The Industrial Institute for Economic and Social Research

Current Research Projects Autumn 1974

The Industrial Institute for Economic and Social Research

is an independent non-profit research institution, founded in 1939 by the Swedish Employers' Confederation and the Federation of Swedish Industries.

Objectives

To carry on research into economic and social conditions of importance for industrial development in Sweden.

Activities

The greater part of the Institute's work is devoted to long-term problems, especially to long-term changes in the structure of the Swedish economy particularly within manufacturing industry. This also includes continuous studies of the development of private consumption in Sweden and projections of demand for various products. Research results are published in the series issued by the Institute.

Along with the long-term research work the Institute carries out investigations concerning special problems and performs certain services to industrial enterprises, organizations, governmental agencies, etc.

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Preface

By this short presentation in English of our current research projects, we wish to give an international audience interested in economic research in Sweden an idea of present research activities at the Industrial Institute for Economic and Social Research.

Stockholm in September 1974
Lars Wohlin

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ESTIMATES OF THE RATE OF RETURN TO INVESTMENT IN RESEARCH AND DEVELOPMENT

The study has two aims; one is to describe and analyze the R&D inputs in Swedish manufacturing, the other is to measure the marginal rate of return of the industries' R&D activities. For this purpose three industry groups have been chosen for a study more in detail: the pulp and paper industries, the chemical industry and the iron, steel and other metals industries.

In the first part of the study the Swedish industrial R&D inputs are compared to those of other industrial countries. Further, the R&D growth during the sixties is compared with, among other things, the productivity growth, and finally the R&D performance is described and analyzed on subindustry level.

The three industry groups studied show variations in total expenditures for their own R&D activities and for purchases of R&D results, in relation to sales value.

These figures are shown in table 1. The figures concern those companies which have R&D activity. The sales value is restricted to their production in Sweden. The high intensity of R&D in the chemical industry can be largely explained by the very high values for pharmaceuticals. The figures only cover 1969, but over a seven-year period (1963-1969) the R&D inputs have increased at various rates. The total R&D expenditures have decreased by more than 1 % per year in the paper

Table 1. Industrial R&D expenditures

Industry	Total R&D expenditures in percent of sales 1969	Annual growth, percent of total R&D expenditures (in constant prices) 1963-1969
Paper and pulp	0.8	-1.1
Chemicals	4.9	8.2
of which pharmaceuticals	25.2	16.0
Iron, steel and metals	1.7	1.5

and pulp industries and increased in the basic metal industries by almost 1 1/2 % per year. In the chemical industry the pharmaceutical companies in the first place have increased their R&D expenditure remarkably.

Some questions, which are dealt with in the second part of the study, concern how to measure the rate of return on R&D, how the marginal rate of return of the R&D inputs develops compared to that of other production factors and how it varies among industries. On the basis of estimates of production functions, attempts are made to determine the increase in production which can be explained by labour, capital or R&D inputs. Preliminary results show that the R&D inputs in some cases give a significantly higher marginal rate of return than other factor inputs. The conclusion is that reallocation gains could be obtained by moving resources from other production factors to R&D inputs.

Investigator: Anita Lignell.

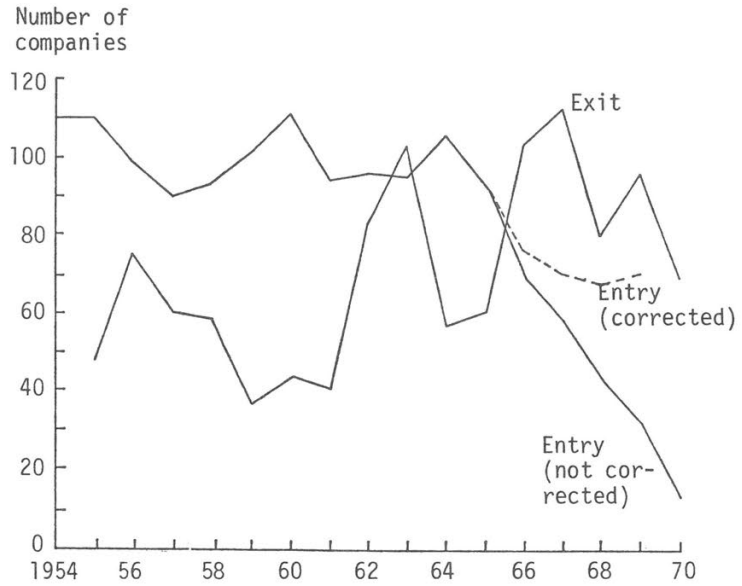
ENTRY INTO SWEDISH MANUFACTURING INDUSTRIES,1954-1970

In this study certain structural changes in Swedish industry are analyzed for the 1954-1970 period. The types of changes dealt with are entry, diversification, exit, specialization and expansion of firms. Very little is known about the magnitude and the determinants behind the formation and discontinuation of firms and the effects upon industrial growth.

The first aim of the study is to provide a statistical description of the extent and character of entry, exit and growth in the Swedish manufacturing industries. This has required collection of new empirical material based on available industry censuses and addition of a large amount of supplementary data. It has been necessary to restrict the investigation to the industries manufacturing plastics, metal and metal products and machinery in 1954-1970.

Figure 1. Entry and exit of independent companies in the Swedish plastics, metal and metal products and machinery industries in 1954-1970

Preliminary data



The second purpose of the investigation is to search for explanations to variations in entry and exit rates among different industries and different years. The main emphasis is put on a model using cross section data and including as explanatory variables profits, entry barriers, demand growth rate and technological advance.

One of the principal findings of the descriptive part of the project is the declining trend of the entry of new firms after 1964 as shown in figure 1. As shown in the same figure, the number of new subsidiaries has not declined in the 1960's.

Investigator: Gunnar Du Rietz.

THE GROWTH AND STRUCTURE OF SWEDISH ENGINEERING EXPORTS

The main purpose of the study is to analyze how some macroeconomic determinants affect the current international specialization of the Swedish engineering industry and the changes in this specialization during the 1960's. Specifically, the analytical purpose is to study how this industry has been affected by Sweden's comparative advantage. The major determinants are derived from theories of comparative advantage and especially from the modern factor proportions theory. The study is designed as a stepwise test of the latter theory and some of its underlying assumptions.

In the two major analytical parts the direction of causality is postulated to be the same as in the factor proportions theory. Sweden's factor abundance is temporarily assumed to be stable throughout the postwar period and is defined from the results of some earlier empirical studies. The factor proportions theorem is put to various tests, first on the current specialization pattern of the engineering industry and then, in the second major part of the study, on the changes in this pattern during the 1960's. Two different cross-sections are used, the first one being the more than 30 subindustries and the second some 100 commodity groups. In essence the factor proportions theorem is thus tested on two different levels of aggregation. Such a cross-checking of the results was motivated by the outcome of a test of the traditional assumption of homogeneous products on the subindustries. Only a few subindustries did seem to be homogeneous as far as production technology is concerned. The outcome of the tests might then be sensitive to the aggregation level chosen.

One method of overcoming the aggregation problem is of course to disaggregate further. In order to make possible an analysis at a commodity group level some proxy variables for factor intensities had to be constructed. These variables were constructed from the implicit price per metric ton, which is shown to be highly correlated with certain factor intensities for the cross-section of subindustries. A second method of tackling the aggregation problem was to analyze the inter-subindustry specialization pattern. Each step in the testing

procedure described here rests on rather bold assumptions and empirical generalizations. However, the outcomes of various tests seem on the whole to be quite similar.

The second part of the study tests the factor proportions theorem on the changes in the pattern of specialization of the Swedish engineering industry from the beginning to the end of the 1960's. By combining the results of these and above-indicated tests, it was possible to reach some firm conclusions on the comparative advantage of Sweden in the 1960's and on how it has changed.

In the third part of the study, the direction of causality of the factor proportions theorem was no longer accepted. Instead the temporary conclusions of the two preceding parts, reformulated as hypotheses, were tested as to the direction of causality. Such an analysis has to use scant time-series data in contrast to the cross-section analysis discussed above and in consequence the tests are in part only tentative or qualitative ones. The purpose of this part is merely to offer an interpretation of the causes to the deep-going structural changes in Swedish industry during the 1960's within the broad framework of the modern factor proportions theorem but without a priori acceptance of its usual direction of causality.

Investigator: Lennart Ohlsson.

THE REAL AND FINANCIAL STRUCTURE OF ENGINEERING FIRMS

During the two latest decades increasing interest has been paid to the factors which determine the profitability, growth and financing behaviour of the industrial firms.

When analyzing the investment and financing behaviour an important aspect is the mutual dependence between profitability and growth. On the one hand the rate of return is influenced by growth costs, and on the other the expansion possibilities are determined by the rate of return via the internal generation of funds. In this study attention is

paid to this interdependence by estimations of the impact of growth on the rate of return. It is shown that, when the growth rate is high, a further increase reduces the rate of return on total capital.

The impact of different financial parameters on the firm's capital costs is also empirically analyzed. We find that the interest rate on borrowed funds is an increasing function of the leverage and that the rate required by the owners is a decreasing function of the pay-out ratio. The higher capital costs caused by a higher leverage and a lower pay-out ratio plus the fact that the rate of return decreases as a result of a higher growth rate are important dynamic restrictions.

Furthermore we analyze theoretically how the firm's financial behaviour is influenced by changes in factors outside the firm. We find, for instance, that an exogenously caused increase in the product price or a decrease in wages and prices of investment goods increases the firm's optimal leverage and retention ratios. The external and internal financing is also influenced in the same direction, if the capital is depreciated at a lower rate or if the rate of borrowed funds is exogenously reduced. The theoretical results are tested against firm data.

An essential assumption is that the firm's goal is to maximize the market value of its shares. In equilibrium, in perfect markets, this value is equal to the discounted value of all expected future dividends of the firm. The market value can then be described by a simple model, in which the explaining variables are the rate of return on equity, the growth rate of dividends, the discount rate, the leverage and the pay-out ratio. For the theoretical analysis we also use estimated functions for the rate of return on total capital, the interest rate on borrowed capital and the discount rate. The data used for the economic studies are the profitability statistics of the Swedish Engineering Association, the industry statistics of the Swedish Central Bureau of Statistics and the official accounts of the firms.

Investigator: Göran Eriksson.

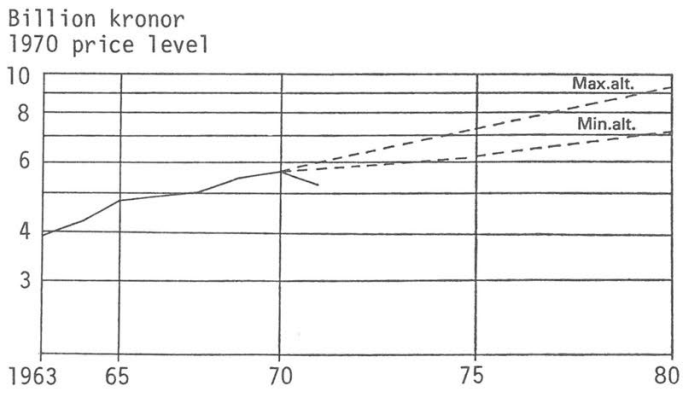
THE PRINTING INDUSTRY

The governmental Printing Industry Committee has commissioned the Institute to study this industry. The purpose of the work done within the Institute is, first, to predict how much of printed products will be bought in Sweden in 1980. This forecast together with a judgement of the development of exports and imports will be combined with a study concerning the development of technology and of the structure of enterprises into a forecast of the industry's demand for labour in 1980.

The quantitative development of the total purchases of printed material is shown in figure 2. The average rate of growth between 1963 and 1970 was about 5.2 percent per annum. During this period there was an increase in the relative price of consumer prints (i.e. books, newspapers and magazines) whereas the relative price of producer prints (i.e. advertisements and office prints) decreased. The analyses carried out indicate that demand in many cases is rather sensitive to price changes. Therefore assumptions about the price development affect in a substantial way forecasts about the purchases of printed products in 1980. In addition the purchases are affected by private consumption, by the volume of production of manufacturing industry, by the activity level of the wholesale and retail sectors, etc.

In the figure two alternatives, a high and a low one, are shown for the forecasting period 1970-1980. In the high alternative it is

Figure 2. Purchases of printed material on retail level,1963-1980



assumed that the relative price of consumer prints will remain unchanged during the period, i.e. stay at the same level as in 1970. In this respect it is assumed that the earlier trend will be broken. It is also assumed that the relative price of producer prints will go down at the same rate as between 1963 and 1970. In the low alternative, on the other hand, it is assumed that the relative price of consumer prints will rise as fast as between 1963 and 1970 whereas the trend for the relative price of producer prints is assumed to be broken, so they will remain at the level of 1970. Forecasts for predictors like private consumption etc. are based on official medium term forecasts.

It can be worth noticing that, given the assumptions in the high alternative about the price development which are favourable to the quantity development, the purchases of printed products will increase at about the same per annum rate as they actually did between 1963 and 1970. In the low alternative, however, the rate of increase goes down to 2.2 percent per annum. The figure is a summary of the actual development and of the forecasts for different groups of printed products.

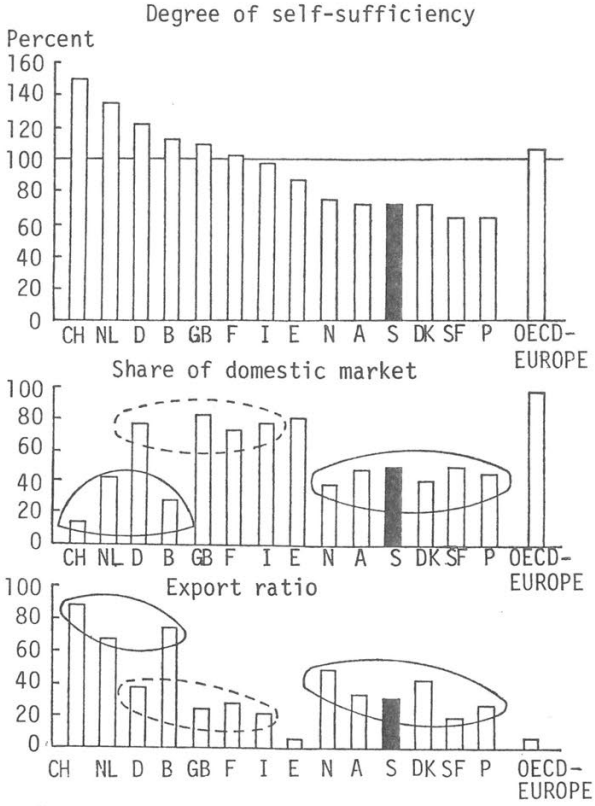
Investigator: Bertil Lindström.

THE CHEMICAL INDUSTRY

The purpose of this project is to study which factors have determined the development of the Swedish chemical industry up to now and to analyze the future prospects of the industry in our country.

The extent to which a country is provided with certain goods can be studied with the aid of three different measures. The degree of self-sufficiency is the ratio between production and consumption, and it gives a relative measurement of the export or import surplus of the country. The Swedish degree of self-sufficiency for chemicals is 73 %, which internationally is a low proportion (figure 3). Several other small countries have similar low figures, while others, e.g. Switzerland and the Netherlands, have high ones. The big countries lie close to 100 %, except West Germany which has 123 %.

Figure 3. The chemical industry in the European OECD countries in 1971



The share of the domestic market is the part of the demand from the domestic market which is covered by the industry of the country, while the export ratio is the part of the production which is exported. All the big OECD countries have a fairly large share of their domestic markets, 70-80 %, and an export share of 20-40 %. Among the small countries there are some which primarily are export oriented (Switzerland, the Netherlands and Belgium) and some which primarily are oriented to the domestic market. Sweden belongs to the latter category, although our orientation is not at all extreme. As can be seen from the figure,

there seems to be among the small countries a negative correlation between the share of the domestic market and the export ratio.

We can distinguish two types of specialization among the small countries. One of them is specialization between industries, the other one specialization within industries. Countries with a high degree of self-sufficiency for chemicals have specialized in chemical production, those with a low one have primarily devoted themselves to other industries. Some countries have specialized within the chemical field and sell a considerable part of their production to export markets, having at the same time left large parts of the domestic market to foreign competitors. This goes for Switzerland, the Netherlands and Belgium and to some extent also for Danmark and Norway. Other countries, among them Sweden, have on the contrary aimed primarily at the needs of the domestic market. This requires a differentiated industry, which exports only marginal parts of the production.

One of the preliminary conclusions of the study is that the domestic market concept has been undermined by the abolition of the tariff barriers through free trade agreements and by the technical developments which have considerably simplified and cheapened most transports. This has among other things made it possible to a larger extent than before to exploit scale economies in production, and hence it has created opportunities for a concentration of production units into fewer and larger plants than before. Of course this increases the possibilities of obtaining profits by an international division of labour between countries with different supplies of production factors. It reduces the possibilities of profitably carrying on production lines which are not suited to the relative supplies of production factors in the country. The domestic market oriented jack-of-all-trades has become obsolete.

One field, however, where the domestic market concept still has an important meaning is the development and production of custom-made special products. Such activities require close and continuous contacts between producer and customer, and then a short distance is a considerable advantage.

Although the domestic market concept has lost some of its importance, the fact that the chemical industry is not so differentiated in

Sweden as in other larger countries is a disadvantage to the Swedish chemical industry. It can be difficult to find customers near by for all the products from a certain production line in the quantities and the proportions in which they are produced. This goes particularly for the early steps in the processing chain, where the only possible outlet is for further processing within the chemical industry.

Investigator: Olle Renck.

FOREIGN DIRECT INVESTMENT IN SWEDEN

This research project has three purposes. The first one is to collect information about the extent of foreign ownership in Sweden. A short report about this has been published, where data about the industrial structure as well as about the country of origin of the foreign-owned companies are presented (H.-F. Samuelsson, "Foreign Direct Investment in Sweden 1965-70". IUI Reprint Series No. 52).

The second purpose is to analyze the characteristics of the industries where foreign-owned companies have been established. Preliminary results show that they are concentrated in industries where they can gain an advantage over domestic firms in access to knowledge and capital. Besides this the international corporation can create an advantage by specializing its production among subsidiaries in different countries and then supplying all other countries from one company. This is indicated by a high export share for foreign-owned firms in Sweden (table 2).

The third purpose is to study transfers of technology via foreign-owned companies. This is a significant problem in view of the importance of technological advance for economic growth. The intention is to analyze the amount and kind of this transfer. An important aspect of this problem is the direction of the technology transfers in those cases where a foreign company has bought a Swedish firm.

The primary statistical basis for the analysis consists of responses to a questionnaire sent in 1971 to all companies in Sweden in

which much of the share capital is held abroad.

Table 2. Export intensity[a] in foreign-owned and domestic firms

	Export intensity (%)	
	Foreign-owned subsidiaries	Domestic firms
Consumer goods industries	13	17
Producer goods industries	53	36
Average	38	29

a) Exports as a percentage of production in manufacturing industries with foreign-owned producing subsidiaries. Preliminary figures.

Investigator: Hans-Fredrik Samuelsson.

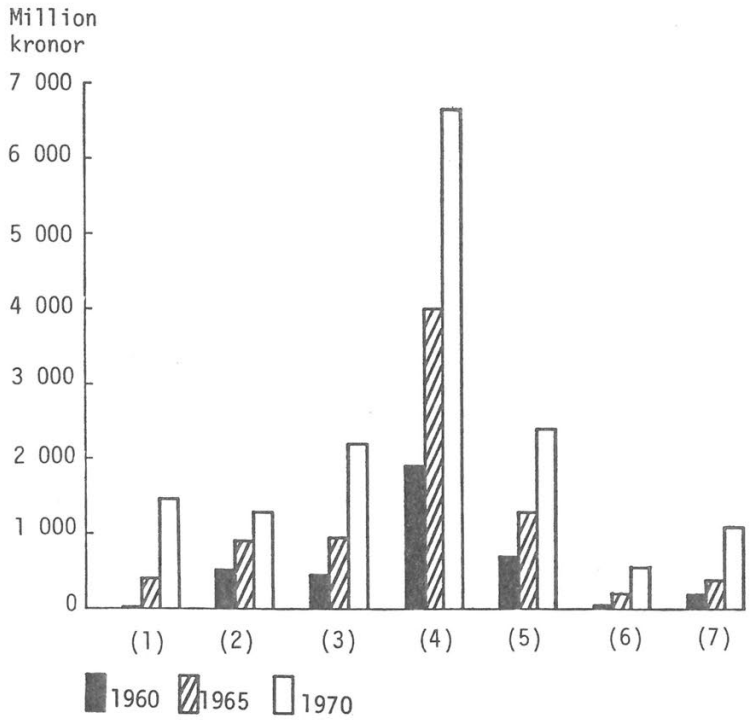
SWEDISH DIRECT INVESTMENT ABROAD

The purpose of this study is to map the size and specialization of foreign interests in Swedish manufacturing industry during the latter half of the 1960's and to analyze the reasons for and effects of the foreign activities of the Swedish firms. The study is based on an extensive inquiry into all manufacturing firms with more than 50 employees in Sweden, which in 1965 or 1970 had foreign subsidiaries or minority interests. The study covers a total of some 250 business combinations in Swedish industry and their almost 1,500 foreign subsidiaries and minority interests.

In 1973 a first report from the study was published. The report presents considerable parts of the data collected. Some comparable data from a previous study relating to the first half of the 1960's have also been included in order to illustrate the development during the whole decade.

The foreign activities of Swedish manufacturing industry are dominated by its producing subsidiaries, and the study has concentrated on the establishment and expansion of foreign production. The producing companies were considerable fewer than the sales companies, but they

Figure 4. Industry distribution of total assets in foreign manufacturing subsidiaries in 1960, 1965 and 1970



(1) = Pulp, paper, paper products and printing
(2) = Chemical
(3) = Primary and fabricated metals
(4) = Machinery, except electrical
(5) = Electrical machinery, equipment and supplies
(6) = Transport equipment
(7) = Food, textiles and other manufacturing

Note: Total assets, defined as equity capital plus long-term debts, in foreign manufacturing subsidiaries in 1970 amounted to 15.6 billion kronor.

accounted for more than 80 % of the total employment in the foreign subsidiaries. Foreign production is heavily concentrated in a few industries: the machinery and electrical industries alone accounted for more than 60 % of employment and total assets in producing subsidiaries at the end of the period. The relatively large foreign engagements of these two industries - and also of the chemical industry - date far back in time, and here we find the first and still some of the largest Swedish investors abroad. In spite of a considerable expansion during the 1960's they have, however, lost some of their relative importance during this period as a consequence of other industries engaging more and more in this kind of foreign activities. The clothing industry, the pulp, paper and paperware industry and the transport equipment industry are among the new big investors abroad. Between 1960 and 1970 these industries increased their share of the total assets of the manufacturing foreign subsidiaries from 1 % to 14 % (figure 4).

The work is now directed to a more penetrating analysis of the conditions which have been described by the inquiry. Among the problems which are given the most attention are the effects of the investments abroad on foreign trade and on the balance of payments and the effects on production and productivity. Does production abroad compete with exports from Sweden, or does it rather increase the Swedish exports? Does it lead to increases in specialization and productivity, and how is the income increase divided between parent country and host country? How does it affect the Swedish balance of payments?

Investigators: Birgitta Swedenborg, Eva Thiel.

THE EFFECTS OF TRADE BARRIERS

Trade policy in Europe has developed towards increased liberalization in the postwar period, mainly in the form of reduction or elimination of tariffs and quotas on industrial products. This development culminated with the enlargement of the Common Market. At the same time there has, however, been an increasing concern about the restrictive effects

on trade of other policy measures.

This study discusses the effects of barriers to trade on the structure of production and the allocation of resources. In this context there is a discussion of the concept of the effective rate of protection. Later in the study empirical measures of effective tariff rates are computed in order to study the importance of tariff changes for explaining changes in production and trade.

Second, the study contains a description of trade barriers affecting Swedish exports and imports. This includes a short survey of trade policy and of the development of the general tariff level and of the commodity structure of the tariffs. The tariff structure is related to a set of explanatory factors which may affect the competitive position of industries. This section also contains a description of the main forms of non-tariff distortions of trade, with a general discussion of their effects and an attempt to study the commodity and industry structure of the non-tariff measures as well. These measures include subsidies, public purchases and various forms of quantitative restrictions.

The third part of the study aims at making empirical estimates of the effects on trade and production of changes in trade barriers. These measurements are mainly concerned with the effects on Swedish exports and imports of the discriminatory tariff reductions following the formation of EEC and EFTA. The study contains a general discussion of different methods of measurement and of their main problems. The results of different method are used in order to arrive at a realistic measure of the tariff effects.

Investigator: Lars Lundberg.

LONG-TERM FORECASTS FOR SWEDISH INDUSTRY

The Institute has for many years participated in the official Swedish programme of long-term economic forecasting. The role of the Institute has been to gauge the development of Swedish manufacturing industry for

a future 5-year period. The next long-term forecast is intended to cover the period 1975-1980.

The estimates of the Institute are based on inquiries addressed to all large manufacturing firms (i.e. those with more than 500 employees) and to a sample of smaller firms. The firms are asked to provide information about their long-term plans concerning production, exports, employment and investments.

A serious, though common, deficiency in the information on future investments are the underestimates for the latter part of the 5-year period. This seems to be caused by the fact that the plans given are often based on a cumulation of projects instead of on a prognosis for the investment volume. As a complement to the collected plans from the firms the Institute therefore tries to provide investment prognoses based on the projected availability of funds. This in turn requires the compilation of funds statements for the individual firms. It is expected that this work will be completed during 1974.

Investigators: Lars Wohlin, Märtha Josefsson, Rolf Rundfelt.

INDUSTRIAL DEVELOPMENT AND THE LONG-TERM SUPPLY OF CAPITAL

The average annual increase in the industrial investments, which is needed to make the planned production possible, was in the latest long-term survey "Svensk industri 1973-1977" estimated at 3.6 percent. With support from the Ministry of Finance the Institute is now supplementing the study with an analysis of the financing problems.

In one part of the study the production and investment plans of the 40 biggest industrial groups are supplemented with financial data in order to make it possible to test the consistency between the plans and the financial structure of the groups. This can be looked upon as a way of developing the estimation methods, but it also helps us to map and analyze the growth of the groups.

To spotlight the role of intangible capital for the development of profitability and solvency, a number of case studies are carried

Table 3. Debt structure of Swedish industry in 1966 and 1971

	1966		1971	
	Billion SKr	%	Billion SKr	%
Trade credits	11.3	28	18.7	25
Debts to affiliated companies	3.5	8	6.4	8
Pension debts	4.5	11	6.5	9
Tax debts	1.7	4	3.2	4
Wage debts	1.3	3	2.8	4
Total "automatic debts"	22.3	54	37.6	50
Debts to the Swedish credit market	12.9	31	23.8	31
Debts abroad[a)]	1.0	2	5.0	7
Other debts	5.3	13	8.7	12
Total debts	41.5	100	75.1	100

a) Excl. debts to affiliated companies and trade credits abroad.

out by the Institute in the second part of the investigation. The task of this part is to describe the relations between the real and the financial structure more in detail and, if possible, also to explain the structural development within the groups. In a third part of the investigation there is a more general macro analysis of the financial structure of Swedish industry. During the late 1960's the debt-equity ratio of Swedish industry increased significantly. The liabilities in current prices increased by about 13 percent a year, while the total assets increased by 8 or 9 percent a year. It is interesting to note that there has been a change from real to financial assets at the same time. Table 3 shows the debt structure of industry in 1966 and 1971. The total liabilities increased by about 80 percent between these two years. Among the liabilities we separate automatic or internally generated debts such as trade credits, tax debts, wage debts etc. These credits are special in the sense that no negotiations with the lenders are necessary.

The external debts of industry to the Swedish credit market have increased at the same rate as the total liabilities and their share is unchanged at about 1/3 of the total debts. The debts abroad (excluding trade credits and debts to affiliated companies) were 5,000 million kronor in 1971. This figure includes 1,500 million kronor in bonds. The debts abroad have increased five times since 1966 and explain the whole increase in the non-automatic debts' share of the total debts.

Investigators: Lars Wohlin, Bo Lindörn, Rolf Rundfelt.

PROFITS, INFLATION AND GROWTH

Recent economic developments have emphasized inflation as a factor of importance for such principal variables as income distribution, profitability and various incentives that operate in an economic system. This is no new problem. The debate on these issues dates back several hundred years.

In this study inflation will be investigated in the broader context of profitability, growth and the distribution of income. The causal relationships among firms between expected rates of return and decisions to invest and to grow will be emphasized.

The project is partly an extension of the study: The Credit Market Investment Planning and Monetary Policy published by the Institute in 1968. This previous analysis was concerned with the impact of economic policy - notably monetary policy - on short-term variations in investment activity during the postwar period. In the present study principal emphasis has been put on factors behind long-term growth.

The investigation will include both a survey of empirical and theoretical literature in the area and separate empirical research mainly on the Swedish economy. In the latter respect the study will draw on results from two separate investigations by the author; one on planning practices among large U.S. and European firms and another on wage determination and profit performance.

As a starting point for the wage-profit study the market expectations of firms have been studied as a factor directly influencing annual production plans and indirectly influencing demand for manpower. From the wage-profit model, a so-called profit function can be derived. This profit function has been estimated for seven subindustries of Swedish manufacturing. One important result seems to be that mistaken expectations as to future prices play an important role in explaining short-term fluctuations in gross profit margins and profitability. An analysis of the feedback effects of inflation on firm planning decisions and profit performance is a natural ingredient of the investigation.

Investigator: Gunnar Eliasson.

SWEDISH ECONOMIC GROWTH

The Institute's investigation of economic growth in Sweden during the last 100 years has so far resulted in five publications.[1] What now remains is a summary analysis. In it the industrial development during different periods is described and analyzed by means of a capital vintage model. The intention is, e.g., to explain differences in growth rate and in income distribution by the investment activity and the introduction of new production processes.

As can be seen from table 4, the three periods prior to the Second World War exhibit only slight differences in the growth rates of gross national product and productivity (GNP per employee). The postwar period, however, contrasts with earlier periods. Between 1949 and 1969

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1) Y. Åberg, Produktion och produktivitet i Sverige 1861-1965 (Production and Productivity in Sweden 1861-1965); V. Bergström, Den ekonomiska politiken i Sverige och dess verkningar (The Economic Policies in Sweden and their Results); L. Ohlsson, Utrikeshandeln och den ekonomiska tillväxten i Sverige 1871-1966 (Foreign Trade and Economic Growth in Sweden 1871-1966); L. Lundberg, Kapitalbildningen i Sverige 1861-1965 (Capital Formation in Sweden 1861-1965); and P. Silenstam, Arbetskraftsutbudets utveckling i Sverige 1870-1965 (The Development of the Labour Supply in Sweden 1870-1965).

Table 4. Production, productivity and exports during 100 years
Annual percentage growth rates

	1869-1889	1889-1914	1919-1939	1949-1959	1959-1969
GNP	3.2	3.3	3.3	3.4	4.6
GNP per employee	2.2	2.3	2.1	2.9	4.1
Exports	3.9	3.0	4.9	6.4	8.3

the average increases in both production and productivity were considerably higher than before. It should be pointed out, however, that the faster growth rates can be attributed entirely to the 1960's. In fact, the 1950's fit rather well into the pattern of the preceding periods. The break in the long-run trend came at the beginning of the 1960's. This decade has been quite unique as far as the rate of economic growth is concerned.

What caused the acceleration of economic growth which became apparent at the beginning of the 1960's? It is important to shed light upon that question, because the answer will probably indicate the nature of future economic development in Sweden and therefore how to influence the economy in the most desirable direction.

Investigators: Ragnar Bentzel, Eva Rabinowicz.

THE DEVELOPMENT OF SWEDISH INDUSTRY DURING THE POSTWAR PERIOD

In a number of research projects, both completed and current ones, the Institute has studied the growth and structural changes of Swedish industry from different angles. Partly as a component of this research program, partly as a follow-up and extension of the dissertation "Entrepreneurial Activity in Swedish Industry 1919-1939", presented by professor Erik Dahmén in 1950, this year a study has been commenced of the development of Swedish industry during the postwar period. In this study particular emphasis will be placed on the contributions of the great innovations to industrial growth.

Investigator: Erik Dahmén.

GOALS AND MEANS IN TRANSPORT POLICY

Since the 1930's the road haulage industry in Sweden has been subject to entry and capacity controls through a licensing system. A license must be obtained for each vehicle to be operated for hire or reward. A "newcomer" who wants to enter the market, or an established road haulage firm which wants to expand its business, has had to show that there is a "need" for the new transport capacity.

These quantity controls have been coupled with "quality" controls as to the applicant's fitness for becoming a road haulage operator. Geographical, commodity or customer restrictions have also very often been attached to a licence, which means that a road haulage firm has not had the freedom to carry any goods anywhere.

The licensing system was designed to eliminate "wasteful" competition within the road haulage industry and to limit competition between road and rail in order to encourage the use of rail. Have these goals been fulfilled? What are the effects on road transport costs and prices? Has the number and size of firms within the road haulage industry been affected by the licensing system? Have the railways been protected by the entry and capacity controls in road freight transport?

The main aim of the Institute's transport policy project is to study the effects of governmental intervention in the road haulage industry. Such a study is of particular interest in Sweden, as our licensing system underwent important changes during the 1960's. As a consequence of the 1963 Transport Act entry controls were lessened and existing hauliers have also been able to expand their business more easily than before. The railways were also affected by the new transport policy. They got more commercial freedom and the unremunerative lines have received direct grants from the Exchequer to cover the deficits. The transport policy changes in Sweden during the 1960's offer an interesting case for studying the effects of deregulation in road freight transport. And the purpose of this research project is to analyze the development before, during and after the new policy was brought into being.

Even if the original "liberalization programme" has not yet been carried out, the main reforms have come into force. Therefore, it will

be possible to demonstrate the effects of the partial deregulation on e.g. frequency of new entrants to the road haulage sector, size and organization of road haulage firms and development of transport costs. The development of own account transport will also be analyzed as well as the effects of the new transport policy on competition between road and rail. It is worth pointing out, however, that it is difficult to separate the effects of the new transport policy from the effects of other factors, such as the business cycle, and special attention has to be paid to this problem.

This research project will not be limited to the situation in Sweden. A fairly large part of the study will be devoted to international comparisons of governmental intervention in road freight transport. The regulatory philosophy has been the same in most countries, but the details of the actual regulations have varied a great deal. Therefore, it may be rewarding to compare the regulatory systems of different countries and their effects on the freight transport markets.

Investigator: Lars Kritz.

INNOVATION PROCESSES IN THE ENERGY SECTOR

Since the autumn of 1972 the Institute has participated in an international research project concerning innovation processes in the energy sector. The project, financed by the Stiftung Volkswagenwerk, Hannover, is directed by IFO-Institut für Wirtschaftsforschung, Munich. The National Institute of Economic and Social Research, London, is also participating. An attempt is made to construct a model of the innovation process which can be used, among other things, to investigate how the process can be influenced by public policy. The model is applied to the energy sector in each of the three countries involved.

In order to create a common ground for the analysis, a study has been made of the size, structure, and development of the energy sector in each of the three countries. The energy producing sector has been divided into four subsectors: petroleum, gas, coal, and electricity.

An inventory of new technologies has been made in each subsector. Interviews have been carried out in the petroleum subsector for the purpose of investigating the development, diffusion, and effects of certain new technologies. Certain innovations in the other subsectors will be studied in a similar manner.

Efforts are also being made to study new technologies in connection with the use of energy in industry. The interest is focused on some of the most important energy using industries, especially the iron and steel industry, in which a pilot study is currently being made. The investigation may be expanded to other sectors as well.

A central question is how international differences in firms' environment, especially with respect to relative factor prices, influence the choice of technology. It is hoped that this kind of study will yield insights into the process of introducing new technologies as well as the possibilities of factor substitution within existing technologies. By throwing some light upon the nature of technological change with respect to the use of energy in certain industries, the analysis should be of value in studying the changes in the industrial use of energy over time.

Investigators: Bo Carlsson, Anders Grufman.

COMPETITION ON EQUAL TERMS

In most countries public policy toward industry is becoming more active. Tendencies to more selective policies are obvious in several countries. The motives behind the interventions vary from case to case. Local policy, defence, a wish to protect industry sectors with problems, a wish to build up industry in sectors that will expand fast in the future have, among other things, been presented as the motives behind the governments' growing ambitions to actively influence the development.

It is obvious that this kind of political goals often conflicts with the traditional assumptions of free competition. The competition

between firms and sectors is influenced nationally and internationally. The effects actualize different estimate criteria, such as equity aspects, effects on economic growth, the allocation of resources between firms and sectors, etc.

In this study the main emphasis is put on the importance of international competition as an explanation behind the selective actions. The international competition and the claims upon the individual country to maintain balance in its foreign payments can, in many cases, be considered as a cause of the growing use of selective instruments on the part of the government.

Investigator: Jan Bröms.

THE COSTS OF REDUCING DISCHARGES OF INDUSTRIAL RESIDUALS

Production processes can be looked upon as transformation processes, into which there flow inputs of mass and energy and out of which there flow the same amounts of mass and energy as were put into the processes. For most production processes only part of the energy or mass outflows will constitute the product. The residual flows will, by definition, have no economic use at existing prices and the producers' only interest in these residuals is therefore their minimum cost disposal. For various reasons, the cheapest way of disposal (at least to the individual producers) has long been direct discharge into the environment.

The environment can be described as a natural asset that renders direct and indirect services to man. These services include residuals assimilation and dispersion services as well as life-sustaining services, amenity, and materials supply services. Since the alternatives of using the environment as a recipient of residuals or as a source of other environmental services generally are mutually exclusive, environmental quality management can be regarded as a problem of allocating scarce natural resources among competing ends.

In an ideally functioning market system the problem of resource allocation is solved by the price mechanism. However, since environ-

mental resources generally can be characterized as "common property resources" whose services do not pass through markets, there will be no market-determined prices on these services to guide their allocation to the highest value use. Thus, since the market system cannot allocate environmental resources, this has become an important field for collective decision-making.

To be able to establish the objectives of their environmental policies in such a way that the resulting environmental quality will represent a "social optimum", the decision-making authorities will need not only a measure of the social costs of achieving and maintaining various levels of environmental quality but also some measure of the social benefits associated with these levels. In practice, the allocation decisions often take the form of establishing national or regional environmental quality standards and/or emission standards. Unfortunately it is generally very difficult to determine the emission standards that correspond to alternative environmental quality standards. This is mainly due to the fact that our knowledge of ecological interrelationships often is insufficient for establishing with any degree of certainty the size of the discharge reductions necessary in order to arrive at a given environmental quality. The problem of expressing various quality standards in terms of their corresponding emission standards is further complicated by the fact that the environment's capacity to assimilate certain residuals varies not only between recipients but also over time for each individual recipient. Thus, in order to be able to specify emission standards for various kinds of activities, the decision-making authorities are forced to make highly simplifying assumptions about the relations between reductions of discharges and improvements in the quality of the environment.

Independent of the choice of objectives for society's environmental policy, there are four basic technological options for environmental quality control. These four options are:

(1) reducing the amounts of materials and energy used in the production and consumption processes;
(2) treating the residuals so as to make them less damaging to the environment;

(3) choosing the time and place of discharge so as to minimize the damage; or

(4) increasing the residuals-assimilative capacity of the environment through various forms of investments.

In the present study an attempt is made to estimate costs associated with measures within the first two categories. The costs of measures within category (2) are relatively easy to estimate. As far as the first category is concerned, the rate of materials throughput can be decreased by reducing the overall level of economic activity or by decreasing the materials and energy input requirements for producing a given level of output. A reduction in materials and energy inputs per unit of production, in turn, can be accomplished by increasing the technical efficiency of materials and energy use by increasing materials recovery and recycling, or by altering the composition of output. For measures of this kind, it is generally very difficult to determine how much of the total costs of these measures should be considered as emission control costs. The present study will attempt to throw some light upon this problem.

The statistical basis for the cost estimates consists of the applications for government subsidies of emission control investments at plants in operation before July 1, 1969. Data for the study were obtained at the Environment Protection Board - the agency to which the firms had to apply for the subsidies. The study is limited to analyses of emission control measures in the iron and steel industry and the pulp and paper industry. The study is made in cooperation with the Economic Research Institute (EFI) at the Stockholm School of Economics.

Investigator: Carl J. Facht.

THE STRUCTURE OF SALARIES IN THE GOVERNMENTAL SECTOR OF SWEDEN

The purpose of the study is to describe and analyze the salary structure in the governmental sector. This is accomplished by comparing

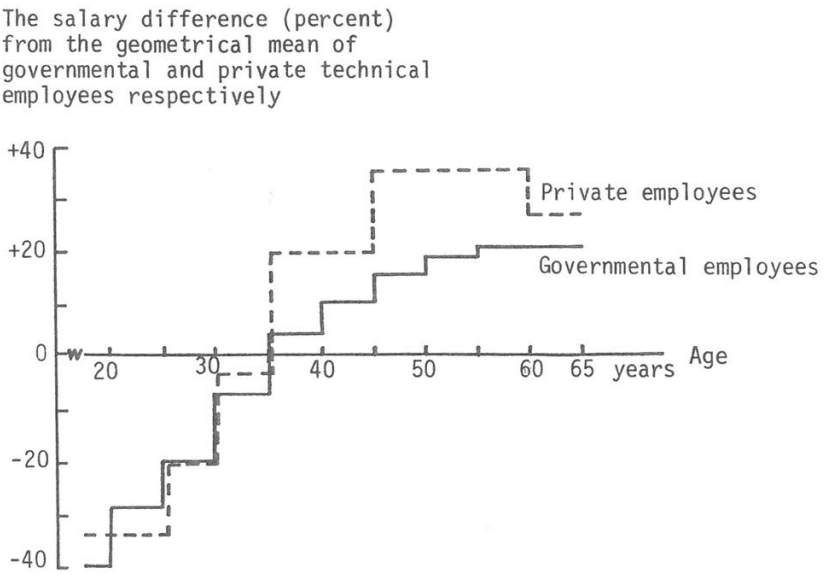
it with the corresponding structure in the private sector. A main difference concerning salary setting between the governmental sector and the private sector is that within the former all salaries are centrally determined for every job within a salary scheme whereas that is not the case in the private sector. It is therefore interesting to see if this fact has caused any differences between the salary structure of the two sectors. Another difference between the sectors is that in the governmental sector salary changes are to a greater extent centrally determined through the bargaining process. The political goals of the labour market organizations can therefore have a stronger impact on the salary structure of the governmental sector.

Other questions dealt with in the study are: How can the existing salary differences between men and women be explained? Can the salary structure be explained within the framework of the human capital theory? What can be said about the lifetime incomes of people with different educations? To what extent has the increased number of college educated people had influence on the corresponding salary differences?

One of the questions empirically investigated is the comparison of the salary structure of technically trained male employees in the two sectors. Figure 5 presents the mean of the age-salary curves of 29,500 technically trained governmental employees and of 34,500 private employees. The curves give the geometrical mean of the salary of every age group, expressed as the percentage difference from the mean of the whole group. This way of presenting the curves makes it possible to compare the curves, although the computations are done for different statistical years (1968 for the private employees and 1971 for the governmental employees). We know by other computations that the cross-sections have remained fairly unchanged over time.

The age-salary curve gives information about the age at which the employees obtain large increases in salary because of promotion. There is a quite noticeable difference between the curves of the governmental employees and the private employees. Private employees obtain salary increases at a faster rate as their age increases than do governmental employees. This can perhaps be explained by the existence of the formal salary scheme. Public employers lack some of the possibilities of

Figure 5. Age-salary cross section curves of technically trained male employees



private employers to raise individual salaries. One reason that this difference has not been washed out by the market mechanism can be that the spread of individual salaries around the mean is larger in the private sector than in the governmental sector. An engineer going into the public sector can thus be more certain to follow the mean salary path than an engineer going into the private sector.

Investigator: Siv Gustafsson.

THE PROBLEM OF WAGE DRIFT

In order to analyze the factors behind wage drift, the Swedish Employer's Federation has collected data on workers' wages in one industry. The data material is unique in that it permits analysis of the wage development for individuals. Previously the wage drift problem has primarily been studied for groups of individuals. E.g., different industries have been compared.

The data have been used by the Institute for econometric calculations based on information for individual wage earners. The wage development has been assumed to depend on a number of variables, some of which are individual-oriented, some firm-oriented. The study has been made for two different periods, i.e. 1969-1970 and 1970-1971. These periods have been chosen because they differ in regard to both negotiated wage changes and the economic situation. In 1969-1970 the wages were changed twice by negotiations, whereas no such changes happened in 1970-1971. Further, the economic outlook improved during the former period, while it worsened during the latter.

One result of the calculations is that wage increases turned out to be bigger for workers with a high percentage of piecework payment than for workers with a low percentage. This means that piece-rate work is in itself a factor which accelerates wage increases and hence also is a factor behind wage drift. However, this tendency proved to be less striking for skilled workers than for unskilled ones.

Investigator: Yngve Åberg.

DEMAND FOR CONSUMER GOODS: CONSUMER DYNAMIC AND INTERACTIVE BEHAVIOUR

The project to be described briefly below is jointly sponsored by the Swedish Council for Social Science Research and the IUI. Demand analysis is by tradition a field of research at the IUI. Several studies of the demand for particular commodities as well as studies covering all private consumption have been carried out at the Institute. The

latter kind of studies has typically been made for the Ministry of Finance as part of the long-term economic surveys of Sweden. The most recent analysis of Swedish private consumption was published in 1971. The model used was a modification of Stone's linear expenditure system. It was applied to nine commodity aggregates to produce forecasts for 1975. The present research project can be viewed as a continuation and expansion of earlier research at IUI. Our plans are that there will be three sub-projects.

The first sub-project involves a direct follow-up of the analysis and forecasts presented in 1971. The accuracy of the forecasts will be analyzed and the results of this analysis will be used to improve the new forecasts, which will be made for 1985. We will also attempt to incorporate the particular properties of consumer durables as well as savings in a linear expenditure model (LES), i.e., we aim at a dynamic version of the linear expenditure model. One deficiency of the present versions of the LES model is the implied restrictions on substitution of one commodity for another. As there is a strong demand for forecasts on a more disaggregated level than is presently used, it is an important task to develop a model which can be applied to relatively small aggregates. This requires a model which more freely permits substitution between commodities.

In the second sub-project we will investigate how demand functions from cross-sections are related to demand functions estimated from time-series and vice versa. The approach attempted is to analyze the lifecycle consumption of a (birth) cohort. Knowledge of the income-consumption-age profile for a number of cohorts makes it possible not only to derive the cross-sectional relationship but also the time-series relationship between consumption and income. By this approach we hope to contribute to the never ending debate about the proper interpretation of cross-sectional v. time-series (demand) elasticities.

The third sub-project deals with the quality problem in demand analysis. It could be argued that changes in quality of a good will affect the demand for this good (and other goods as well) irrespective of price and income changes. Before Lancaster suggested his "new" approach to consumer demand this aspect was largely neglected in demand

analysis. The effect of quality changes has usually been analyzed as a problem in the design of price index numbers. Using Lancaster's model these two aspects of the quality problem could be integrated. An attempt in this direction is made within this sub-project. Also, it may be useful to start an analysis of the quality aspects of demand by analyzing the index number problem, because the data and the results obtained with the so-called "hedonic" approach may be used to make Lancaster's model operational.

Investigators: Anders Klevmarken, Fredrik Henell, Ulf-Åke Sjöström.

ECONOMIC EFFECTS OF THE SWEDISH TAX TRANSFER SYSTEM, 1969-1975

During the last two decades the structure of the personal income tax system has taken a central position in the debate among economists and politicians in Sweden. One reason for this is that income tax influences the consumption possibilities of individuals in a very obvious manner. Another reason is that the personal income tax is the most important source of revenue for national and local government.

The system for personal income taxation has earlier been extensively studied at the Institute.[1] The core of that study was the construction of a simulation model for the system. The model, which covered the period 1952-1971, was used to investigate the role of the personal income tax system in the policies for economic stabilization and income redistribution. One aim of the new project is to follow up these investigations to the present.

The primary aim of the project, however, is to integrate into the tax model central components of the transfer system, i.e. old-age pensions, child and housing allowances. This integration is of obvious interest, since every revision of the personal income tax during the last ten years has been combined with changes in the transfer system.

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1) Jakobsson, U. & Normann, G., 1974, Inkomstbeskattningen i den ekonomiska politiken (Personal Income Taxation and Economic Policy).

An important component of the tax system is the payroll tax. In Sweden this consists of a special charge on employers and their contributions to the social insurances. A third aim of the project is to integrate this part of the tax system into the simulation model.

The extended model will be used for analyzing the historical development, for forecasting future total income, tax revenues and for comparing alternative tax-transfer systems.

Investigators: Ulf Jakobsson, Göran Normann.

THE TAXATION OF FACTORS OF PRODUCTION

All revisions of the Swedish personal income tax system during the seventies have been combined with increases either in the special charge on employers or in their contributions to the social insurances. These imposts could be characterized as taxes on labour as a factor of production. Another factor tax that is currently used in Sweden is the energy consumption tax.

There are several reasons to believe that measures related to the taxing of factors of production will be important elements of fiscal policy also in the near future. Considering the rather limited stock of knowledge concerning the economic effects of these taxes, the need for further research seems quite obvious.

The study that is now in progress is in its first stage intended to be restricted in several respects. For example the empirical analysis will be restricted to the use of existing statistical material. As a matter of fact an important task of the study is to point out problems where further research is needed.

The investigation will include a discussion of the properties of factor taxes as means to reach the policy targets with respect to resource allocation, stabilization, income redistribution, etc. The degree of shifting the incidence of these taxes is of fundamental im-

portance for the understanding of their effects and will thus be carefully studied.

Investigator: Göran Normann.

TAXATION OF CAPITAL GAINS

The Institute has recently started a project on the effects of different forms of taxes on capital gains.

A central question is how the behaviour of the firm is affected by different designs of the capital gains taxation. Clearly, the effects of the capital gains tax is not unaffected by the other taxes levied on the firm. Therefore a theoretical model of a growing firm has been constructed. This model enables us to discuss how different designs of the total tax system affect the investment dividend and financial policies of the firm.

Investigators: Ulf Jakobsson, Göran Eriksson.

THE INSTITUTE'S PUBLICATIONS 1968-1974

A complete list of the Institute's publications can be obtained by request.

Prices given are list prices in Swedish crowns before value-added-tax.

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