer look at the effects of grants on local government expenditures and employment has been presented in: E.M. Gramlich and B.-C. Ysander, *Relief Work and Grant Displacement in Sweden*, IUI Working Paper No. 30, 1980.

[2] One such projection was documented and discussed in: B.-C. Ysander, "Offentlig ekonomi i tillväxt" (Public Service Growth), Chapter 8 in *Att välja 80-tal* (IUI Medium Term Survey 1979), IUI, 1979.

[3] Cf. i.a. T. Nordström and B.-C. Ysander, "Offentlig service och industriell tillväxt" (Public Service Supply and Industrial Growth), IUI Research Report No. 11, 1980.

Swedish Export Performance
A constant-market-share analysis
by *Eva Christina Horwitz*

Swedish Export Growth

Until the mid-60's there was a steady increase in the share of Swedish exports in world trade. From 1965 Swedish exports have increased somewhat less than exports of other countries and consequently the share in total world trade is decreasing. In 1977-78 the Swedish share of world exports was at about 75 % of the 1970 level independent of whether the calculation is based on the value of total exports or on a volume basis, i.e., after adjustment for price increases. This development contrasts sharply with that of industrialized countries in general which have kept their share in world trade on a volume basis, as illustrated in Figure 13, in spite of a slight loss in value terms due to the increase in oil prices.

Figure 13. *Shares in total world trade, 1953—1978*

—— The Swedish share of world export 1953—78

- - - - Industrialized countries share of world exports
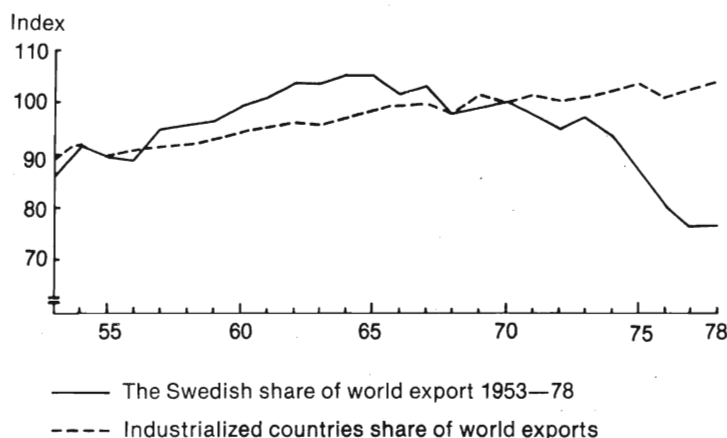
A Constant Market Share Analysis[1]

A country's export performance as compared to trade in general depends to a great deal on its specialization in commodities and on the destination of its exports. World demand is buoyant for some goods and sluggish for some others, and markets differ with respect to the growth rate of imports. A

[1]For a closer description of the method used see E.E. Leamer and R.M. Stern, *Quantitative International Economics*, Allyn and Bacon, Boston 1970, pp. 171—183.

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country surrounded by slow growing neighbors is consequently likely to perform less well than the world average. An often heard explanation for the sluggish development of Swedish exports since the mid 60's is that Swedish exports are handicapped in two respects, being concentrated to slowly growing markets and specialized in raw materials, i.e. products for which the increase in world demand is relatively slow. In this article we set out to test the validity of this statement by an analysis of Swedish exports to the main trading partners at a rather disaggregated commodity and market level. We look systematically at differentials between export potential and actual exports using a method called a constant-market-shares analysis whereby changes in a country's trade through time are decomposed into four components: changes due to (1) the growth of world trade (2) differential product growth (3) differential market growth and (4) a residual or competitive effect.

The difference between the actual change in exports and that calculated under constant market shares assumptions is an "unexplained" residual which we attribute to changes in the competitive position.

The point of reference in this analysis is arbitrarily chosen to be an unchanged share in world markets. This norm could of course be questioned. However, the purpose of a constant market share analysis is precisely to clarify some ambiguities that give rise to much discussion as to the actual development of market shares and decline in the Swedish competitive position.

If we use a high level of aggregation, we regard exports as a single good destined to a single market and consequently disregard the commodity and market composition. The increase in exports is divided into one part explained by the increase in total trade and a residual due to changes in competitiveness. A measure of market shares like the one illustrated in Figure 13 is an example of this "one level" analysis. This is of course a rather crude measure of market shares. Some improvement is obtained at a "two level" analysis whereby the effect of commodity composition is singled out. In this article we proceed to the third step. Export growth is adjusted for commodity as well as recipient country effects. The method used has some obvious limitations. The outcome of the calculations will depend on the periods chosen and the level of the commodity breakdown. Also slightly different results as to the relative effects of commodity and country composition can be obtained depending on whether we start the adjustment by one or the other of these effects.

Swedish Export Performance 1963—1977

The constant market shares analysis in this article is based on annual data for Swedish exports by commanding groups to 14 OECD countries in

1963-77.[1] Swedish imports to each market is compared with total imports to each country using a breakdown of 41 commodity groups.[2]

We calculate the overall trade growth factor, i.e., the relation between the change in total imports to this OECD area and Swedish exports to the same countries. The commodity factor singles out the change in total imports from Sweden that would have occurred had imports from Sweden increased at exactly the same rate as total imports within each of the 41 commodity groups. The third step calculates the change in imports that would have occurred had imports from Sweden to each of the 14 countries in each commodity group changed to the same degree as total imports. The difference between the change in Swedish exports and total import growth that cannot be explained by these two factors is defined as a loss of competitiveness.

When applied to trade data for 1963 to 1973 and from 1973 to 1977 the above method of calculation would attribute the decline in market shares to all three factors.

Looking at Table 4 the loss of market shares between 1963 and 1973 in total OECD imports was marginal. If we compare the actual change in Swedish exports with the increase necessary in order to maintain total market shares at an aggregate level, the increase in exports would have had to be 8.5 percent higher over the 10 year period than the actual outcome. In contrast to assumptions generally made this decline cannot be explained by the commodity composition of Swedish exports. The identification of the contribution by the commodity factor rather suggests that the outcome was 10.3 percent better than expected. The slow-growing raw material sectors must have been more than compensated by an increase in exports of engineering products. The main factors behind the decline in market shares in this period was the geographical distribution of exports and a decline in competitiveness, as reflected in the unexplained residual.

The decline in market shares in the 1973-77 period was much more pronounced than over the preceding 10 year period. The increase in exports needed to maintain constant market shares in OECD imports would had to be 8,400 million dollars as compared to 4,800 million dollars, i.e., 75 % higher than the actual increase. The value of exports in 1977 should have been 25 % higher in order to maintain market shares. During this period the increase in total imports to the OECD countries was inflated by the sharp increase in prices and in particular oil prices. It is, however, striking that very little of the market losses can be explained by the commodity composition factor. A concentration on slowly growing markets and a loss of competitiveness accounts for most of the decline.

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[1] OECD Trade by Commodities Ser. B.

[2] Basically 2-digit SITC except in the case of SITC 3 (Mineral fuels, lubricants and related materials) and SITC 4 (Animal and vegetable oils, fats and waxes).

Table 4. *Swedish export performance 1963-1973, 1973-1977*
Million U.S. dollars

Swedish exports[a]	1963 2 625	1973 9 774	1977 14 592	
	1963—1973		1973—1977	
	Value	Percent	Value	Percent[b]
Actual change in exports	7 149		4 818	
Calculated increase[c]	7 758		8 435	
Total difference	— 609	8,5	—3 617	75,0
Difference explained by				
Commodity composition	742	10,3	— 364	— 7,6
Market distribution	— 667	—9,3	—1 469	—30,4
Competitive effect	— 684	—9,6	—1 784	—37,0

[a]to 14 OECD countries, covers 75 % of total exports.

[b]As percentage of actual change in exports.

[c]Potential increase in exports on the assumption that Swedish exports to 14 OECD countries had increased at the same rate as total imports to these countries, i.e., constant market shares assumption.

Table 5. *Swedish export performance 1963-1977*
Annual data. Million U.S. dollars

	Swedish exports[a] (1)	Actual change in exports (2)	Calculated increase, assuming no market loss (3)	Change due to commodity composition (4)	Change due to market distribution (5)	Change due to "competitiveness" (6)
1964	3 102	477	326	84	103	— 36
1965	3 364	262	275	14	27	— 54
1966	3 585	222	384	37	—166	— 33
1967	3 803	218	208	30	— 27	7
1968	4 118	314	494	75	—196	— 59
1969	4 693	574	639	101	4	—170
1970	5 621	928	702	70	144	12
1971	6 100	479	649	— 145	—137	112
1972	7 094	995	1 159	— 35	—181	52
1973	9 774	2 680	2 668	— 49	22	—116
1974	12 353	2 578	3 863	—1 037	146	—394
1975	12 789	437	118	156	— 5	168
1976	13 869	1 080	2 052	192	—240	—924
1977	14 592	723	1 942	— 251	—240	—728

[a]to 14 countries, covers about 75 % of total exports.
Note: The sum of columns 3—6 = col. 2.

In Table 5 we have proceeded to a constant market share analysis of yearly changes in Swedish exports 1963-77. The table underlines the fact that the decline in market shares over time is neither constant nor attributable to a single factor. In 4 years (1964, 1967, 1970 and 1975) Swedish exports to

OECD countries grew faster than total imports to these markets, i.e., the figure in col. 1 exceeds the "potential export" figure in col. 2. On the other hand, losses of market shares were particularly heavy in 1966, 1968, 1976 and 1977. The factors behind the losses in market shares vary over time. The losses in the 1960's were largely due to market distribution factors or unexplained, i.e., reflecting loss of competitiveness. In the first half of the 1970's losses were due predominantly to the commodity composition of Swedish exports. In drawing conclusions from Table 5 one should have the supply side of exports in mind. Losses in competitiveness could come about as a result of production limitations as well as relatively weaker demand for Swedish exports. 1965 and 1969 were years when the loss of competitiveness could be attributed to a high degree of resource utilization. The last three years in the table are of course of particular interest. In 1975 Swedish exports increased whereas total OECD imports grew very little. The table suggests that most of the increase in 1975 can be attributed to increased competitiveness. We know, however, that this was a year when Swedish export prices increased more rapidly than those of other countries. The consequent loss of competitiveness is evident in the 1976 and 1977 figures where exports would have had to increase at twice and three times the actual rate in order to maintain market shares. Table 5 shows that only a very minor part of this loss can be explained by the commodity composition or market distribution of Swedish exports. The major part of this loss of market shares can be attributed to a decline in competitiveness.

The Internationalization of Swedish Industry: Determinants and Effects

by *Birgitta Swedenborg*

The multinational operations of national firms have been a subject of intensive study in the past decade. It has been a challenge for international trade theory to explain the large two-way factor movements across national borders occasioned by the multinational corporations. It has posed a challenge to policy makers having to decide whether to allow or restrain the rapidly growing foreign operations of national firms.

These questions are among those addressed in a recently completed study at the IUI.[1] This study uses unique census data on foreign investment by Swedish firms and contains an analysis of the determinants of foreign production by these firms and the effects on home country exports of allowing foreign production.

Swedish Foreign Investment in an International Comparison

Swedish manufacturing industry has, relative to its size, very large foreign operations. In 1974 employment in foreign manufacturing affiliates of Swedish firms amounted to 24 percent of manufacturing employment in Sweden. This represents a doubling of foreign relative to domestic manufacturing employment since 1960. It also means that Swedish manufacturing industry is more multinational than its better known counterpart in the United States.

Earlier empirical studies of the determinants of outward investment have almost exclusively been based on data for the U.S. for the simple reason that comparable data for other countries have not been available. The result has been that theories of foreign investment have tended to be formulated on the basis of observations of the patterns of U.S. direct investment or of the characteristics of the often very big U.S. multinational companies. But how valid are these hypotheses for the foreign operations of firms from other countries? And what can we learn from comparative analyses?

Comparisons of the relative size and pattern of outward investment by the U.S., the U.K. and Sweden reveal differences which are due to differences in investing country characteristics such as the size of the country, traditional commercial ties with foreign countries and comparative advantage in production, where the latter is shown to also affect "comparative advantage" in producing abroad.

For example, the fact that Swedish firms have relatively larger foreign sales and also a higher propensity to supply foreign markets through exports

[1]The Multinational Operations of Swedish Firms. An Analysis of Determinants and Effects. IUI, Stockholm 1979.

than U.S. firms can be explained by the difference in size between the two countries. A smaller domestic market has meant that growth has inevitably led to foreign expansion for Swedish firms. The shorter distance to major foreign markets for a small European country, coupled with the fact that the home market is not large enough to allow firms to exploit economies of scale in production, explain why Swedish firms have higher export shares than U.S. firms. These differences are brought out in Table 6.

Table 6. *The relative size of Swedish and U.S. manufacturing abroad*

	Sweden			United States	
	1965	1970	1974	1966	1970
Property, plant and equipment expenditures: foreign manufacturing affiliates in % of domestic manufacturing	n.a.	22[a]	n.a.	17[b]	20[b]
Employment: manufacturing and sales affiliates in % of domestic manufacturing	18	24	30	16	n.a.
manufacturing affiliates in % of domestic manufacturing	16	20	24	13	(18)[c]
Net sales by manufacturing and sales affiliates in % of total foreign sales[d]	31	32	32	60[e]	62[e]
Imports from manufacturing affiliates in % of total imports manufactures	0	1	2	13	16

[a]Only majority-owned manufacturing firms. The change in the book value of property, plant and equipment 1969-70 plus depreciation has been related to the manufacturing industry's investment in these assets according to *Nationalräkenskaperna*.

[b]Foreign investment includes investment in minority-owned manufacturing firms abroad and consequently is somewhat overestimated in relation to the corresponding Swedish figure.

[c]The figure is an estimate of total imports from affiliates based on information from a sample survey.

[d]*Net sales* by foreign affiliates is defined as total sales, less imports from parent firm in the investing country. *Total foreign sales* is defined as affiliate net sales plus total manufacturing exports.

[e]Information on foreign sales is based on a sample survey and therefore underestimates foreign sales by all firms.

n.a. = not available.

Sources: *Survey of Current Business*, Oct. and Dec., 1967, Sept. 1971, Jan. 1973; *U.S Direct Investment Abroad* 1966, Part II; *Statistical Abstract of the United States*, 1971; U.S. Tariff Commission (1973); *Nationalräkenskaperna, Industri, Utrikeshandel*.

Country differences in the industry composition of foreign manufacturing suggest differences in the competitive advantage of firms of different national origin in producing abroad. Swedish foreign manufacturing is relatively concentrated in industries in which Sweden has a comparative advantage as a producing and exporting country, while U.S. manufacturing abroad is relatively larger in industries in which the United States has large export shares. This may seem paradoxical, since favorable conditions for a certain kind of production in a country should mean that such production stays in the country. A possible explanation, however, is that superior know-how has been accumulated in industries in which the country has a comparative advantage and that this know-how can be exploited even when such production is moved abroad, e.g., in response to tariff or transportation costs.

The Determinants of Foreign Manufacturing

An economic analysis of the determinants of the propensity of Swedish firms to export and to produce abroad, respectively, indicates that Swedish firms have a competitive advantage in production, both at home and abroad, that requires relatively large proportions of skilled labor.

A high R&D intensity does not play the same role, however. Instead, a high R&D intensity appears to introduce a bias towards exporting and against producing abroad. This result is consistent with the notion—based on the theory of the product cycle—that innovative firms are able to supply foreign markets through exporting, at least in the initial stages of product or process development, and choose foreign production only when production costs between countries weigh more heavily in the total cost calculus.

The choice between exports and foreign production in serving foreign markets depends on a number of other factors as well. A high capital intensity and scale economies in production work against foreign production by Swedish firms. Different host country characteristics bring out the influence of "market proximity"—an euphemism for distance related costs—on the location of production.

Wage differences between countries do not, in general, affect the location of production as one might expect. Swedish firms turn out to have a higher propensity to produce in countries with high wages than in countries with low wages. The interpretation of this finding must be that high wage countries have other characteristics which *more than* compensate for the high wage level. Among these compensating characteristics are, on the supply side, a high labor productivity and, on the demand side, relatively large markets for sophisticated manufactured products.

Apart from the influence of relative wages, the results are not unexpected. On the whole, they agree with those obtained in similar studies of U.S. manufacturing investment. There is, now, a concensus on the general

characteristics that are conducive to multinational activity. Foreign investors have a comparative advantage in producing abroad that is based on superior know-how—a unique product or unique production or marketing know-how. Foreign production tends to replace exports when production costs abroad are favorable and barriers to trade are high.

The Effect on Exports of Controls on Foreign Production

The international location of production and the volume and pattern of trade are determined simultaneously and essentially by the same set of factors. This means that one can speak of the influence of these factors on both foreign production and trade but one cannot speak of "the effect of foreign production on trade", since one cannot speak of the effect of an endogenous variable. One can ask, however, what would be the effect on exports from the home country if quantity controls were imposed on foreign production? Then, the question is how much larger or smaller exports would have been *if* foreign production *had not been allowed* to increase?

The effect on exports depends on the extent to which foreign production causes the price abroad to fall and on whether home country exports are mainly substitutes for, or complementary to, foreign production. If increased foreign production leads to a lower price abroad and exports are mainly substitutes, exports will be smaller than they otherwise would have been. In a longer time perspective the effect depends, in addition, on whether the firms' growth in foreign markets indirectly enhances their overall competitive position, e.g., because increased firm size allows larger investments in R&D and a specialized and geographically dispersed distribution and servicing network.

Problems in Measuring the Export Effect

The meaning of "the effect on exports of foreign production" and how it should be measured is far from clear to those that take part in the public policy debate. Arguments are often based on the observed simple correlation between exports and foreign production, such as that shown in Table 7.

The table reveals a negative correlation between the growth of Swedish exports and the growth of foreign production by Swedish firms in different groups of countries 1965-70 and 1970-74. Export growth has been relatively modest in countries where foreign production growth has been relatively high, as in the Common Market, in Europe outside the trading blocks (mainly Spain) and in Latin America. The negative correlation is stronger for the 1965-70 period. In the latter period it is insignificant.

An opposite relationship emerges in a comparison of exports and foreign production across firms. The simple relationship between the firms' exports and foreign production is strongly positive, as shown in Figure 14.

Table 7. *Net sales by foreign manufacturing affiliates relative to Swedish exports in different countries, 1965-1970 and 1970-1974*

| | Production[a] by subsidiaries in relation to total foreign sales[b] (%) 1970 | Percentage change | | | |
| | | Production by subsidiaries | | Swedish exports[c] | |
		1965— 1970	1970— 1974	1965— 1970	1970— 1974
Industrial countries	29	83	93	66	96
EEC	42	103	96	52	87
EFTA	15	992	78	79	97
of which					
Nordic countries	12	120	94	79	93
Other Europe	11	327	368	39	175
North America	37	15	94	76	83
of which					
United States	36	9	89	70	79
Other industrial countries[d]	42	104	74	40	124
Developing countries	31	76	78	92	140
Africa	5	10	224	128	74
Asia	22	7	26	94	162
Latin America	49	131	90	69	121
World	29	82	91	69	101

[a]Manufacturing affiliate sales less imports from Sweden.

[b]Affiliate output plus Swedish exports.

[c]Excluding exports to Eastern Europe.

[d]Australia, New Zeeland, South Africa.

In neither case does the relationship indicate what the effect is on exports of allowing foreign production. The relationship appearing in the table is likely to reflect mainly the influence of factors affecting the location of production, e.g., trade barriers and comparative production costs. The relationship pictured in the figure reveals the influence of factors which positively affect both exports and foreign production, e.g., differences among firms in the degree of competitiveness.

In order to answer the question of how much larger or smaller exports would have been if foreign production had not been allowed to increase it is necessary to hold constant all other factors which influence both exports and foreign production. In addition, it is necessary to isolate the effect which runs from foreign production to exports from the one which runs in the opposite direction. Earlier studies have not done this in a satisfactory manner. Although the method used in the Swedish study presented here is superior in principle, the results should, nevertheless, be interpreted with caution.

Figure 14. *Simple correlation between exports and foreign production by Swedish firms*
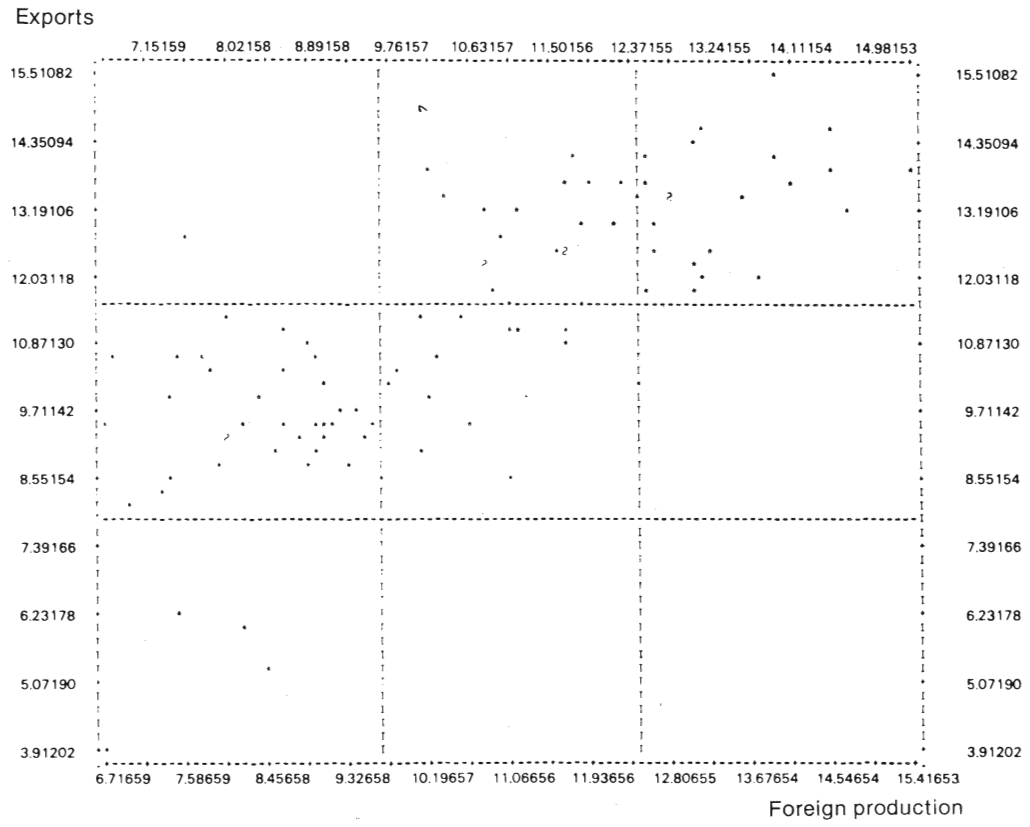
Empirical Results for Swedish Firms

Regression estimates (based on estimation in two stages) of the effect of an exogenous change in foreign production by Swedish firms—e.g., as a result of decreased controls—show the following. Increased foreign production leads to increased exports of products which are complementary to foreign production and reduced exports of products which are non-complementary to, or substitutes for, foreign production. The net result of these opposite effects is a small positive effect on the exports of foreign investors. It comes to about 6 cents for every one dollar increase in foreign production. Since the estimated effect is non- linear (it is linear in logs), this is the *mean* effect. Also, it is the short-run effect of marginal changes in foreign production. For larger changes and in the longer run it is also necessary to take account of the probably positive effect of foreign growth on the overall competitiveness of foreign investors. This effect has not been estimated, however.

But why, one might wonder, have the implications of foreign production for home country exports been the subject of such controversy — not just in Sweden but in other investing countries as well — when the effects are so small? In large part it has been due to uncertainty regarding what the alternative to foreign production would have been and the extent to which foreign markets could have been served through exports. The results for Sweden indicate that they could not have been so served, that without foreign production these markets would largely have been lost to the firms. By producing abroad these firms not only gain in foreign market shares through foreign production, but they actually succeed in exporting somewhat more than they could otherwise have done. This result is important, not because increased exports is a goal in itself (it is not) but because it eliminates one of the stated reasons for the current regulation of foreign investment by Swedish firms.

Industrial Profits—Their Importance and Evaluation

by *Thomas Lindberg*

Profitability - a Difficult Concept

The Medium-Term Survey (LB 79)[1] recently published by the Institute concluded that the Swedish economy is suffering from a serious structural adjustment problem. The rate of expansion, for instance, of industrial investment and growth during the 1970's has been far below the levels of the 50's and 60's and biased towards low growth, low profit industries.

The study points at several deficiencies in the way the "profits system" functions. It deals partly with the extremely depressed profits situation during the crisis years of the 70's and partly with the allocation of total investment in the Swedish economy. This article will attempt to shed some light on the difficulties involved in using the traditional concept of profits as an indicator of industrial performance. The effects of corporate taxation will be emphasized in particular.[2] In addition, some of the material used as a basis for the financial analysis carried out in LB 79 will be presented.

In a market economy information on ex-post profitability and its components is interpreted by economic agents and used inter alia for projecting expected profitability on investment. These rate of return criteria, as perceived by the firms before tax and by the shareholders after tax, will ideally guide resources to those investments that yield the highest returns and the highest total growth. For this to happen, a number of requirements on the performance of markets themselves have to be satisfied. Some of these, especially those related to taxes, will be dealt with here. Some have been discussed elsewhere in this volume.[3]

Important questions are whether, in fact, decentralized investors interpret the rate of return criteria in roughly the same way. For instance, what conflicts exist between the objectives of individual firms and those of society at large?

In Sweden and in other countries there has been a lively debate as to whether industrial profitability of real capital investments has really fallen in the long-run. As shown in Figure 15 profitability can be measured in a number of different ways. Different purposes and problems normally require different definitions. An "objective" approach, trying them all also fails to give any clear picture of the development. The chart shows both a measure of real returns for intertemporal comparisons and a measure of

[1] See p. 83.

[2] These issues are dealt with in the project "Corporate Taxation, Profitability and Growth" (p. 99).

[3] See for instance articles by G. Eliasson, and D. Bradford & J. Södersten in this volume.

Figure 15. *Profitability in Swedish Manufacturing industry, 1952—1975*

%

1. Nominal rate of return on total capital incl. nominal capital gains.
   Longevity of capital 37 years.
2. Gross profits after calculated depreciation, in relation to total
   capital. Longevity 10 years.
3. Real rate of return on material capital incl. real capital gains.
   Longevity 17 years.
4. Operative rate of return on total capital excl. capital gains.
   Longevity 37 years.
5. Real rate of return on total capital incl. real capital gains.
   Longevity 15 years.

nominal returns to facilitate an evaluation of alternative financial placements at any given point in time.

The considerable statistical (and theoretical) difficulties involved in achieving a good measure of any one of these variables explain why the result is often a compromise (as in Fig. 15, curve 2) or a hybrid. How, for example, should price variations in inventories be correctly captured when converting from a nominal to a real rate of return? And how does one choose the correct instrument for measuring the capital invested that corresponds to a particular income stream?

The problem of evaluating capital is as topical today as ever before. A common assumption is that the value of installed capacity reflects the cost of replacing it with new equivalent capital goods—the replacement value. This is often misleading, particularly if applied to individual firms in an aggregate. Take the Swedish shipyards as an example that barely succeeded in obtaining a value added exceeding the wage bill in 1978. What does it mean to calculate a rate of return for them with accumulated price-corrected net investments according to a fixed depreciation scheme? However, for an (external) observer with imperfect information, it seems to be one of the better approximations available for *sufficiently large aggregates*. The crucial problem is to calculate the *economic* life span of capital, i.e., how large should the depreciation allowances be? Can one reasonably assume that the depreciation factor does not change over time? One can reject almost any hypothesis about profit performance depending upon the assumptions one makes regarding depreciation allowances.

The Micro Perspective

Economic activity is often studied at the macro-level using aggregate data relating, for instance, to the whole industry or one of its sectors.

However, working with averages for an entire sector or industry means that one misses the influence of the structural change that occurs continuously. The indices studied will then present a misleading picture of the dynamics of development if there are considerable variations among individual companies.

A study at the individual company level allowing a closer examination of the dispersal pattern is, therefore, an important complement for explaining the development of aggregates.

In order to achieve this a data base built on generally available statistics for the largest Swedish industrial corporations has been created at the Institute, to be used together with other individual firm information in the micro-to-macro model (see p.104). In some instances these statistics have been complemented by information gathered directly from the companies involved. Results will be presented here for 37 corporations (or groups of companies) selected from the data base. During the period 1971-75 these com-

Figure 16. *Total capital employed at various rates of real return* [a]. 37 large industrial companies

▷ Average rate of return in manufacturing   ——— 1965

▶ Average rate of return for the 37 companies   - - - - 1970

➤ Real rate of interest on industrial loans   ······· 1975

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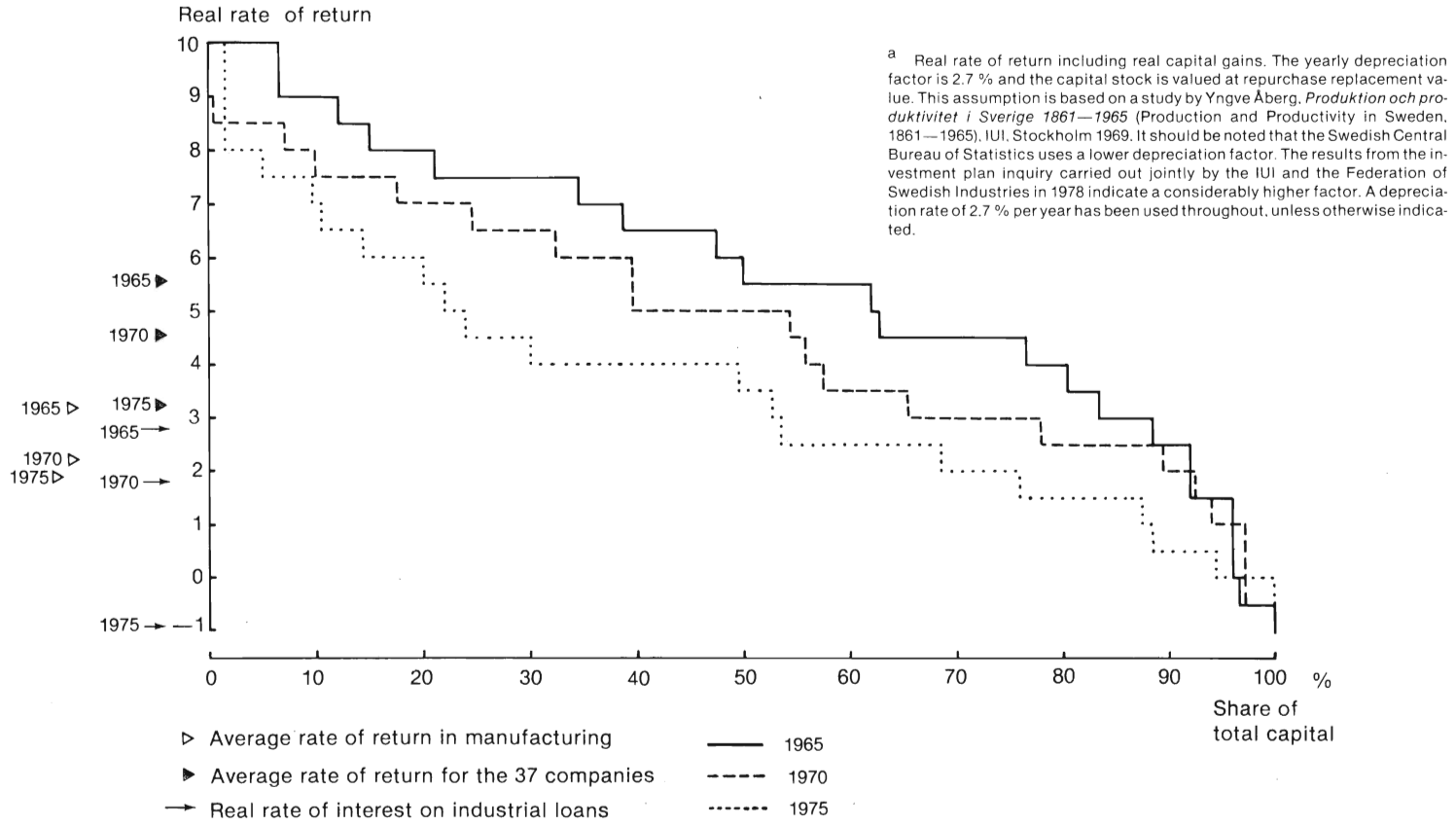
panies accounted for, on average, 50 and 54 percent respectively, of the manufacturing industry's total sales and balance sheet totals. Keeping the reservations regarding the conceptual difficulties associated with profitability measures in mind, we shall take a closer look at one of these measures at the company level.

Figure 16 indicates the distribution of the rate of return with respect to total assets employed for the group of large corporations in 1965, 1970 and 1975. The decline in profitability that can be observed is partly due, however, to 1975 not being a peak year in the business cycle as were 1965 and 1970. In addition, the distribution tends to concentrate around the average in 1975. (The slope of the curve has decreased somewhat). The latter tendency illustrates a dampening which occurred in most companies simultaneously. Data have not yet been analyzed for the years after 1975 witnessing an extremely low economic activity, but we expect a further lowering of the average and a decreased dispersion around the same average (i.e. a flatter curve or an extended inflexion point).

The real rate of return experienced by the larger corporations has been higher than the average in manufacturing industry during all three years. In 1975, all 37 corporations showed an internal rate of return exceeding the "real" interest rate on loans to industry (calculated as effective rate of interest deflated by the Consumer price index) while 13 percent of the capital in 1965 and 5 percent in 1970 yielded an internal rate of return below this interest rate.

This gives some indication of the dispersion in profitability of this group of companies. It would be interesting to follow individual corporations over time (including some small and medium size firms) and particularly to trace their development during 1976-79. Such a study is currently in progress (p. 00).

The Role of Corporate Taxation

The Swedish corporate income tax has gradually acquired a new function during the postwar period. In 1950 the tax revenue from corporations amounted to some 15 percent of total Central Government tax receipts. In 1975 this share had decreased to 4 percent. This reflects a shift of the adjustment burden of stabilization policy from corporate investment to private consumption.

During the 1950's, corporate investments were held back by direct taxes on investments at the same time as the availability of long-term credit was restricted through regulation to provide finance for a very expansive residential construction and public sector growth programme. The 1960's and 70's, however, witnessed a growing concern regarding the low level of investment in industry. Fiscal policy shifted towards greater investment incentives with a certain tilt towards regional economic policy. Through advantageous depreciation rules for fixed assets and inventories, the companies were partly

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Figure 17. *Profitability, rate of interest, taxes and dividends*
37 large industrial companies
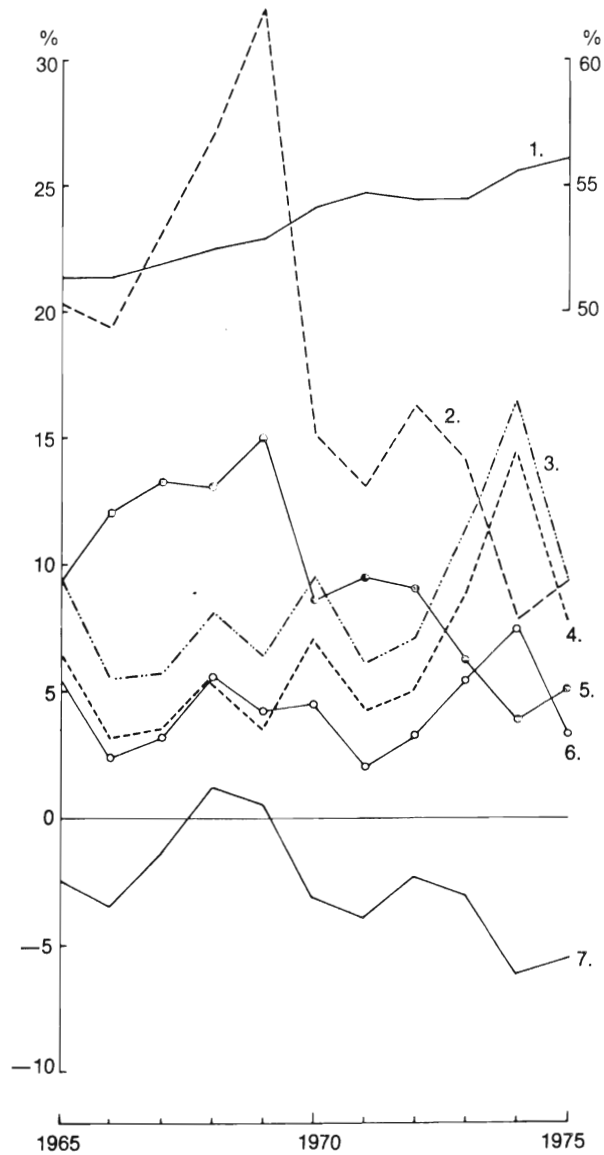
1. Nominal tax rate (right hand scale).
2. Effective tax rate (after calculated depreciation allowances and financial adjustments, including nominal capital gains.)
3. Real rate of return on equity capital before tax.
4. Real rate of return on equity capital after tax.
5. Dividend rate (on the same base as in the effective tax rate calculation).
6. Real rate of return on total capital before tax.
7. Real rate of interest on borrowed capital (financial costs in relation to total debts, minus the consumer price index).

given back the possibilities of averaging out the results of good to bad years through tax consolidation. Direct tax payments again became flexible even though still not to the extent possible before the suspension in the 1950's of the right for the firm to determine its own rate of fiscal write offs. Through investment funds and various investment deductions, etc., the government has also tried increasingly to use short-term stabilization measures in its growth policy. The same is true for subsidies in which inventory support programmes have come to play an important role during the last few years.

The system of corporate taxation with its extensive arsenal of rules and regulations constitutes an interesting field for analysis, indeed. However, only a few questions regarding its importance for the allocation of resources and economic growth will be dealt with here. Figure 17 shows the change, since the middle of the 1960's, in the nominal tax rate for incorporated entities (please note the scale). Given the existing possibilities for deductions, however, this does not give an accurate indication of the real tax burden on companies.

The *effective* tax rate measured for the 37 corporations in the data base as the tax actually paid in relation to the result (including nominal capital gains on real assets and stocks)—after calculated depreciation and net of financial costs—shows an entirely different development. Measured in this way, the average tax for the period 1970-75 was 12.4 percent as compared to 54.9 percent in nominal terms. The relatively small effect that the income tax has had on the real profitability on equity capital during the last few years is clearly seen when curves 3 and 4 are compared. Actual tax payments have been subtracted from the result in curve 4, while the tax credits obtained through excess depreciation allowances as well as the entire visible untaxed reserve and visible equity capital are included in the denominator. The difference between profitability on total and equity capital is composed of the so called "leverage effect". With a negative cost for borrowed capital (see the curve representing the real interest rate on loans—note the definition), it is remarkable that the difference in profitability is not greater. One explanation is to be found in the debt-equity ratio which is rather low (less than 1), given the fact that the capital stock has been valued at replacement cost and thus includes substantial "hidden reserves". As a result, the difference in interest rates between borrowed and total capital is reduced. In spite of this, interest rates on loans have continued to be a positive factor in the profitability of equity capital well into the 1970's.

Figure 17 indicates further that dividends paid to shareholders (curve 5) follow tax payments (curve 2) quite closely.

Dividend payments in relation to *visible* equity capital show a weak upward trend during the period studied. The proportion of tax payments in relation to visible equity capital shows a cyclical development and reaches its absolute peaks when nominal profits from price increases, resulting from the rising business cycle, are largest. Dividend payments reach their peaks at the

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downturn of the business cycle.

It is reasonable to assume that the firm bases its tax planning on a certain minimum dividend requirement. This, together with the nominal tax rate and a correction for desired retained earnings, gives the net taxable profit. Consolidation is undertaken in various forms to the extent necessary. This reversed principle of consolidation—where the relationship between need and action is unclear—is a natural result of the existing taxation of the yield on risk capital. The strong merger tendency through the 1970's can probably also be explained partly by the nature of the Swedish corporate income tax. While the firm on the one hand—using advantageous rules of depreciation—has been able to exempt a considerable part of its profits from current taxation, it suffers on the other hand from the fact that its dividends are subject to extremely high taxation pressures through a combination of the corporate tax and the highly progressive personal income tax. It is extremely costly to reallocate internal corporate financial resources openly via the equity market. This may have led companies to attempt, through mergers, to find alternative uses for the non-taxed profits. Diversification through the spreading of risks, however, does not seem to have been the guiding principle. The companies have rather tried to achieve higher returns through concentrating on those sectors in which they are most competent. The combination of double taxation of profits and high marginal income tax rates counteracts the policy of strengthening firms financially through a generous tax treatment of retained earnings. Inflexibility in the allocation of resources, lower targets for internal rates of return, and inefficient capital allocation are likely consequences.

Financing Alternatives

For borrowed capital to be attractive relative to plow back of own profits, the rate of return on the firm's total capital must be sufficiently larger than interest on debts on the margin to cover the extra risks associated with external finance. In Sweden as well as many other industrialized countries, credit market interests are to some extent controlled by the policy authorities, mostly in the downward direction. Especially in inflationary times interest rates tend to be unduly low. Also here the risk for lowered internal profit requirements and misplaced investments can result from an "artificially" low cost of capital. This is illustrated to some extent by the very low real interest on debt shown in Figure 17.

External financing through new share capital, on the other hand, is considerably more costly for the firm. The returns demanded by shareholders are determined by the profitability of alternative investments seen through a complex network of taxes. Between 50 and 70 percent of the total stock of shares in Sweden is thought to be privately owned. Private investors have a broad spectrum of alternative investment possibilities—where after-tax

inflation-proof[1] non-productive investments in property, in particular, have become an increasingly important alternative to stock. Shareholders are, in addition, interested in the net payments after tax, as their tax burden varies with the source of income. Double taxation of dividends and capital gains raises the pre-tax profitability demanded to such an extent that investments financed by way of issuing new shares appears to be three times as expensive as those financed through internal plow-back of funds.

The third method of financing, retained earnings, is also directly related to the tax system. Profits are plowed back because interest free tax credits are created through accelerated depreciation allowances, the investment funds system and other tax schemes. To be able to take full advantage of these schemes in reducing current taxable income, however, firms have to achieve a high profitability.

The tax burden, therefore, differs between growing, highly profitable firms and those that stagnate and run at a loss. This naturally encourages structural change. The incentives to growth that are built into the corporate tax system assume that a relationship exists between ex ante and ex post profitability. Structural changes can be impeded because of the fact that the resources are tied up in existing (often out of date) unprofitable projects. This is compounded by the structure of investment funds that can imply long time lags between the allocation and the disposal of funds, and by the fact that newly established firms are not eligible.

Profit-Growth: What Lies in between?

At the macro level it is quite easy to demonstrate a correlation between profit flows and investment. This connection is illustrated in Figure 18 where the profit margin (operating profits in relation to value added) and the investment ratio (investments also related to value added) are shown for the whole manufacturing industry.

At the individual firm level this result seems to fade away. During the period 1968-75 only a few firms appear to have had the ability to combine vigorous growth in production with high profitability. Similar patterns have been observed previously in simulation experiments carried out on the Institute's micro-based macro model (MOSES).[2] In the very short run and the extremely long run (more than 10 years) the rapid growth and high profits pattern appear, however. In the medium term, individual firms often find themselves in different phases of the long process of profit increases—raised expectations—decision making—investment—capacity creation—production. A sophisticated dynamic model is needed to capture that process. The assumed connection appears most clearly for companies operating within the

See article by D. Bradford and J. Södersten in this volume.

See p. 106.

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Figure 18. *Investment ratio and profit margins in manufacturing
industry, 1965—1975*
Index, 1965—75 = 100
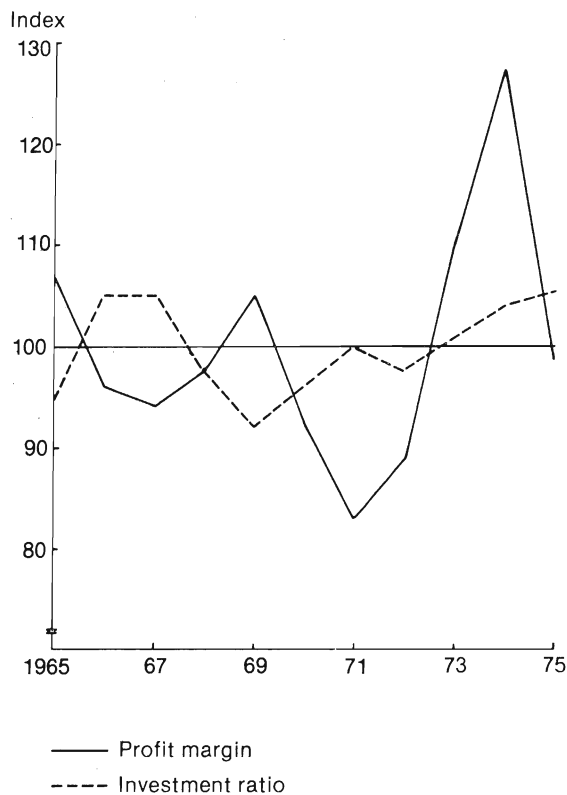
two groups identified in the micro-to-macro model as "investment goods" and "consumption goods". Firms producing raw materials and intermediate goods, in those exceptional instances where any trend is evident at all, seem to find themselves in the low profitability and low growth end.

It is important to make a distinction between expected and actual profitability. At the moment of investment it is of importance that the revenue surplus expected to be generated by the newly acquired resources is greater than the capital cost involved in using them. It is obviously difficult to calculate the ex ante profitability. Important factors that influence the forecast are the future development of product and factor prices and the market situation, etc. With the rates of price increase and relative price movement experienced in the 70's, it is questionable whether investors dare to use market size signals to make judgements about their future profits. Use

of ex post profitability to approximate ex ante profitability can be defended in some situations. Investments often provide a complement to, or an extension of, already existing activity. It is, however, more difficult to assume past profitability to be a good prediction of the future when new investments involve diversification into a new product line, requiring a completely new technology. It is difficult to establish the relationship between expected and realized profitability, partly because expectations are not readily measured, partly because of the difficulty involved in isolating the actual contribution of the new resources to profitability.

Despite this fact, an attempt is made in Figure 19 to compare profitability during the two periods 1965-70 and 1970-75 for each of the firms. The deviation from the respective period's average is presented for the 37 companies. In addition to the fact that positive deviations dominate in the latter period, we see that the large majority of observations appears in the first and third quadrant. Thus, relatively high profitability in the first period is followed in general by relatively high profitability in the second period. Similarly, low profitability in the first period is followed by low profitability in the second. This finding provides at least some support for the use of historical profitability data in making judgements regarding the future. In simulations done on the micro-to-macro model, it is evident that it takes a long time, even in the face of large changes in the competitive position of the firm, for this pattern to break down.

Final Remarks

The picture of the development of profitability in industry during the last couple of decades is somewhat unclear. A number of recent studies show conflicting results; something that, in itself, is understandable with regard to the conceptual difficulties involved in measuring both the value and the profitability of capital. Since the mid-1970's, however, profitability in industry has drastically deteriorated while at the same time firms' average cost of capital appears to have decreased.

When one compares the cost of various forms of financing—which should be regarded as complements rather than as substitutes—one finds reason to believe that these costs vary to a greater extent than can be explained when taking into account the yield required by the creditors. One reason for this may be the locking-in effects that follow from the existing corporate tax system which rewards activities that are not necessarily the most viable and profitable in the long run.

We have been able to demonstrate a correlation between past and future relative profitability rankings. In contrast, it is more difficult to identify the significance of the actual yield for expectations and future growth. A long list of other factors, interact and influence investment decisions: access to

Figure 19. *Real rate of return on total capital, 1965—1970 and 1970—1975*

Percentage points deviation from the average for 37 large
industrial companies
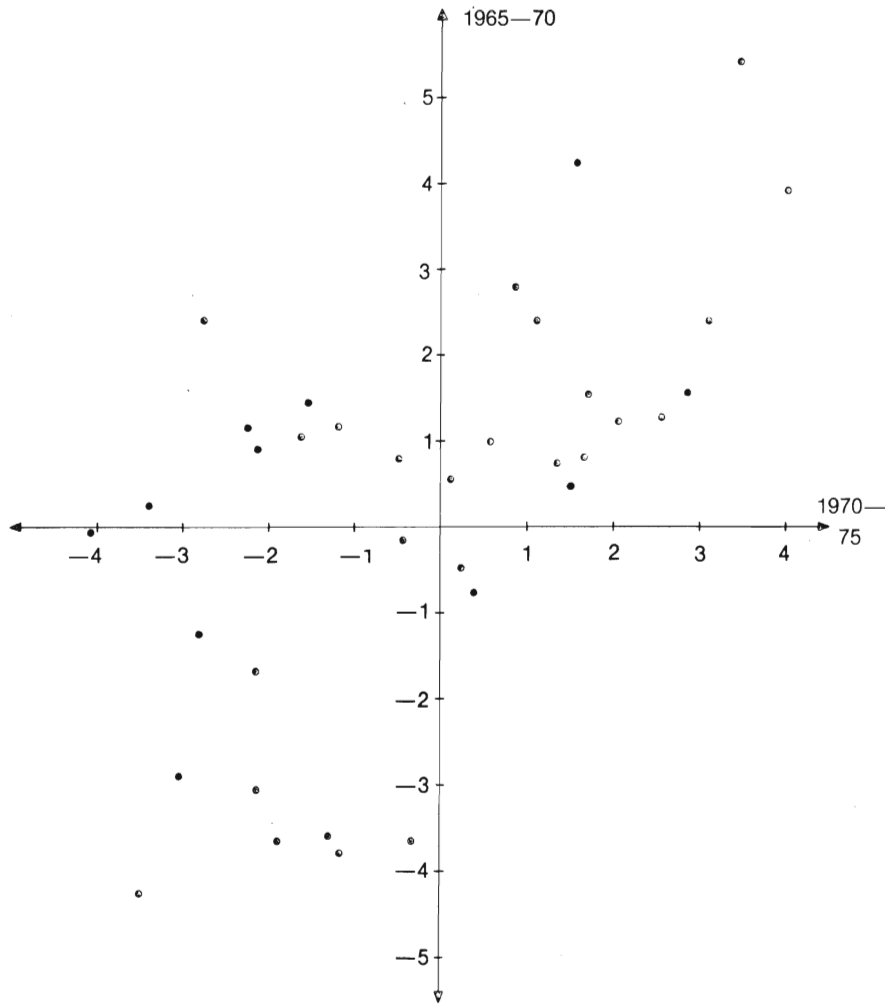
and the cost of financing, the level of capacity utilization within the firm, its competitiveness in the market, etc.

It is essential for the formulation of rational expectations that existing market price information is not distorted by inflation and government or monopolistic interferences. Inflation has played a fundamental role disturbing the market price signaling function during the last few years and our simulation experiments suggest that this together with a spectrum of tax wedges, creates both instability and misallocation of investments hence retarding growth. As a consequence considerable attention to this problem is paid in several ongoing IUI projects.

An International Comparison of Effective Corporate Tax Rates

by *David Bradford* and *Jan Södersten*

During the spring of 1980 the Institute joined an international project initiated by the National Bureau of Economic Research (NBER) in the United States aiming at comparing effective marginal tax rates on capital income derived from corporate investment in four countries: the United States, Great Britain, West Germany and Sweden.

The procedure employed in the first part of the research project may be described in a fairly simple way. Assume that an investment project undertaken by a firm earns a before tax real rate of return of p %. Using the statutory tax rules, the after tax real rate of return of the saver who supplied the necessary finance may then be calculated. Let this post-tax rate of return be s %. The "tax wedge" between the before and after tax returns determines the effective tax rate:

$$t = \frac{p-s}{P}$$

This tax wedge between the pre-tax return on the firm's real investment and the post-tax return to the individual saver is determined by several kinds of taxes. On the individual side, there is the wealth tax, income tax on interest receipts and dividends and capital gains tax. For the firm, there is the corporation tax with its complicated rules of defining taxable income. The tax wedge also depends on whether savings are channeled directly from the household sector to the firms or via some kind of institutional intermediary, e.g., an insurance company. Equally important are the kind of financial instrument the saver invests in and the kind of real assets firms acquire.

For this project we have chosen to calculate effective tax rates for three categories of owners, households, tax exempt institutions and "insurance companies", differing as to the marginal tax rates on interest receipts, dividends and capital gains. Three sources of finance with different tax treatment, debt, retained earnings and new share issues, are taken into account. As for the uses of finance by the firms, finally, three asset types—machinery, buildings and inventories—are considered.

A few preliminary results of the Swedish part of the study appear in Table 8. The table indicates the before tax real rate of return (p) on real investment within the manufacturing industry required to secure a 2 % real after tax return (s) for the different categories that provide the necessary finance. The calculations behind the table reflect the tax rules in effect during 1978. No account of the investment funds system (IF-system) is taken, however. Though an important feature of the Swedish corporate tax system, only

about 20 % of manufacturing gross investments were actually financed via the IF-system during the mid-70's. For these calculations, therefore, we have assumed that the marginal investment is written off according to the regular rules of fiscal depreciation.

The table clearly brings out the highly uneven character of the Swedish system of taxing the return on real investment. The required before tax real rate of return thus ranges from 30.7 % on inventory investment when savings are channeled directly from the household sector by way of an issue of new share capital, to —5.8 % when a tax exempt institution provides debt finance to buildings.

Table 8. *Real rate of return before tax (%) required to obtain a 2 % after tax return*

		Buildings	Machinery	Inventory
Households	Retained earnings	10.9	4.1	10.7
	New share capital	28.4	9.1	30.7
	Debt	11.6	4.2	9.7
Insurance companies	R	14.4	6.1	13.2
	N	12.8	1.6	14.2
	D	3.9	0.2	5.6
Tax exempt institutions	R	7.7	2.3	8.3
	N	1.5	—3.8	2.2
	D	—5.8	—5.1	—2.1
Foreign owners	R	7.7	2.3	8.3
	N	1.5	—3.8	2.2
	D	—5.8	—5.1	—2.1

Calculations of the kind indicated here provide information of relevance to much of the current debate on tax policy. Knowledge of the distribution of tax rates depending, e.g., on source of finance and type of asset presents a framework for appreciating the efficiency effects of present and possible alternative systems of taxing capital income. Recent discussion in the U.S. and the U.K., and also in Sweden, has included proposals to replace present income taxes with an expenditure tax. This would involve effectively exempting from tax the yield on savings. While the debate often proceeds as though this would mark a sharp departure, it turns out that existing rates are far from defining a comprehensive income tax base which would include all returns from saving. A close look at the tax systems of, e.g., the U.S. and Sweden reveals a bewildering array of tax rules affecting the future yield from present consumption foregone. On balance, it is far from clear whether these tax systems, on average, are closer to a "pure" income tax, characterized by a tax rate on capital income equal to that on labor income, or an expenditure tax, with a zero tax rate on the return to savings. To illustrate the point, we may consider the main features of U.S. and Swedish law tending to treat the yield from savings favorably relative to a "pure" income tax.

● Perhaps best known is the special treatment of capital gains. In the first place, such gains are taxed only on realization by sale or exchange; long-term deferral of tax can greatly reduce it. Secondly, in many cases only a fraction of long-term capital gains must be included in the individual income tax base. For the U.S., the inclusion rate is 40 %, irrespective of asset type. Swedish legislation employs rates ranging from zero on personal property to 100 % on real estate; as in U.S. practice, 40 % of long-term gains on financial assets, e.g., shares, constitute taxable income. A special U.S. feature, finally, pertains to inheritance: When assets pass to heirs by bequest the basis for calculating capital gains to the heirs is set at the value at the time of bequest; any gain unrealized during the giver's lifetime thus goes free of income tax.

● In the U.S., contributions by employers to qualified pension plans are excluded from the taxable income of employees; all of the earnings of the pension fund are exempt from tax. The same treatment is accorded contributions to and earnings on retirement plans for the self-employed and employees not covered by a qualified employer plan (subject to, however, rather modest limits on deduction of contributions). Pension payments received are fully taxable to individuals but because typically the taxable income of the worker is lower during retirement than before, pension benefits are likely to be taxed at lower rates than apply at the time of contributions. (Of course, secular increases in tax rates can upset this). Similar tax rules apply in Sweden. As in the U.S., savings for pension purposes are for the most part collectively organized. Employer contributions to the National Pension Insurance Fund are regulated by law, while savings for supplementary pension schemes are determined by way of negotiations between labor market organizations. In addition to this, tax legislation allows deduction from the income tax base (up to a certain limit) of voluntary contributions to individual pension plans supplied by insurance companies. Earnings on these funds are tax exempt.

● In both Sweden and the U.S. the return on savings via life insurance policies is favorably taxed. The formula for taxing insurance companies effectively exempts the yield on policy holder reserves, at least in times of stable prices. Furthermore, the cash value of the policy is not taxed as income to the holder as it increases over time, nor are the proceeds to the beneficiary taxed when received.

● The entire yield in kind of household durables is excluded from tax. For the U.S. this also holds for owner-occupied houses; the associated mortgage interest payment and real estate taxes (though not maintenance expenses and depreciation) are nevertheless deductible from the individual tax base. Sweden differs in this respect by imputing a 3 % (higher rates on more expensive houses) yield on the tax assessment value of owner-occupied houses. The tax assessment values, however, tend to run at approximately 75 % of

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the market values prevailing at the time they are set, and an interval of about five years separates revisions in assessment.

● In Sweden, and contrary to the U.S., only real capital gains on owner-occupied houses are taxable. U.S. tax law allows, on the other hand, a $ 100,000 tax free capital gain once in the lifetime of a taxpayer over age 55. In both countries liberal "roll over" provisions allow the tax payer to avoid realizing gain on sale of a house when he purchases a replacement.

The rules of defining taxable income from real investment within the business sector represent an additional cause of departure from taxing "economic income".

● It is widely, though not uniformly, believed that the rate at which assets may be written off for tax purposes in the U.S. is excessive in the absence of inflation. This applies especially to real estate, and it is thought to occur also on assets accounted for under the Asset Depreciation Range (ADR) procedures. The regular depreciation rules in Sweden allow accelerated write off mainly on machinery. By the use of the investment funds system (IF), however, firms may obtain the equivalent effect—or more—of expensing for both machinery and buildings. It may also be noted that Swedish tax laws—contrary to the practice in most non-Scandinavian countries—allow firms a 60 % undervaluation of their (FIFO-valued) stocks of inventory.

● In the U.S., a credit against tax is allowed for up to 10 % of the cost of business equipment for domestic use. The full credit is granted for assets with a useful life of 7 years or more; reduced credits are given for less durable assets. Additional investment tax credit allowances are available for corporations making contributions to an employee stock ownership plan (ESOP).

The Swedish counterpart is the possibility of deducting 25 % of the cost of business equipment against taxable income. This provision applies for the 40 % state tax only. For buildings this "investment deduction" is limited to 10 %.

While all of these exemplified elements of the tax system tend to reduce the rate of tax on the yield from savings, two major elements of the tax system work in the other direction. The first is the two-tier system of taxation ("double taxation") of income arising in corporations.

The *second* element is the tax-increasing effect of inflation working through the procedures by which returns from capital are measured for income tax purposes. The failure to index capital gains and depreciation results in overstatement of income for tax purposes. It is instructive to refer here to some recent studies carried out by economists associated with the NBER. In an analysis of a sample of more than 30,000 individual income tax returns showing capital gains realized on corporate stock in 1973, Martin

Feldstein and Joel Slemrod[1] made the startling discovery that whereas individuals were taxed on $4.6 billion of such gains, adjustment for the increase in price level would have produced instead a *loss* of nearly $1 billion. They found, furthermore, that the difference between nominal gains and real gains (commonly losses) varied systematically by income class, with the highest income category experiencing the least divergence and the lowest income category the most. In another study, Martin Feldstein and Lawrence Summers[2] looked at the overstatement of income attributable to the use of historical cost as the basis for depreciation allowances and to current methods of inventory accounting. According to their estimate, in 1977 the tax burden on corporate sector capital income was larger by $32 billion than it would have been with properly indexed depreciation allowances and inventory accounting, an increase in effective (average) tax rate from 43 to 66 percent on this income flow.

Another important interaction between inflation and taxation of savings in Sweden and the U.S. occurs in the treatment of interest income. Whereas a part of the nominal return on interest-bearing assets represents a premium for inflation, in both countries this premium is taxed as income. We mention this as secondary to the overstatement of the yield from real investment because it is in principle possible for the nominal interest rate to adjust sufficiently to offset approximately both inflation and the tax on the inflation premium—although in neither Sweden nor the U.S. has such an extreme movement in interest rates with inflation been observed.

The discussion above makes it quite clear that the tax treatment of the rewards to savings in various forms is highly uneven. The tax codes of Sweden and the U.S., furthermore, exhibit a remarkably parallel variation in the treatment of any act of saving according to the particular asset acquired, the form of its ownership and method of financing, the circumstances of its purchase and the rate of general price change. The resulting systems carry with them costs of a well-known sort to individual taxpayers in optimizing their affairs and to the revenue collection agency in defending the fisc. But quite apart from these costs of administration, and certainly far larger in magnitude, are the economic losses due to inefficient resource allocation and the political losses due to what are perceived as inequities in the working of the tax rules.

The specific cases of departure from the norm of a comprehensive income tax presented here are all well-known. Much less familiar are their interrelationships. Little is known, e.g., about how the reliefs provided at the corporate level interact with individual income taxation to determine the over all effective tax burden on the returns to saving. The forthcoming results of the international research project at the IUI will shed light on this issue.

[1]See M. Feldstein and J. Slemrod, "Inflation and the Excess Taxation of Capital Gains on Corporate Stock" in *National Tax Journal*, June 1978.

[2]M. Feldstein and L. Summers, "Inflation and the Taxation of Capital Income in the Corporate Sector" in *National Tax Journal*, December 1979.

Current and Recently Completed Research Projects

Long-term Projections and Coordinated Projects

This heading includes both larger studies in which a group of researchers work together within a project and coordination projects that hold together a number of individual projects.

Medium-term Survey (LB79)

The main results of the Institute's medium-term survey were presented in the spring of 1979 in the publication *Att välja 80-tal* (Choosing the 80's). Some of the results of this study are summarized in "The Firms in the Market Economy" on pp.13-32. This comprehensive team work engaged a considerable part of the Institute's total resources for more than a year and, to some extent, delayed the completion of other studies. A series of special reports and preliminary studies were published between autumn 1979 and spring 1980. In addition to the main report two volumes of appendices have been published, and a third volume is in progress.[1] The first special study includes an analysis of Swedish foreign trade (see also p. 54), inflation and resource utilization, labor market turnover and the role of women in the supply of labor (see p 119).The second volume deals partly with a more detailed presentation of methods and calculations and partly with special studies of Sweden's external balance and industrial financing (see p 115). Another volume of special studies includes analyses of the construction industry and housing markets during the 80's, the development of the Swedish shipping industry and an analysis of the distribution sector (the latter a joint project with Handelns Forskningsinstitut (The Trade Research Institute; HFI), see p. 85). In addition, a more comprehensive and updated survey of the industry sector than that presented in the main text is also planned (see p. 85).

Project leader: Gunnar Eliasson

[1] B. Axell, S. Gustafsson, B. Holmlund, E.Ch. Horwitz, *Utrikeshandel, inflation och arbetsmarknad* (Foreign Trade, Inflation and the Labor Market), Special Studies, Vol. I, for IUI's Medium-Term Survey 1979. G. Eriksson, L. Jansson, B. Lindström, T. Nordström, J. Södersten, B.-C. Ysander, *Kalkyler för 80-talet* (Modeling the 80's), Special Studies, Vol. 2, for IUI's Medium-Term Survey 1979. G. Normann, O. Renck, F. Larsson, *Byggmarknad, sjöfart och varuhandel* (The Housing Market, Shipping and Wholesale & Retail Trade), Special Studies, Vol. 3, for IUI's Medium-Term Survey 1979.

The Development of Macro Models

The Macro-Model

A quantitative macro model was developed in connection with the Institute's first long-term survey and was used as an instrument for the medium-term (5—7 years) analysis of the development of the Swedish economy. Not only was the data base updated during the latest medium-term survey but the model itself was also elaborated further. This took the form of, primarily, the introduction of a price setting mechanism and various other relations dealing with the distribution of income. This work was completed in connection with LB79.[1] The macro model is now being implemented for a more long-run growth analysis within the Institute's energy project (p. 86).

The Structure of Industry and Economic Growth

This project deals with a sector growth model of the Swedish economy which above all facilitates a study of how relative price changes in international markets and those in domestic factor markets influence structural changes in industry and the development of productivity.

The growth models used earlier for long-run analyses have normally been adapted to study how the economy adjusts to a high and relatively stable growth in demand. The emphasis, therefore, has been on the effects of shifts in demand on the relative ability of various industries to compete in the factor markets. However, these models have not facilitated the analysis of supply related problems and questions regarding cost related structural and productivity changes.

The new situation that Swedish industry has faced since the mid-70's requires new tools of analysis. The future growth of the Swedish economy will increasingly become a question of the possibilities and costs of achieving a structural adjustment that will ensure a sufficient development of productivity in relation to the rest of the world.

An analysis of growth from this perspective demands, among other things, a supply oriented model that takes account, for example, of the existence within different industries of fixed capital equipment that reflects earlier technological choices and often varying possibilities for substitution.

Considering the significance of energy in the analysis of growth it is obvious that it should, in addition, be possible to identify, individually, different types and uses of energy. The model will primarily be applied in the study of risk and uncertainty in energy policy (see p. 00) and deal with long-run effects on productivity and structural changes of possible drastic increases in the price of energy.

Project leader: Bengt-Christer Ysander
Other investigators: Leif Jansson, Tomas Nordström

[1] *Att välja 80-tal* (Choosing the 80's). IUI's Medium-Term Survey 1979.

Studies on Productivity within the Distribution Sector

Distribution services are carried out primarily by wholesale and retail trade firms but also to a significant extent by manufacturing firms. This is evident from, among others, the joint study by the IUI and the Trade Research Institute (HFI). The findings of this study will be published in a supplement to the medium-term survey.[1] Apart from the aspect of physical transportation, the distribution of products involves various other functions, such as the storage of inventories, the provision of a comprehensive assortment of products and various marketing activities. Even the final users—the consumers—play a part in this activity, though their involvement is not included in the national accounts statistics. Structural changes in commodity trade result in a productivity growth that also affects the production sector. From an overall economic point of view, however, the consequences of productivity change in the consumption process must also be taken into account.

One of the main purposes of this study is to introduce more accurate methods of calculating the production of trade for the purposes of the National Accounts. The model that is being developed will also provide a more accurate means of calculating the level and development of private consumption.

Investigator: Folke Larsson

Swedish Industry Facing the 80's

The Institute's latest medium-term survey (presented in 1979) included an analysis of the problems that have become apparent during the 1970's in some of Sweden's most important basic industries: iron ore mining, iron and steel, shipyards, shipping, and to some extent also the forest based industries.

While these problems are likely to remain with us during the 80's, a more comprehensive study of the situation in Swedish industry and its prospects for the coming decade also seems appropriate. For example, an evaluation of the competitive situation of the engineering industry and the chemical industry—widely expected to form the base for industrial growth in the 80's—is highly desirable. Therefore, a study of the impact of recent changes in the production technology in the engineering industries (e.g. associated with electronics and increasing scale economies) on the competitiveness of Swedish industry will be made. This part of the study is commissioned by the State Board for Technical Development. It will be based largely on informa-

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[1] In G. Normann, O. Renck, F. Larsson, *Byggmarknad, sjöfart och varuhandel (The Housing market, Shipping and The Wholesale & Retail Trade), Special Studies, Vol. 3, for IUI's Medium-Term Survey 1979.*

tion obtained through interviews in various engineering firms. The results of the Institute's ongoing study of the chemical industry (see p. 93), with particular emphasis on pharmaceuticals and fine chemicals, will also be summarized.

Besides analyses of particular industries, the study will include a survey of the international literature dealing with long-term prospects for industrial development. Numerical calculations for Swedish industry in the coming decade will also be made, using existing models.

An important part of the project is an analysis of the macroeconomic consequences of the Swedish industry subsidy program during the 1970's. This part of the study is commissioned by the Government Committee on the Industry Support Program. Data on various support measures are being collected both through the Committee and through the Institute's own efforts. The macroeconomic consequences of both general and selective subsidies will be analyzed through simulations on the Institute's micro-to-macro model.

Project leader: Bo Carlsson
Other investigators: Louise Ahlström, Lars Jagrén, Tomas Pousette, Johan Örtengren a.o.

Energy Crises and Economic Development

This is a joint project involving primarily the Institute and the Stockholm School of Economics.

The objective is to study how a future energy crisis—defined, e.g., as a drastic change in the relative price of energy or as a long-term rationing in the international energy markets—might affect the structural development and the conditions for growth in the Swedish economy. What problems and costs of adjustment would arise, and how is the adjustment process conditioned by to-day's choice of energy policy?

The work on the project within the Institute is divided into several parts. One part analyzes the vulnerability of Swedish industry with respect to energy and its possibilities of adjusting to drastic changes in energy prices and/or availability. Another part consists of model simulations and analyses of the process of adjustment to successive price and quantity changes created both internationally and in the Swedish economy by a disturbance or disequilibrium in the energy markets. A third part deals with the determinants of Swedish exports and imports. In collaboration with the Research Group for Energy Systems Studies at the University of Stockholm, the domestic price development for various kinds of energy is studied. Econometric estimates of the role of energy in the production system of various industries are also made. The growth model currently being developed at the Institute (see p.

84) is utilized as an instrument in the analysis of the long-term effects of energy crises on the Swedish economy.

Project leader: Bengt-Christer Ysander
Other investigators: Bo Carlsson, Joyce Dargay, Gunnar Eliasson, Eva Christina Horwitz, Leif Jansson, Märtha Josefsson, Tomas Nordström, Tomas Pousette and Johan Örtengren

Swedish Industrial Development—Theory and Practice During a Century

On October 8—9, 1979, the Institute organized a seminar on *Swedish Industrial Development—Theory and Practice during a Century* to commemorate the 80th birthday of its honorary chairman and protector for many years, Dr. Marcus Wallenberg.

The purpose was at least twofold, one, to put the current economic situation in Sweden into a much needed, long-run historical perspective and two, to come to grips with the social and economic mechanisms that eventually moved the whole economy onto a higher growth path during the second half of the 19th century.

A selection of presidents and senior researchers from earlier times and some from the current research staff were asked to contribute papers to the conference. A few high executives from industry also participated. The idea was to confront simplified theoretical abstractions on industrial develop-
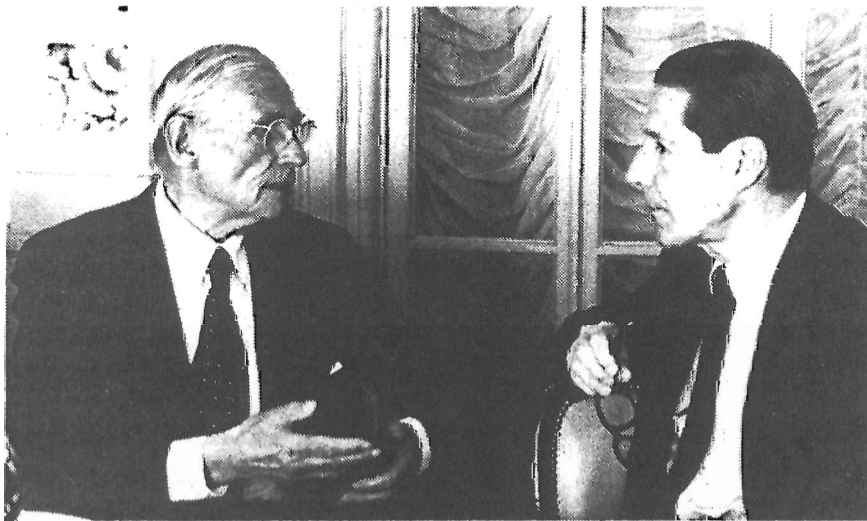
Dr. Wallenberg (left) and Dr. Waldenström (chairman of the IUI) discussing some of the many issues that came up during the seminar.

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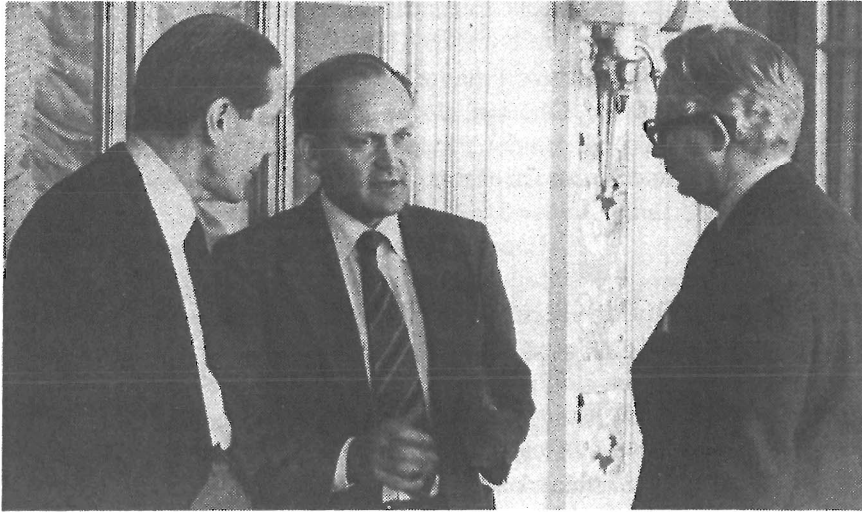
The seminar participants represented very different professional backgrounds. One principal idea of the seminar was that theory and professional reality should be confronted at the seminar table. Dr. Erland Waldenström (left) in debate with Dr. Lars Wohlin, Governor of the Bank of Sweden, president of the IUI 1972—76 and Lars Nabseth (right) president of the Federation of Swedish Industries and for IUI 1966—72.

There was not always agreement on the state of reality. Peter Wallenberg, chairman of the Atlas Copco, in argument with Ragnar Bentzel, Uppsala University, president of the IUI 1961—66.

Gunnar Eliasson, current president of the IUI (right) discussing the possibility of capturing the dynamics of firm behavior in theory with Björn Lundvall, chairman of L. M. Ericsson.

We are sad to report that Björn Lundvall, also member of the IUI Bord, was killed in 1980 in a tragic car accident.

Dr. Jan Wallander, chairman of Svenska Handelsbanken, president of IUI 1953—61, argued that forecasts are made to stimulate argument. Numerical precision tends to lock up people's thinking, he argued, and make business leaders overly confident in the future.

ment with the realities of everyday economic life. In fact, several participants in the seminar have been on the research staff of the Institute as well as in executive positions in industry or banking for many years. The pictures tell part of this story.

The first three papers by *Dahmén* and *Eliasson* (see list of contents below) approach the industrialization problem from a historical-theoretical point of view. How has industrial development been treated in theoretical economic discussion during the past 100 years and how does it correspond to measured reality? The answer is: not well, and theory may even have deteriorated in quality by that standard in the more recent past. Eliasson looks specifically at the theory of the firm in a macro context and maps the life histories of four large Swedish corporations from the end of the 19th century.

Ståhl analyzes the development of interest and inflation rates over the 20th century and *Bentzel* decomposes economic growth into factor contributions in a production function analysis on a vintage based simulation model of the Swedish economy.

Carlsson concentrates on the role of agriculture in the early stages of Swedish industrialization around the middle of the 19th century. He emphasizes the importance of certain international arrangements which allowed rapid responses to changing international market signals in both agriculture and the small but rapidly growing industrial sector. Especially, the existence of internationally oriented "merchant houses" seems to have played a decisive role.

Josefsson and *Örtengren* continue to measure and analyze the interaction between changing price signals and structural adjustment responses over a 100 year period. They conclude that structural flexibility may have diminished during the postwar period while competitive pressure *may* have increased.

Whether actual economic flexibility has a deeper social counterpart is, among other things, discussed in *Albinsson's* paper. It is obvious that the crass and profit-oriented industrialists, who have been the prime movers behind the present Swedish economic welfare have rarely been treated well in the intellectual circles that dominate as makers of documentary historic material.

In fact, *Jakobsson* and *Wohlin* are quite worried about the postwar tendencies to play down the importance of the industrialists and market agents and to burden a central Government with industrial responsibilities that it has neither competence nor has got time to handle.

It may even be true that the postwar development of economic theory has led both economists and politicians to the illusion that economic growth depends on an overriding demand control by a central Government, or to paraphrase Lord Keynes—one should not underestimate the importance of economists. Politicians and other "practical" men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist.

As argued by *Dahmén* and *Eliasson* the idea of the seminar was to demonstrate that the truth about our economic past depends on how one looks at it—as does our understanding of what lies ahead.

Nabseth's paper tells the story about a research institute under continuous structural change and learning by doing. *Wallander's* concluding paper makes us understand that it may be even more important for success in research how you organize such activities and which people you group together than what you ask them to do.

Editors: Erik Dahmén and Gunnar Eliasson

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Productivity, Technology and Resource Use

The Institute's work in this field during the last few years has largely been associated with several large projects. In 1979, the joint project between the IUI and the Royal Swedish Academy of Engineering Science (IVA) resulted in the publication of B. Carlsson, E. Dahmén, A. Grufman, M. Josefsson and J. Örtengren, *Teknik och industristruktur—70-talets ekonomiska kris i historisk belysning* (Technology and Industrial Structure—the Economic Crisis of the 70's in Historical Perspective). Cf. article on p 33. In the same year, the Institute's medium-term survey was published. In 1980, the work has been dominated by two other large projects, namely Energy Crises and Economic Development (p. 86) and Swedish Industry Facing the 80's (p. 85).

In addition to these team projects, two historically oriented studies of Swedish industrial development are being carried out (pp. 92 and 93), as well as a study on the chemical industry (p. 93), one on industrial structure, technical progress and efficiency, and one on the macroeconomic consequences of electronics and technical change.

Bo Carlsson is directing research in this area.

The Development of Swedish Industry During the Postwar Period

During the last few years a comprehensive study of various aspects of Swedish industrial development during the postwar period has been carried out at the IUI. This work can be seen partly as a step in the Institute's research concerning growth and structural changes in Swedish industry, partly as a follow-up and widening of Erik Dahmén's thesis, *Svensk industriell företagarverksamhet* (Entrepreneurial Activity in Swedish Industry in the Period 1919—1939) published by IUI in 1950. As a base for the study other projects within the IUI and some special research projects have been utilized. In this predominantly historical study the focus has been on the interaction between technical development, financing and economic development. The emphasis is on entrepreneurship, its prerequisites and meaning.

An important expression of entrepreneurship constitutes new and better products. Therefore, particular attention has been paid in the study to the impact that postwar innovations and inventions have had on industrial development. Using a narrow definition, one finds that, in 1974, new products accounted for just over 30 percent of the value of industrial production. If it were possible, in addition, to include large and significant improvements in the quality and functioning of existing goods, the share would probably be significantly higher. The study also deals with the causal mechanisms behind new products and the effects of their diffusion that may

have the form of, for example, characteristic chain reactions and development blocks. While earlier studies have mainly been interested in the role played by new and improved products in changing methods of production, this project emphasizes their effect on productivity.

Investigator: Erik Dahmén

Economic growth in Sweden

One large research project at the IUI deals with economic growth in Sweden over the last 100 years. Large sections of this study dealing with production and productivity, foreign trade, capital formation, labor supply and economic policy, covering a period from about 1870, have already been published. A comprehensive analysis of the material is under way and, inter alia, a simple annual model has been designed for analyzing economic development in Sweden during the period 1870 to 1975.[1]

The model focuses on the importance of investment and technical development in economic growth. The analysis shows, among other things, that technical development has progressed at a faster rate during the postwar period than ever before, and this has caused a very sharp decrease in the life span of capital during the last few years. This, in turn, has meant that old capital has been replaced at a higher rate and that the differences in productivity between old and new plants have diminished. At the same time, the capital stock has increased in relation to the volume of production. In total, this means that the growth potential of Swedish industry will weaken unless the volume of investment increases substantially.

Investigator: Ragnar Bentzel

The Chemical Industry

The chemical industry has for many years been one of the fastest growing sectors of Swedish industry. A study of the development of this industry during the postwar period, and the present and future competitive conditions relating to it, are therefore of great interest. What are the basic technical and economic conditions that have generated the expansion in this industry and in which ways have these changed over time?

The chemical industry, as it is defined according to the International Standard Industrial Classification (ISIC), includes a large number of separate activities. Among these are the production of chemical elements and compounds, paints, plastic materials and the refining of crude petroleum. To be

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[1]This part of the study has been published i.a. in Carlsson-Eliasson-Nadiri (eds.), *The Importance of Technology and the Permanence of Structure in Industrial Growth*. IUI Conference Reports, 1978:2, as well as in Dahmén-Eliasson (eds.), *Sveriges industrialisering—Teori och verklighet under ett sekel* (Swedish Industrial Development—Theory and Practice during a Century). IUI, Stockholm 1980.

meaningful, an analysis of the chemical industry therefore has to treat the different sub-branches separately.

The work with the project has been divided into two parts. In the first part all sub-sectors are studied. An important part of this work is to compare the chemical industry in Sweden with that in other countries. In the second part, certain important sub-branches are studied more in detail, e.g. the pharmaceutical industry.

The study will partly be reported within the project "Swedish Industry Facing the 80's". (See p. 85)

Investigator: Tomas Pousette

Industrial Structure, Technological Development and efficiency

This study undertakes the analysis of various aspects of industrial structure, technological development and efficiency.

The first part consists of a theoretical discussion concerning the concept of structure and various aspects of structural development. The spread of technology between old and new plants within an industry has been given special emphasis. This structural analysis is based on a production function approach involving the use of three types of production functions. The first type is a best-practice production function which represents the best possible production technology. The second is a traditional production function describing the average technological skills existing within a particular industry. The third type is the short-run sector production function representing the overall structure of an industry and the existing short-run substitution possibilities within a given structure (achieved by varying the degree of utilization of existing plants at various levels of capacity utilization within the industry). An analysis over time of the short-term sector production functions implies an analysis of the long-run structural development within the industry.

A number of different definitions of efficiency are compared within the study, such as, a measure of technological efficiency and economies of scale for individual plants and a measure of the structural efficiency in the sector as a whole. One can, thus, measure the distance of individual plants and the average plant from the best-practice production function.

The second part of the study presents an empirical analysis of the structural and technical development of Swedish industry. Substantial effort has been put into computer work to facilitate various types of structural analyses. The findings have been reported on periodically.[1] The industries

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[1]"Technical Progress, Best-Practice Production Functions and Average Production Functions in the Swedish Dairy Industry". Paper presented at The Econometric Society European Meeting, Helsinki, August 23—27, 1976.

covered include the dairy industry, particle board industry, the cement industry, and blast furnaces in the iron and steel industry.

Investigators: Finn Førsund and Lennart Hjalmarsson

The Macroeconomic Consequences of Electronics and Technical Change

Computers and automation were discussed intensively during the 60's and spectacular changes were forecasted for work life, employment and the international competitiveness of various industries.

The electronics revolution has been the theme of a similar global debate during the last few years. On the one hand, politicians and employees worry about the job market consequences. On the other hand, politicians and business executives are concerned about the effects on the competitiveness of domestic industries. Most industrial countries have initiated public investigations into the probable consequences. The Swedish computer and electronics committee has asked the Institute to assess and quantify the macroeconomic effects of electronics in industry. This study is now in its final stage. Focus is on the *use* of electronics in industry and its macroeconomic consequences, not on the performance development of electronics hardware. This problem is of a dynamic, general equilibrium kind and *should not* be approached, as is commonly done, by partial case analysis or through the use of econometric models that do not endogenize relative prices and the structural adjustment process. Analytical methods, where sticky prices are assumed or the supply side is disregarded, lead to biased results by assumption.

The *first* phase of the study is concerned with *bringing the measurement of technical change* down to the firm or plant levels[1]. It is a direct further

"Structural Change and Economic Efficiency of Swedish Dairy Plants". Paper presented at The European Meeting on Antitrust and Economic Efficiency, Bruxelles, September 2—4, 1976.

"Technical Progress and Structural Efficiency of Swedish Dairy Plants". Paper presented at the International Colloquium on Capital in the Production Function at Paris X-Nanterre, November 18—20, 1976.

"Production Functions in Swedish Particle Board Industry". Paper presented at The International Colloquium on Capital in the Production Function at Paris X-Nanterre, November 18—20, 1976.

"Frontier Production Functions and Technical Progress: A Study of General Milk Processing in Swedish Dairy Plants". Econometrica No. 4, 1979. Also published as IUI Booklet No. 100.

"Generalized Farrell Measures of Efficiency: An Application to Milk Processing in Swedish Dairy Plants". The Economic Journal, June 1979. Also published as IUI Booklet No. 105.

"On the Estimation of Deterministic and Stochastic Frontier Production Functions. A Comparison". Journal of Econometrics No. 13 1980. Also published as IUI Booklet No. 107.

[1]See B. Carlsson, *Technical Change and Productivity in Swedish Industry in the Post-War Period*, IUI Research Report No. 8, 1980.

development of an earlier joint research venture between the Institute and the Royal Swedish Academy of Engineering Sciences. A *second* step is to quantify the effects on employment, manufacturing output and structure of variations in technical change at the firm level.[1] The micro-to-macro simulation model (see p. 104) is used for this purpose. We have found here that technical change at the plant level may not even explain 50 percent of the residual technical factor in production function analysis. Changes in the composition of production explain the rest. Moreover, long-term mass unemployment and even persistent local unemployment problems are highly improbable phenomena, even at high rates of technical change if factor market prices are given a reasonable chance to adjust. Unemployment consequences at the macro level should primarily be viewed as a problem of *how fast* the market adjustment takes place. The real employment problems are more of a local nature. Job changes may be forced on individuals and distressed economic conditions on particular firms. At the same time, growth is stimulated elsewhere in the economy. This adjustment process on the supply side has always been a natural parallel of economic growth and of structural change. Ill-conceived regulatory policies may even worsen the social side of the adjustment process. Experiments on the model indicate that what one should worry about regarding electronics is the likelihood of foreign competitors taking the lead in introducing the new techniques and depressing market prices at a faster rate than the domestic firms can cope with. Under such circumstances the simulation experiments indicate that the structural adjustment process needed in the labor market may be much larger than in a corresponding case with only domestic technical change.

The *third* and final phase in the study is to identify the electronics factor in automation and technical change at the firm level and to assess the macroeconomic importance of this technology on the basis of the results obtained from the two earlier phases.[2] The relationships here are very complex. We have proceeded by way of several case studies. The conclusions are that it is highly unlikely that electronics in its various forms will take technical change at the plant level back to the high rates of change of the 60's. The electronics potential may be there but mechanical engineering techniques, sensory equipment and above all the absence of complete, centrally based process knowledge will hold down the rate of change. Neither should one—as is often done—generalize to industry level from spectacular individual observations. Electronics enters production processes in a very gradual fashion. When the effects are aggregated to the firm or industry levels they appear quite normal. Futhermore, electronics is perhaps

[1] See G. Eliasson, *Technical Change. Employment and Growth—Experiments on a Micro-to-Macro Model of the Swedish Economy*, IUI Research Report No. 7, 1979.

[2] See G. Eliasson, *Electronics, Technical Change and Total Economic Performance*, IUI Research Report No. 9, 1980 and S. Nilsson, "Changing Organization of Production and Its Impact on Capital Inputs: A Study at ASEA", IUI Working Paper No. 23, 1980.

associated more with new product development than with the production process. In fact, earlier well-known changes of a technical nature, like the spectacular jumps in economies of scale in process industries during the 60's, may have had a much more profound and rapid structural influence than electronics will ever have during the same time span. These two last points are illustrated in Figure 20. It shows total productivity change for a family of sophisticated engineering products accounting for some 30 percent of output of a fairly large Swedish plant. To begin with, the product design remained unchanged for several years when practically no productivity change was recorded. A new design was introduced in 1972. After an initial breaking-in period, productivity rose to twice the earlier level. Gradual design improvements increased productivity performance somewhat but at a slower pace. Again a new product technology combined with a design change in 1976 brought productivity up to more than double the earlier level in less than a year.

Figure 20. *Total factor productivity change for a family of sophisticated engineering products*

Legend:

——— New process methods only   —··—··— New product design

– – – – Technology change   ········ Weighted average for whole family of products
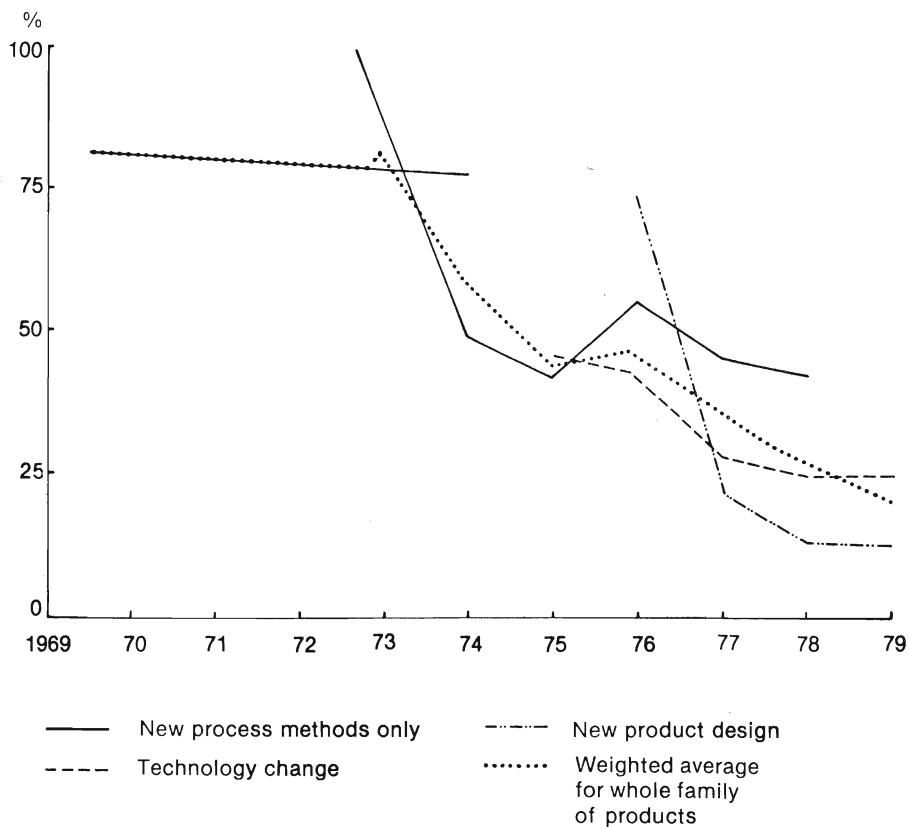
This case illustrates two important results from the study. The large improvements in process performance in engineering industries are usually associated with changes in product designs. Even at the fairly low level of aggregation of 30 percent of output of a medium-sized factory, average productivity change is faster but only somewhat faster than for all manufacturing and most of the change depends on structural change within the plant. This illustrates the hazards associated with applying standard, economic taxonomies like the macro production function to study production structures.

Investigators: Gunnar Eliasson, Bo Carlsson, Sam Nilsson

Taxes and Public Finance

Effect of Income Taxes and Transfers on Households

The Swedish income tax system has over the last few years been the subject of extensive analyses at the IUI. The simulation model TAX which was developed for this purpose facilitates the analysis of the development of income taxes since the beginning of the 1950's for various categories of households. A revised version of the model incorporates legislated payroll taxes as well from 1968 onwards. Different tax systems can be compared by changing the rules relating to taxes and fees and charges. The model also includes the distribution of income between households, and thus makes possible the analysis of, for example, the income equalization effects of different tax systems, or the fiscal consequences of tax and fee adjustments.

The simulations done with TAX have made it possible in our medium term survey to analyze both the automatic consequences of the existing tax system in the long run and the tax changes that are necessary in order to achieve the desired economic balance in the medium term.

Investigator: Tomas Nordström

Corporate Taxation, Profitability and Growth

The main objective of this study is to illustrate how corporate taxation influences the allocation of resources within industry.

Several factors imply that corporate taxation, in its present form, tends to lock in profits and conserve existing structural patterns of industry. This will create problems if competitive conditions among firms change considerably and rapidly. This hypothesis rests on the fact that the corporate tax is a net profits tax.

Companies with a high ex post profitability have greater possibilities of keeping funds within the enterprise through the use of tax deductions, thereby reducing their tax burden, than do low profitability firms. This form of financing is considered to be, relatively speaking, "inexpensive". This can in turn lead to lower rate of return requirements on new investments and thereby, lower profitability.

A series of experiments on the Swedish micro-to-macro model under more or less generously designed fiscal regimes for business firms,[1] showed that

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[1] See further G. Eliasson and T. Lindberg, "Allocation and Growth Effects of Corporate Income Taxes" in Eliasson-Södersten (eds.), *Business Taxation and Firm Behavior*, IUI Conference Reports, 1981:1.

excessive fiscal stimulus to plough back internally generated profits can be both stimulating to economic growth and highly detrimental to overall growth in the entire economy. When relative prices continue along past trends and correct forecasts are easy to make. Indigenous plough back means maximum growth. However, when the competitive situation (as after 1975) turns against previously profitable firms, the opposite happens. It is not so much the waste of investment resources that matters but the fact that production continues. Less labor becomes available to growth industries and artificially high wages on the margin are established throughout the economy.[1] When an economic scenario is engineered in the micro- to-macro model that rapidly cuts down non-competitive production activities (e.g. by tough fiscal rules to keep down investment and/or by making foreign competition so severe that firms simply have to shut down) we observe that a strong expansion is created in other industries with a few years' delay that simply did not occur when the inefficient firms continued to operate. This suggests that one should be sceptical about simple propositions such that fast structural change can no longer be allowed, since we see only stagnant industries around us. The absence of expansion may be due to the absence of structural change. This problem will be investigated further on the model in the project on the macroeconomic effects of the subsidy program in Swedish industry during the 70's. (See p. 86).

Investigator: Thomas Lindberg

Capital Gains Taxation

The discussion about capital gains taxation has centered around the wish to construct a consistent system implying equal treatment of capital gains on property and shares. This study deals mainly with the behavior of firms. The influence on the firm's behavior of the capital gains tax is not independent of its other tax payments. We have, therefore, built a dynamic steady-state model for a firm that maximizes the wealth of its owners. Using this model which incorporates the capital gains tax, the profits tax and the personal income tax, we examine the effects of these taxes on the investment and financing policy decisions of the firm.

Compared to earlier models this one is more in conformity with business reality in so far as account is taken of a simple form of uncertainty. Assuming short-run random fluctuations in the gross earnings of the firm, and risk averting lenders and stockholders, it can be shown that the cost of capital for the firm rises owing to either increased borrowing or increased retention through plough-back of profits. These financial restraints imply a mutual dependency between the investment and financing decisions within the firm, and this interrelationship is given special attention in the study.

Another important phenomenon which is analyzed is that capital gains are not taxed until the date of realization according to Swedish tax law. This means a lower effective tax rate than the nominal one due to the fact that the postponement of tax payments implies that the individuals are given a tax credit. The longer the holding period of the shares and the faster the increase in their value, the smaller is the effective capital gains tax rate. Obviously, there exists an optimal average stockholding period for the stockholders. Determination of this period and hence the turnover of stocks are also interrelated with the firm's investment and financial behavior. Thus taxes also have real effects through their impact on the optimal holding period.

Investigator: Göran Eriksson

Economic Development and Expenditure Growth of Local Government

In 1962, the Institute published a study by Erik Höök on the expansion of the public sector 1913-58. The present study develops further and discusses questions regarding the development of local government expenditures and its connection with economic development against the background of postwar economic development in Sweden.

There are several objectives of this study. *Firstly*, it presents a statistical overview and descriptive analysis of the development of local government expenditures during a period of more than a hundred years for which collective local government accounts exist.

Secondly, an econometric analysis is undertaken of the nature of local government expenditures and finance based on time-series data of the postwar period. It is hoped that this model, used within the framework of a macro model of the total economy, will facilitate a better analysis and deeper understanding of the interaction between local government budget decisions and development in other sectors of the economy.

A *third* objective is the analysis of the effectiveness of various central government actions effecting the local governments.

Investigator: Bengt-Christer Ysander

The Effects of General Output and Commodity Taxation

During the 70's the possibility of "moving taxation closer to production" has been discussed in Sweden. Those advocating this change often refers to the basic idea that an increasing share of tax revenues should be taken out of the income creating process by a broad-based tax before the proceeds of pro-

duction are distributed to households. Psychological, administrative and equity arguments are usually raised for this position. One objective is to lower the burdensome personal income tax in the future.

To a certain extent a shift in the Swedish tax system in this direction has been going on for some time by means of increases in payroll taxes and the value added tax (of the consumption type, CVAT). However, these two taxes have been criticized inter alia because of the exemptions that are admitted in relation to (private) national income. It is argued that these exemptions give rise to undesirable effects from the points of view of income distribution and stabilization. The idea is therefore that a new tax including the whole private national product in its base should be considered.

In this project the argument against payroll taxes and the CVAT are critically examined. Some reform proposals are also analyzed. One of these proposals can be characterized as an income-type value added tax (IVAT) constructed according to the origin principle. Contrary to the present CVAT this variant will include investment goods in the base (income-type). It will *not* tax imports and will not exempt exports (origin principle). By using the latter principle it is argued that the IVAT will be shifted backwards onto the rewards to capital and labor rather than forward onto prices.

In a first report some effects of a tax on capital have been analyzed. It is argued there that a tax on the rewards to capital taken out at the firm level rather than on households will be ultimately borne by labor. The shifting process involving international reallocation of capital is expected to be concluded in a few years. The study will include a report on the performance of the existing CVAT[1] and an econometric study of the inflationary effects of different taxes. Efforts will be made to test the so called "tax push hypothesis", i.e., the extent to which taxes might be inflationary from the cost side.

Investigator: Göran Normann

[1]G. Normann, "Value Added Tax: Experience in Sweden", paper presented to the Brookings Conference on Value Added Tax Experience in Europe. Washington, D.C., October, 1980.

Profitability, Financing and Capital Market Analysis

Inflation and Growth

During the last two years a research project has been carried out at the Institute dealing with the consequences of inflation on the growth prospects of the firm.

By constructing a model of neoclassical firm behavior, the *nominal* cost of capital is derived from the rates of return on financial markets, i.e., the credit market and the stock market, taking into account profit taxation and shareholders' taxation of dividends and capital gains. Making simple assumptions as to how market rates are changed by inflation, the impact of inflation on *real* capital cost is then analyzed. By this procedure several counteracting tendencies are taken into account, e.g., the current practice of basing depreciation allowances on historical costs, of allowing the firm to deduct the nominal cost of debt, of taxing shareholders' nominal rates of return on alternative financial investments and of taxing nominal capital gains on corporate stock. The result of the analysis indicates that for most reasonable assumptions the net outcome of these effects is to lower capital cost, when both profit and personal taxes on dividends and capital gains are taken into account.[1]

The analysis of inflation and capital cost has been furthermore developed in several directions. One important extension concerns the financial behavior of the firm. On the assumption that firms adjust their debt positions so as to minimize the cost of capital, inflation can be demonstrated to have effects similar to that of a rise in the general level of interest rates. The theoretical and empirical analysis briefly reported for the last medium-term survey[2] indicates that inflation in effect has induced industrial firms to reduce their debt financing.

A further extension of the inflation project concerns the short run adjustment of the firm to changes in the size of the long run optimal capital stock. Attempts to formulate empirical investment functions for Swedish manufacturing industry have thus included effects of variables such as liquidity and retained earnings defined so as to depend explicitly on the rate of inflation.

[1] See V. Bergström and J. Södersten, "Double Taxation and Corporate Capital Cost", and "Inflation, Taxation and Capital Cost" in Eliasson-Södersten (eds.), *Business Taxation, Finance and Firm Behavior*, IUI Conference Reports, 1981:1.

[2] See G. Eriksson and J. Södersten, "Industrins finansiering och tillgångsstruktur" (Finance and Structure of Assets in Industry) in *Kalkyler för 80-talet* (Modeling the 80's), Special Studies, Vol 2, for IUI's Medium-Term Survey 1979.

Inflation induced changes in the financial structure of the firms are also taken into account in current attempts to explain the investment behavior of manufacturing firms.

Investigator: Jan Södersten

The Swedish Micro-to-Macro Model— a Theory of Market Allocation and Market Instabilities

This project is concerned with the dynamic market processes and their effects on a national economy. The institutions of the markets (the firms) have been studied and modeled in an earlier project. The ambition is now to improve our understanding of the properties of the macroeconomic system by basing our analysis on micro information: not to capture particular features of individual firms. The model—called MOSES for a *Mo*del of the *S*wedish *E*conomic *S*ystem—is a formalized version of the Schumpeterian concept of an economic process. As with Schumpeter, the technical competence of individual entrepreneurs is exogenous. The realization of their competence in terms of economic growth at the macro level is, however, determined by the market characteristics of the entire economic system. The modeling project has gradually moved out of its original theoretical domain to become empirically founded and a useful tool in several ongoing projects where quantification along the micro-to-macro links is essential. Since October 1980 the model is based on a complete micro-to-macro data base of the manufacturing sector that is consistently integrated within the national accounts framework for 1976 and in all forward simulation experiments.

The Market and Its Institutions[1]

The model system is a dynamic theoretical representation of the entire Swedish economy. Market processes and the market institutions in the industry sectors are central. Hence the sequential ordering of period-to-period (quarter) decision processes within business firms and in the labor, product and credit markets is explicit.

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[1] A complete description of the model as it stood in Autumn 1977 is found in Eliasson (ed), *A Micro-to-Macro Model of the Swedish Economy*, Proceedings of a joint IUI-IBM symposium in Stockholm, IUI Conference Reports, 1978:1. A full report from the same conference that also includes other contributions has recently been published in Bergmann-Eliasson-Orcutt (eds.), *Micro Simulation—Models, Methods and Applications*, IUI Conference Reports, 1980:1.

The representation of the individual firm in the Swedish model rests heavily on experience from

Figure 21. *Wage change and the real return to total assets in investment goods industries before and after inflationary period, 1969—1973 and 1969—1975*

Wage change, annual
average for each period

%

• 1969—1973

* 1969—1975

Real return to
total assets, annual
average for each period
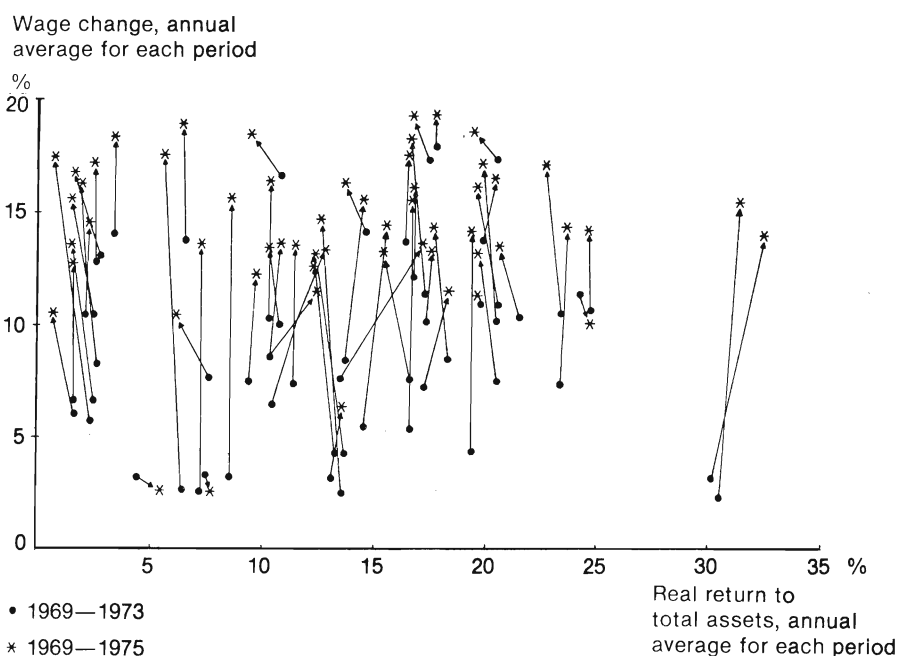
The diagram shows wage changes and rate of return figures for individual firms during two periods in a MOSES simulation. During the first period 1969—73 (dots) the price level is dramatically increased. During the second, more extended period, 1969—75 (stars) a delayed wage inflation occurs as a result of the first price increase. A fairly parallel upward drift in the wage level (indicated by the length of the arrows) can be seen among the firms, irrespective of initial profitability conditions, a circumstance that reflects the presence of across markets arbitrage in the labor market. Firms exhibit a tendency to remain at their initial relative rate of return rankings. However, the scatter shows a clear tencency for low profit firms to be hurt relatively more by the inflationary wave (arrows pointing upwards to the left). A somewhat weaker, reversed tendency can be seen among the high profit firms (arrows pointing upwards to the right). They improve their relative profitability ranking.

an extensive study on planning and decision methods in some 60 U.S. and European firms reported on in G. Eliasson, *Business Economic Planning* (John Wiley & Sons, 1976).

Also see G. Eliasson, "Competition and Market Processes in a Simulation Model of the Swedish Economy", *AER* 1977:1 and (same author) "Relative Price Change and Industrial Structure", and J. Albrecht, "Production Frontiers of Individual Firms in Swedish Manufacturing 1975 and 1976", both in Carlsson-Eliasson-Nadiri (eds), *The Importance of Technology and the Permanence of Structure in Industrial Growth*, IUI Conference Reports, 1978:2. Some recent illustrations of the empirical potential of the model is found in G. Eliasson, "Experiments with Fiscal Policy Parameters on a Micro-to-Macro Model of the Swedish Economy", in Haveman-Hollenbeck (eds.), *Microeconomic Simulation Models for Public Policy Analysis*, Academic Press, 1980.

This means that *supply* and resource allocation mechanisms in both the short and the long runs at the individual firm level figure importantly in the macro income determination process. The macro economic effects of short term instabilities in the relationships between market supplies and demand, created, e.g., by economic polices or Government regulatory intervention in the markets can be studied. The price signaling functions of the markets as well as the speed of adjustment of economic agents are important for the stability properties of the entire economic system.

Technical Change and Supply

Economic growth is endogenous under an upper technical constraint on the level of labor productivity of new investment in the individual firms. The interaction between business cycles and economic growth can be analyzed empiricially within a general equilibrium framework. The structural adjustment process is so to speak endogenous. In particular, we have found the "residual factor" in production function analysis to be heavily dependent on the market organization of the economy (see p. 33). Some 50 percent of total factor productivity seems to depend on structural adjustments in the composition of output among plants. Differences in long term growth rates of the same magnitude as have been observed between nations, as in Figure 21, have been simulated for identical technical specifications at the plant level but under different assumptions as to the market process.

Stability Analysis and the Optimal Rate of Structural Change

Structural change can be both too slow and too fast in a fashion that slows down economic growth. Erratic absolute and relative price movements in foreign trade disturb the decision machinery in firms. Erroneous production and investment decisions often follow, and the mismatch of supply and demand created may perpetuate and even reinforce itself for a long time.

The conditions for stable economic growth after major market shock experiences are studied in the MOSES system in the context of the large energy project (see p. 86). We have found that unstable market price disturbances, especially if reinforced by a speedy labor market arbitrage and large tax wedges in the price system (see p. 72) may generate cumulative shock waves through the model economy for a long time. A slow growth period of some length usually follows. Very flat so called "Salter structures" in each market tend to reinforce this problem. When relative price movements are sudden and strong, entire sectors may have to close down—if not aided by subsidies—at such a fast rate that growing firms cannot fill in the slack. Sudden drops in output from whole sectors and temporary changes in the supply composition give rise to a delayed and temporary new pivoting of relative prices. The sequence keeps repeating itself until the system eventually converges into a bounded domain of relative stability. Once out of order,

relative prices become difficult to interpret, especially if combined with high rates of inflation. Therefore firms in the MOSES system often form mistaken expectations. After a series of mistakes they get cautious and cut investment spending to preserve profitability. Therefore, the optimal rate of structural change is an important aspect in determining the fastest stable rate of growth possible. But it cannot be done without a fully dynamic micro-to-macro market model with endogenous investment and relative prices.

Future

The MOSES model system has now been completed for more than a year. However, the micro specification is still restricted to the industry sectors within a conventional 10 sector Leontief-Keynesian macro model. The household sector in particular is still modeled in macro as a Stone type, non-linear expenditure system. Further theoretical work in the direction of micro specification cannot yet be done due to lack of necessary micro information. Profect work is currently organized along the following lines; (a) to complete and update the systematic micro-to-macro data base within the Swedish national accounts framework, (b) to improve estimation of micro structural relationships (e.g. the individual firm production system), (c) to estimate the monetary part of the model, and (d) to make the model useful in other projects as described above.

Project leader: Gunnar Eliasson
Other investigators: Jan Södersten, Jim Albrecht, Fredrik Bergholm, Thomas Lindberg, Louise Ahlström

Industrial Finance and the Industrial Transformation Process in Sweden

The purpose of this study is to explore the development of industrial finance in Sweden focusing on its role in the industrial transformation process. A long-term perspective is taken starting with the take-off of Swedish industrialization in the 19th century. The emphasis, however, is on postwar industrial finance. For this period, data on financial flows have been collected for some 300 firms. The study has its theoretical point of departure in the Austrian school of economic thought, represented, e.g., by von Hayek, Schumpeter, Kirzner and Dahmén.

After World War I Swedish industry adapted to peace time conditions in a severe crisis. In fact, it was the most severe crisis Swedish industry has gone through as far as production, employment and industrial finance are concerned; more severe than the great depression of 1929-32. Industry emerged from the crisis financially weak and heavily dependent on the merchant banks. As a consequence financial consolidation became an even more pro-

minent feature of industrial finance in the interwar period than risk-taking had been before World War I. The consolidation process started on a moderate scale in the 20's but was in full swing during the 30's. World War II and the first few years of peace did not disrupt this process.

The long period of favorable financial development culminated in the Korean boom in 1951. After a temporary surge in profits, mainly reflecting the extreme profits of the forestbased industries, profitability fell. Nevertheless, profitability in the industry seen as an aggregate remained high in a longer perspective. Furthermore, it remained remarkably stable. Behind this superficial impression, however, there are large differences between, for instance, the forest industries on the one hand and the textile industry on the other.

As the industrial transformation process gained momentum in the upswing of 1958 the financial picture was altered. As in most Western countries the upswing marked the beginning of a period of rapid growth, but it also marked the end of the long period of financial consolidation. The relatively stable pattern of the 50's, according to our measurements, was replaced by a cyclically falling profitability. The inflationary boom that characterized Swedish industry in 1973-75 meant a temporary break in this trend. Falling profitability, a rising debt-equity ratio and rising interest rates have resulted in a rapid fall in the ratio between operating income and interest payments ("times interest earned") since the 50's. Another characteristic feature has been that the large differences among industries have disappeared (Figure 22).

Investigator: Johan Örtengren

The Growth of Large Firms and its Determinants

Existing theory has not paid much attention to how individual firms change their output over time. Nor does it explain to what extent the growth of the industry is accounted for by existing firms and how much is contributed by new entrants to the industry. This study deals mainly with the former gap in our knowledge. Its purpose is to describe and explain the growth of output of the largest firms in about 30 manufacturing industries in Sweden, covering the period 1954-68. Data on firm size are available for all large firms and most smaller firms in the plastic materials industry and in the engineering industries for the years 1954-58, 1964 and 1968. The rate of growth of each of the largest firms in these industries has been calculated for these three periods. The variance in growth rates in each period as well as the covariance between periods have been calculated.

The study seeks to determine whether the variance in growth between in-

Figure 22. *Ratio between operating income and interest payments
(times interest earned) in Swedish manufacturing
industry, 1951—1976*

(cash flow = interest changes)

- - - - Engineering industry
-··-··- Textile and clothing industry
o——o Forest industry
——— Total manufacturing industry
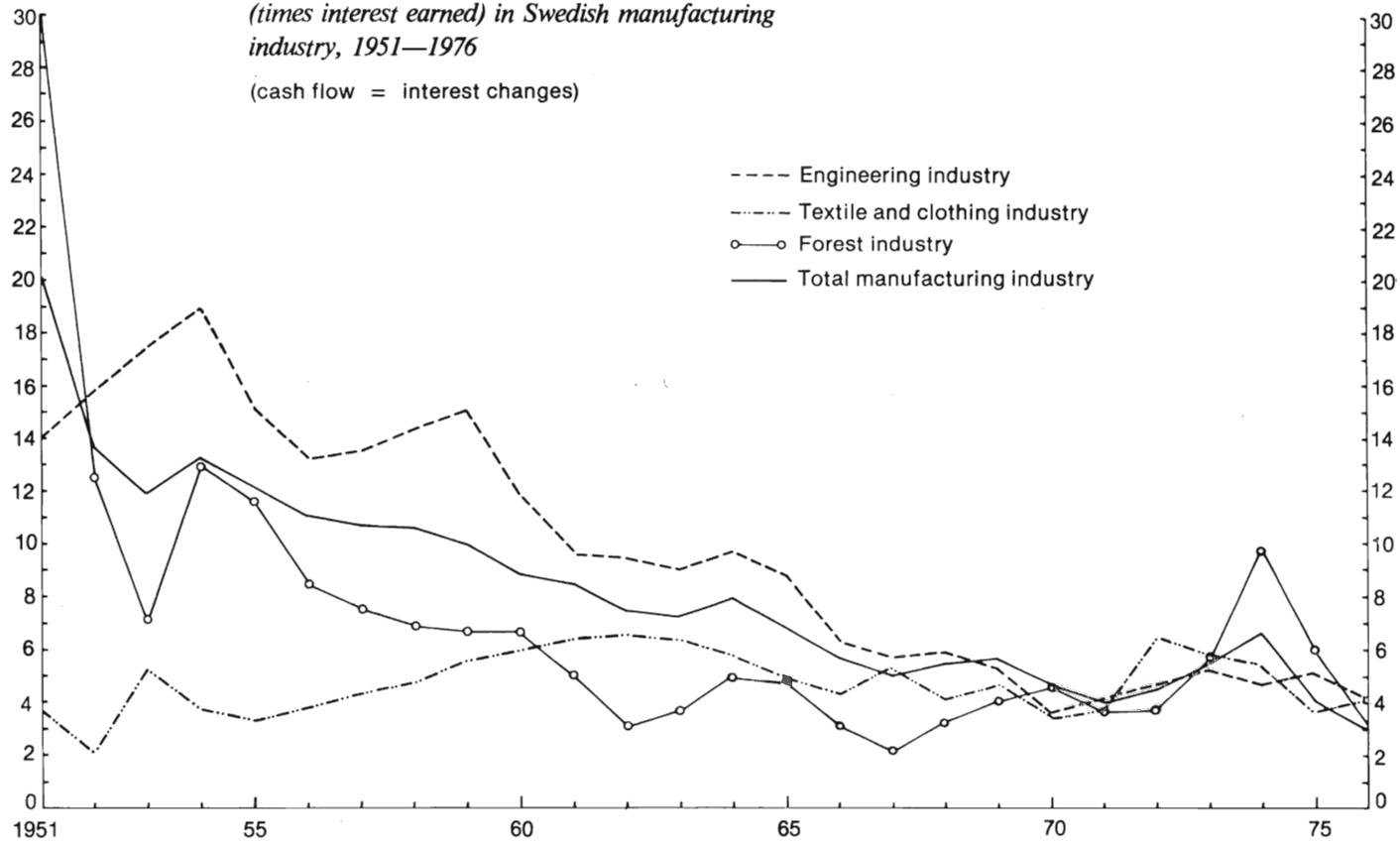
dustries can be explained by a) the degree of concentration in the industry, b) the rate of industry growth, c) the technological characteristics of the industry, d) product characteristics, and e) cartelization. A similar analysis has been carried out to explain the variance in the growth rate of small firms in the same industries, and the results for large and small firms have been compared. One purpose of this analysis is to test the hypothesis that a high degree of concentration facilitates the division of markets between the largest firms.

Investigator: John Hause

Profitability, Finance and Taxes— Their Role in the Growth Decisions of Firms

This project consists both of a) an extensive analysis of the dynamic interaction of profit development, taxes, investment and growth and of b) the construction of a necessary company data base for that analysis. The ambition will be to take a broad historical view of the firm in a competitive macroeconomic environment. This requires that we observe the historical development of individual firms and groups of firms in a data system that is consistent with the national account statistics at the macro level. This project coordinates several related projects (pp. 99, 104 and 115) and draws the results from others (pp.87,107). The micro-to-macro model (p.104)is used as a theoretical framework. Properties of the model that have been ascertained theoretically will be tested. A central part of the new data set is the questionnaire which has been designed according to the needs of the micro-to-macro model and which, for the last two years, has been sent out jointly by the Federation of Swedish Industries and IUI. Another important source is a data base constructed from external information on the 40 largest Swedish industrial firms and used for various other micro-based projects within the Institute.

A main theme will be the firm or the entrepreneurial function as a moving force behind macro-economic development. To what extent does the political economic environment improve, affect or impair this function. This means that the effects of various forms of taxation will have to be considered. Besides a separate study (p.103)this project also involves participation in an international research project including the National Bureau of Economic Research in Cambridge, Massachusetts, the Ifo Institute in Munich and the University of Birmingham (see article on p. 78). As part of the project a volume from an international IUI conference on corporate tax-

ation and finance is about to be published.[1] One important set of questions analyzed in this volume concerns the extent to which tax wedges between supply and demand prices distort the allocation process and destabilize the economy.

During the past decade the Swedish economy has moved into a state of heavy international indebtedness from a strong net asset position. This means a strong further integration of the Swedish credit system with the international credit system and tight reins on domestic monetary policy independence. The effects of this new development on the situation of the firms and their financial environment will be part of this inquiry.

During a number of years, the domestic real rate of interest on borrowing in Sweden has been negative at the same time as it has deviated from corresponding international interest rates. What does this mean for investments and their distribution among sectors? How does this influence the choice between financial investments and real capital formation? To what extent is a situation like this for a prolonged period of time compatible with a capitalistically based market economy? These are some of the important problem areas within the study.

Investigators: Gunnar Eliassson, Thomas Lindberg, Jan Södersten, Fredrik Bergholm

[1]Eliasson-Södersten (eds.), *Business Taxation and Firm Behavior*, IUI Conference Reports, 1981:1.

Private Consumption

Demand for Consumer Goods

Through this project an earlier investigation of various demand oriented models that explain and predict demand for food products is complemented by a similar study dealing with all commodity groups.[1] The results show, as before, that it is difficult to differentiate between the ability of various theories to explain reality. Certain conclusions can, however, be drawn. Models based on the theory of choice are better than simpler models. The model that was previously used in the Institute's consumption projection and medium-term surveys, the so called linear expenditure system with habit formation, appears to give both a comparatively good approximation to the observed consumption development and accurate predictions. Estimates of income and price elasticities are very dependent on the model being used, furthermore on how the consumption goods are grouped. In a situation when income and price development can be expected to deviate from that observed so far, the choice of model and the commodity groupings used are of great importance in making predictions.

One difficulty in studying private consumption is in distinguishing between changes in demand and changes in supply. During a large part of the postwar period the housing market, for instance, has been regulated, resulting in excess demand. This has not only been of importance for the consumption of housing services but can be expected also to have had spin-off effects on other commodity groups. In order to estimate demand correctly it is of importance to consider the special situation on the housing market.

Investigator: Anders Klevmarken

The Demand for Printed Matter

The Institute's study of the industry was initiated by a government committee on the printing industry. Its main objective was to analyze the situation for labor in the printing industry against the background of an expected rapid technological change in the sector. The committee was asked, among other things, to predict demand for labor.

The development of employment is determined by the demand for the products of the sector and the increase in productivity. The Institute had earlier conducted an analysis of the demand for printed matter, and this study has

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[1] A publication with the title: *On the Complete Systems Approach to Demand Analysis* is planned to appear in spring of 1981.

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now been updated on the request of Statens Industriverk (National Industrial Board).

There are various theories about how the price in the market is determined. According to traditional analysis of the interaction between supply and demand, the price is influenced by, not only the costs to the company, but also the willingness of consumers to pay. It has, however, been claimed that the latter influence is negligible compared to the former.

An attempt has been made in the study to discriminate between the two hypotheses. It appears that only a cost-oriented variable generated a significant result in explaining price development. Consequently, the traditional hypothesis that prices generally change only with costs cannot be rejected.

Investigator: Bertil Lindström

Foreign Trade, International Specialization and Multinational Business Activities

Swedish Manufacturing Investment Abroad

This study, which was completed in 1979, analyzes the determinants and effects of foreign manufacturing investment. The empirical analysis is based on unique census data regarding the foreign operations of Swedish manufacturing firms, data which have been collected at the IUI through several questionnaire surveys.

This is the first study in which hypotheses regarding the determinants of foreign production have been tested using data for a country other than the United States, and it is one of a few studies where these hypotheses have been tested on the level of individual firm data. A presentation of some of its findings appears on p. 59 of this report.

The study has been published as a doctoral dissertation at the University of California, Los Angeles, under the title *The Multinational Operations of Swedish Firms: An Analysis of Determinants and Effects*. It has also been published in English under the same title by the IUI.[1]

Investigator: Birgitta Swedenborg

Effects of Foreign Manufacturing Investment on the Domestic Economy

The analysis of the international operations of Swedish manufacturing industry continues in a project financed by a government committee whose task it is to evaluate the effects of international investment on the domestic

[1]Earlier publications within this project are:

B. Swedenborg, *Den svenska industrins investeringar i utlandet* (Swedish Manufacturing Investment Abroad), IUI, 1973.

B. Swedenborg, "Svenska, amerikanska och engelska utlandsinvesteringar: några jämförelser" ("Swedish, U.S. and U.K. foreign investment: Some comparisons") in *De internationella koncernerna och samhällsekonomin* (The International Corporations and the Economy) N. Lundgren (ed.) Stockholm 1975.

B. Swedenborg, with the assistance of B. Lindörn, *Den svenska industrins investeringar i utlandet, 1970-74. En preliminär rapport*. (Swedish Manufacturing Investment Abroad, 1970-74. A Preliminary Report). IUI Research Report No. 5, 1976.

B. Swedenborg, "Industrins utlandsproduktion och export" ("Foreign Production and Exports by Manufacturing Industry") in Expertbilaga 1 (a separate appendix volume DSJu 1979:2) to *Vägar till ökad välfärd* (Roads to Increased Prosperity), DsJu 1979:1.

economy. The Institute's study is based on census data regarding Swedish manufacturing firms and their foreign affiliates which have been collected at the IUI. The earlier data covering the years 1965, 1970 and 1974 have been supplemented with data for 1978 for the purpose of this study. Thus, it will be possible to describe the growth of foreign operations in the period 1965-78 and analyze the implications of these operations for the Swedish economy over a relatively long time period.

Many of the effects with which the study is concerned derive from the relationship between foreign production, firm size and exports from Sweden which was the subject of Swedenborg (1979) presented above. The present study will focus on the implications of foreign production for the pattern of production and employment in Sweden.

Investigators: Birgitta Swedenborg, Eva Christina Horwitz, Fredrik Bergholm

The Financing of Foreign Investment

The Swedish economy is greatly influenced by events in the rest of the world. This is an outcome not only of its smallness and openess which are reflected in the large scale of its international trade, but also of the marked internationalization that is characteristic of Swedish industry.

This project includes three parts. One is concerned with the *financial macro relationships* between the Swedish economy and the rest of the world. This part was concluded within the medium-term survey project.[1]

A second part on *International Direct Investment and the Foreign Exchange Regulation Act* was concluded as part of a government committee contract.[2] This study is concerned with that part of the act which applies directly to international investment, especially international direct investment.

The basic aim of the foreign exchange regulations is "to protect the domestic credit market from unwanted influence from the outside" so as to allow maximum freedom for domestic monetary and fiscal policy. That part of the regulation which applies to international investment is, however, different in character.

First, portfolio investment, i.e., investment which does not involve a controlling interest in foreign operations, is not allowed. Second, direct investment which does involve such an interest is only allowed subject to certain

[1]See B. Lindström, "Sveriges finansiella relationer med utlandet" ("Sweden's International Financial Relations") in *Kalkyler för 80-talet* (*Modeling the 80's*, Special Studies, Vol. 2, for IUI's Medium-Term Survey 1979.

[2]See B. Swedenborg, "Valutaregleringen och direkta investeringar" (Swedish Foreign Exchange Controls and Direct Investments). IUI Working Paper No. 32, 1980.

conditions. These conditions are that the investment must have a positive effect on the trade balance and may not have adverse effects on domestic employment. In addition, as part of Sweden's current policy of financing a trade deficit through foreign borrowing, firms are now required to finance their new foreign investments abroad for a period of at least 5 years. With the exception of the borrowing requirement, the regulations have been applied liberally. The issue of direct investment controls is a controversial one, however, with unions pressing for increased influence.

The study describes Sweden's growing foreign investment in the period 1960-79, compares the rate of return on that investment to investment in Sweden, relates the earnings inflow to the outflow of investment capital, and calculates balance of payments recoupment periods, i.e., the time it takes before the inflow of accumulated earnings equals the initial outflow, taking account of reinvested earnings.

It also presents data on the contribution of multinational companies to the international flow of payments for patents, licences, knowhow and administrative services.

Finally, it contains a detailed discussion of the effects on exports of allowing foreign production, based largely on the results obtained in an empirical analysis of these effects for Swedish firms.

The study concludes that the balance of payments flows occasioned by Swedish multinational firms are both small and relatively stable, a fact that cannot be ascribed to the regulation act since it has been enforced so liberally. The outlow of direct investment capital has been held relatively steady at 2—3 percent of Swedish exports in the 1960's and 1970's. Given that the much larger payments in connection with international trade are usually exempted from the regulation, controls on foreign investment can hardly be justified on the basis of the actual or potential destabilizing effect of the investment related payment flows.

With respect to the controversial issue of the effect on the trade balance, the study suggests the following. First, that the trade balance is an inadequate criterion by which to judge the effects of foreign investment on the home country. However, given this criterion, the empirical results indicate that the effect on the trade balance is positive. Second, and more importantly, the study argues that it is extremely difficult, if not impossible, to determine what the effect of a particular investment is going to be, and as there are no strong reasons on either theoretical or empirical grounds to expect that these effects are damaging, the controls based on the balance of trade criterion should be continued.

For practical reasons a planned third part of the study concerning financial and investment analyses of firms will be concluded as an integrated part of the project "Profitability, Financing and Taxes—Their Role in the Growth Decision of Firms". (P. 110.)

Investigators: Birgitta Swedenborg, Bertil Lindström, Thomas Lindberg

The International Competiveness of Swedish Industry and Sweden's Long-Term Balance of Payments

This study concentrates mainly on identifying long-term patterns in the development of Sweden's international trade and explaining the changes that have taken place. The project focuses on the demand for Swedish exports in which the connection between economic development abroad and the development of Swedish exports play important roles as does the price and cost situation in Sweden compared to that in other developed countries.

During 1979, one part of the project which was tied to the Institute's medium-term survey was completed. It includes projections of international economic growth and an analysis of Swedish exports as a percentage of international trade grouped, for example, according to the classification used in the Institute's sector model. The data collected facilitate a detailed breakdown of the Swedish market over a large number of products and countries. A report on this sector of the study is presented in the article on p. 54.

Investigator: Eva Christina Horwitz

Labor Market Studies

The Mobility of Labor

The purpose of this study is to analyze the determinants and effects of the mobility of labor by focusing on the individual's quit and migration behavior as well as the effects on wage and employment of past mobility decisions.

The theoretical framework is based on an extension of traditional utility analysis of household behavior. Decisions regarding labor supply and job search—and indirectly job mobility—are simultaneously determined and affected by essentially the same set of explanatory variables. This empirical analysis explores different data sets, including (I) pooled cross-section and time- series data for individual firms, (II) household survey data at the micro level, and (III) aggregate time series.

The analyses of individual establishment data indicate that quit rates as well as hours per worker are negatively related to the firm's relative wage level; the quit-wage elasticities are between —0.5 and —1.0. In addition, the regressions reveal that quit probabilities decrease rapidly with the size of the firm (an "internal labor market effect") and with the workers' length of tenure.

The analyses of household data show, among other things, that returns on investments in human capital undertaken within a firm exceed returns on individual training undertaken outside it. Another noteworthy finding is that the growth in individual wage rates 1968-74 appears to have been left fairly unaffected by the extent of geographical mobility.

Finally, the study develops a macro simulation model of gross employment flows in the labor market viewed as an interrelated dynamic system. It consists of ten stochastic equations estimated on monthly data and focuses on the relationships that govern the flows among the categories of employed, unemployed and job vacancies. The model is driven as a self-contained system by exogenous output demand and provides a framework suitable for taking account of the indirect effects and interactions that occur throughout the labor market if one part of it is directly changed. In particular, the model incorporates information on important labor market policies adhered to during the 70's and is useful in showing the quantitative effects of these schemes.

Investigator: Bertil Holmlund

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Male-Female Lifetime Earnings Differentials and Labor Force History

Sweden has an international reputation for equality between the sexes. So far, however, analyses of male-female earnings differentials have been rare. It has, therefore, been difficult to judge whether this reputation, which is justified as regards family policy, is justified also when considering the earnings situation of Swedish women compared to Swedish men.

In this project, earnings functions have been estimated from a set of data based on cross-section statistics of white-collar salaries in the private sector and a time series of observations of earned income. The earned income statistics are in the form of "ATP" points, i.e., points accumulated for the calculation of old age pensions. These data have been used primarily to construct a labor force participation variable which is positive if earned income exceeds an amount equivalent to 2—4 months of full-time work depending on the wage rate.

It turns out that for the subsample of men and women white-collar workers in the private sector who were in the labor force during the whole period from 1960 to 1974, the earnings differential when standardized for education and age was 22.6 %. That is, full-time workers with equal education and labor force history earned 22.6 % less if they were women than they did if they were men. This differential is of about the same size as that calculated in similar studies based on US data with schooling and labor force experience held constant.

Investigator: Siv Gustafsson, Petra Lantz

Labor Market and Profit Influences on Wage Formation at the Plant Level

The aim of the study is to investigate empirically the forces operating at a disaggregated level which explain the dynamic behavior of wages as observed at the aggregated level. The study focuses on the behavior of wage drift, i. e., the development of earnings over and above the centrally negotiated increases.

There is strong evidence that the development of the aggregate wage drift, based on earnings data for workers in the Swedish manufacturing sector, varies closely with the state of the labor market and also with the overall profitability performance of the enterprises.[1]

[1] Cf. "The Duration of Vacancies as a Measure of the State of Demand in the Labor Market. The Swedish Wage Drift Equation Reconsidered", and the references to earlier studies included in it, published forthcoming in *Studies on Labor Market Behavior: Sweden and the United States*, IUI, 1981.

The observed impact on wage drift of both labor market conditions and profit levels can be derived from established theory. That the price of labor should be influenced by supply and demand conditions in the labor market is certainly a straight-forward implication of neoclassical disequilibrium theory. The hypothesis has been successfully reconciled with empirical findings both in Sweden and in most other countries since the mid-50's. It should be pointed out, however, that the reformulation of price and wage dynamics within the framework of models of search under uncertainty requires a more careful interpretation of the traditional aggregate relationships. Instead of taking for granted that the disequilibrium in the labor market can be measured by some aggregate figures on unemployment and vacancies, the more modern approach focuses on the hiring process of the firm and its dependence on the firm's wage policy. It is thus one of the merits of the new disequilibrium models that they offer an immediate opportunity to specify behavior equations for the individual agents.

The hypothesis that the profitability of enterprises should influence the amount of wage drift may not be quite as orthodox. In contrast to the neoclassical assumptions it relies on the possibility of collective action on the part of workers. Since a long time such behavior is a basic feature in models dealing with organized labor markets. The case may be described and formalized as one of bargaining under bilateral monopoly, in which the workers as a group are able to seize a part of the "surplus value added".

While thus the two hypotheses of wage drift according to hiring needs and wage drift according to "surplus value" are supported by aggregated Swedish data, they really refer to microeconomic relationships. They should be tested at a level of aggregation that corresponds as closely as possible to the relevant agents, i.e. they should be tested against data gathered at firm or plant level. Such studies have not been carried out, however, the obvious reason being the lack of suitable data, especially the lack of data on earnings at plant level.

In the present study it has nevertheless been possible to overcome this difficulty. Data on the development of earnings, hires and quits and announced vacancies have been gathered for more than 200 plants belonging to private firms in Swedish manufacturing industry. Data on the profit performance of the corresponding firms have also been gathered. This comprehensive information constitutes the empirical base for studying whether any systematic pattern in the amount of wage drift at different plants and at different points of time might be traced, consistent with the hypotheses outlined above.

Investigator: Nils-Henrik Schager

Industrial Salaries in the United States and Sweden

This project represents a continuation of an earlier study dealing with the formation of industrial salaries.[1] The objects of the new project are a) to study salary formation and salary revision systems at the local level in the United States and Sweden; and b) to compare statistical information systems, statistical methods for salary analysis, and statistical data for salary revision in the two countries. Part of this information will be collected through personal visits to American companies, organizations, and academic institutions while the investigator is visiting professor at the University of Michigan.

Investigator: Anders Klevmarken

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[1]A. Klevmarken, *Ålders-, kvalifikations- och befordringstillägg. En studie av industri-tjänstemännens lönebildning* (Salary Supplements Due to Age, Qualifications, and Promotion. A Study of Industrial Salary Formation), Göteborgs Universitet, 1980.

Other Research Projects

The Determinants of the Establishment of New Firms

This project is an attempt to identify the factors that have determined the establishment of firms as well as new diversification, in the postwar period. It is evident that both these factors are extremely sensitive to the rate of growth in the particular industry.

Given the rate of growth in the industry, the establishment of new firms appears to be greatly restrained if a high capital outlay is required in the process. In industries that have a large average establishment size, e.g. iron and steel works etc., the rate of new establishment was either negligible or nonexistent during the period 1954-68. The only significant entry occurred in industries with an average installed capacity of machinery of less than 400 horsepower per plant, with the exception of the large intermediate plastics industry which was the most expansive of those included in the study.

Diversification undertaken by firms, however, does not appear to have been hampered by the requirement of a high capital outlay.

In addition to the growth rate and a high capital requirement, a high share of technically skilled personnel slows down the rate not only of the establishment of new firms, but also of diversification. The relation between new entry and the degree of concentration of production has also been studied and it appears clearly to be a negative one.

Finally, it should be mentioned that it was not possible to establish any statistical relationship between the entry rate and the rate of technological change or the propensity to innovate in various industries. This does not, however, preclude the existence of a positive relationship for the postwar period similar to that shown by Dahmén for the interwar years.

Investigator: Gunnar Du Rietz

Price Controls in Sweden

During and immediately after the Second World War price controls were used in Sweden in an ineffective attempt to bring down the rate of inflation. The result was a loss of faith in the effectiveness of price controls in reducing inflation.

Scepticism also characterized the government study on price controls presented in 1955. This study resulted in a new price control law that made it possible to introduce different kinds of price controls in case of war or the threat of war or if for some other reason there was a danger of a sharp rise in the general price level. This law had to be ratified by Parliament.

Figure 23. *Overview of the model*
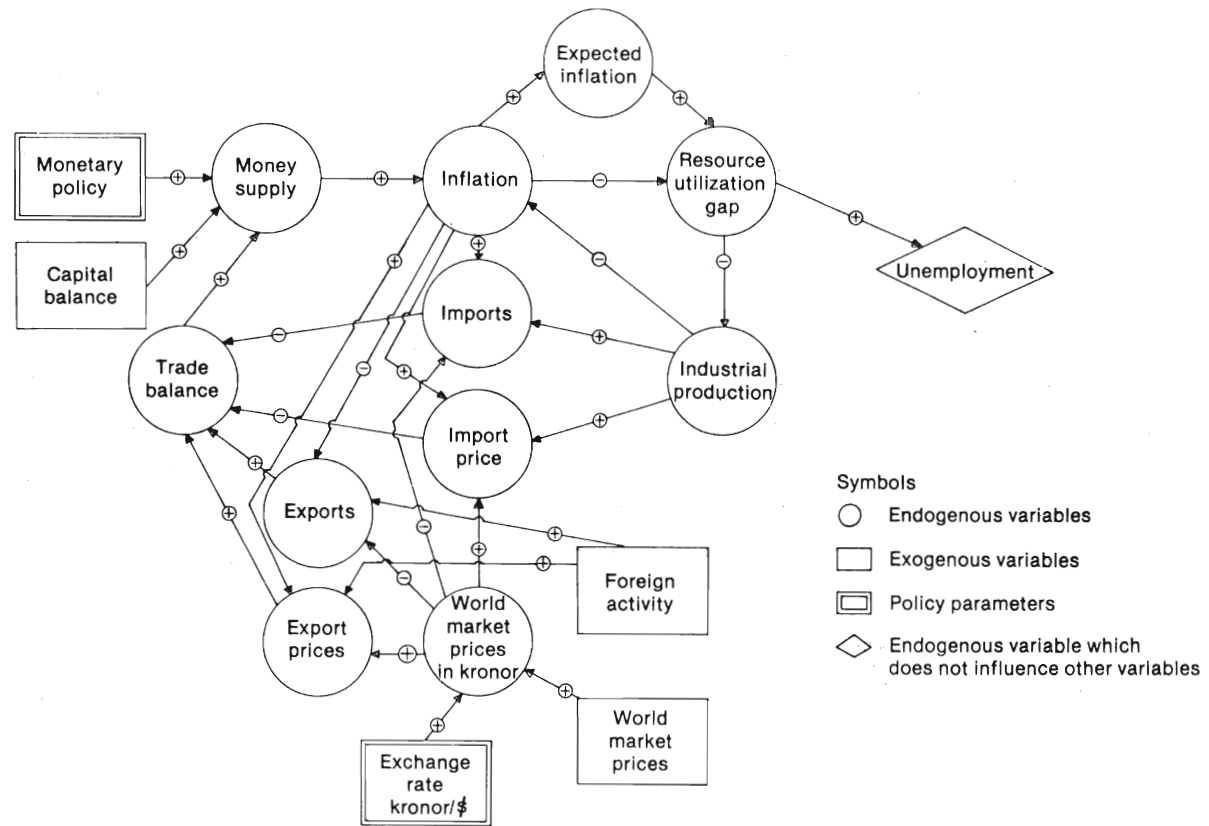
Price controls were not, however, introduced under this law until August 27, 1970 when controls on certain food stuffs were announced. In October 1970, a general price freeze was announced and stayed in effect until the end of 1971.

In the spring of 1973, Parliament passed a new law which stated that price controls may be introduced in the event of danger of a serious rise in prices of essential commodities or services—that is, even in the absence of a rise in the general price level. This law further stated that government agencies may negotiate with firms to set prices that may not be altered subsequently without permission from the agency. Under the provision of this law it also became possible to require that advance notice be given of planned price increases. Price controls have been used fairly extensively under this law.

In early 1977, about 10 percent of total consumption was subject to some sort of price control. The present high rate of inflation has caused many problems. Some economists believe that the decrease in the growth rate can be explained by the fact that the higher rate of inflation has severely disturbed the information system that works through the price system and has thus resulted in a less efficient allocation of resources.

The main purpose of this study is to describe and analyze the effects of price controls in Sweden since 1970. The problem has been approached in three stages.

In order to evaluate whether or not price controls actually decrease the rate of inflation one has to know what the rate of inflation would have been in the absence of these price controls. To enable us to do this we need a model that explains inflation and we have, therefore, constructed a model of the Swedish economy with inflation as one of the central variables.

This model has been used for testing the effects of the general price freeze during 1970-71.[1] The analysis shows that inflation during the price freeze was as high as it would have been without the price freeze. In the period *following* the price stop, however, the rate of inflation was significantly *higher* than that explained by the model, thus suggesting that the effects of price controls were exactly the opposite of those desired.

A second part of the project is theoretical. In order to evaluate the effects of price control on a market, a generalized theory of pricing on market with imperfect information is developed. It is a development of modern search theory. In this model it is possible to draw more general conclusions regarding the effects of price controls than in the ordinary demand-supply model.

A third part combines the first two with an evaluation of studies made

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[1]The model was also used to simulate the development of inflation and resource utilization for the period 1978-85 within IUI's medium-term survey project. The results of this were published in B. Axell, S. Gustafsson, B. Holmlund, E.Ch. Horwitz, *Utrikeshandel, inflation och arbetsmarknad* (Foreign Trade, Inflation ad the Labor Market), Special Studies, Vol. 2, for IUI's Medium-Term Survey 1979.

abroad, especially in the US, with a view to assessing both if there is any potential at all in the policy of fighting inflation by forbidding it and what side effects and disturbances may occur as a result of that same policy.

Investigator: Bo Axell

A Study of the Unobserved Sector of the Swedish Economy

The unobserved sector consists of those economic activities (legal or illegal), market or non market, monetary or barter) that escape the purview of our current statistical measurement apparatus. A recent study by the principal investigator developed alternative methods of estimating the monetary component of the unobserved sector. Estimates of its size and growth rate for the United States economy revealed an unobserved sector of considerable magnitude (25 % of official GNP) and one that has grown considerably faster than the observed sector during the decade of the 70's. These findings suggest that reliance on official government statistics may give a distorted picture of the present state of the economy and thus could serve to undermine sound economic policy making based on systematically biased information.

Growth of the unobserved sector is believed to be encouraged by high rates of taxation, increasing costs of regulation and compliance and by a growing sense of social and political alienation from constituted governmental authority. Given Sweden's relatively high tax rates and its extensive regulatory system, it is the purpose of this study to attempt to estimate the size and growth of the monetarized unobserved sector. Methods employed in the United States study will be adapted to the particular institutional setting of Sweden in order to calculate tentative estimates by "indirect" macroeconomic approaches. These estimates will then be compared with other available evidence on the phenomenon from various sources. Given preliminary estimates on the growth of the unobserved sector, it then becomes possible to explore both its causes and economic consequences.

Investigator: Edgar L. Feige

OTHER ACTIVITIES

Several of the members of the Institute's research staff have published articles in scientific journals, presented papers at conferences, and delivered lectures to various audiences during the year. In most cases these activities have been connected to research projects going on at the Institute.

Gunnar Eliasson, the Institute's director, is a member of the advisory group to the Government's Long Term Survey, a member of the monetary committee of the International Chamber of Commerce, member of the Projections Group of the State Industrial Board, member of the Government Committee on Computers and Electronics, member of the Royal Swedish Academy of Engineering Sciences and a former member of Special Committee IV within the Academy's project on Sweden's Technical Capability and Industrial Competence. He is also associate editor of The Journal of Economic Behavior and Organization and was a guest, together with Bo Carlsson, of the Central Economic-Mathematical Institute of the USSR Academy of Sciences in October-November, 1980.

Bo Carlsson, the Institute's deputy director, is a member of the Swedish Government Committee on the Content of National Statistics, member of the steering committee of the European Association for Research in Industrial Economics, associate editor of the Journal of Industrial Economics, member of the editorial committee of the Rivista di Economia e Politica Industriale. He was secretary of the Royal Swedish Academy of Engineering Sciences Special Committe I in the project on Sweden's Technical Capability and Industrial Competence in 1978-79, visiting scholar at the University of Washington, Seattle, in the summer of 1979 and scientific mediator between proponents and opponents of nuclear power on the issue of projections of electricity demand 1979-80.

Bengt-Christer Ysander is a member of the Government Committee on Household Savings, a member of the Board of the Swedish Economic Association and of the editorial board of the journal "Ekonomisk Debatt". 1978-79 he served as a member of the Swedish Market Court, of the SNS Economic Council and in 1980 he was a member of the Olivetti International Panel on Public Budgeting.

Bo Axell was a lecturer on "New Labor Market Theories—Applications of the Economics of Information" at the Nordic researchers' course in economics in Oslo, August 4—15, 1980.

Bertil Holmlund served as an expert in the Department of Labor and wrote a report on employment and mobility in Swedish industry. In 1980-81 he is visiting professor in economics at the University of Michigan, Ann Arbor.

Siv Gustafsson is a member of the group for research on equality between the sexes of the Tercentenary Fund of the Swedish National Bank. She was

an editorial writer for Dagens Nyheter in the summer of 1979 and a visiting scholar in economics at Columbia University, New York, during the fall of 1979.

Göran Normann is an Expert in the Royal Committee on Value Added Taxation and also an expert for the Government's Long Term Survey on taxes, inflation and growth. He is also a referee for the Tercentenary Fund of the Swedish National Bank and for the Scandinavian Journal of Economics. In October, 1980, he gave guest lectures at the University of Michigan, Ann Arbor, and at Columbia University, New York.

Birgitta Swedenborg is engaged as an expert in a Government Committee for Direct Investments and has served in the same capacity in both the Special Government Delegation on Industrial Policy (the so-called Bjurel Committee) and the Government Committee on the Regulation of Foreign Exchange. She has also participated in a joint study with the National Bureau of Economic Research, New York, on "Multi-National Firms and Host Country Technology".

Foreign guests

On the resignation of Dr Marcus Wallenberg as chairman of the Institute's Board of Directors the IUI received a donation from the Marianne and Marcus Wallenberg Foundation set aside to enable the Institute to invite foreign researchers to the IUI.

Within the framework of this program the following persons visited the IUI during 1979 and 1980:

Professor Ronald Teigen, University of Michigan, USA

Dr Cliff Pratten, Cambridge University, U.K.

Professor Jim Albrecht, Columbia University, USA

Professor Axel Leijonhufvud, University of California at Los Angeles, USA

Professor Frank P. Stafford, University of Michigan, USA

Professor Edward Gramlich, University of Michigan, USA

Professor Mark Sharefkin, Resources for the Future, USA

Professor Robert E. Lipsey, National Bureau of Economic Research, New York, USA

Hans Genberg, Institut Universitair de Hautes Etudes International, Genèva, Switzerland

Nikolai Petrakov, Central Economic-Mathematical Institute of the USSR Academy of Sciences, USSR

Vsevolod Altaev, Central Economic-Mathematical Institute of the USSR Academy of Sciences, USSR

Professor Ronald Jones, University of Rochester, USA

Professor Robert Pindyck, Massachusetts Institute of Technology, USA

Professor David Bradford, Princeton University, USA

Professor Walter McMahon, University of Illinois, USA

Dr Christian Stoffaes, Centre d'Etudes Prévision Ministère de l'Industrie, Paris, France

Professor Linda Leighton, Columbia University, USA

Professor Kenneth Burdett, Columbia University, USA

Professor Dale Mortenson, Northwestern University, USA

Professor Richard Caves, Harvard University, USA

Professor Edgar Feige, NIAS, Holland

Conferences Arranged by the IUI

During 1978, 1979, and 1980 the Institute has sponsored three international conferences. In August, 1978, a symposium was held on "Taxation and Firm Behavior". In July, 1979, a conference on "Labor Market Issues in Sweden" was held, and in June, 1980, an informal seminar was arranged as part of the "International Tax Comparison" project, an international study in which the IUI is engaged together with the NBER, Cambridge, MASS., Ifo Institute in Munich, and the University of Birmingham.

The program and participants of the conferences are presented below. The Institute intends to publish a collection of the papers presented at each of the conferences.

Taxation and Firm Behavior

August 28—29, 1978

Gary Hufbauer, Department of the Treasury, Washington, D.C., USA,
National Borders and Tax Boundaries.
Sven-Olov Lodin, University of Stockholm,
International Cash Flows and Tax Effects.
Göran Eriksson, IUI,
Taxation and the Firm's Investment and Financial Behavior.
Villy Bergström, Social Research and Center for Worklife Studies,
Stockholm, and University of Uppsala,
Inflation, Taxation and Capital Cost.
Charles McLure, Jr, National Bureau of Economic Research, Cambridge, Mass.,
Integration of the Corporate and Personal Income Taxes.
John Bishop, Robert Haveman, University of Wisconsin,
Economic Effects of Direct Wage Subsidies.
Martin Feldstein, National Bureau of Economic Research, Cambridge, Mass.,
Taxation and Corporate Financial Decisions.
Jan Södersten, IUI,
Double Taxation and Corporate Capital Cost.
Rolf Rundfelt, The Federation of Swedish Industries,
Capital Gains Taxation and Effective Rates of Return.

Labor Market Issues in Sweden

July 10—11, 1979

Frank Stafford, University of Michigan,
Unemployment and Labor Market Policy—Sweden and the United States.
Jan Johannesson, The Expert Group for Labor Market Research (EFA), Stockholm,
The Composition of Swedish Labor Market Policy.
Edward M. Gramlich, University of Michigan and Bengt- Christer Ysander, IUI,
The Role of the Local Public Sector in Employment Policy.
Anders Björklund, Stockholm School of Economics,
Inflationary Expectations and the Duration of Unemployment: Evidence
from Sweden and the U.S.
Bo Axell, IUI,
Controlling Unemployment by Controlling Inflation.
Siv Gustafsson, IUI, and Social Research and Center for Worklife Studies, Stockholm,
Male - Female Lifetime Earnings Differentials and Labor Force History.
Roger Axelsson, Roger Jacobsson, and Karl-Gustaf Löfgren, University of Umeå,
On the Determinants of Labor Supply in Sweden.
Jim Albrecht, Columbia University, New York,
A Procedure for Testing the Signalling Hypothesis.
Anders Klevmarken and Anita Jonsson, University of Gothenburg,
The Relative Importance of Market Effects and Negotiated
Increases on Age-Earnings Profiles.
Nils-Henrik Schager, The Federation of Swedish Industries,
The Duration of Vacancies as a Measure of the State of Demand in the Labour
Market. The Stability of the Swedish Wage Drift Equation.

IUI — 40 YEARS
Pictures from the past

The 40th "birthday" 1979 was celebrated with an informal cocktail party in the IUI boardroom. All IUI employees from the past and today were invited and participation was very large. The picture shows IUI chairman, Dr. Erland Waldenström (center) in conversation with three earlier presidents, Professor Ragnar Bentzel (1961—1966, left), Professor Erik Dahmén (1949—1950) and Ragnar Sundén (1940—1941, to the right).

Professor Ingvar Svennilson, president 1941—1949 was instrumental in forming the IUI as an advanced research institution in industrial economics.

Two earlier presidents of the Institute at the 1979 symposium in honor of Dr. Marcus Wallenberg: Professor Lars Nabseth, now president of the Federation of Swedish Industries (right), and Dr. Lars Wohlin (left), now Governor of the Bank of Sweden.
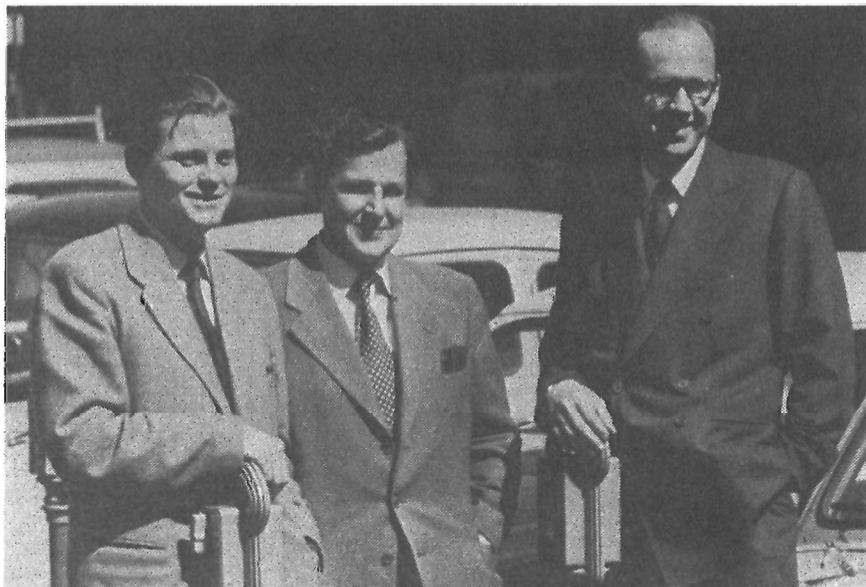
Dr. Jan Wallander (right), President of the Institute 1953—1961, Karl-Olov Samuelsson (left) and Bengt G. Rundblad (center), respectively, with appropriate background in 1958 when "The Economics of Automotive Demand" was presented.

Exhibits most of the IUI senior research staff at an IUI contact conference in 1960. From the right Professor Erik Höök, Professor Ragnar Bentzel, Dr Göran Albinsson, Dr. Jan Wallander (President), Professor Bengt G. Rundblad, Dr. John Ekström, Professor Odd Gulbrandsen and Professor Erik Dahmén. Dr. Marcus Wallenberg (chairman of the IUI board 1950—1975) is opening the conference.
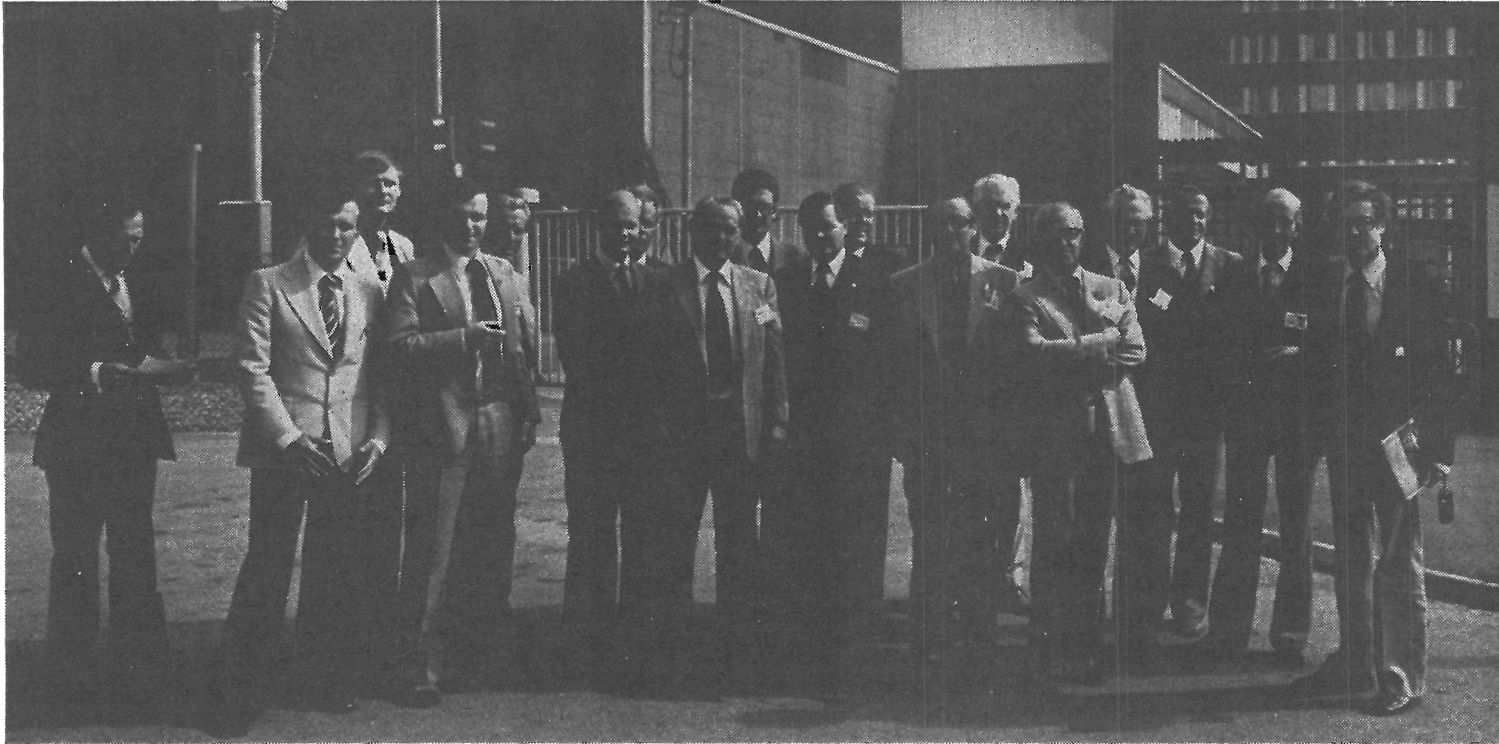
The early autumn board meetings are devoted to a discussion of the future research program of the Institute. It is normally a two day session combined with a visit to two or three companies. In August 1979 the Board visited the nuclear power plant in Oskarshamn (picture) and the Mönsterås pulp manufacturing plant of the Southern Forest Owners Cooperative Association.

Earlier Presidents of the IUI

Name	Years	Later Positions
Ivar Andersson	1939—1940	Chief Editor of *Svenska Dagbladet*
Ragnar Sundén	1940—1941	President *Jernkontoret*
Ingvar Svennilson	1941—1949	Professor *University of Stockholm*
Erik Dahmén	1949—1950	Professor *Stockholm School of economics*
Jonas Nordenson	1951—1953	President *The Swedish Bankers Association*
Jan Wallander	1953—1961	Chief executive officer and later chairman of the *Handelsbanken*
Ragnar Bentzel	1961—1966	Professor *University of Uppsala*
Lars Nabseth	1966—1972	President *Federation of Swedish Industries*
Lars Wohlin	1973—1976	Governor *Bank of Sweden*
Gunnar Eliasson	1976—	

Chairmen of the IUI Board Position at time of chairmanship

Name	Years	Position at time of chairmanship
Sigfrid Edström	1939—1943	Chairman ASEA Corporation
Ernst Wehtje	1943—1946	President Skånska Cement AB
Sven Lundberg	1946—1947	President Förenade Superfosfatfabriker
Sven Schwartz	1947—1949	President Boliden AB
Marcus Wallenberg	1950—1975	President Chairman of Stockholms Enskilda Bank and later Chairman Skandinaviska Enskilda Banken

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