

"Productivity isn't everything, but in the long run it is almost everything."
Krugman (1992, p. 9)

Beaten by the Swedes?

A comparison of productivity growth in Norwegian and Swedish manufacturing*

Pål Boug and Bjørn E. Naug

National accounts figures indicate that in the last 20-25 years Norwegian manufacturing has recorded far lower productivity growth than manufacturing in our trading partner countries. These comparisons, however, are very uncertain as the underlying data and calculation methods may vary in the national accounts of different countries. Moreover, the overall figure for manufacturing may provide a distorted picture because Norway's manufacturing structure differs from that of our trading partners. In this article, productivity changes in Norwegian and Swedish manufacturing are compared for the period 1993-1999, based on disaggregated data and applying a new common national accounting standard. The figures show that Norwegian manufacturing as a whole recorded average annual productivity growth of 0.6 per cent in the period analysed, compared with annual growth of 5.1 per cent in Swedish manufacturing. The growth differential to some extent reflects the fact that Sweden has a higher share of manufacturing industries with a potential for high productivity growth than Norway. Swedish productivity growth is thus dominated by the industry producing Radio, television and communications equipment, an industry that has a different structure and is of far less importance in Norway. Productivity growth in Norway is reduced in particular by developments in the industries Publishing, printing and reproduction and Food products, beverages and tobacco, where many activities are protected against foreign competition. The calculations indicate that the difference in productivity growth between Norwegian and Swedish manufacturing is virtually eliminated when the aforementioned industries are excluded and adjustments are made for the two countries' differing manufacturing structure. The figures also show that many export-oriented manufacturing sectors in Norway recorded (appreciably) stronger productivity growth between 1993 and 1999 than the same sectors in Sweden.

Introduction

Productivity growth plays an important role for the Norwegian economy in the short and long term. In particular, the economy's ability to increase value added per employee is crucial for long-term developments in living standards in Norway. Productivity growth is also an important factor behind developments in employment, the structure of the economy and the Norwegian business sector's competitiveness. In other words, there are several reasons for studying

productivity changes in the Norwegian economy. This article looks more closely at productivity growth in manufacturing.

International comparisons indicate that Norwegian manufacturing as a whole has systematically recorded lower productivity growth than manufacturing in our trading partner countries. These comparisons, however, are very uncertain. According to NOU (1996:4), it is likely that some of the difference in estimated productivity growth reflects the use of different measurement methods in different countries. It is therefore natural to question the reliability of earlier studies. Moreover, average figures for manufacturing may provide a distorted picture as Norway has a manufacturing structure that differs from that of its trading partners. In this article, productivity growth in Norwegian and

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* The article is based on the appendix concerning labour productivity in *Økonomiske analyser* 1/2001. Pål Boug was responsible for the work on the article (including calculations and text). Naug's suggestions and comments were quite extensive, however, so we considered it appropriate to include him as co-author of the article. Enquiries concerning the analysis should be addressed to Pål Boug. Our thanks to Knut Moum, Svein Longva, Ådne Cappelen and Per Richard Johansen for their useful suggestions and comments.

Swedish manufacturing is compared for the period 1993-1999 based on disaggregated data and using a new – common – national accounting standard.

The rest of the article is organised as follows: the next section discusses further the uncertainty of earlier analyses. This is followed by a presentation of the data the framework and the main results. The conclusion provides a summary of what we have learned.

The uncertainty of earlier analyses

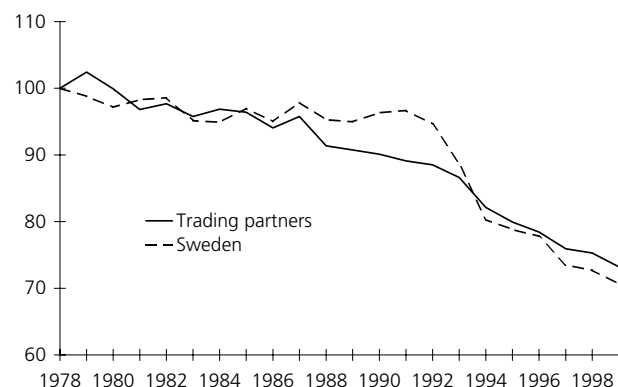
In keeping with common practice, we focus on developments in labour productivity, defined as value added at constant prices divided by the number of hours worked.¹ The national account figures indicate that, measured in this way, productivity growth in manufacturing has been appreciably lower in Norway than among our trading partners. According to recent figures compiled by the US Bureau of Labor Statistics,² relative productivity was reduced by a good 25 per cent from 1978 to 1999 (see Figure 1). A corresponding deterioration is found in a separate comparison of Norwegian and Swedish manufacturing for the same period.

As discussed in NOU (1996:4), there are several sources of bias and/or uncertainty in such comparisons:

- The underlying data for the national accounts and methods for deflating value added appear to vary across countries, factors that influence the estimated productivity figures. It is therefore doubtful whether the figures are comparable.³
- The overall figure for manufacturing may provide a distorted/incomplete picture when comparing productivity growth between countries that have (very) different manufacturing structures. The reason is that the various manufacturing industries have a different potential for productivity growth, partly for technological reasons.
- Productivity figures may be influenced by short-term cyclical fluctuations that do not occur at the same time across countries.

Against this background, the discussion in NOU (1996:4) concluded with two specific recommendations for future analyses. The first recommendation was that one should look more closely at the methods used for constructing constant-price estimates for value added in Norway and among our trading partners. The second recommendation was that one

Figure 1. Labour productivity in Norwegian manufacturing relative to manufacturing in Sweden and among trading partners¹. Index 1978=100



¹ Figures for trading partners are calculated as a weighted geometric mean using competitiveness weights (IMF weights for 1994) as weights. Sources: Bureau of Labor Statistics (USA) og NOU (2000:25).

should study, on the basis of more disaggregated figures, to what extent differences in the manufacturing structure can explain lower productivity growth in Norwegian manufacturing. These recommendations form the basis of this article.

Data and framework

Through the EEA Agreement, Norway is obligated to follow the European System of Accounts (ESA95), the EU's new standard of national accounting. This standard aims at reducing measurement problems of the type described above, through use of common definitions and methods.⁴ In particular, the standard states that value added at constant prices shall be calculated by first deflating production and intermediate consumption individually and then taking the difference (so-called double deflating). Whereas Norway has for a long time followed this practice in its national accounts, the work on converting the accounts to the new standard has not come very far in most EU countries. There is thus limited access to comparable figures on productivity growth.

Norwegian national account figures based on the new standard have now been calculated back to 1970. Of Norway's three most important European trading partners, Germany, the UK and Sweden, only Sweden has figures for value added and hours worked based on the new standard. These figures are only available for the years 1993-1999. We therefore compare productivity growth in Norwegian and Swedish manufacturing from 1993 to 1999. In order to study whether differen-

1 Value added is the value of production less the value of intermediate consumption. Hours worked is the sum of man-hours worked by employees and self-employed. The concepts labour productivity and manufacturing productivity are used interchangeably in the following.

2 See Bureau of Labor Statistics (2000).

3 The question of the quality of productivity figures was raised in Norwegian newspapers last autumn. In an article in the Norwegian daily *Aftenposten* on 4 November 2000, economists from the Norwegian Confederation of Trade Unions and the Confederation of Norwegian Business and Industry questioned the quality of the productivity figures that were compiled by the US Bureau of Labor Statistics. The quality of productivity figures was also questioned in an article in *Finansavisen* on 23 September 2000.

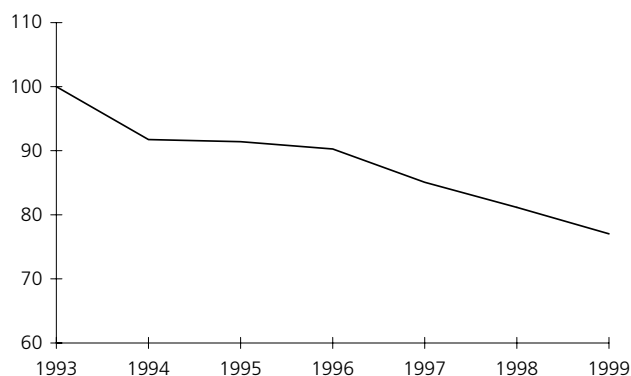
4 The importance of any remaining measurement problems is discussed in *Økonomiske analyser* 1/2001.

Table 1. Productivity growth and man-hour shares in Norwegian and Swedish manufacturing

Industry	Average percentage growth in productivity, ¹ 1993-1999		Man-hour shares in per cent. 1993	
	Norway	Sweden	Norway	Sweden
Manufacturing total	0.6	5.1	100.0	100.0
Food products, beverages and tobacco	-1.5	2.7	18.2	9.7
Textiles, wearing apparel and leather	0.1	2.8	3.2	2.6
Wood and wood products	-0.6	3.3	5.7	5.2
Pulp, paper and paper products	5.7	0.8	3.8	6.4
Publishing, printing and reproduction	-1.7	3.9	11.5	8.0
Refined petroleum products	0.8	15.2	0.7	0.4
Chemicals and chemical products	2.9	0.6	5.5	4.6
Rubber and plastic products	-0.2	2.8	2.0	3.0
Other non-metallic mineral products	-0.4	0.8	2.9	2.7
Basic metals	4.2	3.1	5.7	4.8
Fabricated metal products	0.3	1.0	5.5	8.7
Machinery and other equipment	3.2	2.8	8.4	12.8
Office machinery and computers	15.4	9.3	0.4	1.1
Electrical machinery and apparatus	-1.7	0.4	3.7	3.3
Radio, television and communications equipment	4.9	38.4	1.7	4.1
Medical and optical equipment	2.7	3.9	2.0	3.0
Motor vehicles, trailers and parts	3.8	6.8	1.0	8.6
Other transport equipment	0.4	-2.4	14.2	3.0
Furniture and other manufacturing	0.6	10.2	4.0	7.8

¹ Geometric mean.

Sources: Statistics Norway and Statistics Sweden

Figure 2. Labour productivity in Norwegian manufacturing relative to Swedish manufacturing. Index 1993=100

Sources: Statistics Norway and Statistics Sweden.

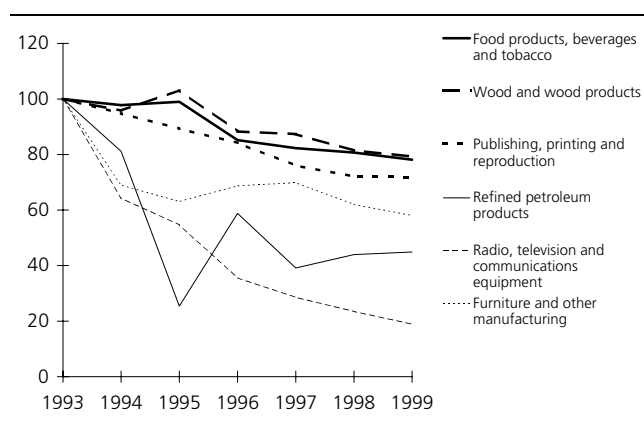
ces in manufacturing structure can explain any differences in productivity growth between Norway and Sweden, we have obtained data for 19 manufacturing industries. The level of detail is thus so high that it is possible to adjust for differences in productivity growth that are due to a differing manufacturing structure in the two countries. We shed light on this issue by calculating what Norwegian productivity growth would have been if Norway had the same manufacturing structure as Sweden. Box 1 provides a further account of the calculations.

Main results

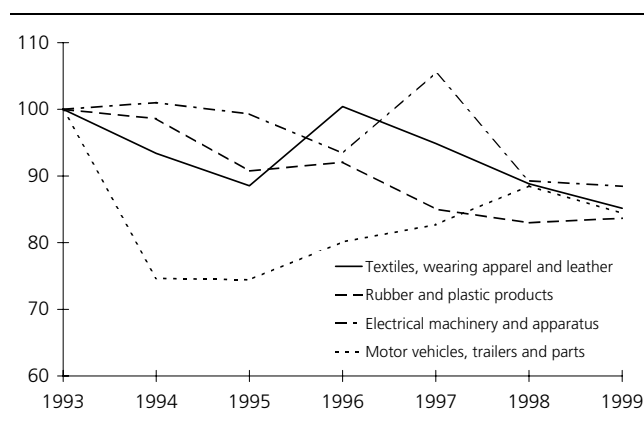
The data show that Norwegian manufacturing as a whole recorded appreciably lower productivity growth than Swedish manufacturing in the period 1993-1999 (see Figure 2 and Table 1). Annual productivity growth in Norwegian manufacturing averaged 0.6 per cent in this period, compared with annual growth of 5.1 per cent in Swedish manufacturing. Norwegian manufacturing productivity was reduced by about 23 per cent relative to manufacturing productivity in Sweden between 1993 and 1999. The decline was particularly strong from 1993 to 1994, partly reflecting different cyclical stages for Norwegian and Swedish manufacturing in these years. Both Norwegian and Swedish manufacturing experienced a cyclical recovery from 1993 to 1994, but the upturn appears to have been far stronger in Sweden than in Norway.⁵ The cyclical turnaround contributed to an increase in Swedish manufacturing productivity of as much as 9.8 per cent from 1993 to 1994, while productivity in Norwegian manufacturing only rose by 0.7 per cent. Average productivity growth for Sweden is reduced to 4.1 per cent if 1993 is excluded from the period analysed.

The lower productivity growth in Norwegian manufacturing as a whole is also reflected in lower productivity growth than Swedish manufacturing in 13 of the 19 manufacturing industries (see Table 1 and Figures 3-5). It is particularly the industries Publishing, printing and reproduction and Food products, beverages

⁵ The sharp upturn for Sweden must be seen in the light of the very strong downturn in the period 1991-1993, cf. OECD (1999, p. 178).

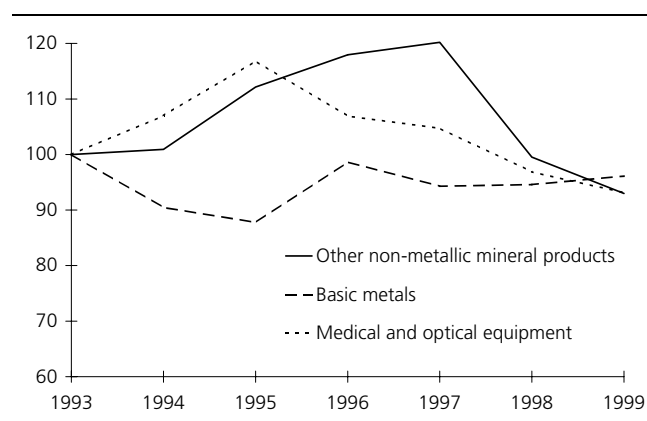
Figure 3. Labour productivity in Norwegian manufacturing relative to Swedish manufacturing. Index 1993=100

Sources: Statistics Norway and Statistics Sweden.

Figure 4. Labour productivity in Norwegian manufacturing relative to Swedish manufacturing. Index 1993=100

Sources: Statistics Norway and Statistics Sweden.

and tobacco – with a total share of manufacturing employment of 30 per cent and average productivity growth of about –1.5 per cent – that reduce productivity growth in Norwegian manufacturing. A substantial proportion of activities in Food, beverages and tobacco is protected against foreign competition through trade policy measures.⁶ Similarly, many activities in Publishing, printing and reproduction are

Figure 5. Labour productivity in Norwegian manufacturing relative to Swedish manufacturing. Index 1993=100

Sources: Statistics Norway and Statistics Sweden.

characterised by *natural* protection against foreign competition. Weak productivity developments in these industries have thus only to a limited extent contributed to reducing the manufacturing sector's competitiveness. From a living standards point of view, this is little consolation. The other manufacturing industries as a whole recorded average productivity growth of 1.4 per cent in the period 1993-1999 (see Table 2).

Productivity changes in Swedish manufacturing are dominated by the exceptional rise in productivity in the industry producing Radio, television and communications equipment. This must be seen in connection with the strong growth in Ericsson's telecom product activities, which are activities that encounter limited competition from Norwegian enterprises. Swedish manufacturing excluding Radio, television and communications equipment recorded average productivity growth of 2.9 per cent in the period 1993-1999. If all three industries mentioned above are excluded from the analysis, the difference in average productivity growth (between Norway and Sweden) is reduced from 4.5 percentage points to 1.5 percentage points.

The discussion above illustrates that the use of aggregated productivity figures to analyse manufacturing

Table 2. Productivity growth in Norwegian and Swedish manufacturing. Average percentage growth¹. 1993-1999

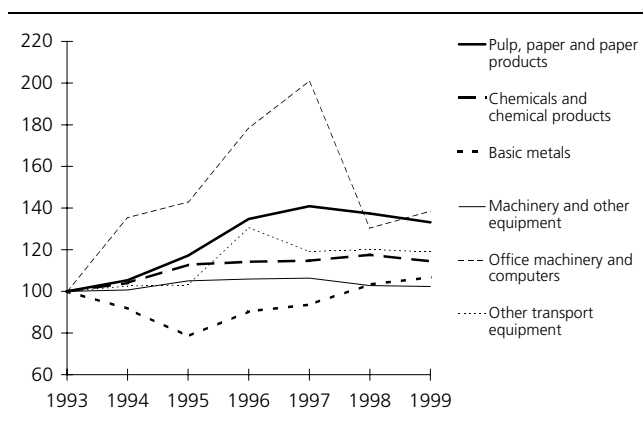
Industry	Norway	Sweden
Manufacturing total	0.6	5.1
Manufacturing excluding Publishing, printing and reproduction and Food products, beverages and tobacco	1.4	5.3
Manufacturing excluding Radio, television and communications equipment	0.5	2.9
Manufacturing excluding Publishing, printing and reproduction and Food products, beverages and tobacco and Radio, television and communications equipment	1.3	2.8

¹ Geometric mean

Sources: Statistics Norway and Statistics Sweden.

6 See Fæhn and Hægeland (1996), Jørgensen *et al.* (1999) and Fæhn *et al.* (2001).

Figure 6. Labour productivity in Norwegian manufacturing relative to Swedish manufacturing. Index 1993=100

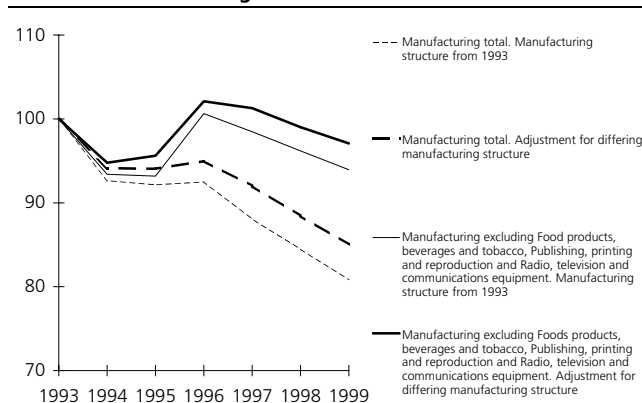


Sources: Statistics Norway and Statistics Sweden.

competitiveness may provide a distorted/incomplete picture. This is also illustrated by the fact that important segments of Norwegian manufacturing recorded *stronger* productivity growth in the period 1993-1999 than the same sectors in Sweden (see Table 1 and Figure 6). More specifically, this was the case for Basic metals, Machinery and other equipment, Pulp, paper and paper products, Chemicals and chemical products, Office machinery and computers and Other transport equipment⁷, industries that account for about half of the manufacturing sector's exports and more than a third of manufacturing employment in Norway. Norwegian and Swedish manufacturers in these industries recorded average productivity growth of 2.6 and 1.6 per cent, respectively, per year in the period under review.

A closer study shows that changes in the manufacturing structure only explain a limited portion of productivity growth in Norwegian and Swedish manufacturing as a whole: the average growth figures become 0.8 per cent and 4.5 per cent, respectively, if the coun-

Figure 7. Labour productivity in Norwegian manufacturing relative to Swedish manufacturing with fixed manufacturing structure¹ and adjustment for differing manufacturing structure². Index 1993=100



¹ See formula 2 in box 1.

² See formula 3 in box 1.

Sources: Statistics Norway and Statistics Sweden.

tries are given the 1993 manufacturing structure throughout the period (see Table 3). The relative deterioration in Norwegian manufacturing productivity measured in this way was 19 per cent in the period from 1993 to 1999 (see Figure 7).

Table 1 shows that Norway and Sweden have a different manufacturing structure. The lower productivity growth in Norwegian manufacturing may therefore to some extent reflect the countries' production of different products with a different potential for productivity growth. This possibility is examined by using the Swedish manufacturing structure from 1993 for calculating productivity growth for Norwegian manufacturing (see last column in Table 3). The calculations indicate that Norwegian manufacturing, with this structure, would have recorded annual productivity growth of 1.7 per cent in the period 1993-1999. The total deterioration in relative productivity is now 15 per cent (see Figure 7), compared with a reduction of 19 per cent in the calculations based on a fixed and country-specific manufacturing structure. The conclu-

Table 3. Productivity growth in Norwegian and Swedish manufacturing. Average percentage growth¹ with fixed manufacturing structure and adjustment for differing manufacturing structure. 1993-1999

	Norway with Norwegian manufacturing structure from 1993 ²	Sweden with Swedish manufacturing structure from 1993 ²	Norway with Swedish manufacturing structure from 1993 ³
Manufacturing total	0.8	4.5	1.7
Manufacturing excluding Food products, beverages and tobacco, Publishing, printing and reproduction and Radio, television and communications equipment	1.7	2.7	2.2

¹ Geometric mean.

² See formula 2 in box 1.

³ See formula 3 in box 1.

Sources: Statistics Norway and Statistics Sweden.

⁷ The industry Other transport equipment includes the production of ships and oil platforms.

sion is therefore that a good 1/5 of the difference in productivity growth can be attributed to a manufacturing structure in Norway which differs from that of Sweden.⁸

The differences in productivity growth are thus considerable even after adjustments are made for differing manufacturing structures. This conclusion, however, changes when we (in line with the discussion above) omit Publishing, printing and reproduction, Food products, beverages and tobacco and Radio, television and communications equipment from the analysis. Calculations excluding these industries actually show that the difference in productivity growth is virtually eliminated when adjustments are also made for a differing manufacturing structure (see Table 3 and Figure 7).

What have we learned?

This article has looked more closely at productivity growth in Norwegian and Swedish manufacturing on the basis of disaggregated data. The data show that Norwegian manufacturing as a whole recorded appreciably lower productivity growth than Swedish manufacturing through the period 1993-1999. Part of the difference in productivity growth reflects that the countries have different manufacturing structures. Sweden has a higher proportion of manufacturing sectors that recorded very strong productivity growth in the period analysed, primarily the telecommunications industry. Norway, on the other hand, features traditional (and perhaps "ageing") industries with a more limited potential for productivity growth. However, the difference in productivity growth is considerable even after adjustments are made for the countries' differing manufacturing structure.

Norwegian productivity growth is reduced in particular by the industries Publishing, printing and reproduction and Food products, beverages and tobacco. One possible explanation is that many of the activities in these industries are protected against foreign competition. At the same time, this protection implies that the industries have so far not had to face the competitive consequences of low productivity growth. This may change in the future if the protection is removed. Productivity growth in Swedish manufacturing is dominated by the industry producing Radio, television and communications equipment. This reflects the sharp growth in Ericsson's telecom product activities, which are activities that encounter limited competition from Norwegian enterprises. Calculations excluding these three industries show that the difference in productivity growth between Norwegian and Swedish manufacturing is virtually eliminated when adjust-

ments are also made for the countries' differing manufacturing structure. The analysis also shows that many export-oriented manufacturing sectors in Norway recorded (appreciably) higher productivity growth in the period 1993-1999 than the same sectors in Sweden.

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⁸ In *Økonomiske analyser* 1/2001, the countries' differing manufacturing structure explained about half of the growth differential. The different results are due to the fact that Sweden was given Norway's manufacturing structure from 1993. (The industry producing Radio, television and communications equipment has a far higher share of employment and productivity growth in Sweden than in Norway. Sweden therefore shows a sharp decline in estimated productivity growth when the country is given Norway's manufacturing structure.)

Box 1. A closer look at the calculations

The calculations are based on the formula for labour productivity (LP) in manufacturing as a whole:

$$(1) \quad LP_t^i = \frac{\sum_j Q_{jt}^i}{\sum_j L_{jt}^i} = \sum_j \frac{L_{jt}^j}{\sum_j L_{jt}^j} \cdot \frac{Q_{jt}^i}{L_{jt}^i}, \quad \begin{array}{l} i = \text{Norway, Sweden} \\ j = \text{industry } j \\ t = 1993, \dots, 1999 \end{array}$$

where Q is value added measured at constant prices and L is the number of hours worked. The last part of the equation states that LPⁱ is a weighted average of productivity in each industry with industry shares of hours worked as weights. In the text, man-hour shares are denoted as "manufacturing structure". The following formula is used to isolate the effect of industry productivity for total manufacturing productivity in each country:

$$(2) \quad LP_t^i = \sum_j \frac{L_{j(93)}^i}{\sum_j L_{j(93)}^i} \cdot \frac{Q_{jt}^i}{L_{jt}^i}, \quad \begin{array}{l} i = \text{Norway, Sweden} \\ j = \text{industry } j \\ t = 1993, \dots, 1999 \end{array}$$

The manufacturing structure in 1993 is consequently kept fixed in the calculations. The calculation of a differing manufacturing structure is quantified with the help of the formula:

$$(3) \quad LP_t^i = \sum_j \frac{L_{j(93)}^{\text{Sweden}}}{\sum_j L_{j(93)}^{\text{Sweden}}} \cdot \frac{Q_{jt}^i}{L_{jt}^i}, \quad \begin{array}{l} i = \text{Norway, Sweden} \\ j = \text{industry } j \\ t = 1993, \dots, 1999 \end{array}$$

Sweden's manufacturing structure, measured by man-hour shares in 1993, is thus applied for calculating productivity growth in Norwegian and Swedish manufacturing. The calculations in *Økonomiske analyser* 1/2001 were based on the reverse problem, i.e. Norway's manufacturing structure was applied for calculating productivity growth in Swedish manufacturing. The figures reported here are therefore not directly comparable to corresponding figures in *Økonomiske analyser* 1/2001