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Total Factor Productivity and R&D in Finnish, Swedish and Norwegian Manufacturing Industries, 1964 to 1983

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TOTAL FACTOR PRODUCTIVITY AND R&D
IN FINNISH, SWEDISH AND NORWEGIAN
MANUFACTURING INDUSTRIES, 1964 TO1983

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ABSTRACT: In this paper developments in total factor productivity and research intensity in ten manufacturing industries of three Nordic countries are compared. These developments vary both across industries and across countries. The average growth rate of total factor productivity has been fastest in Sweden and slowest in Norway, and research intensity has also been clearly higher in Sweden than in the other two countries in manufacturing as a whole. These data will be used for later studies on the relationship between research activity and productivity.

KEY WORDS: Total factor productivity, R&D, manufacturing industries, Finland, Sweden, Norway

TOTAL FACTOR PRODUCTIVITY AND R&D IN FINNISH, SWEDISH AND NORWEGIAN MANUFACTURING INDUSTRIES, 1964 TO 1983

Contents:

1. INTRODUCTION

The development of productivity in industry has been the subject of wide interest in industrialized countries in the 1970s and 1980s, in part because of an extensive restructuring of capacity in this sector after the oil and raw material price shocks in this period. The need to assess the successfulness of this adjustment process has also caused an increasing interest in international comparisons of productivity developments.

Changes in total factor productivity are defined as those changes in the volume of output which are not explained by changes in the traditional factor inputs capital and labour, but rather by technological change, improvements in the quality of inputs and products as well as in management and organization. Technological change based on research and development activities by firms is generally acknowledged as a major factor behind improvements in total factor productivity.

This paper is an interim report of a larger research project on productivity and research activity in industry. The main aim at this stage is the presentation of the data which will be used at a later stage for a causal analysis between total factor productivity and research activity. Thus the paper contains a three-country comparison, consisting of Finland, Sweden and Norway, of the development of total factor productivity in ten manufacturing industries in the period 1964 to 1983, as well as a comparison of research intensity in these industries and countries. The motivation for the separate presentation of these comparisons is that they are regarded as interesting as such.

While only developments in total factor productivity and research intensity are discussed in this paper, the data appendix provides the basis for future more complex analyses, and includes the results of constructing capacity utilization and research capital stocks series (see Appendix 1 for a description of the data).

An earlier paper /Vuori (1986)/ analysed the returns to R&D in Finnish and Swedish manufacturing industries in 1964 to 1980. That paper differed from most other previous studies in two respects: it examined the various industries separately, and the analysis was based on time series instead of cross-section data. While the results were of a tentative character, they indicated the existence of a clearly positive relationship between research input and total factor productivity. This analysis is to be continued later on the basis of the data presented in this paper.

2. INTERCOUNTRY COMPARISON OF TOTAL FACTOR PRODUCTIVITY BY INDUSTRIES

2.1 Calculation of changes in total factor productivity

The most commonly used method of calculating total factor productivity (TFP) is based on a Cobb-Douglas value added production function. To permit wider applicability, however, we have used a gross output translog function as the starting point. Define the production function y as follows:

$$y = \exp(\ln F(X_n)).g(t), \qquad (1)$$

where $F(X_n)$ is a translog function and g(t) is a function describing Hicks neutral technological change

$$g(t) = e^{\mu t} R^{\alpha} . \qquad (2)$$

R represents research capital, α is the output elasticity of this capital, and μ is the rate of autonomous technological change.

F(X) is in the form of a factor requirements function with three inputs: capital X_k, labour X_l, and material inputs X_m.

With certain restrictions on the parameters this function provides a second-order approximation to an arbitrary twice differentiable function of (X_n), which is linearly homogenous with respect to the inputs /See Diewert (1980), p. 487-90/. It is thus considerably more flexible than the Cobb-Douglas function which has quite commonly been used but is only a first-order approximation.

From (1) it follows that

$$d \ln y - d \ln F(Xn) = d \ln g(t), \qquad (3)$$

where d ln F(Xn) is a Törnqvist-type input index $\Sigma w_n \hat{X}_n$. The logarithmic differences of each input $\hat{X}_n$ (n = k,l,m) are weighted by the mean of the current and previous periods' value shares /Diewert (1980), p. 445 and 490-91/. Thus we have for the logarithmic differences of total factor productivity f, when definition (2) is taken into account, the expression

$$f = \hat{y} - \Sigma w_n \hat{X}_n = \mu + \alpha \hat{R}. \qquad (4)$$

The TFP differences to be presented in this paper were calculated according to equation (4). The data which were used are described in Appendix 1.

2.2 Development of total factor productivity in 1964-83

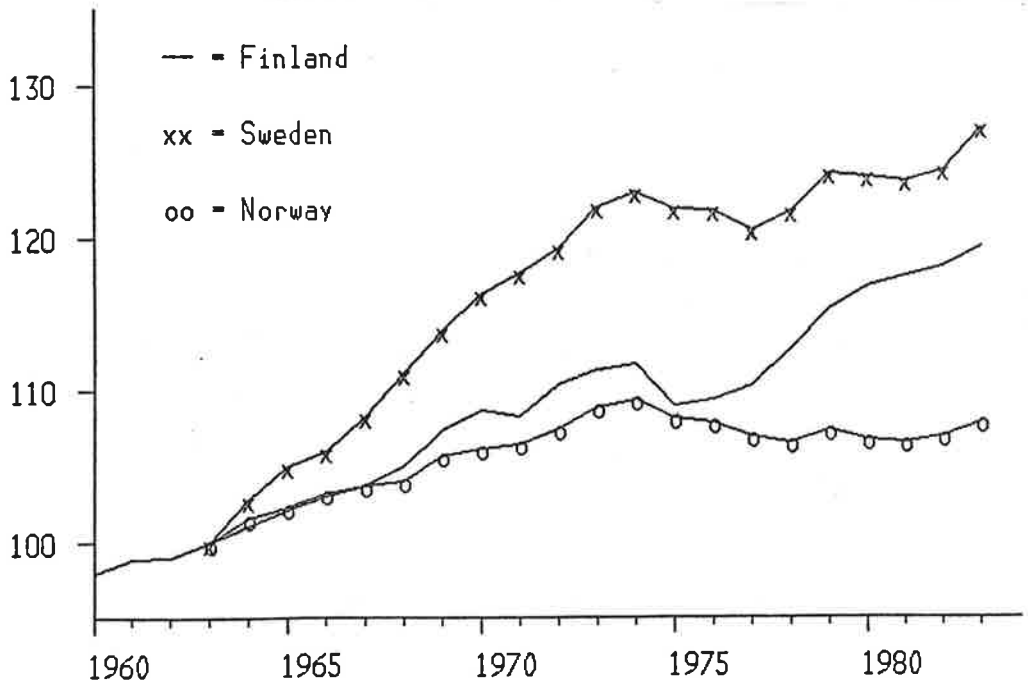
In this section we present graphically the results of the TFP calculations in the form of three-country comparisons for total manufacturing and separately for the ten manufacturing industries being studied. To facilitate the comparisons, index series describing developments in the level of TFP, with 1963=100, have been calculated on the basis of the changes in productivity. The data are given in Appendix 2.

As stated already in Wyatt (1983), which contained an analysis of the Finnish and Swedish industries in the period 1963 to 1980, TFP growth slowed down in most manufacturing industries of both countries after the early 1970s. Similar developments were typically experienced in other industrial-

ized countries as well. Before this turning point, growth was in general faster in Sweden, but thereafter in Finland. This general picture is not much altered when the years 1981-83 are added to the earlier data.

Figure 1 depicts the productivity developments for total manufacturing in the three countries. While there are remarkable differences between developments in the various industries, as we shall see shortly, this figure roughly summarizes some of the main intercountry differences and similarities. Firstly, for this 20-year period on average, the development of total factor productivity has been clearly more favourable for Sweden than for the other two countries. Secondly, clearly at this aggregate level and also for several of the subsectors, the first oil crisis of 1973-74 formed a turning point, before which a period of almost uninterrupted productivity growth was experienced in all three countries.

Figure 1. Total factor productivity in manufacturing, 1963=100



After this turning point the developments in the three countries were at the aggregate level notably different. In Sweden the recovery after the recession of the mid-70s was fairly slow, and in 1983 the level of productivity was only some 3.4 percent higher than in 1974. In Finland the growth rate was much more rapid, and the 1974 level was exceeded by almost 7 percent in 1983. For Norway, an oil-producing nation itself, the consequences of the first oil price shock were clearly different from those for the other two countries. It seems that the reallocation of resources towards the oil sector resulted in declining performance of the manufacturing sector. In 1983 the level of TFP was nearly 1.5 percent lower than in 1974. [1)]

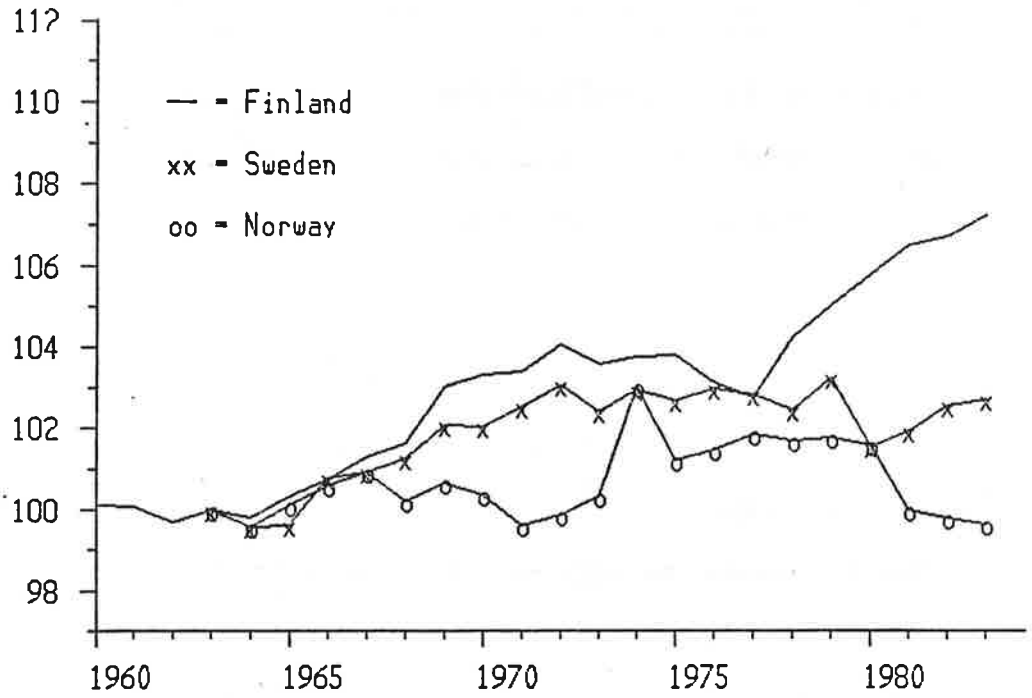
The productivity developments of the nine two-digit (ISIC) industries as well as of the three-digit industries 341 and 342 (paper and paper products, and printing and publishing) are shown in Figures 2-12. In the following we as a rule first compare the developments in the corresponding industries in Finland and in Sweden, as in general their differences are smaller than either's differences from Norway. A few things stand out in this comparison. In the food, beverages and tobacco industry TFP has stagnated in Sweden since the early 1970s, whereas in Finland the level of productivity rose rapidly after 1977 and thus reached a slightly higher average growth rate for the whole 20-year period than that for Sweden. In Norway the

---

1) Holmöy(1986) reports results on TFP calculations for various sectors of the economy, which for the aggregate industry level are qualitatively fairly similar to our results for total manufacturing, but the figures cannot be strictly compared because of differences in data, methods of calculation and level of aggregation.

development of productivity has been stagnating with the exception of just a few years, and in 1983 its level was about the same as in the beginning of the period under study.

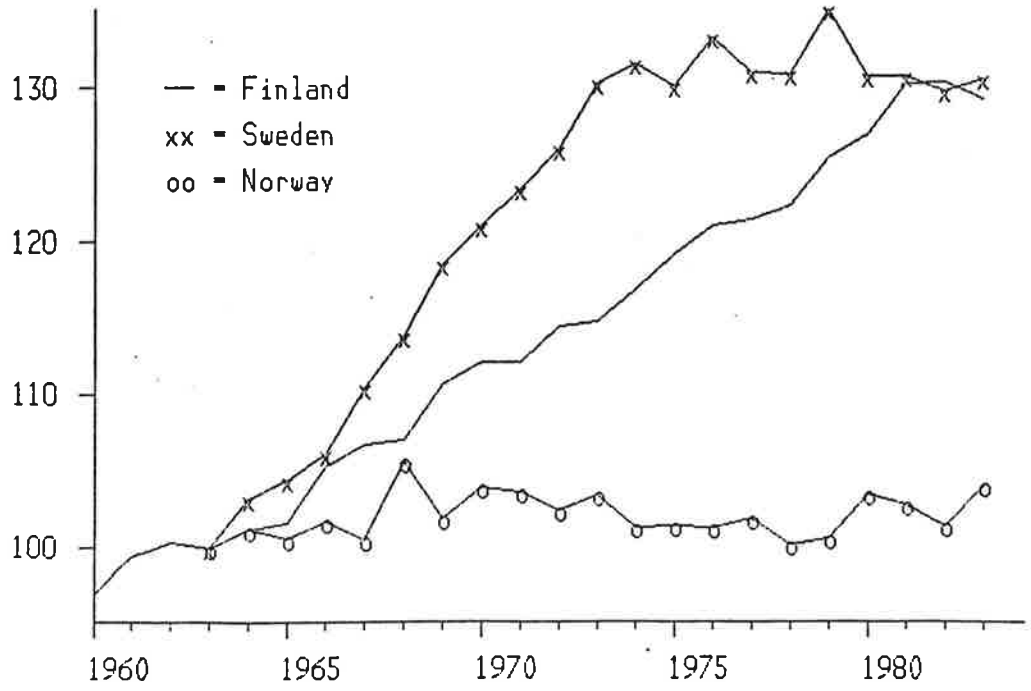
Figure 2. Total factor productivity in the food, beverages and tobacco industry, 1963=100



The textile, clothing and leather industry also shows different developments in Finland and in Sweden (Fig. 3). In Sweden the clothing sector has been a sharply declining industry since the mid-70s, and the volume of output dropped to roughly one third between 1970 and 1983. In Finland the development was much more favourable until the early 1980s, partly because of steadily growing demand in nearby markets and the bilateral nature of Finland's trade with the Soviet Union, which assured a high level of exports as long as the price of oil was rising. The situation has, however, drastically changed in recent years, and output has started to decline also in

Finland. These developments are reflected in the total factor productivity figures for the whole textile and clothing sector. Another thing which no doubt has contributed to the rather favourable development of TFP in Finland is that capital intensity, although it still is appreciably lower than in total manufacturing, rose rapidly from the mid-70s onwards in the clothing industry. Again, in Norway the level of productivity has stagnated during the whole 20-year period.

Figure 3. Total factor productivity in the textile, clothing and leather industries, 1963=100



In the forest-based main industries (wood and wood products, and paper industry, Figs. 4 and 5) the development of productivity resembles that in total manufacturing, except that the fluctuations in the former are larger. This may be expected when comparing a subsector (and especially one which is highly sensitive to cyclical variations) to the aggregate. This general

picture changes somewhat, however, when the two subsectors of the paper industry are looked at separately. This is due to two factors: firstly, the printing and publishing industry does not seem to be very sensitive to business cycles. Secondly, in Norway the development of the paper and paper products industry is nearly the opposite of that in the printing and publishing sector (Figs. 6 and 7). Surprisingly, the average growth in TFP is in the Norwegian paper and paper products industry higher than in Finland and even in Sweden. While the share of this sector in total manufacturing output is clearly lower than in the other two countries, its productivity seems to have been developing relatively well, at least in comparison with other industries in Norway. On the other hand, the development of TFP in the Norwegian printing and publishing industry has been rather unfavourable, and its level has decreased by some 20 percent over the whole period.

Figure 4. Total factor productivity in the wood and wood products industry, 1963=100

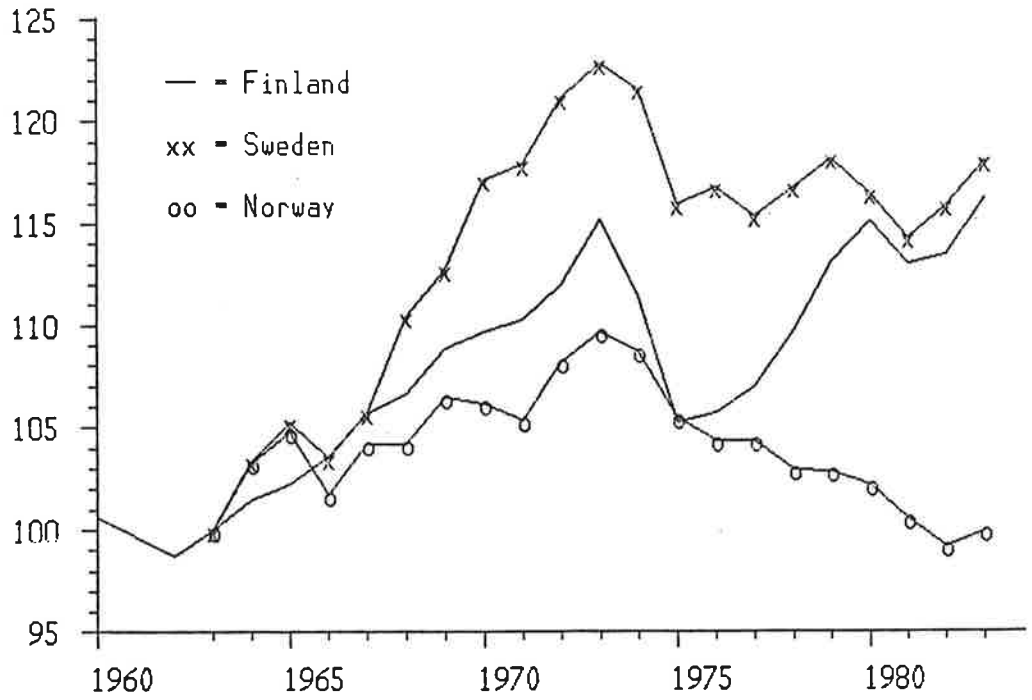


Figure 5. Total factor productivity in the paper industry, 1963=100

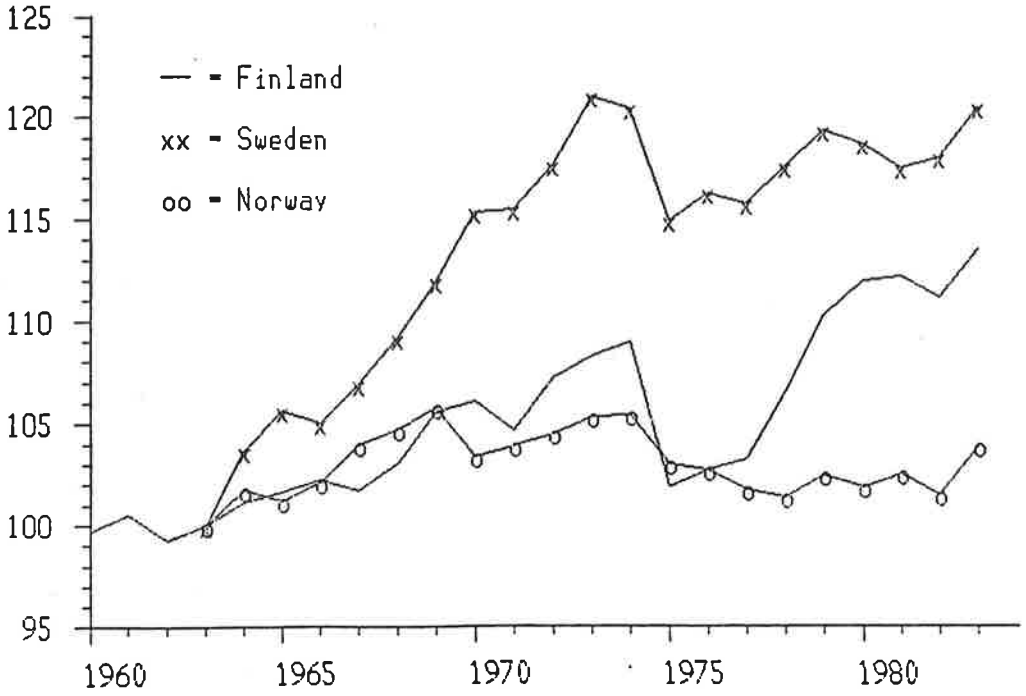


Figure 6. Total factor productivity in the paper and paper products industry, 1963=100

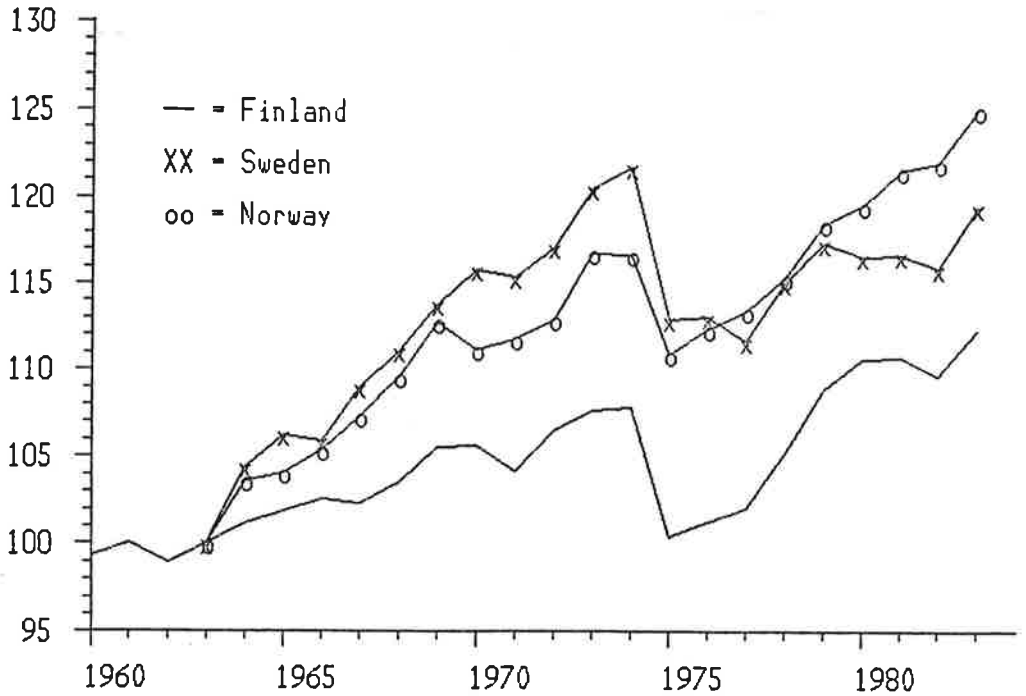
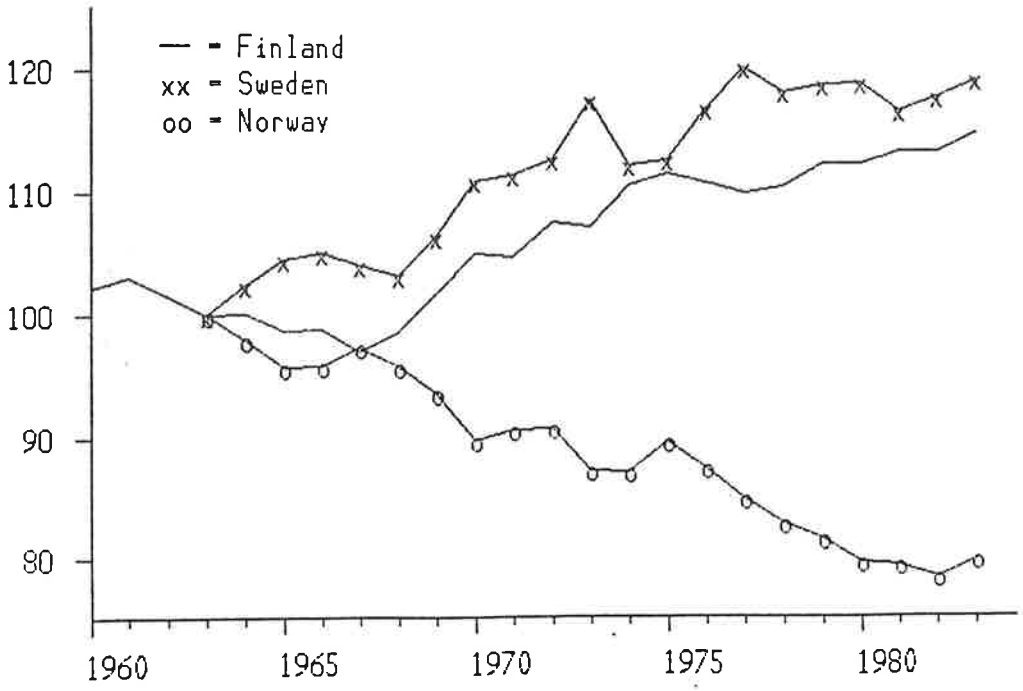
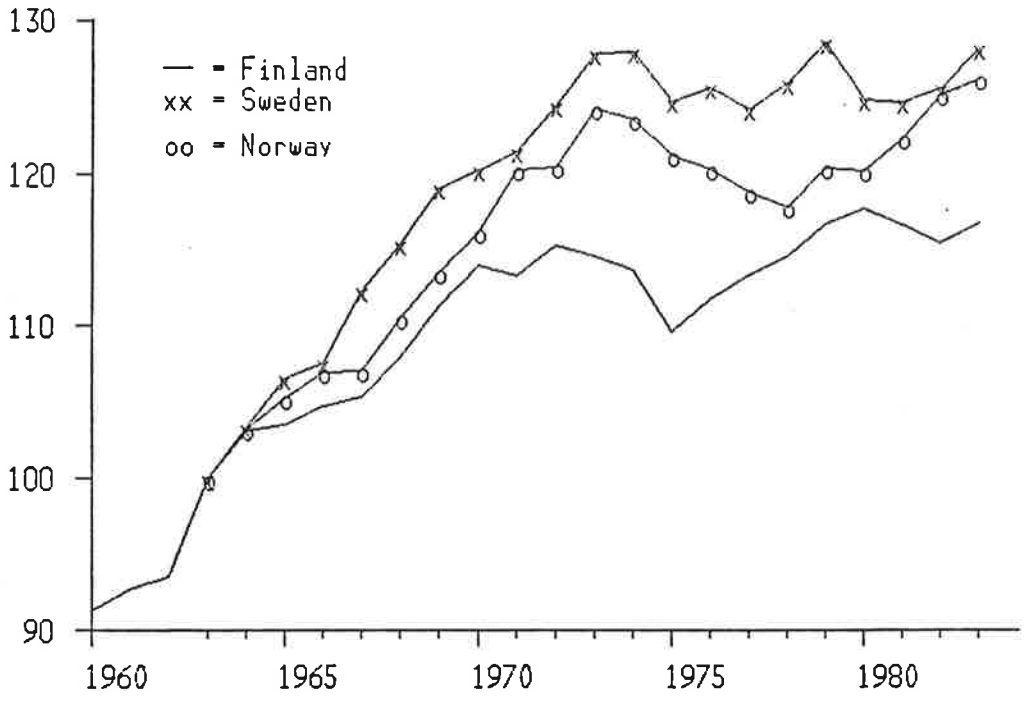


Figure 7. Total factor productivity in the printing and publishing industry, 1963=100



In the chemical industries Sweden follows the general trend of faster growth than in the other two countries in the earlier part of the period, but slow growth in the latter part. On the other hand, this is another sector where the Norwegian figures diverge from the general picture: the growth in total factor productivity has been fairly fast, and faster than in Finland. In addition, the growth rate has been close to the corresponding Swedish rate, so that in the end of the period there appeared to be practically no loss in the relative productivity of the Norwegian chemical industries vis-a-vis Sweden (Fig. 8). As a part of this sector is closely related to the production of oil, the boom of the oil sector may be one explanation of the exceptionally favourable productivity development in most years in the chemical industries.

Figure 8. Total factor productivity in the chemical industries, 1963=100



In the non-metallic mineral products industry (Fig. 9) total factor productivity has developed in a fairly similar way in Finland and Sweden on average, but growth was relatively rapid in Finland after the mid-70s whereas it stagnated in Sweden. In Norway the slow growth in TFP turned into decline in the latter part of the period.

The basic metal industries (Fig. 10) are the third sector where Norway has experienced relatively favourable growth. Here the performance of the Finnish industry has been fairly parallel with Norway, except that in Finland the fluctuations in TFP have been larger.

Figure 9. Total factor productivity in the non-metallic mineral products industry, 1963=100

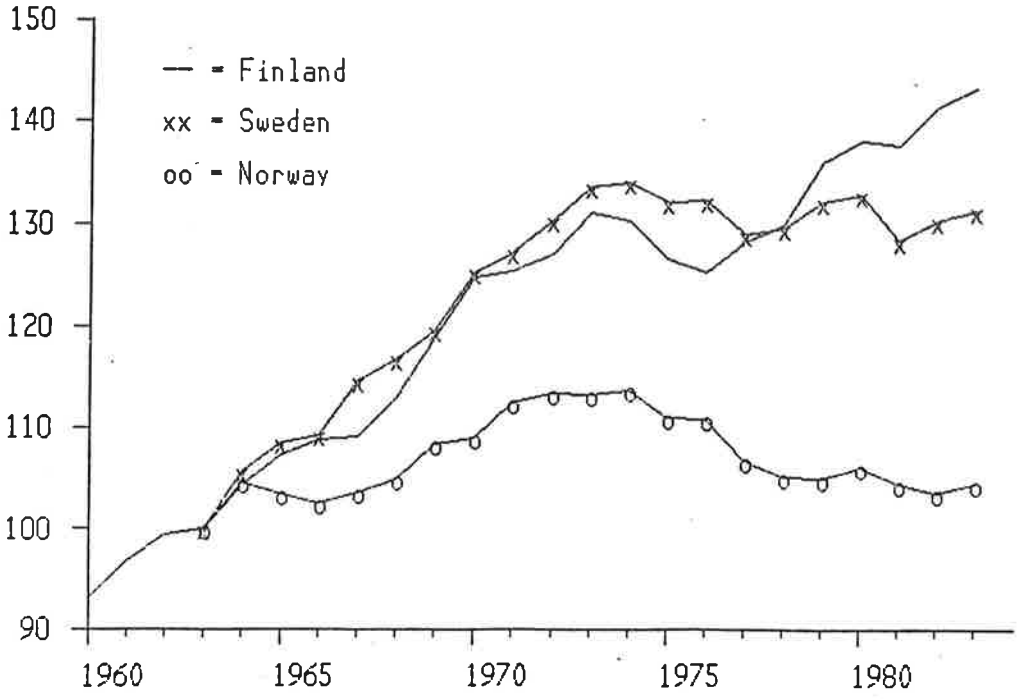
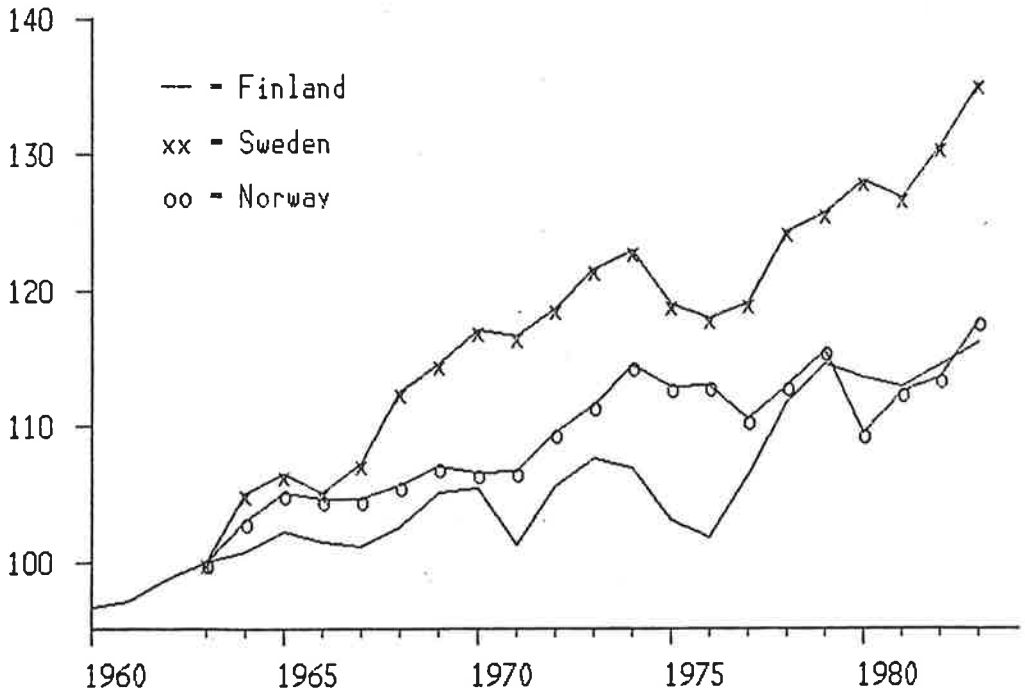


Figure 10. Total factor productivity in the basic metal industries, 1963=100



In the metal products and engineering industries the development of TFP has been very much in line with that of total manufacturing for all three countries. However, after 1966 the differences between Finland and Sweden have been small, but in contrast the difference between Norway and the other two countries were much greater than on average. Over the whole period there were only minor improvements in productivity in Norway (Fig. 11).

Finally, the results of total factor productivity calculations for the sector other manufacturing are shown in Figure 12. As is clear from this figure, this industry performs quite differently from the rest of the industries, and indeed it is to some extent doubtful whether it should be regarded as an industry in the normal sense at all. Due to its residual character it contains very heterogenous activities, and thus the idea of an industry production function is not very well motivated. In addition, the definition of this industry seems to have changed importantly in Sweden, which is seen as an abnormal kink in the TFP curve in 1970. Thus, while there seems to have been very rapid growth of TFP in this sector in Finland, and a remarkable decline in the latter part of the period in Norway, we do not suggest any conclusions to be drawn on the basis of these figures. This is in any case not a serious omission, since this sector produces only about or even less than one percent of the output of total manufacturing in all three countries.

Figure 11. Total factor productivity in the metal products and engineering industries, 1963=100

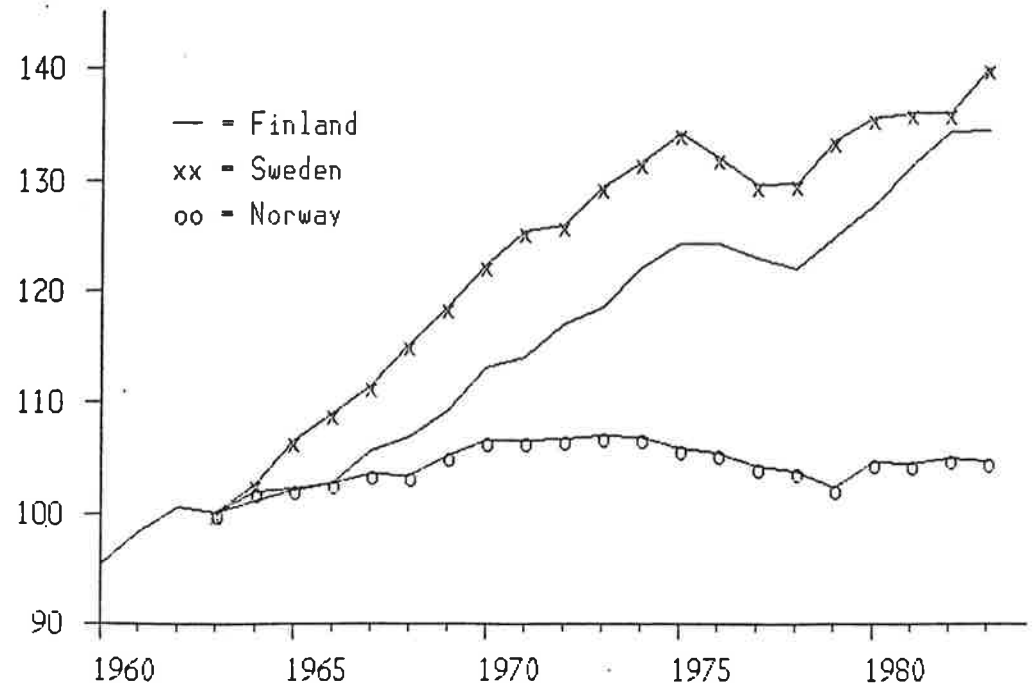
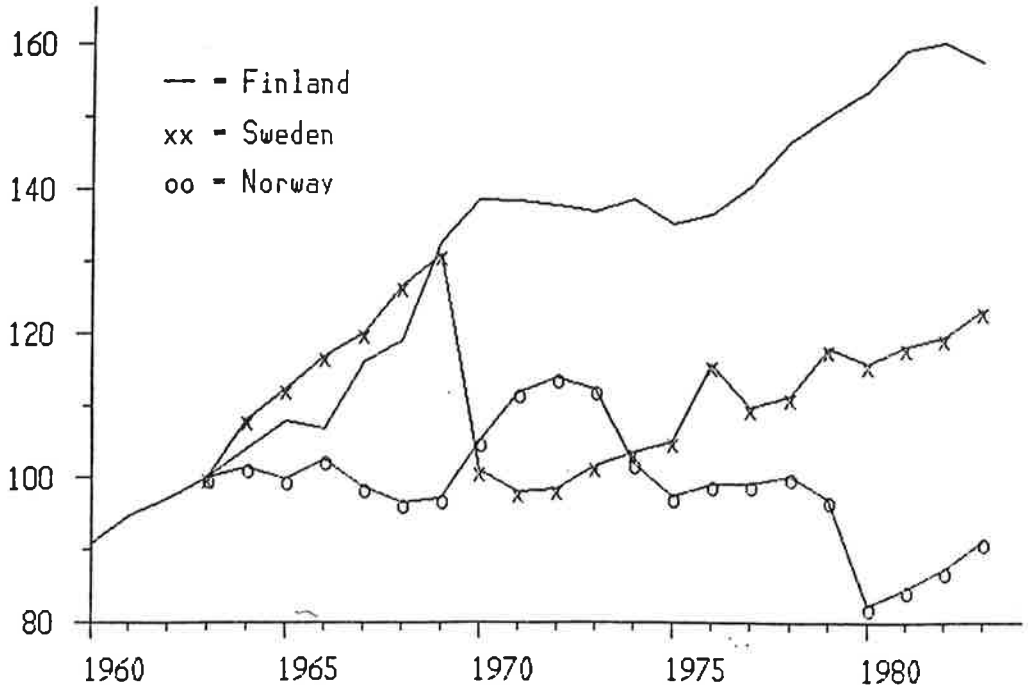


Figure 12. Total factor productivity in other manufacturing, 1963=100



2.3 Summary and conclusions

As already noted in the previous section, total factor productivity developed in a different fashion in Finland, Norway and Sweden in the period 1963-83, even when looking at the various manufacturing industries separately. Thus, medium- or long-term changes in TFP are dependent not only on the industry but also on the country which is being studied. In most industries the country-specific pattern of TFP is such that Sweden shows the fastest average growth for the whole period, with a slowdown or stagnation in the latter part of the period, Finland shows slightly slower average growth but the fastest growth after the mid-70s, and Norway has experienced slow growth in the early part of the period, and stagnation or even deterioration of TFP levels in the latter part. These developments are summarised in Table 1, which contains the average compound growth rates of TFP for the two sub-periods 1963-73 and 1973-83. This division into sub-periods is quite arbitrary and does not take into account the fact that the average growth rates are very sensitive to end-year developments. Thus differences in the timing of peaks and bottoms may produce a misleading picture for the comparison of industries and countries. The on average fairly low growth rates also conceal the fact that in some years and some industries considerable improvements of productivity have occurred. Nevertheless, the figures in Table 1 provide a rough description of developments in the three countries.

Table 1. Average growth rates of TFP by industries, 1963-73 and 1973-83, %

Industry	Finland		Sweden		Norway	
	1963-1973	1973-1983	1963-1973	1973-1983	1963-1973	1973-1983
31 Food, beverages and tobacco	0.35	0.35	0.24	0.03	0.03	-0.06
32 Textile, clothing and leather	1.37	1.20	2.67	0.01	0.33	0.06
33 Wood and wood products	1.43	0.09	2.08	-0.39	0.93	-0.93
34 Paper	0.79	0.47	1.92	-0.05	0.52	-0.15
341 Paper and paper products	0.74	0.43	1.88	-0.09	1.56	0.69
342 Printing and publishing	0.69	0.68	1.61	0.12	-1.38	-0.87
35 Chemical industries	1.37	0.19	2.50	0.02	2.20	0.16
36 Non-metallic mineral products	2.74	0.89	2.93	-0.16	1.25	-0.08
37 Basic metal industries	0.73	0.77	1.97	1.06	1.09	0.54
38 Metal products and engineering	1.72	1.27	2.61	0.80	0.68	-0.21
39 Other manufacturing	3.21	1.42	0.18	1.92	1.18	-2.07
3 Total manufacturing	1.07	0.70	2.01	0.41	0.86	-0.09

One possible reason for the observed differences in total factor productivity developments could be different structures of the manufacturing industries of the three countries concerned. While it is not possible to investigate this matter in detail in this context, some sort of an idea of these differences can be derived on the basis of Table 2. While Sweden seems to be nearest to the structures often observed in the most industrialized countries, with a high share of the metal products and engineering industries in the total value of output and fairly low shares of some consumer goods industries, Norway is in a way a case between Sweden and Finland.

On the other hand, Norway shows surprisingly high shares of the food industries, the printing and publishing industries, as well as the basic metal industries, whereas the share of the chemical industries does not exceed the corresponding shares in the other two countries, as might have been expected because of synergy potentials with the oil sector. It seems therefore that these synergies have been more than offset by the negative effects of the

violently fluctuating prices related to these sectors. In contrast, in the Finnish industrial structure the most outstanding features are perhaps the relatively high shares of the forest-based industries, especially the paper industry, and the textile, clothing and related industries. We therefore conclude that there seems to be some degree of specialization between the three countries, which no doubt also means substantial differences in the product structures of output. Thus this may indeed be one reason behind the different productivity developments of corresponding industries in the three countries.

As to Norway, another candidate (in addition to the insufficient restructuring of the manufacturing industry as a result of the oil sector boom) for explaining the exceptionally weak performance of TFP could be efficiency losses due to extensive public sector subsidies in some industries. [1)] This could be suspected in the case of the food industry, the basic metal industry and one part of the metal products and engineering industry, namely the transport equipment industry (and more precisely, shipbuilding). In all these industries the compensations paid to employees exceeded value added in several years from 1977 onwards (in shipbuilding also in several years between 1968 and 1975), which leaves the remunerations to capital negative values without the subsidies.

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1) Obviously, subsidies are not a sufficient explanation for weak performance; e.g. in the case of Sweden TFP developments have been much more favourable in spite of considerable subsidies. The problems of the Norwegian economy have been dealt with e.g. in Growth Policies in a Nordic Perspective (1987), Chapter V.

Table 2. Share in value added of total manufacturing (CP) by industries in 1963, 1973 and 1983, %

Industry	Finland			Sweden			Norway		
	1963	1973	1983	1963	1973	1983	1963	1973	1983
31 Food, beverages and tobacco	16.4	12.5	11.8	11.2	10.4	10.5	17.9	15.0	17.3
32 Textile, clothing and l.	11.6	9.1	7.1	8.9	5.2	2.8	10.5	6.0	3.2
33 Wood and wood products	9.3	11.4	8.2	7.4	9.2	7.4	7.4	10.1	8.7
34 Paper	19.9	18.4	20.0	13.6	14.0	15.1	13.6	13.0	14.8
341 Paper and paper prod.	14.3	13.2	12.2	7.0	8.1	8.6	6.7	5.5	4.4
342 Printing and publ.	5.6	5.2	7.8	6.6	5.9	6.4	6.9	7.5	10.4
35 Chemical industries	8.0	10.9	11.6	7.6	8.9	10.2	10.1	11.1	9.9
36 Non-metallic min. products	4.3	4.3	5.1	4.8	4.0	3.2	3.8	4.5	4.9
37 Basic metal industries	3.0	5.5	4.1	6.5	6.8	5.8	7.8	7.3	7.9
38 Metal prod. and engineering	26.2	27.1	31.3	39.2	40.6	44.5	27.6	31.8	32.1
39 Other manufacturing	1.2	0.8	0.8	0.8	0.9	0.5	1.2	1.3	1.1
3 Total manufacturing	100	100	100	100	100	100	100	100	100

Sources: OECD National Accounts; Finnish, Swedish and Norwegian National Accounts

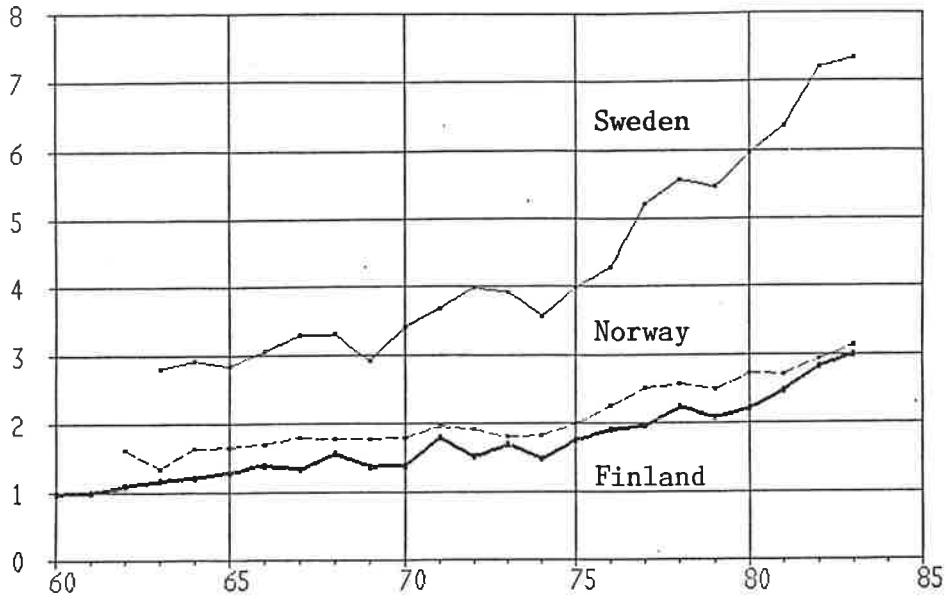
3. COMPARISON OF RESEARCH INTENSITY BY INDUSTRIES

In this section we compare the development of research intensity in the different manufacturing industries of Finland, Sweden and Norway. By research intensity we mean in this case research and development expenditures of the industry in question divided by value added in that industry (and multiplied by 100). This is the measure most commonly used in comparing the development of research activities in different industries and countries, since it is considered appropriate to relate the level of research effort to the ability of the industry to create income. On the other hand, in firms it is more usual and practical to relate such figures to turnover. In addition, in this study we have explicitly chosen gross output to be the relevant output measure in the productivity calculations. For these reasons, R&D expenditures divided by the gross value of output is the research intensity variable to be used later on in the causal analysis of the relationship between R&D and TFP. These figures are shown in the data appendix, but to facilitate comparison with other similar data the graphic representation of research intensity shows the intensities based on value added.

In Figure 13 research intensity in the total manufacturing sector of the three countries is shown. On this average level research intensity is considerably higher in Swedish manufacturing than in the other two countries; the level has been roughly twice that of the others, and even more, especially in recent years. The Norwegian level of R&D intensity has been slightly higher than in Finland throughout the period, but in many years the difference has been very small. This comparison provides no surprise, as

Sweden has for long been counted as one of the leading R&D spenders in the world. E.g. in 1985 total gross domestic expenditure on R&D in per cent of GDP amounted to 2.81 in the United States and Japan, 2.79 in Sweden, 2.66 in Germany, 2.32 in France, 2.19 in the United Kingdom, and 1.53 in Finland and Norway /STI Review, p. 103/.

Figure 13. Research intensity (R&D expenditures/ value added) in manufacturing, %



A common thing for all three countries is that there has been a rising trend in research intensity throughout the period, and after 1975 its level has been rising rapidly. The growth rate of the volume of R&D expenditures in the whole business sector, which conducts very little research activities outside the manufacturing sector (about 10 % in Finland in monetary values), has been especially high in Finland (Table 3). However, because of higher growth rates of output in the Finnish manufacturing industry than in Sweden,

Finland has not been able to narrow the gap in research intensity. Thus, it should be borne in mind that research intensity figures tell only one part of the story of investments in research activities.

Table 3. R&D expenditures in the business enterprise sector in selected countries, 1975-83

	Annual change in volume, %	
	1975-79	1979-83
United States	4.9	5.6
Japan	6.6	11.7
Germany, FR	8.2	2.6
France	3.8	4.3
United Kingdom	5.0	0.3
Italy	2.6	7.5
Sweden	3.9	7.6
Norway	6.0	6.9
Denmark	5.3	8.0
Finland	7.5	10.5

Source: OECD

The research intensities of the ten subsectors are depicted in Figures 14-18. As is typical in almost all industrialized countries, these intensities are relatively high in the chemical industries and in the metal products and engineering industries. Extremely low R&D intensities are found in the wood and wood products industry and the printing and publishing industry.

The metal products and engineering industry (Fig. 18) follows most closely the average pattern of inter-country differences, although the level of research intensity is higher than in total manufacturing. There are several deviations from that average pattern. From the early or mid-70s onwards, R&D intensity was higher in Finland than in Norway in the food industries, the non-metallic mineral products industries, and in other manufacturing. The curve for the other manufacturing industry in Sweden again contains

implausible kinks, which may be due to discontinuities in the industry classification.

On the other hand, in the wood and wood products industry Norwegian firms invested a clearly higher share of output in research activities in the early part of the period than Finnish rivals, and almost throughout the period this share was also higher than in Sweden. In the latter part of the period Swedish paper-producing as well as printing and publishing firms increased their research intensity rapidly. There was also a considerable increase in some years from the mid-70s onwards in the research intensity of the Norwegian basic metal industries.

Figure 14. Research intensity in the food industries (ISIC 31) and in the textile and clothing industries (ISIC 32), %

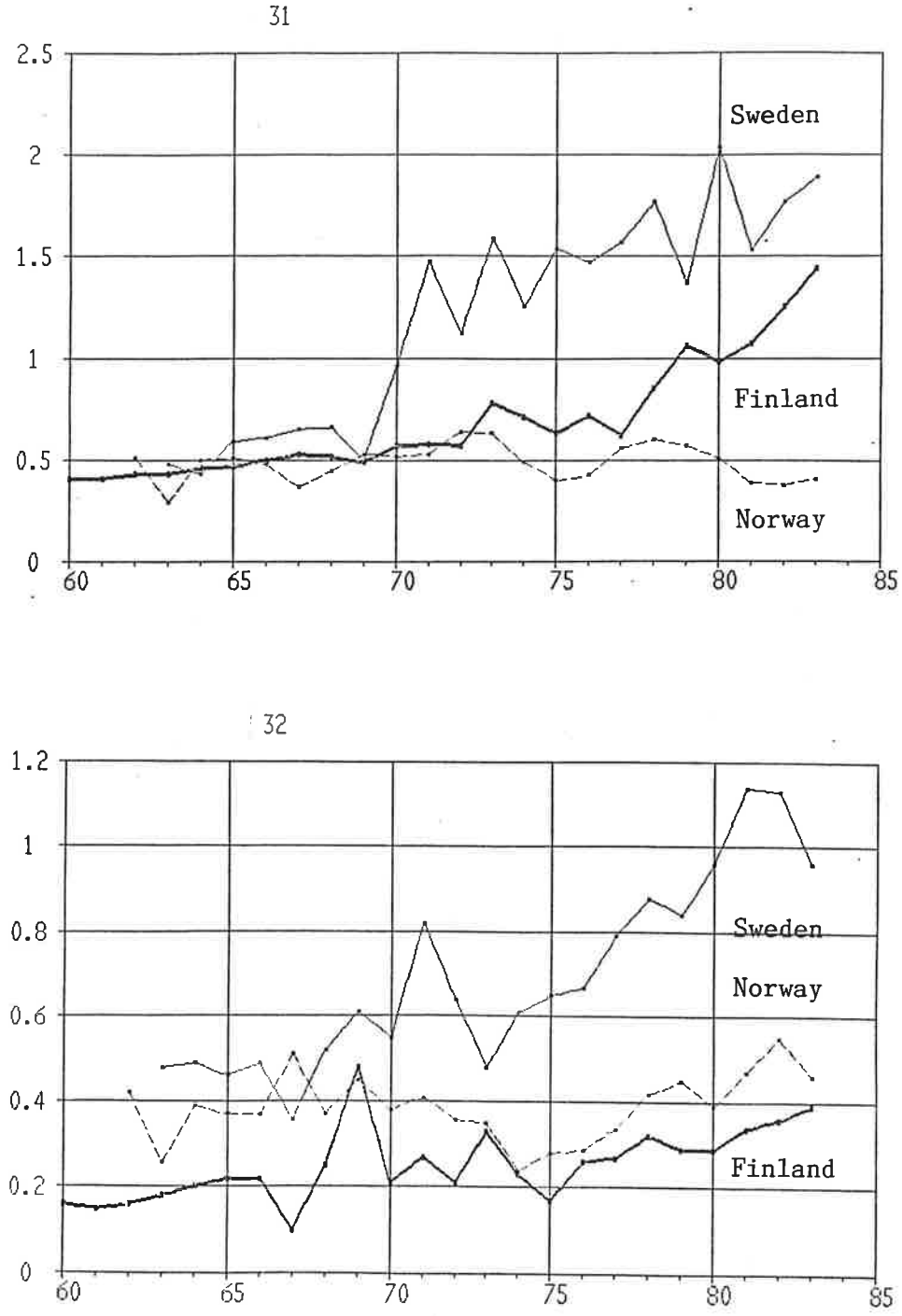


Figure 15. Research intensity in the wood industry (ISIC 33) and in the chemical industries (ISIC 35), %

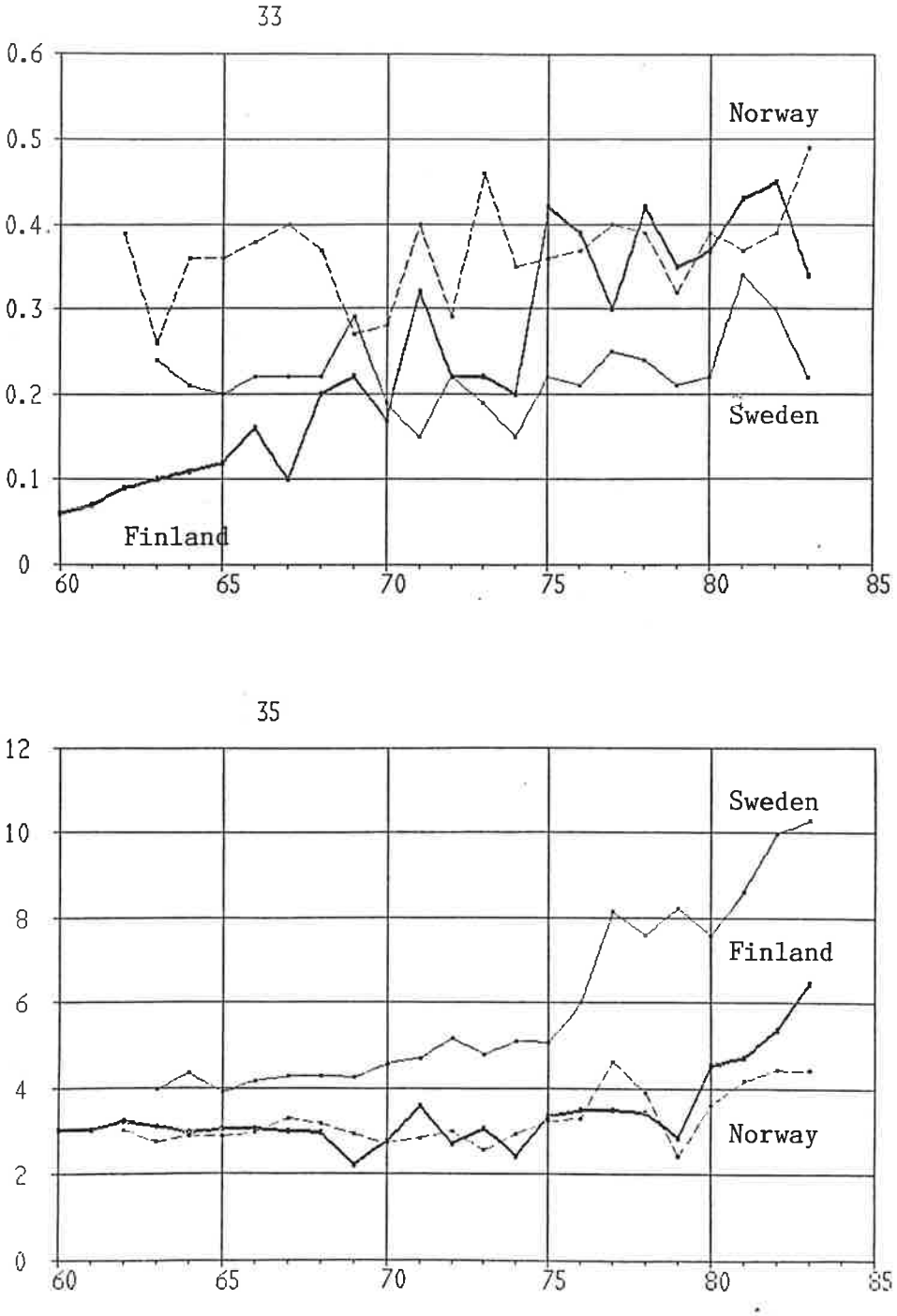


Figure 16. Research intensity in the paper and paper products industries (ISIC 341) and in the printing and publishing industries (ISIC 342), %

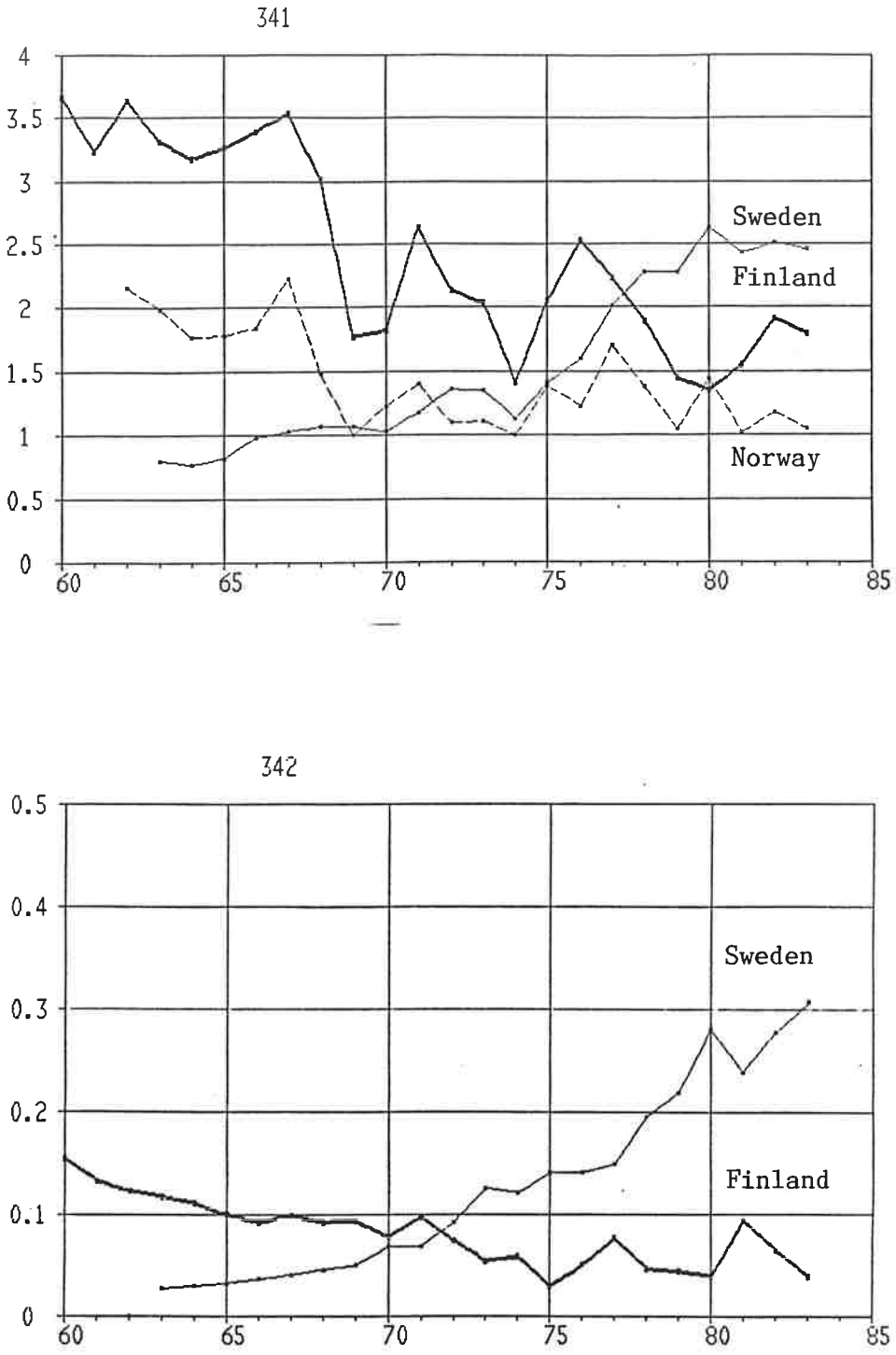


Figure 17. Research intensity in the non-metallic mineral products industries (ISIC 36) and in the basic metal industries (ISIC 37), %

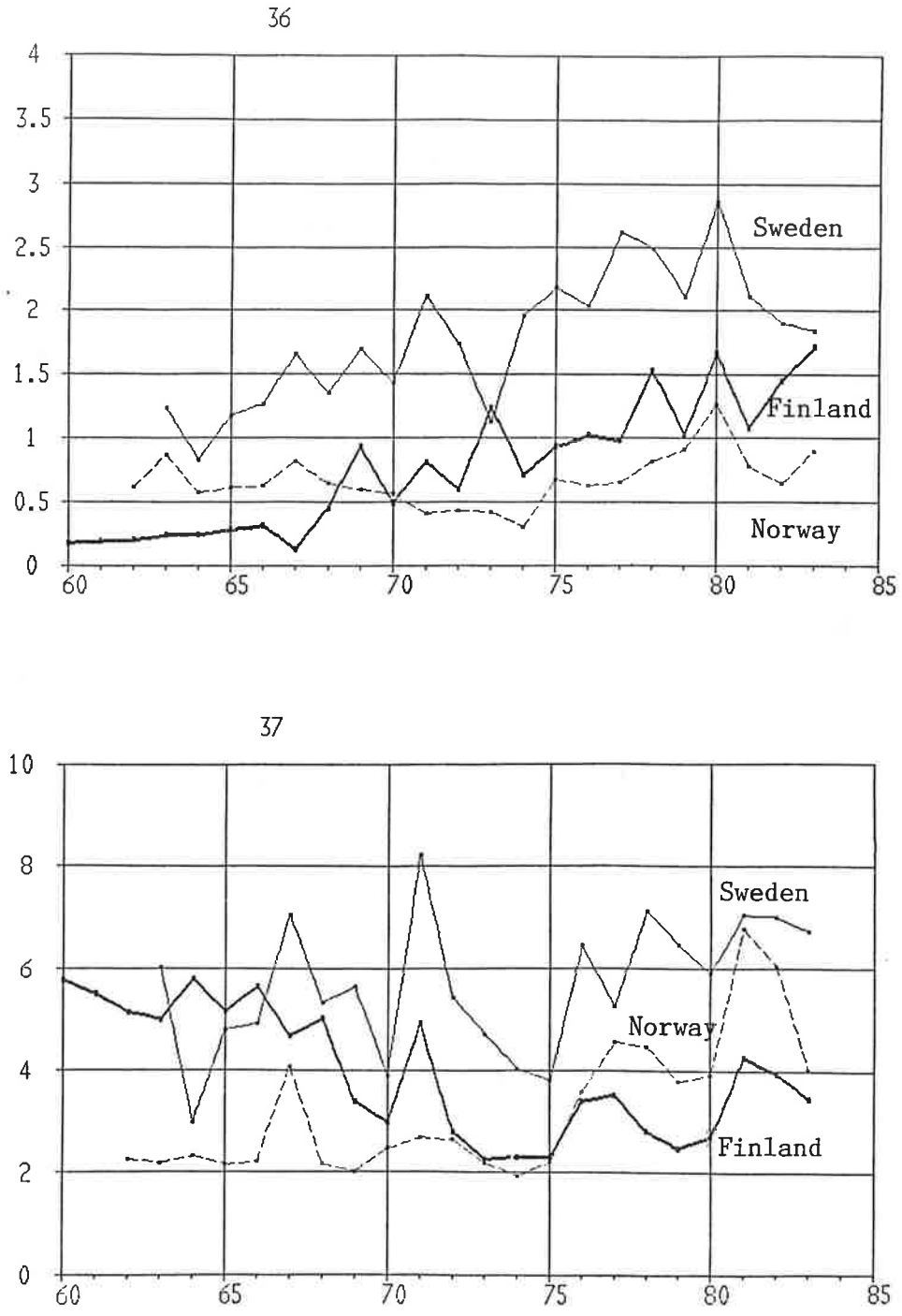
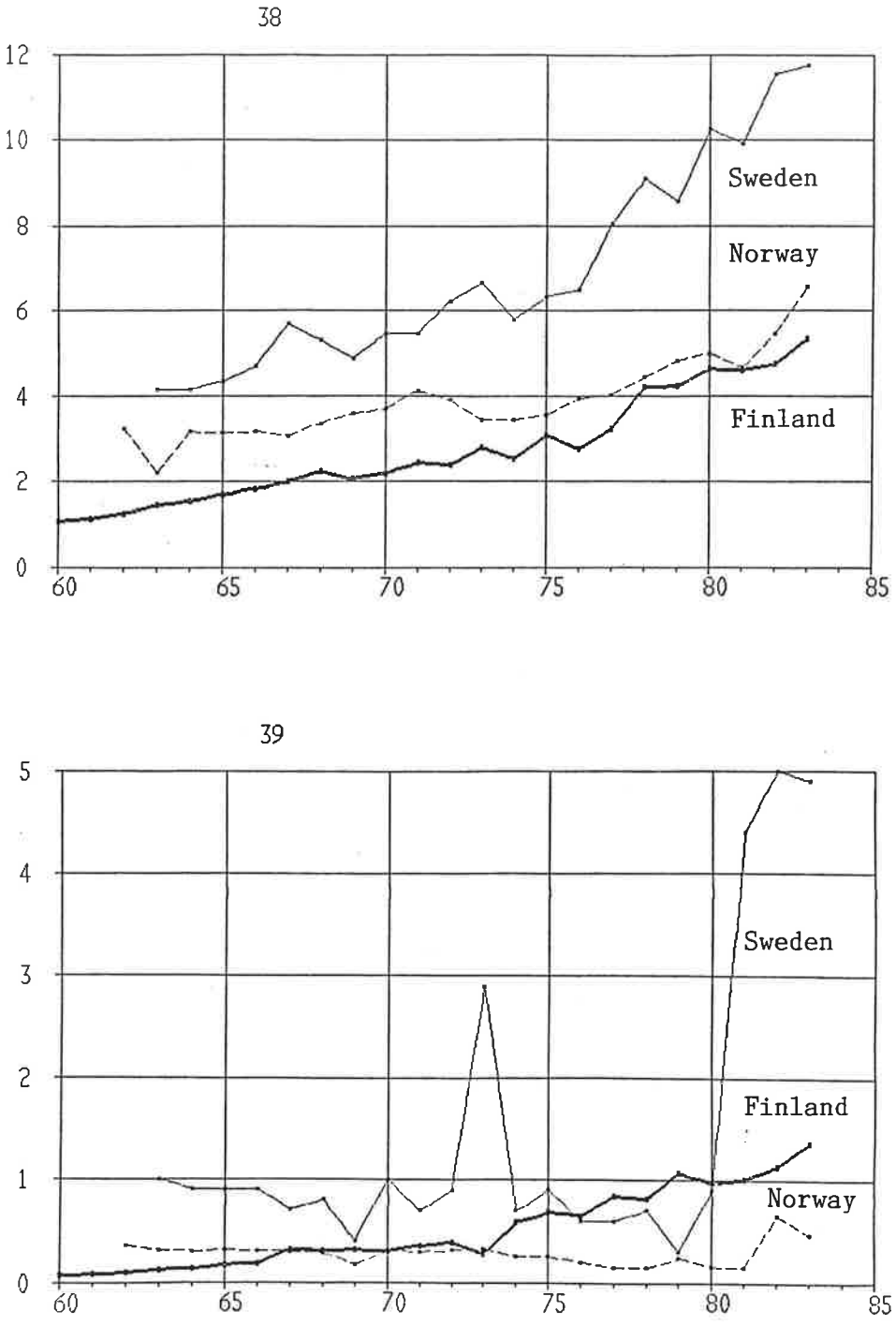


Figure 18. Research intensity in the metal products and engineering industries (ISIC 38) and in other manufacturing (ISIC 39), %



4. CONCLUSIONS

This paper presents data on total factor productivity and research intensity in ten manufacturing industries in Finland, Sweden and Norway in the period 1964 to 1983. There are clear differences in the behaviour of these variables between the three countries, although the pattern of these differences is not quite similar across the industries. Some fairly general conclusions can, however, be drawn on the basis of this comparison.

The country-specific pattern of total factor productivity is in most industries such that the average growth rate for the whole period is highest in Sweden, with a slowdown or stagnation in the latter part of the period, while in Finland the average growth rate is slightly slower, but faster than in the other two countries after the mid-70s. In contrast, Norway has experienced slow growth in the early part of the period, and stagnation or even deterioration in the latter part. As preliminary hypotheses it may be stated that these differences are partly due to different product structures within the industries and perhaps also different industrial policies. Specifically, the relatively weak performance of the Norwegian manufacturing industry is probably a consequence of the shift of resources to the oil sector, and perhaps also of inefficiencies related to industry subsidies. It may be mentioned also that Holmöy(1986) takes up measurement problems as one possible reason behind the weak performance.

As to research intensity (research expenditures divided by output), the average picture is such that this ratio is cosiderably higher in Sweden than in the other two countries, and slightly higher in Norway than in Finland.

There are, however, large differences between the various industries. In most industries there has been a rising trend in research intensity throughout the period, and the highest intensities are found in all three countries in the chemical industries and in the metal products and engineering industries.

As stated already in the Introduction, these data will be used for a causal analysis between research activity and total factor productivity in a subsequent paper. Earlier results /see Vuori (1986)/ have indicated the existence of positive returns to R&D in Finland and in Sweden, and it is hoped that furher evidence for this can be found with these slightly longer time series. As to Norway, however, it may be anticipated on the basis of a quick comparison of developments in R&D and productivity series that a positive relationship may not be found, as TFP has been declining in many industries since the mid-70s despite a rising trend in research intensity. Even if there is such a relationship, it may thus be that other factors (with a negative effect) are more dominant. These questions remain to be dealt with later on.

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APPENDIX 1. DESCRIPTION OF DATA[1)]

The data is mainly based on National Accounts and covers ten manufacturing industries in Finland, Sweden and Norway in 1964-83 (1961-83 for Finland and 1963-83 for Norway). The main part of the total factor productivity series for Finland (1961-80) and Sweden (1964-80) were taken from Wyatt's (1983) study. These series were updated for this study for the period 1981-83, and the whole data set for Norway was compiled. The aim was to define the data sets in such a way that as strict a correspondence as possible between the variables in these three countries would be reached, so as to ensure a relevant comparison. There are some differences, however. Thus e.g. the labour input data for Norway are expressed in 1000 man-years, whereas the data for the other two countries are in millions of hours. This is a result of our aim to stick to the same data sources (National Accounts) in order to ensure consistency between the data.

Another difference is in the industry classification used for certain industries. While all three countries being studied use the ISIC classification in their National Accounts and other statistics as well, the research expenditure series for Norway could not be obtained separately for printing and publishing (ISIC 342), but instead it is included in other manufacturing (ISIC 39), and likewise for professional and scientific instruments etc. (ISIC 385). The industry ISIC 385 is included in ISIC 39 in the National

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1) I thank Kaija Hyvönen-Rajecki and Antti Ripatti for assistance in the processing of data.

Accounts also. Thus the definition used here for Norwegian industries 38 and 39 differ from those in Finland and Sweden, and in addition, the industry content of industry 39 (other manufacturing) differs between the productivity etc. data based on National Accounts and the data related to research activities. While the research intensity of the printing and publishing industry is presumably low also in Norway, this difference should, however, be borne in mind when making inter-country comparisons.

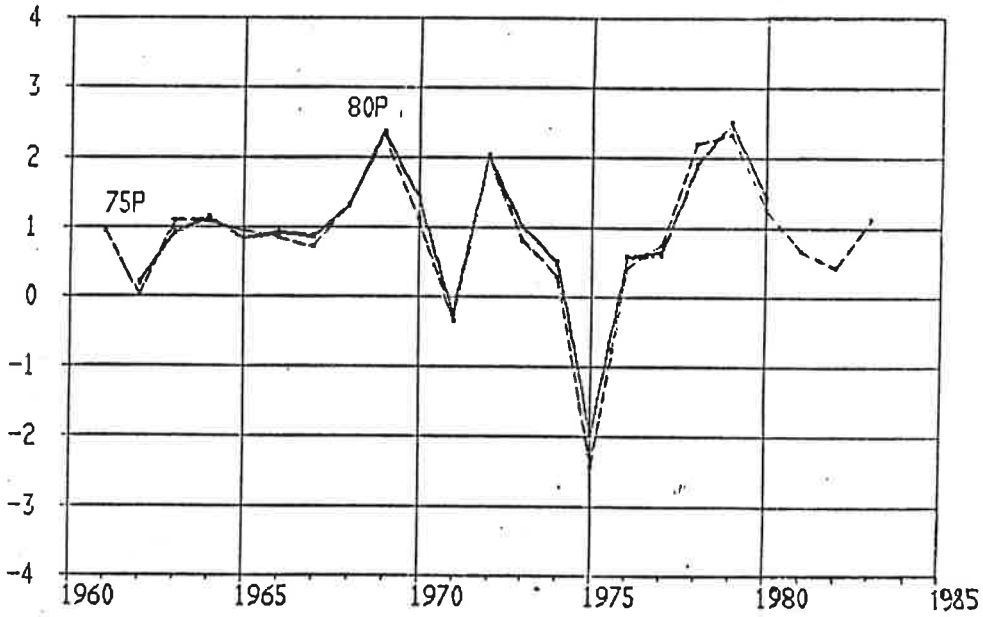
The question of which capital variable to use in TFP calculations has been the subject of wide debate. We have followed the method used by Wyatt (1983), i.e. using a weighted average of the gross capital stock and capital consumption, the weights being 0.0174 and 0.9826 respectively. The Norwegian gross capital stock series were obtained separately from the central statistical office in Norway.

Since the Finnish TFP data for 1961-80 were compiled in the early 1980s, they were based on National Accounts (NA) series with 1975 as the base year. The NA series have thereafter been revised twice with 1980 and 1985, respectively, as the base year. To get a rough idea of how much the revisions affect productivity developments, we calculated the TFP changes for total manufacturing with the 1980-based series. The comparison between the results with the two data sets is shown in Fig. A1. While for some years the absolute values of the TFP changes are clearly different, the development of the series are qualitatively very similar. We therefore decided not to revise the TFP calculations for 1961-80.

As R&D data we used the gross expenditures on R&D of the respective indus-

tries from OECD research statistics and national sources. There are several problems with this kind of data. The most serious one is the lack of long time series, and we therefore had to make some assumptions as to the long-term development of research expenditures. Another problem is the lack of a suitable price deflator for R&D expenditures. We have sticked to the usual practice of using the GDP deflators.

Figure A1. Changes in total factor productivity in Finnish manufacturing based on earlier (1975 prices) and newer (1980 prices) National Accounts series



For constructing the research capital series, we assumed the trend growth rate of constant-price research expenditures in the 1960s and 1970s to have prevailed in the earlier period also. We then have for research capital in each industry in the "base year" 1960 /See e.g. Hirschey (1982), p. 378-9/

$$R_{1960} = r_{1960} ((1+\Gamma)/(\Gamma+\delta)),$$

where r_{1960} is research expenditure (in constant prices) in 1960, Γ is the trend growth rate of research expenditures, and δ is the depreciation rate of research capital. As the depreciation rate we used mainly zero, which has most commonly been used in the relevant literature, but we also constructed the R&D capital series based on 10 and 20 per cent depreciation rates respectively.

Since comparable industry capacity utilization time series for the three countries were not available, we constructed such series by using a very simple method, the so called Panic procedure. It is based on the assumption of linear trend growth of the ratio of potential output to capital stock /See e.g. Christiano (1981), p. 152-4/. This procedure is a fairly crude one and does not work quite satisfactorily in all industries, but we believe that the resulting series reflect fluctuations in utilization to such an extent that they may be used as additional explanatory variables for causal analyses, where the main interest is in the effects of research input.

APPENDIX 2. THE DATA

This appendix contains data on total factor productivity, research expenditures, research intensities, capacity utilization and research capital stocks for total manufacturing and ten manufacturing industries in Finland, Sweden and Norway. The logarithmic differences of total factor productivity, the research intensities and the capacity utilization rates have been multiplied by 100. The research intensities equal research expenditures in current prices divided by gross output in current prices. The research expenditures and the research capital stocks series based on three different depreciation rates (d = 0, 0.1 and 0.2) have been compiled with fixed prices, and the figures for the Finnish industries are in mill. FIM and the corresponding figures for Sweden in mill. SEK and for Norway in mill. NOK respectively.

The industry classification (ISIC) codes used in the data tables refer to the following industries:

31	Food, beverages and tobacco
32	Textiles, wearing apparel and leather
33	Wood and wood products (341 in Sweden)
341	Paper and paper products (342 in Sweden)
342	Printing and publishing (343 in Sweden)
35	Chemical industries
36	Non-metallic mineral products
37	Basic metal industries
38	Metal products and engineering
39	Other manufacturing
3	Total manufacturing

TOTAL FACTOR PRODUCTIVITY (logarithmic changes), FINLAND

	31	32	33	341	342	35	36	37	38	39	3
Y:1960											
Y:1961	-.029	2.519	-.871	.756	.822	1.603	3.839	.493	3.013	4.153	.943
Y:1962	-.367	1.014	-1.029	-1.111	-1.632	.895	2.606	1.659	2.261	2.484	.028
Y:1963	.304	-.321	1.326	1.067	-1.377	6.841	.660	1.269	-.572	2.943	1.099
Y:1964	-.193	1.171	1.479	1.157	.075	3.020	4.359	.849	1.059	4.087	1.082
Y:1965	.505	.373	.776	.697	-1.393	.455	2.798	1.359	.904	3.724	.955
Y:1966	.425	3.623	1.327	.673	.174	1.097	1.492	-.748	.720	-.908	.846
Y:1967	.564	1.397	1.985	-.258	-1.894	.607	.294	1.608	2.778	8.537	.725
Y:1968	.336	.217	.889	1.227	1.660	2.455	3.366	.720	1.261	2.461	1.290
Y:1969	1.333	3.352	2.062	1.970	3.184	3.134	5.231	-1.409	2.079	11.583	2.291
Y:1970	.321	1.277	.771	.083	3.200	2.439	4.956	-1.066	3.567	4.532	1.146
Y:1971	.044	.063	.552	-1.482	-.322	-.618	.558	-1.254	.843	-.102	-.345
Y:1972	.673	2.047	1.592	2.287	2.629	1.809	1.253	.101	2.742	-.446	1.969
Y:1973	-.471	.223	2.875	1.081	-.310	-.600	3.201	-.029	1.260	-.660	.802
Y:1974	.184	1.882	-3.327	.186	3.127	-.851	-.600	-.965	3.026	1.165	.307
Y:1975	.028	1.929	-5.528	-6.917	.822	-3.605	-2.791	-1.257	1.784	-2.402	-2.422
Y:1976	-.649	1.559	.434	.888	-.623	2.066	-1.050	1.284	.032	.948	.423
Y:1977	-.354	.400	1.190	.755	-.793	1.371	2.325	2.447	-1.148	2.737	.759
Y:1978	1.435	.722	2.596	3.111	.435	1.099	1.300	.887	-.774	4.457	2.196
Y:1979	.783	2.536	3.055	3.481	1.697	1.934	4.795	-.260	2.380	2.498	2.323
Y:1980	.692	1.228	1.799	1.626	-.019	.870	1.512	-.808	2.243	2.190	1.282
Y:1981	.672	2.583	-1.821	.057	.840	-.943	-.383	-.611	2.859	3.689	.666
Y:1982	.240	.027	.377	-.969	.090	-1.051	2.768	1.378	2.232	.755	.441
Y:1983	.460	-.803	2.491	2.447	1.311	1.128	1.228	1.470	.130	-1.599	1.140

TOTAL FACTOR PRODUCTIVITY (logarithmic changes), SWEDEN

	31	32	341	342	343	35	36	37	38	39	3
Y:1960											
Y:1961											
Y:1962											
Y:1963											
Y:1964	-.434	3.161	3.397	4.377	2.483	3.208	5.683	5.040	2.621	8.112	2.711
Y:1965	.050	1.140	1.770	1.785	2.023	3.146	2.727	1.329	3.696	4.061	2.223
Y:1966	1.154	1.611	-1.645	-.298	.525	.911	.587	-1.296	2.293	3.898	.947
Y:1967	.139	4.056	2.151	2.896	-1.047	4.482	4.810	2.021	2.349	2.784	2.140
Y:1968	.330	3.015	4.414	1.899	-.801	2.745	1.853	4.940	3.326	5.444	2.564
Y:1969	.843	4.181	2.150	2.460	3.086	3.265	2.471	1.771	2.983	3.494	2.533
Y:1970	-.039	2.092	3.892	1.747	4.200	1.016	4.839	2.163	3.199	-22.898	2.132
Y:1971	.482	2.000	.620	-.385	.389	.945	1.464	-.334	2.460	-2.785	1.218
Y:1972	.499	2.072	2.738	1.514	1.218	2.554	2.555	1.743	.497	.299	1.296
Y:1973	-.625	3.408	1.422	2.917	4.188	2.764	2.462	2.482	2.691	3.321	2.315
Y:1974	.506	.983	-.998	1.025	-4.465	.061	.394	1.128	1.705	1.740	.790
Y:1975	-.249	-1.089	-4.621	-7.286	.308	-2.504	-1.504	-3.215	2.023	1.470	-.849
Y:1976	.297	2.405	.673	.196	3.715	.722	.196	-.847	-1.664	10.082	-.128
Y:1977	-.138	-1.716	-1.227	-1.281	2.704	-1.089	-2.567	.884	-1.856	-5.153	-1.018
Y:1978	-.387	-.062	1.284	3.050	-1.606	1.348	.535	4.450	.109	1.435	.929
Y:1979	.794	3.685	1.168	2.022	.518	2.075	1.926	1.137	2.922	5.899	2.122
Y:1980	-1.658	-3.698	-1.436	-.642	.053	-2.895	.547	1.834	1.617	-1.810	-.215
Y:1981	.389	.019	-1.837	.053	-1.829	-.149	-3.425	-.984	.263	2.012	-.216
Y:1982	.604	-.788	1.385	-.683	.947	.727	1.565	2.964	-.031	1.166	.532
Y:1983	.151	.589	1.868	3.063	1.141	2.043	.847	3.520	3.028	3.056	2.239

TOTAL FACTOR PRODUCTIVITY (logarithmic changes), NORWAY

	31	32	33	341	342	35	36	37	38	39	3
Y:1960											
Y:1961											
Y:1962											
Y:1963											
Y:1964	-.419	1.179	3.299	3.608	-2.089	3.134	4.604	3.051	1.845	1.582	1.503
Y:1965	.519	-.627	1.449	.401	-2.272	1.919	-1.119	1.921	.306	-1.735	.754
Y:1966	.499	1.096	-2.946	1.271	.167	1.650	-.823	-.391	.575	2.788	.886
Y:1967	.314	-1.139	2.434	1.829	1.495	.087	.934	-.042	.722	-3.790	.457
Y:1968	-.698	4.994	-.020	2.106	-1.611	3.272	1.358	1.021	-.091	-1.958	.246
Y:1969	.452	-3.421	2.154	2.882	-2.295	2.732	3.255	1.287	1.728	.470	1.702
Y:1970	-.320	1.898	-.222	-1.363	-4.129	2.372	.502	-.477	1.299	8.120	.414
Y:1971	-.735	-.250	-.784	.541	1.075	3.546	3.209	.120	-.033	6.586	.368
Y:1972	.265	-1.145	2.661	1.013	.138	.155	.769	2.680	.184	1.876	.926
Y:1973	.437	.929	1.432	3.396	-4.075	3.210	-.066	1.817	.275	-1.455	1.301
Y:1974	2.701	-2.024	-.881	-.063	-.074	-.531	.348	2.621	-.207	-9.066	.397
Y:1975	-1.753	.112	-2.989	-4.923	2.881	-1.972	-2.352	-1.383	-.841	-4.580	-1.100
Y:1976	.287	-.074	-1.052	1.314	-2.622	-.688	-.179	.137	-.359	1.752	-.226
Y:1977	.366	.576	-.046	.951	-2.831	-1.247	-3.555	-2.211	-1.204	-.057	-.853
Y:1978	-.166	-1.709	-1.359	1.708	-2.419	-.897	-1.645	2.265	-.363	.954	-.349
Y:1979	.090	.392	-.088	2.718	-1.406	2.204	-.114	2.303	-1.505	-3.197	.709
Y:1980	-.207	2.893	-.648	.852	-2.388	-.147	1.204	-5.274	2.298	-14.956	-.501
Y:1981	-1.555	-.691	-1.624	1.712	-.280	1.738	-1.624	2.728	-.101	2.874	-.268
Y:1982	-.193	-1.312	-1.288	.333	-1.184	2.422	-.803	.965	.462	2.997	.392
Y:1983	-.147	2.556	.752	2.539	1.784	.776	.785	3.612	-.192	4.423	.874

RESEARCH EXPENDITURES (fixed prices), FINLAND

	31	32	33	341	342	35	36	37	38	39	3
Y:1960	7.401	2.317	.866	62.169	.876	25.939	.838	17.644	34.932	.117	116.661
Y:1961	7.963	2.459	.987	62.196	.872	28.108	.985	18.392	39.432	.136	127.451
Y:1962	8.567	2.609	1.126	62.223	.867	30.457	1.158	19.170	44.512	.159	139.238
Y:1963	9.217	2.768	1.283	62.249	.863	33.003	1.362	19.982	50.247	.186	152.116
Y:1964	9.916	2.937	1.463	62.276	.858	35.761	1.601	20.828	56.720	.218	166.185
Y:1965	10.668	3.117	1.668	62.303	.854	38.751	1.883	21.710	64.028	.254	181.556
Y:1966	11.477	3.307	1.901	62.329	.850	41.990	2.213	22.629	72.277	.297	198.348
Y:1967	12.638	1.580	1.128	62.356	.845	44.234	.903	19.860	78.763	.451	192.056
Y:1968	13.284	3.723	2.471	62.383	.841	49.303	3.060	24.586	92.100	.406	236.734
Y:1969	13.183	8.300	3.857	52.336	.888	41.144	6.974	26.565	96.643	.475	249.890
Y:1970	15.376	4.191	3.211	62.437	.832	57.889	4.230	26.713	117.360	.555	282.550
Y:1971	16.394	5.360	5.952	73.442	1.062	83.066	6.805	37.626	136.251	.592	362.391
Y:1972	17.797	4.719	4.173	62.490	.824	67.972	5.848	29.023	149.548	.757	337.232
Y:1973	23.658	7.310	5.932	66.236	.675	80.784	12.890	29.955	183.568	.534	409.951
Y:1974	20.600	5.313	5.424	62.544	.816	79.810	8.084	31.533	190.563	1.034	402.498
Y:1975	20.380	3.920	6.200	68.230	.460	91.540	10.050	28.070	253.320	1.300	444.332
Y:1976	23.844	5.981	7.049	62.597	.807	93.709	11.175	34.260	242.828	1.413	480.394
Y:1977	21.718	5.857	6.148	55.877	1.234	97.652	10.674	35.466	244.591	1.944	481.162
Y:1978	27.598	6.734	9.161	62.651	.799	110.030	15.448	37.222	309.428	1.929	573.366
Y:1979	32.990	6.687	9.418	61.668	.815	107.704	12.260	39.168	331.227	2.487	604.423
Y:1980	31.944	7.581	11.906	62.705	.791	129.193	21.356	40.441	394.293	2.635	684.331
Y:1981	36.139	8.751	10.796	67.959	1.989	147.908	13.524	46.537	411.450	2.557	747.497
Y:1982	44.232	8.596	9.534	68.979	1.407	160.516	20.787	45.065	463.679	3.126	842.437
Y:1983	50.889	8.386	8.386	69.529	.910	170.493	26.786	43.606	505.969	3.546	919.311

RESEARCH EXPENDITURES (fixed prices), SWEDEN

	31	32	341	342	343	35	36	37	38	39	3
Y:1960	32.912	22.385	8.531	35.917	.569	124.368	25.342	182.168	666.761	9.723	1257.803
Y:1961	35.450	22.387	8.731	39.464	.663	133.515	26.623	184.467	719.204	9.361	1333.664
Y:1962	38.184	22.388	8.934	43.363	.774	143.335	27.970	186.796	775.771	9.012	1414.100
Y:1963	41.129	22.390	9.143	47.646	.903	153.877	29.384	189.154	836.788	8.676	1499.388
Y:1964	37.195	24.797	8.943	52.352	1.054	178.862	21.748	115.854	874.593	8.353	1677.642
Y:1965	47.717	22.393	9.574	57.524	1.230	177.344	32.432	193.960	973.596	8.042	1685.705
Y:1966	51.397	22.394	9.798	63.206	1.435	190.387	34.072	196.408	1050.172	7.742	1787.374
Y:1967	59.005	15.952	9.605	69.449	1.675	206.518	46.827	255.060	1268.268	6.346	1949.057
Y:1968	59.630	22.397	10.260	76.310	1.955	219.421	37.606	201.398	1221.867	7.176	2009.477
Y:1969	46.278	26.375	14.563	84.142	2.265	229.773	47.087	251.294	1171.683	5.016	1878.479
Y:1970	69.182	22.400	10.745	92.130	2.662	252.884	41.506	206.515	1421.632	6.651	2259.179
Y:1971	105.714	30.286	7.714	98.857	2.714	257.857	57.286	335.429	1474.286	4.714	2374.857
Y:1972	80.264	22.403	11.252	111.230	3.624	291.449	45.811	211.761	1654.057	6.165	2539.909
Y:1973	113.200	17.186	12.080	123.661	5.106	289.913	31.009	216.812	1843.836	18.306	2671.108
Y:1974	93.121	22.406	11.783	134.289	4.935	335.896	50.562	217.141	1924.483	5.714	2855.523
Y:1975	122.900	22.400	13.300	152.900	5.900	319.500	59.800	179.600	2278.500	7.100	3161.900
Y:1976	108.038	22.409	12.340	162.130	6.720	387.121	55.805	222.658	2239.120	5.296	3210.357
Y:1977	111.093	23.401	13.117	173.036	7.530	479.352	66.640	169.717	2461.943	4.615	3510.445
Y:1978	125.344	22.412	12.922	195.742	9.150	446.159	61.593	228.315	2605.198	4.908	3609.283
Y:1979	96.365	22.291	12.346	215.501	10.357	499.040	54.390	242.593	2620.988	2.881	3776.955
Y:1980	145.422	22.415	13.532	236.322	12.460	514.199	67.981	234.116	3031.127	4.549	4057.780
Y:1981	106.751	23.642	17.270	211.657	10.060	500.387	45.774	251.034	2917.719	20.232	4104.200
Y:1982	123.275	21.206	14.155	229.976	12.147	640.155	43.236	274.112	3284.560	23.214	4666.282
Y:1983	135.373	18.802	11.328	241.980	13.725	748.313	40.424	289.610	3546.780	25.382	5070.857

RESEARCH EXPENDITURES (fixed prices), NORWAY

	31	32	33	341	342	35	36	37	38	39	3
Y:1960	17.035	8.505	4.789	27.743		51.117	3.940	32.307	141.810	4.499	263.738
Y:1961	17.118	8.304	5.023	27.010		53.426	4.140	34.006	149.431	4.616	278.955
Y:1962	17.203	8.107	5.269	26.296		55.840	4.351	35.795	157.676	4.736	295.049
Y:1963	9.850	5.139	3.640	25.268		52.891	6.210	32.120	115.715	4.859	253.319
Y:1964	17.373	7.727	5.798	24.925		61.000	4.804	39.659	176.279	4.986	330.076
Y:1965	17.458	7.544	6.082	24.266		63.756	5.048	41.745	186.771	5.115	349.120
Y:1966	17.544	7.365	6.380	23.625		66.637	5.304	43.941	198.159	5.249	369.262
Y:1967	14.208	10.018	7.104	29.144		69.399	7.104	81.785	209.617	5.385	402.550
Y:1968	17.718	7.020	7.021	22.392		72.794	5.857	48.685	223.976	5.525	413.101
Y:1969	22.278	8.878	5.695	16.080		73.199	5.863	49.079	262.144	3.685	446.901
Y:1970	22.107	7.864	6.973	18.398		72.849	6.083	51.484	274.184	6.973	466.914
Y:1971	23.922	8.345	10.570	19.471		78.720	5.007	46.453	324.618	7.510	524.618
Y:1972	30.199	6.887	8.609	16.821		86.490	5.695	47.682	337.351	8.609	548.344
Y:1973	27.184	6.189	13.714	17.961		91.141	5.340	48.665	316.262	8.252	534.709
Y:1974	17.052	4.070	11.111	21.562		98.240	4.180	59.626	334.763	6.381	556.986
Y:1975	14.700	4.500	12.100	23.700		113.000	9.800	65.300	395.600	7.100	645.800
Y:1976	15.256	4.651	12.372	19.349		113.302	9.581	86.326	453.860	6.047	720.744
Y:1977	17.955	5.326	13.230	24.485		155.928	10.309	90.636	456.873	5.155	779.897
Y:1978	19.855	6.295	12.510	20.178		126.150	13.156	88.297	501.695	5.327	793.462
Y:1979	18.547	6.359	9.992	16.427		128.312	14.156	109.084	514.534	7.570	824.981
Y:1980	17.239	5.218	11.955	18.494		119.022	17.834	108.719	495.905	4.624	799.009
Y:1981	16.222	5.736	10.429	12.862		110.313	10.487	113.847	472.074	4.751	757.242
Y:1982	16.614	5.573	10.568	13.722		108.097	8.202	81.020	535.489	18.980	790.431
Y:1983	18.402	4.095	12.284	12.580		127.430	11.495	79.477	577.060	15.590	858.411

RESEARCH INTENSITY, FINLAND

	31	32	33	341	342	35	36	37	38	39	3
Y:1960	.068	.064	.022	.936	.063	1.158	.087	.809	.512	.036	.299
Y:1961	.073	.065	.025	.828	.059	1.203	.096	.834	.531	.039	.311
Y:1962	.077	.068	.031	.849	.055	1.254	.103	.862	.566	.049	.336
Y:1963	.079	.075	.034	.803	.053	1.200	.119	.924	.699	.062	.362
Y:1964	.083	.082	.036	.741	.051	1.177	.123	.902	.764	.070	.377
Y:1965	.082	.093	.038	.711	.046	1.208	.138	.829	.812	.086	.389
Y:1966	.087	.090	.048	.718	.043	1.189	.154	.768	.879	.096	.414
Y:1967	.096	.043	.030	.761	.044	1.174	.064	.738	.957	.152	.408
Y:1968	.099	.105	.067	.755	.043	1.145	.220	.785	1.047	.147	.485
Y:1969	.093	.177	.084	.524	.043	.835	.442	.687	.940	.155	.443
Y:1970	.105	.082	.061	.553	.036	.995	.232	.561	.964	.158	.445
Y:1971	.111	.105	.112	.650	.044	1.288	.366	1.077	1.105	.170	.571
Y:1972	.115	.084	.077	.527	.031	.962	.282	.685	1.074	.191	.491
Y:1973	.156	.130	.087	.534	.023	1.076	.572	.554	1.262	.129	.561
Y:1974	.141	.091	.072	.399	.027	.676	.304	.539	1.142	.259	.478
Y:1975	.136	.070	.123	.501	.014	.908	.396	.571	1.422	.340	.567
Y:1976	.154	.110	.124	.494	.023	.928	.457	.758	1.341	.349	.613
Y:1977	.138	.117	.103	.467	.034	.949	.439	.744	1.491	.450	.627
Y:1978	.174	.138	.146	.493	.021	1.019	.667	.688	1.961	.418	.732
Y:1979	.201	.122	.124	.417	.019	.821	.463	.586	1.879	.505	.678
Y:1980	.194	.129	.134	.381	.017	.796	.747	.572	1.993	.483	.683
Y:1981	.205	.149	.143	.399	.040	.911	.458	.771	1.960	.496	.749
Y:1982	.247	.157	.142	.457	.028	1.093	.653	.717	2.116	.592	.870
Y:1983	.284	.167	.115	.455	.017	1.118	.812	.681	2.388	.687	.944

RESEARCH INTENSITY, SWEDEN

	31	32	341	342	343	35	36	37	38	39	3
Y:1960											
Y:1961											
Y:1962											
Y:1963	.147	.196	.092	.408	.015	1.682	.636	1.854	1.925	.735	1.109
Y:1964	.128	.210	.080	.404	.016	1.814	.421	.969	1.894	.662	1.153
Y:1965	.165	.200	.080	.435	.018	1.685	.603	1.470	1.974	.643	1.111
Y:1966	.177	.222	.087	.520	.020	1.813	.642	1.523	2.107	.647	1.199
Y:1967	.207	.161	.086	.571	.023	1.831	.849	2.143	2.599	.537	1.323
Y:1968	.207	.232	.088	.625	.026	1.725	.682	1.582	2.431	.670	1.323
Y:1969	.158	.270	.116	.637	.028	1.699	.835	1.730	2.164	.514	1.164
Y:1970	.232	.237	.080	.618	.032	1.758	.714	1.245	2.361	.642	1.298
Y:1971	.372	.355	.061	.702	.031	1.792	1.036	2.339	2.416	.493	1.408
Y:1972	.277	.268	.085	.814	.044	2.038	.854	1.583	2.704	.655	1.515
Y:1973	.396	.199	.076	.773	.058	1.857	.573	1.392	2.808	1.822	1.475
Y:1974	.318	.246	.061	.593	.049	1.506	.884	1.106	2.468	.518	1.315
Y:1975	.451	.282	.084	.769	.058	1.579	1.089	1.082	2.856	.693	1.549
Y:1976	.388	.287	.075	.890	.059	1.754	1.002	1.527	2.870	.481	1.582
Y:1977	.405	.335	.081	1.096	.064	2.268	1.269	1.347	3.448	.471	1.853
Y:1978	.463	.358	.082	1.239	.082	2.104	1.217	1.719	3.790	.505	1.949
Y:1979	.353	.330	.073	1.185	.095	1.970	1.016	1.475	3.541	.290	1.869
Y:1980	.545	.371	.082	1.252	.116	1.774	1.231	1.457	4.244	.291	2.005
Y:1981	.398	.466	.122	1.130	.097	1.785	.950	1.770	4.188	1.360	2.123
Y:1982	.433	.443	.103	1.272	.115	2.213	.877	1.850	4.626	1.530	2.370
Y:1983	.477	.383	.077	1.226	.126	2.327	.848	1.779	4.747	1.530	2.435

RESEARCH INTENSITY, NORWAY

	31	32	33	341	342	35	36	37	38	39	3
Y:1960											
Y:1961											
Y:1962	.111	.169	.144	.479		.976	.287	.626	1.374	.143	.596
Y:1963	.063	.102	.096	.442		.904	.398	.585	.965	.149	.434
Y:1964	.107	.154	.137	.412		.961	.276	.629	1.355	.142	.591
Y:1965	.102	.157	.136	.396		.989	.291	.602	1.311	.143	.584
Y:1966	.097	.148	.142	.399		.991	.290	.604	1.290	.144	.582
Y:1967	.078	.206	.148	.492		1.003	.363	1.111	1.255	.140	.571
Y:1968	.101	.157	.143	.368		.949	.290	.594	1.373	.135	.600
Y:1969	.124	.195	.103	.253		.932	.264	.546	1.446	.085	.589
Y:1970	.108	.164	.110	.260		.834	.247	.530	1.320	.149	.549
Y:1971	.111	.180	.157	.292		.875	.183	.492	1.508	.154	.602
Y:1972	.137	.150	.115	.263		.977	.191	.529	1.491	.164	.614
Y:1973	.123	.142	.169	.271		.917	.187	.514	1.271	.155	.571
Y:1974	.074	.094	.125	.247		.761	.125	.510	1.145	.116	.517
Y:1975	.065	.113	.134	.307		.832	.290	.601	1.139	.120	.577
Y:1976	.063	.114	.132	.270		.766	.270	.846	1.332	.094	.633
Y:1977	.072	.129	.136	.385		1.045	.278	.959	1.241	.072	.665
Y:1978	.079	.165	.131	.336		.850	.353	1.014	1.517	.072	.706
Y:1979	.074	.165	.108	.259		.600	.381	1.003	1.581	.103	.684
Y:1980	.068	.141	.131	.288		.613	.491	.982	1.556	.066	.680
Y:1981	.063	.177	.119	.197		.596	.294	1.194	1.513	.066	.663
Y:1982	.065	.200	.128	.239		.629	.210	1.029	1.776	.262	.726
Y:1983	.071	.179	.155	.225		.733	.325	.878	2.017	.212	.798

CAPACITY UTILIZATION, FINLAND

	31	32	33	341	342	35	36	37	38	39	3
Y:1960	89.898	94.201	86.062	92.139	96.267	64.127	73.288	76.244	76.023	64.829	92.215
Y:1961	91.220	97.839	83.375	94.291	100.000	68.082	80.302	79.731	82.735	65.857	94.763
Y:1962	89.277	96.902	77.768	84.018	95.570	68.919	83.922	85.042	85.972	66.064	91.291
Y:1963	89.108	90.095	78.849	82.955	91.217	79.207	81.644	89.341	80.848	65.862	88.328
Y:1964	87.468	90.203	80.990	86.440	92.589	83.795	86.816	91.570	82.149	70.362	89.646
Y:1965	88.925	84.117	82.223	86.326	88.917	86.856	87.874	98.958	83.875	73.667	89.708
Y:1966	90.003	88.889	81.260	86.222	86.981	83.300	87.677	89.282	82.581	68.713	88.788
Y:1967	91.836	89.338	81.630	81.300	80.960	81.156	82.560	72.859	80.593	75.765	86.000
Y:1968	91.627	85.630	83.401	85.752	80.047	84.827	81.639	71.521	80.243	73.633	86.931
Y:1969	98.012	97.052	90.489	92.830	83.018	92.832	91.192	83.588	84.603	90.637	94.198
Y:1970	99.231	100.000	92.097	94.014	88.830	100.001	99.137	87.380	94.631	100.000	99.566
Y:1971	97.235	95.157	87.458	89.579	89.010	94.835	94.586	68.697	88.962	95.050	94.447
Y:1972	100.001	98.448	91.260	94.154	93.747	96.877	94.887	80.454	95.536	95.695	98.905
Y:1973	97.371	96.543	100.002	97.751	93.499	90.800	100.001	86.072	90.653	90.346	99.540
Y:1974	93.999	97.137	89.714	100.003	96.572	84.817	96.709	86.395	100.001	80.935	100.003
Y:1975	91.466	94.604	64.360	75.508	95.095	70.621	82.320	75.024	96.472	67.857	90.205
Y:1976	86.880	93.089	64.788	76.301	94.854	69.797	74.339	64.794	88.553	66.790	86.479
Y:1977	83.297	87.048	65.183	73.057	89.104	68.202	74.389	70.756	78.646	70.090	82.101
Y:1978	85.401	85.988	70.546	79.876	87.486	72.919	72.735	84.840	72.525	70.608	83.182
Y:1979	88.209	92.492	82.398	92.411	88.627	78.464	81.425	94.440	77.525	73.230	91.076
Y:1980	90.984	94.614	87.661	98.608	86.891	83.082	84.604	100.002	84.324	74.938	96.775
Y:1981	92.869	95.188	78.135	97.739	87.795	77.644	82.714	94.928	87.320	74.838	96.169
Y:1982	91.089	89.959	73.218	89.424	86.345	72.067	85.646	98.386	88.069	74.150	93.830
Y:1983	90.674	83.154	77.844	96.415	83.406	74.021	86.906	104.248	83.338	69.371	94.302

CAPACITY UTILIZATION,SWEDEN

	31	32	341	342	343	35	36	37	38	39	3
Y:1960											
Y:1961											
Y:1962											
Y:1963	94.588	87.744	83.629	74.606	100.001	72.930	80.866	76.668	80.700	69.584	84.622
Y:1964	93.729	92.785	90.667	83.662	98.533	77.059	90.655	86.385	82.743	76.902	88.473
Y:1965	93.214	90.070	93.069	86.956	99.034	83.044	95.627	88.910	88.382	78.416	91.899
Y:1966	96.655	86.998	85.977	84.398	95.976	83.487	93.848	82.353	90.709	77.742	91.544
Y:1967	97.378	92.389	86.587	87.370	92.144	87.911	97.286	81.001	87.253	76.043	91.098
Y:1968	98.222	93.716	92.288	87.888	89.395	91.459	95.736	87.993	87.851	76.881	92.535
Y:1969	100.000	100.000	94.727	91.509	91.875	98.572	98.296	92.507	93.274	71.286	96.906
Y:1970	97.702	92.700	95.243	94.012	94.821	92.926	99.368	96.106	95.335	87.541	97.575
Y:1971	95.458	89.363	90.690	89.344	92.910	92.009	96.504	91.878	96.738	81.477	96.086
Y:1972	94.926	90.840	95.057	89.896	88.691	93.510	95.897	89.980	91.507	86.336	94.358
Y:1973	89.614	96.631	100.001	96.609	98.271	100.001	100.003	96.102	94.583	95.736	98.266
Y:1974	93.741	98.632	96.879	100.003	88.889	95.843	98.775	100.002	98.393	98.315	100.001
Y:1975	93.338	93.349	80.337	80.406	87.673	84.390	93.792	87.333	100.000	93.750	95.139
Y:1976	95.102	94.335	79.515	80.526	95.703	84.586	91.794	79.976	91.524	100.001	91.828
Y:1977	93.457	87.035	75.020	72.691	99.262	78.489	84.660	71.055	81.166	88.417	84.234
Y:1978	92.039	79.938	79.428	76.729	93.405	78.721	82.950	74.419	75.699	85.558	81.943
Y:1979	94.859	84.699	81.689	82.133	99.551	80.253	86.941	86.611	81.210	88.136	87.029
Y:1980	95.306	85.947	83.995	80.344	97.334	75.780	86.959	81.915	81.880	52.956	86.183
Y:1981	95.537	80.414	77.020	78.149	89.323	71.871	76.998	73.380	80.032	51.175	82.619
Y:1982	98.665	77.034	82.210	73.627	87.989	72.504	80.435	77.466	77.093	53.463	81.951
Y:1983	102.170	79.903	90.096	80.720	89.347	78.533	82.947	84.984	80.880	62.536	86.798

CAPACITY UTILIZATION, NORWAY

	31	32	33	341	342	35	36	37	38	39	3
Y:1960											
Y:1961											
Y:1962											
Y:1963	95.175	93.647	82.565	70.415		66.878	82.884	69.771	78.177	72.525	83.202
Y:1964	91.920	95.735	89.222	80.291		69.123	90.250	82.742	81.863	72.118	85.868
Y:1965	95.757	95.553	92.067	83.085		73.515	86.374	85.795	85.712	71.935	88.022
Y:1966	100.000	99.205	90.354	82.760		77.315	82.541	87.802	88.240	75.431	90.456
Y:1967	96.814	95.465	89.450	85.052		75.363	81.302	85.694	90.057	71.989	89.484
Y:1968	93.300	86.715	89.237	92.331		76.088	83.153	82.018	87.690	70.823	87.207
Y:1969	95.884	96.169	95.136	98.008		78.590	87.832	82.913	91.735	71.817	90.508
Y:1970	93.435	99.307	95.686	95.635		83.386	89.228	81.943	97.264	78.839	92.189
Y:1971	88.676	97.618	93.790	91.793		92.744	94.657	79.418	96.134	87.001	92.546
Y:1972	91.644	92.806	97.929	90.916		90.696	97.113	83.536	94.001	100.000	93.578
Y:1973	93.425	93.199	100.000	98.889		100.000	96.693	89.251	95.754	91.943	96.990
Y:1974	97.963	90.935	98.810	100.000		96.233	100.000	100.000	100.000	73.035	100.000
Y:1975	90.679	88.809	87.823	79.956		87.461	93.280	93.249	97.547	62.813	94.381
Y:1976	94.890	91.715	85.091	79.900		83.588	91.758	91.615	92.443	63.832	92.041
Y:1977	98.430	96.599	86.285	79.088		77.619	87.883	79.670	87.477	66.250	88.637
Y:1978	98.420	90.650	82.825	79.616		69.404	83.417	77.710	82.872	66.293	84.747
Y:1979	99.401	91.799	81.462	86.104		72.912	81.789	86.990	75.372	61.270	85.200
Y:1980	98.777	100.000	80.639	86.569		71.274	82.626	72.853	80.617	40.898	83.459
Y:1981	87.854	95.986	78.404	83.273		74.093	79.062	78.305	79.962	42.781	81.468
Y:1982	86.576	87.584	75.071	74.908		77.701	75.902	69.313	79.118	43.812	79.524
Y:1983	84.179	83.738	77.409	78.928		77.377	73.196	75.096	72.752	48.078	78.301

RESEARCH CAPITAL STOCK (depreciation rate=0), FINLAND

	31	32	33	341	342	35	36	37	38	39	3
Y:1960	104.971	40.274	7.051	1251.400	16.885	336.268	5.605	434.337	306.069	.809	1494.668
Y:1961	112.933	42.733	8.039	1313.596	17.757	364.375	6.590	452.729	345.501	.945	1622.118
Y:1962	121.500	45.342	9.164	1375.818	18.624	394.832	7.748	471.899	390.014	1.105	1761.357
Y:1963	130.716	48.110	10.447	1438.068	19.487	427.835	9.110	491.881	440.261	1.291	1913.473
Y:1964	140.632	51.048	11.910	1500.344	20.345	463.597	10.712	512.709	496.981	1.509	2079.658
Y:1965	151.300	54.164	13.578	1562.646	21.199	502.347	12.594	534.419	561.009	1.763	2261.214
Y:1966	162.777	57.471	15.479	1624.976	22.049	544.337	14.808	557.049	633.286	2.060	2459.561
Y:1967	175.415	59.051	16.607	1687.332	22.894	588.571	15.710	576.909	712.049	2.512	2651.617
Y:1968	188.699	62.774	19.078	1749.715	23.735	637.874	18.770	601.495	804.149	2.918	2888.352
Y:1969	201.882	71.074	22.935	1802.051	24.623	679.017	25.745	628.060	900.792	3.392	3138.241
Y:1970	217.258	75.265	26.146	1864.487	25.455	736.907	29.975	654.773	1018.152	3.947	3421.791
Y:1971	233.652	80.625	32.098	1937.930	26.517	819.973	36.779	692.399	1154.403	4.539	3783.182
Y:1972	251.450	85.344	36.272	2000.420	27.341	887.945	42.627	721.422	1303.951	5.296	4003.754
Y:1973	275.107	92.654	42.204	2066.655	28.016	968.729	55.517	751.377	1487.518	5.830	4413.705
Y:1974	295.707	97.966	47.627	2129.199	28.831	1048.539	63.601	782.909	1678.082	6.864	4816.203
Y:1975	316.087	101.886	53.827	2197.429	29.291	1140.079	73.651	810.979	1931.402	8.164	5260.535
Y:1976	339.930	107.867	60.876	2260.027	30.099	1233.788	84.826	845.239	2174.230	9.577	5740.929
Y:1977	361.649	113.724	67.024	2315.904	31.333	1331.440	95.499	880.705	2418.820	11.521	6222.091
Y:1978	389.247	120.458	76.184	2378.555	32.132	1441.470	110.948	917.927	2728.248	13.451	6795.456
Y:1979	422.237	127.145	85.602	2440.223	32.947	1549.174	123.207	957.095	3059.475	15.937	7399.880
Y:1980	454.181	134.726	97.508	2502.928	33.738	1678.367	144.563	997.537	3453.768	18.572	8084.210
Y:1981	490.320	143.477	108.304	2570.887	35.727	1826.275	158.087	1044.074	3865.218	21.129	8831.707
Y:1982	534.551	152.073	117.838	2639.866	37.133	1986.792	178.874	1089.140	4328.897	24.255	9674.144
Y:1983	585.441	160.459	126.224	2709.395	38.044	2157.285	205.661	1132.745	4834.866	27.801	10593.456

RESEARCH CAPITAL STOCK (depreciation rate=0), SWEDEN

	31	32	341	342	343	35	36	37	38	39	3
Y:1960	459.680	451.300	218.300	1112.358	79.700	1815.380	526.400	4210.700	9144.010	2000.000	23370.543
Y:1961	495.130	473.687	227.031	1151.822	80.363	1948.895	553.023	4395.167	9863.214	2009.361	24704.207
Y:1962	533.314	496.075	235.965	1195.185	81.138	2092.230	580.993	4581.963	10638.985	2018.373	26118.307
Y:1963	574.443	518.465	245.108	1242.831	82.041	2246.107	610.378	4771.117	11475.773	2027.050	27617.695
Y:1964	611.638	543.262	254.051	1295.184	83.095	2424.969	632.126	4886.971	12350.367	2035.403	29295.337
Y:1965	659.355	565.655	263.625	1352.707	84.325	2602.313	664.557	5080.930	13323.963	2043.445	30981.043
Y:1966	710.752	588.049	273.423	1415.913	85.761	2792.699	698.630	5277.338	14374.135	2051.187	32768.416
Y:1967	769.757	604.001	283.028	1485.363	87.436	2999.217	745.456	5532.398	15642.402	2057.534	34717.473
Y:1968	829.387	626.398	293.289	1561.672	89.390	3218.639	783.062	5733.796	16864.269	2064.709	36726.950
Y:1969	875.665	652.773	307.852	1645.815	91.656	3448.412	830.150	5985.091	18035.952	2069.726	38605.429
Y:1970	944.847	675.173	318.597	1737.945	94.317	3701.296	871.656	6191.605	19457.584	2076.377	40864.607
Y:1971	1050.561	705.459	326.311	1836.802	97.032	3959.153	928.941	6527.034	20931.870	2081.091	43239.464
Y:1972	1130.825	727.862	337.563	1948.031	100.656	4250.602	974.752	6738.795	22585.927	2087.256	44521.570
Y:1973	1244.025	745.047	349.643	2071.693	105.762	4540.515	1005.761	6955.607	24429.763	2105.562	47192.678
Y:1974	1337.146	767.453	361.426	2205.982	110.697	4876.411	1056.322	7172.749	26354.246	2111.276	50048.202
Y:1975	1460.046	789.853	374.726	2358.882	116.597	5195.911	1116.122	7352.349	28632.746	2118.376	53210.102
Y:1976	1568.084	812.262	387.065	2521.012	123.317	5583.033	1171.928	7575.007	30871.865	2123.671	56420.459
Y:1977	1679.177	835.663	400.183	2694.048	130.847	6062.385	1238.567	7744.724	33333.809	2128.287	59930.904
Y:1978	1804.521	858.075	413.105	2889.790	139.998	6508.544	1300.160	7973.039	35939.007	2133.195	63540.186
Y:1979	1900.886	880.365	425.451	3105.291	150.354	7007.583	1354.550	8215.631	38559.994	2136.076	67317.141
Y:1980	2046.308	902.780	438.983	3341.613	162.814	7521.783	1422.531	8449.747	41591.121	2140.625	71374.921
Y:1981	2153.059	926.422	456.253	3553.270	172.875	8022.169	1468.305	8700.780	44508.800	2160.858	75479.121
Y:1982	2276.334	947.628	470.408	3783.246	185.022	8662.325	1511.541	8974.890	47793.400	2184.072	80145.403
Y:1983	2411.707	966.430	481.736	4025.226	198.747	9410.638	1551.965	9264.510	51340.200	2209.454	85216.260

RESEARCH CAPITAL STOCK (depreciation rate=0), NORWAY

	31	32	33	341	342	35	36	37	38	39	3
Y:1960	389.608	137.233	171.429	441.524		1235.328	54.189	548.781	2337.161	116.381	4891.924
Y:1961	406.727	145.537	176.452	468.534		1288.754	58.329	582.787	2486.592	120.997	5170.878
Y:1962	423.929	153.644	181.721	494.830		1344.595	62.680	618.581	2644.268	125.733	5465.927
Y:1963	433.780	158.783	185.361	520.098		1397.486	68.890	650.701	2759.983	130.592	5719.246
Y:1964	451.152	166.510	191.160	545.023		1458.486	73.694	690.361	2936.262	135.578	6049.322
Y:1965	468.611	174.054	197.242	569.289		1522.242	78.741	732.106	3123.033	140.693	6398.443
Y:1966	486.155	181.420	203.622	592.914		1588.879	84.046	776.046	3321.191	145.942	6767.705
Y:1967	500.363	191.438	210.726	622.058		1658.277	91.149	857.831	3530.808	151.327	7170.255
Y:1968	518.080	198.458	217.747	644.450		1731.072	97.006	906.516	3754.784	156.852	7583.356
Y:1969	540.359	207.336	223.442	660.530		1804.271	102.869	955.595	4016.928	160.537	8030.257
Y:1970	562.465	215.199	230.415	678.928		1877.120	108.952	1007.079	4291.112	167.510	8497.171
Y:1971	586.387	223.544	240.986	698.400		1955.840	113.959	1053.532	4615.729	175.021	9021.788
Y:1972	616.586	230.432	249.595	715.221		2042.330	119.654	1101.214	4953.080	183.630	9570.133
Y:1973	643.771	236.621	263.308	733.182		2133.471	124.994	1149.879	5269.342	191.883	10104.841
Y:1974	660.822	240.691	274.420	754.744		2231.711	129.174	1209.505	5604.106	198.263	10661.827
Y:1975	675.522	245.191	286.520	778.444		2344.711	138.974	1274.805	5999.706	205.363	11307.627
Y:1976	690.778	249.843	298.892	797.793		2458.013	148.556	1361.131	6453.566	211.410	12028.371
Y:1977	708.733	255.169	312.122	822.277		2613.941	158.865	1451.766	6910.439	216.564	12808.268
Y:1978	728.588	261.464	324.632	842.455		2740.091	172.021	1540.063	7412.134	221.891	13601.731
Y:1979	747.135	267.823	334.624	858.882		2868.403	186.177	1649.147	7926.669	229.461	14426.712
Y:1980	764.374	273.041	346.579	877.376		2987.425	204.010	1757.866	8422.574	234.085	15225.721
Y:1981	780.596	278.777	357.008	890.238		3097.738	214.497	1871.713	8894.648	238.836	15982.963
Y:1982	797.210	284.350	367.576	903.960		3205.835	222.699	1952.733	9430.137	257.816	16773.394
Y:1983	815.612	288.445	379.860	916.541		3333.265	234.194	2032.210	10007.196	273.405	17631.806

RESEARCH CAPITAL STOCK (depreciation rate=0.1), FINLAND

	31	32	33	341	342	35	36	37	38	39	3
Y:1960	45.279	15.267	4.114	619.302	9.186	153.102	3.572	129.205	172.318	.508	712.567
Y:1961	48.714	16.199	4.689	619.567	9.139	165.900	4.200	134.676	194.518	.593	768.761
Y:1962	52.409	17.188	5.346	619.833	9.093	179.767	4.939	140.379	219.578	.693	831.123
Y:1963	56.385	18.238	6.095	620.099	9.046	194.793	5.807	146.323	247.868	.810	900.127
Y:1964	60.662	19.351	6.948	620.365	9.000	211.075	6.827	152.519	279.801	.947	976.300
Y:1965	65.264	20.533	7.921	620.631	8.954	228.718	8.027	158.977	315.849	1.107	1060.226
Y:1966	70.214	21.786	9.030	620.898	8.908	247.836	9.438	165.709	356.541	1.293	1152.551
Y:1967	75.831	21.187	9.255	621.164	8.863	267.287	9.397	168.998	399.650	1.615	1229.351
Y:1968	81.532	22.792	10.800	621.431	8.817	289.861	11.517	176.685	451.785	1.860	1343.151
Y:1969	86.562	28.812	13.578	611.623	8.823	302.018	17.339	185.581	503.249	2.148	1458.725
Y:1970	93.282	30.123	15.431	612.897	8.774	329.706	19.836	193.736	570.284	2.488	1595.402
Y:1971	100.348	32.471	19.840	625.050	8.958	379.802	24.657	211.988	649.507	2.831	1798.253
Y:1972	108.110	33.942	22.029	625.035	8.886	409.793	28.039	219.812	734.104	3.305	1941.412
Y:1973	120.957	37.858	25.758	628.767	8.672	449.598	38.125	227.786	844.261	3.509	2157.222
Y:1974	129.461	39.384	28.606	628.434	8.620	484.448	42.396	236.540	950.398	4.192	2343.998
Y:1975	136.895	39.366	31.945	633.821	8.218	527.543	48.207	240.956	1108.679	5.073	2553.930
Y:1976	147.049	41.410	35.800	633.036	8.204	568.498	54.561	251.120	1240.639	5.978	2778.931
Y:1977	154.062	43.127	38.367	625.610	8.618	609.300	59.779	261.474	1361.166	7.325	2982.200
Y:1978	166.254	45.548	43.691	625.700	8.555	658.400	69.249	272.549	1534.477	8.522	3257.345
Y:1979	182.619	47.680	48.740	624.798	8.515	700.264	74.584	284.462	1712.256	10.156	3536.034
Y:1980	196.301	50.493	55.772	625.023	8.454	759.431	88.481	296.457	1935.324	11.776	3866.761
Y:1981	212.809	54.194	60.991	630.480	9.597	831.396	93.157	313.349	2153.241	13.155	4227.582
Y:1982	235.760	57.371	64.426	636.411	10.044	908.773	104.629	327.080	2401.596	14.965	4647.261
Y:1983	263.074	60.020	66.369	642.299	9.950	988.388	120.952	337.977	2667.405	17.015	5101.846

RESEARCH CAPITAL STOCK (depreciation rate=0.1), SWEDEN

	31	32	341	342	343	35	36	37	38	39	3
Y:1960	200.150	223.720	70.790	552.764	39.850	769.330	176.810	1637.920	4025.700	1000.000	8745.065
Y:1961	215.585	223.735	72.442	536.952	36.528	825.912	185.752	1658.595	4342.334	909.361	9204.222
Y:1962	232.211	223.750	74.132	526.620	33.650	886.656	195.147	1679.532	4683.872	827.437	9697.901
Y:1963	250.118	223.765	75.861	521.604	31.188	951.867	205.017	1700.732	5052.273	753.370	10227.498
Y:1964	262.301	226.185	77.218	521.796	29.124	1035.543	206.263	1646.513	5421.639	686.386	10882.391
Y:1965	283.788	225.959	79.071	527.140	27.441	1109.332	218.069	1675.821	5853.071	625.789	11479.857
Y:1966	306.806	225.757	80.961	537.632	26.133	1188.785	230.334	1704.647	6317.936	570.953	12119.245
Y:1967	335.131	219.134	82.471	553.318	25.194	1276.425	254.127	1789.242	6954.410	520.204	12856.377
Y:1968	361.248	219.617	84.484	574.296	24.630	1368.204	266.320	1811.716	7480.836	475.359	13580.216
Y:1969	371.401	224.031	90.599	601.009	24.432	1461.157	286.776	1881.839	7904.435	432.840	14100.673
Y:1970	403.443	224.028	92.284	633.038	24.650	1567.925	299.604	1900.170	8535.624	396.207	14949.785
Y:1971	468.813	231.911	90.770	668.591	24.900	1668.989	326.929	2045.581	9156.347	361.300	15829.663
Y:1972	502.195	231.123	92.945	712.962	26.034	1793.540	340.047	2052.785	9894.770	331.335	16666.323
Y:1973	565.176	225.196	95.730	765.327	28.536	1904.099	337.051	2064.318	10749.128	316.508	17670.799
Y:1974	601.780	225.082	97.940	823.083	30.618	2049.585	353.908	2075.028	11598.698	290.571	18759.243
Y:1975	664.502	224.974	101.446	893.675	33.456	2164.126	378.317	2047.125	12717.328	268.614	20045.218
Y:1976	706.089	224.885	103.641	966.437	36.830	2334.835	396.290	2065.071	13684.715	247.048	21251.053
Y:1977	746.573	225.798	106.394	1042.830	40.678	2580.704	423.301	2028.280	14778.187	226.959	22636.393
Y:1978	797.260	225.630	108.677	1134.289	45.760	2768.792	442.564	2053.767	15905.566	209.171	23982.037
Y:1979	813.899	225.358	110.155	1236.361	51.541	2990.953	452.697	2090.983	16935.997	191.135	25360.788
Y:1980	877.931	225.236	112.672	1349.047	58.847	3206.057	475.408	2116.000	18273.524	176.571	26882.489
Y:1981	896.889	226.354	118.675	1425.799	63.023	3385.838	473.642	2155.430	19363.900	179.146	28298.440
Y:1982	930.475	224.925	120.962	1513.195	68.868	3687.409	469.514	2214.000	20712.100	184.445	30134.878
Y:1983	972.801	221.235	120.194	1603.855	75.706	4066.982	462.986	2282.210	22187.600	191.383	32192.247

RESEARCH CAPITAL STOCK (depreciation rate=0.1), NORWAY

	31	32	33	341	342	35	36	37	38	39	3
Y:1960	169.435	68.617	85.714	220.762		372.461	23.817	211.179	917.219	44.441	1775.756
Y:1961	169.610	70.059	82.166	225.696		388.641	25.575	224.067	974.927	44.613	1877.135
Y:1962	169.852	71.160	79.219	229.423		405.617	27.368	237.455	1035.111	44.888	1984.470
Y:1963	162.717	69.183	74.937	231.748		417.946	30.841	245.830	1047.315	45.258	2039.342
Y:1964	163.818	69.992	73.242	233.498		437.152	32.561	260.906	1118.862	45.718	2165.485
Y:1965	164.895	70.537	72.000	234.414		457.193	34.353	276.560	1193.747	46.261	2298.056
Y:1966	165.950	70.848	71.180	234.598		478.110	36.222	292.845	1272.531	46.884	2437.513
Y:1967	163.562	73.782	71.166	240.282		499.698	39.703	345.346	1354.894	47.581	2596.312
Y:1968	164.924	73.424	71.070	238.646		522.522	41.590	359.496	1443.381	48.348	2749.781
Y:1969	170.709	74.959	69.658	230.862		543.469	43.293	372.625	1561.187	47.198	2921.704
Y:1970	175.745	75.327	69.666	226.173		561.971	45.047	386.846	1679.252	49.452	3096.448
Y:1971	182.093	76.139	73.269	223.027		584.494	45.549	394.615	1835.944	52.017	3311.421
Y:1972	194.082	75.413	74.552	217.546		612.535	46.690	402.835	1989.701	55.424	3528.623
Y:1973	201.859	74.061	80.810	213.752		642.422	47.361	411.217	2106.993	58.134	3710.469
Y:1974	198.724	70.725	83.840	213.939		676.420	46.805	429.721	2231.057	58.702	3896.408
Y:1975	193.552	68.152	87.556	216.245		721.778	51.924	452.049	2403.551	59.931	4152.567
Y:1976	189.453	65.988	91.173	213.970		762.902	56.313	493.170	2617.057	59.985	4458.055
Y:1977	188.463	64.716	95.286	217.057		842.540	60.991	534.489	2812.224	59.141	4792.146
Y:1978	189.471	64.540	98.267	215.529		884.436	68.048	569.337	3032.696	58.554	5106.394
Y:1979	189.071	64.445	98.433	210.403		924.304	75.399	621.487	3243.961	60.268	5420.736
Y:1980	187.403	63.218	100.545	207.857		950.896	85.693	668.057	3415.470	58.865	5677.671
Y:1981	184.885	62.632	100.919	199.933		966.120	87.610	715.098	3545.997	57.729	5867.146
Y:1982	183.010	61.942	101.395	193.662		977.604	87.051	724.608	3726.886	70.937	6070.863
Y:1983	183.111	59.843	103.540	186.876		1007.274	89.841	731.625	3931.257	79.432	6322.188

RESEARCH CAPITAL STOCK (depreciation rate=0.2), FINLAND

	31	32	33	341	342	35	36	37	38	39	3
Y:1960	28.865	9.419	2.904	310.314	4.473	99.115	2.622	75.890	119.915	.370	465.256
Y:1961	31.055	9.994	3.310	310.447	4.450	107.399	3.082	79.104	135.364	.432	499.656
Y:1962	33.411	10.604	3.774	310.580	4.427	116.376	3.624	82.453	152.804	.505	538.963
Y:1963	35.945	11.252	4.302	310.713	4.405	126.104	4.261	85.945	172.490	.591	583.286
Y:1964	38.672	11.938	4.905	310.847	4.382	136.645	5.010	89.584	194.712	.690	632.815
Y:1965	41.605	12.667	5.591	310.980	4.360	148.067	5.891	93.377	219.798	.807	687.807
Y:1966	44.761	13.441	6.374	311.113	4.337	160.443	6.926	97.331	248.115	.943	748.593
Y:1967	48.447	12.332	6.228	311.247	4.315	172.588	6.444	97.725	277.255	1.205	790.931
Y:1968	52.042	13.589	7.453	311.380	4.293	187.373	8.215	102.766	313.904	1.370	869.479
Y:1969	54.816	19.171	9.820	301.440	4.322	191.042	13.546	108.778	347.766	1.571	945.473
Y:1970	59.229	19.528	11.067	303.589	4.290	210.723	15.067	113.735	395.573	1.811	1038.928
Y:1971	63.777	20.983	14.805	316.313	4.494	251.645	18.858	128.614	452.710	2.041	1193.534
Y:1972	68.819	21.505	16.018	315.541	4.419	269.288	20.934	131.914	511.715	2.390	1290.031
Y:1973	78.713	24.514	18.746	318.668	4.210	296.214	29.637	135.486	592.940	2.446	1441.976
Y:1974	83.570	24.923	20.420	317.478	4.184	316.781	31.794	139.922	664.915	2.991	1556.079
Y:1975	87.236	23.859	22.536	322.213	3.807	344.965	35.485	140.007	785.252	3.693	1689.195
Y:1976	93.632	25.068	25.078	320.368	3.853	369.681	39.563	146.265	871.030	4.367	1831.750
Y:1977	96.624	25.912	26.210	312.171	4.317	393.397	42.324	152.478	941.414	5.438	1946.562
Y:1978	104.898	27.463	30.129	312.388	4.252	424.748	49.308	159.205	1062.559	6.280	2130.615
Y:1979	116.908	28.657	33.521	311.578	4.217	447.502	51.706	166.532	1181.275	7.510	2308.915
Y:1980	125.470	30.507	38.722	311.968	4.164	487.194	62.720	173.667	1339.313	8.643	2531.463
Y:1981	136.515	33.156	41.774	317.534	5.320	537.664	63.700	185.471	1482.900	9.472	2772.667
Y:1982	153.444	35.121	42.953	323.006	5.663	590.647	71.747	193.442	1649.999	10.703	3060.571
Y:1983	173.644	36.483	42.748	327.934	5.441	643.011	84.184	198.359	1825.968	12.109	3367.768

RESEARCH CAPITAL STOCK (depreciation rate=0.2), SWEDEN

	31	32	341	342	343	35	36	37	38	39	3
Y:1960	127.920	111.900	39.090	367.756	19.920	488.090	106.250	867.580	2581.000	385.500	5356.467
Y:1961	137.786	111.907	40.003	333.669	16.599	523.987	111.623	878.531	2784.004	317.761	5618.838
Y:1962	148.413	111.914	40.936	310.298	14.054	562.525	117.268	889.621	3002.974	263.221	5909.170
Y:1963	159.859	111.921	41.892	295.885	12.146	603.897	123.199	900.851	3239.168	219.253	6226.724
Y:1964	165.082	114.333	42.457	289.060	10.771	661.979	120.307	836.534	3465.928	183.756	6659.022
Y:1965	179.783	113.860	43.540	288.772	9.847	706.927	128.678	863.187	3746.338	155.047	7012.922
Y:1966	195.223	113.482	44.629	294.223	9.313	755.928	137.014	886.958	4047.243	131.779	7397.712
Y:1967	215.184	106.737	45.309	304.828	9.126	811.261	156.438	964.626	4506.062	111.770	7867.226
Y:1968	231.777	107.787	46.508	320.172	9.255	868.430	162.756	973.099	4826.716	96.592	8303.257
Y:1969	231.700	112.605	51.769	340.280	9.669	924.517	177.293	1029.774	5033.056	82.290	8521.085
Y:1970	254.542	112.484	52.160	364.354	10.397	992.498	183.340	1030.333	5448.077	72.483	9076.046
Y:1971	309.348	120.273	49.442	390.340	11.032	1051.855	203.958	1159.695	5832.747	62.701	9635.694
Y:1972	327.742	118.621	50.806	423.502	12.450	1132.933	208.977	1139.518	6320.255	56.325	10232.443
Y:1973	375.394	112.083	52.724	462.463	15.066	1196.260	198.190	1128.426	6900.040	63.366	10857.063
Y:1974	393.436	112.072	53.963	504.260	16.988	1292.904	209.114	1119.882	7444.514	56.407	11541.174
Y:1975	437.649	112.058	56.470	556.308	19.490	1353.823	227.091	1075.506	8234.111	52.225	12394.839
Y:1976	458.157	112.055	57.516	607.176	22.312	1470.180	237.478	1083.063	8826.409	47.076	13126.228
Y:1977	477.619	113.045	59.130	658.777	25.380	1655.496	256.622	1036.167	9523.071	42.276	14011.428
Y:1978	507.439	112.847	60.226	722.763	29.454	1770.556	266.891	1057.249	10223.654	38.730	14818.425
Y:1979	502.316	112.569	60.527	793.711	33.920	1915.484	267.902	1088.391	10799.911	33.864	15631.695
Y:1980	547.275	112.470	61.953	871.291	39.596	2046.587	282.302	1104.829	11671.056	31.641	16563.135
Y:1981	544.570	113.617	66.833	908.690	41.737	2137.656	271.616	1134.900	12254.600	45.545	17354.708
Y:1982	558.931	112.100	67.621	956.928	45.537	2350.280	260.529	1182.030	13088.200	59.650	18550.049
Y:1983	582.518	108.482	65.425	1007.522	50.155	2628.537	248.847	1235.230	14017.300	73.102	19910.896

RESEARCH CAPITAL STOCK (depreciation rate=0.2), NORWAY

	31	32	33	341	342	35	36	37	38	39	3
Y:1960	84.970	34.308	42.857	110.381		219.289	15.262	130.746	570.569	22.372	1084.760
Y:1961	85.094	35.750	39.309	115.315		228.858	16.350	138.603	605.886	22.513	1146.763
Y:1962	85.278	36.707	36.717	118.548		238.926	17.431	146.677	642.385	22.746	1212.459
Y:1963	78.073	34.505	33.013	120.106		244.032	20.154	149.462	629.623	23.056	1223.286
Y:1964	79.831	35.331	32.209	121.010		256.226	20.927	159.228	679.977	23.431	1308.705
Y:1965	81.323	35.809	31.850	121.074		268.737	21.790	169.128	730.753	23.860	1396.084
Y:1966	82.603	36.012	31.860	120.484		281.626	22.736	179.243	782.761	24.337	1486.130
Y:1967	80.290	38.828	32.592	125.531		294.700	25.293	225.179	835.825	24.854	1591.454
Y:1968	81.950	38.083	33.094	122.817		308.554	26.091	228.828	892.636	25.409	1686.264
Y:1969	87.838	39.344	32.170	114.334		320.042	26.735	232.141	976.253	24.012	1795.912
Y:1970	92.377	39.339	32.710	109.865		328.883	27.471	237.197	1055.186	26.183	1903.644
Y:1971	97.824	39.816	36.738	107.364		341.827	26.984	236.211	1168.767	28.457	2047.533
Y:1972	108.458	38.740	38.000	102.712		359.951	27.283	236.651	1272.364	31.375	2186.370
Y:1973	113.951	37.181	44.113	100.131		379.102	27.166	237.986	1334.154	33.352	2283.805
Y:1974	108.212	33.816	46.402	101.667		401.521	25.913	250.014	1402.086	33.062	2384.030
Y:1975	101.270	31.552	49.221	105.033		434.217	30.530	265.312	1517.269	33.550	2553.024
Y:1976	96.272	29.893	51.749	103.376		460.676	34.006	298.575	1667.676	32.886	2763.163
Y:1977	94.973	29.241	54.630	107.185		524.469	37.514	329.496	1791.013	31.464	2990.427
Y:1978	95.833	29.688	56.214	105.926		545.725	43.167	351.894	1934.506	30.498	3185.804
Y:1979	95.213	30.109	54.963	101.167		564.892	48.689	390.599	2062.139	31.968	3373.625
Y:1980	93.409	29.305	55.926	99.428		570.936	56.785	421.198	2145.616	30.198	3497.909
Y:1981	90.950	29.180	55.169	92.405		567.062	55.915	450.805	2188.567	28.909	3555.569
Y:1982	89.374	28.917	54.703	87.646		561.746	52.934	441.664	2286.343	42.108	3634.887
Y:1983	89.901	27.228	56.047	82.697		576.827	53.842	432.808	2406.134	49.276	3766.321

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