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The Canada-Atlantic Canada Manufacturing Productivity Gap: A Detailed Analysis

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TABLE OF CONTENTS

Abstract	5
Executive Summary	6
I Introduction	9
II The Contribution of Productivity to Regional Income Disparities	10
A. Trends in Employment/Total Population	10
B. Trends in Output per Worker	11
C. Output per Worker Levels by Industry	12
III Characteristics of Manufacturing in the Atlantic Provinces	13
A. Output	13
B. Employment	15
C. Total and Average Hours Worked	16
D. Capital Stock	17
E. Size Distribution and Average Size of Firms and Establishments	17
IV Manufacturing Productivity in the Atlantic Provinces	18
A. Labour Productivity	18
B. Capital Productivity	20
C. Total Factor Productivity	21
V Explanations of the Atlantic Canada-Canada Manufacturing Productivity Gap	22
A. Industrial Structure and Intersectoral Shifts	22
B. Capital Intensity of Production	23
C. Quality of Human Resources	24
D. Innovation	24
E. Other factors	26
VI Regression Analysis	27
A. The Model	27
B. The Data	29
C. Results	30
D. Summary of Regression Results	32

VII Conclusion	33
References	33
List of Tables and Charts	36
Tables	40
Charts	61
List of Appendix Tables	125

(The Appendix Tables are available with this report at www.csls.ca under Research Reports.)

Abstract

The objectives of this report are to examine the characteristics of manufacturing in Atlantic Canada and to shed light on the factors behind the productivity gap between Atlantic Canada and Canada in the context of the manufacturing sector. A number of possible factors contributing to the Atlantic Canada-Canada manufacturing productivity gap are examined, including innovative activity, capital intensity, quality of human resources, economies of scale and the seasonality of production. Of these, innovation is found to be the most important. Since research and development activity has been historically much lower in Atlantic Canada relative to Canada, it is possible that the level of technology embedded in the capital stock in Atlantic Canada is much lower than in Canada. In the end four factors are identified as contributing the most to the Atlantic Canada-Canada manufacturing productivity gap, namely less innovative effort, particularly in high-tech industries; fewer economies of scale; lower educational attainment of the workforce; and greater seasonality of production.

The Atlantic Canada-Canada Manufacturing Productivity Gap: A Detailed Analysis

Executive Summary

In 2002, output per worker in Atlantic Canada was 82.8 per cent of the national average. But in the manufacturing sector the productivity gap was much larger, with Atlantic Canada's output per worker level only 77.0 per cent of the Canadian level. The gaps in manufacturing capital and total factor productivity were even larger, at 54.7 per cent and 65.0 per cent respectively. Productivity is the key driver of GDP per capita, which in Atlantic Canada in 2002 stood at only 74.9 per cent of the Canadian level. An effective strategy to reduce income disparities between Atlantic Canada and Canada would hence be to close the productivity gap between the two, particularly in sectors such as manufacturing where the size of the productivity gap is larger than average. From this perspective, the objectives of this report are to examine the characteristics of manufacturing in Atlantic Canada and to shed light on the factors behind the productivity gap between Atlantic Canada and Canada in the context of the manufacturing sector.

The distribution of manufacturing output and employment by industry in Atlantic Canada differs significantly from the national average, with resource-related manufacturing industries of much greater importance. The three largest manufacturing industries in Atlantic Canada as a whole are food, wood and paper, accounting for over two fifths of total Atlantic Canada manufacturing output. These same three industries, however, accounted for only one fifth of manufacturing output in Canada. In each of the individual Atlantic provinces, namely Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, the food industry plays a dominant role, although in New Brunswick the paper industry is also large.

The average size of manufacturing establishments is smaller in Atlantic Canada relative to Canada. The proportion of total establishments with fewer than 50 employees is typically higher in Atlantic Canada, for example at 75.2 per cent in 1999 compared to only 72.7 per cent in Canada as a whole. The average number of employees per establishment in Atlantic Canada was 89.4 per cent of the national level in 1999, the average value of shipments per establishment was 72.2 per cent of the national level, and the average value added per establishment was only 64.4 per cent. This is evidence of a substantial size disadvantage of manufacturing firms in Atlantic Canada relative to the rest of Canada.

Nine possible factors contributing to the Atlantic Canada-Canada manufacturing productivity gap are identified and discussed:

- industrial structure and intersectoral shifts;
- the capital intensity of production;

- quality of human resources;
- innovation;
- economies of scale and scope;
- seasonality of production;
- the corporate tax environment;
- public infrastructure; and
- entrepreneurship.

Of these, the most important are found to be innovation and economies of scale.

In terms of industrial structure, Atlantic Canada is found not to have a disproportionate share of output or employment in low-productivity manufacturing industries, while the capital-labour ratio in Atlantic Canada manufacturing is higher than that in Canada, although the gap between the two has shrunk over time. The level of educational attainment of the manufacturing workforce is lower in Atlantic Canada than in Canada, but the gap between the two is not substantially larger than the gap at the total economy level.

Seasonal operations have a negative effect on capital productivity since the capital stock is a fixed input that cannot be adjusted according to the ebb and flow of production, so that capital must sit unused during seasonal downtime. But labour, on the other hand, can be hired as necessary to meet actual requirements, so that seasonality should not in theory affect labour productivity greatly. In terms of the final three possible factors identified, Atlantic Canada is not found to be seriously lagging Canada so that these are not thought to exert significant pressure on the Canada-Atlantic Canada manufacturing productivity gap.

In terms of innovation, Atlantic Canada lags Canada substantially. In 2000, Atlantic Canada accounted for only 3.2 per cent of Canada's general expenditure on research and development, well below its population, employment and output shares. Further, the research and development undertaken by the business sector accounted for only 0.2 per cent of GDP in Atlantic Canada, compared to 1.0 per cent for Canada. Since productivity is determined by technical change and innovation in the long run, this lagging relative performance has likely played a large role in Atlantic Canada's poor relative productivity performance. Within the manufacturing sector, the technological revolution is concentrated in two industries, namely machinery and electrical and electronic products. The size and growth of these industries in Atlantic Canada lags those in Canada badly.

Economies of scale and scope refer to the cost advantages that can be attained through production on a larger and more diverse scale. As noted before, Atlantic Canadian manufacturing firms seem to have a large size disadvantage relative to Canadian manufacturing firms, suggesting that these economies of scale and scope are not being realized in Atlantic Canada. The hypothesized negative effect this has on Atlantic Canada's relative manufacturing productivity performance is supported by two observations. First, economies of scale are generally recognized as being more important in manufacturing than in other sectors. This may explain why the Atlantic Canada-Canada productivity gap is larger in manufacturing than in other sectors. Second, average plant size is smaller in

Newfoundland and Prince Edward Island, also the two provinces with the largest manufacturing productivity gaps with Canada.

Regression analysis is undertaken to further examine the effects of some of these variables on the Atlantic Canada-Canada manufacturing productivity gap. Four variables in particular are included in the regressions, all for Atlantic Canada as a proportion of Canada:

- average years of education in the manufacturing workforce, as a proxy of the quality of human capital;
- the ratio of the capital stock to hours of work in manufacturing, as a measure of capital intensity;
- business sector research and development expenditure as a proportion of GDP, as a proxy of manufacturing innovation intensity; and
- the average number of employees per establishment, to measure the extent that economies of scale and scope have been realized.

The regression analysis is for the most part exploratory only, but the results do show that the relative drop in capital intensity in Atlantic Canada has played a large role in the deterioration over time in Atlantic Canada's relative manufacturing productivity performance. Although statistical significance is problematic due to small sample sizes, less innovative activity and fewer economies of scale relative to Canada over time also appear to have had a negative effect on Atlantic Canada's relative manufacturing productivity. Overall though, it is likely that the structural nature of the productivity gap emanates from a long-term technological deficiency in Atlantic Canada. Since research and development activity has been historically much lower in Atlantic Canada relative to Canada, it is possible that the level of technology embedded in the capital stock in Atlantic Canada is much lower than in Canada. This suggests that, although the measured capital intensity of manufacturing production is higher in Atlantic Canada than Canada, this may not be the case if the *quality* of the capital stock could also be taken into account.

In the end four factors are identified as contributing the most to the Atlantic Canada-Canada manufacturing productivity gap, namely less innovative effort, particularly in high-tech industries; fewer economies of scale; lower educational attainment of the workforce; and greater seasonality of production. A reversal of the deficiency of the technological quality of the manufacturing capital stock in Atlantic Canada would require far more than innovative activity comparable to the national level. Measures to address this deficiency could include research and development expenditure sustained above national levels for several years, and increased openness to technological spillovers from other regions and countries.

I Introduction

In 2002, GDP per capita in Atlantic Canada was 74.9 per cent of the national average, up from 70.5 per cent in 1989 (Table 1, Chart 1). This disparity in income between Canada and Atlantic Canada can be decomposed into two components, the difference in productivity or output per worker and the difference in the employment-population ratio or the proportion of the total population with jobs.

In 2002, output per worker in Atlantic Canada was 82.8 per cent of the national average (Chart 2), and the proportion of the total population employed 90.4 per cent (Chart 3). The product of these two ratios determines Atlantic Canada's GDP per capita relative to the national average (74.9 per cent). Thus in 2002 about two thirds of Atlantic Canada's regional income disparities reflected lower productivity levels. The productivity gap varies by sector (Appendix Table 40B), and in manufacturing the gap at 76.3 per cent in 2001 was above that in the non-manufacturing sectors (81.1 per cent).

Consequently, a key way to reduce income disparities between Atlantic Canada and Canada is to eliminate the productivity gap between Atlantic Canadian firms and the national average, particularly in sectors that have above average gaps such as manufacturing. This strategy of course is easy to enunciate, but much hard to put into practice, particularly when the causes of the productivity gap are poorly understood. The objective of this report is to shed light on the factors behind the productivity gap between Atlantic Canada and Canada in the context of the manufacturing sector.

The report is divided into six parts. The first part discusses the contribution of productivity differentials to the income disparities between Atlantic Canada and Canada. The second part examines the characteristics of the manufacturing sector in Atlantic Canada, looking at output, employment, and the size distribution of firms. The third part analyzes levels and trends in manufacturing productivity in Atlantic Canada over the 1984-2002 period, looking at labour productivity, capital productivity, and total factor productivity. The fourth part discusses explanations for the Atlantic Canada-Canada manufacturing productivity gap, including industrial structure, capital intensity of production, quality of human resources, innovation, and other factors. The fifth part undertakes regression analysis to explain the trends in the Canada-Atlantic Canada labour productivity gap in manufacturing over time. The final section concludes.

II The Contribution of Productivity to Regional Income Disparities

Table 1 provides a detailed decomposition of GDP per capita into productivity and employment ratio components for Canada, Atlantic Canada and the four Atlantic provinces in 1984, 1989 and 2002 and gives data for Atlantic Canada and the four Atlantic provinces as a proportion of the national average. A number of interesting observations can be drawn from the table, as discussed below.

From the mid-1980s to 2002, the relative importance of Atlantic Canada in the national context has been falling. The region's share of national GDP, expressed in constant prices, fell 0.6 percentage points from 6.3 per cent to 5.7 per cent, its population share 1.4 points from 9.0 per cent to 7.6 per cent, and its employment share 0.5 points from 7.3 per cent to 6.8 per cent. All four Atlantic provinces have experienced these trends. The falling shares mean Atlantic Canada has been experiencing slower growth in these variables than the national average.

There has been improvement in Atlantic Canada's per capita GDP or income relative to the Canadian average since the mid-1980s. From 69.9 per cent of the national average in 1984, it rose slightly to 70.5 per cent in 1989 and then to 74.9 per cent in 2002 (Chart 1).

A. Trends in Employment/Total Population

It has been the rise in the relative employment/total population ratio that has been responsible for this reduction in regional income disparities, not any convergence in productivity growth across regions. The proportion of the total population with jobs in Atlantic Canada rose 9.5 percentage points from 80.9 per cent of the national average in 1984 to 90.4 per cent in 2002. Two factors contributed about equally to this development: the changing demographic structures in Atlantic Canada and relative improvement in employment opportunities for the working age population.

The relative importance of the working age population, defined as the population 15 and over, in the total population in Atlantic Canada increased 4.7 points from 96.9 per cent of the national average in 1984 to 101.6 per cent in 2002 (Chart 4). For Canada, the growth rates for working age and total population were almost identical over the 1984-2002 period (1.3 per cent per year versus 1.1 per cent), keeping the ratio of the working age population to total population relatively constant. In contrast, in Atlantic Canada working age population growth outpaced total population growth by 0.4 percentage points (0.6 per cent per year versus 0.2 per cent), resulting in an absolute and relative increase in the region's ratio of working age population to total population. Of course, both working age and total population growth, in absolute terms, was much stronger in Canada than in Atlantic Canada.

The employment rate, defined as the proportion of the working age population with jobs, rose 5.6 points from 83.5 per cent of the national average in 1984 to 89.0 per cent in 2002 (Chart 5). For Canada, employment growth was somewhat faster than growth of the

working age population over the 1984-2002 period (with respective average annual growth rates of 1.7 per cent per year versus 1.3 per cent, a 0.4 percentage point difference). In contrast, in Atlantic Canada employment growth outpaced working age population growth by a wider margin of 0.8 percentage points (the respective average annual growth rates were 1.4 per cent per year versus 0.6 per cent), resulting in an increase in the region's ratio of employment to working age population in absolute terms and relative to the national average. Of course, both employment and working age population growth, in absolute terms, were stronger in Canada than in Atlantic Canada.

All Atlantic provinces experienced an improvement in their employment/total population ratio relative to the national average over the 1984-2002 period (Chart 3). The increase was largest in New Brunswick (12.8 percentage points), followed by Newfoundland (11.9 points), PEI (8.6 points), and Nova Scotia (4.6 points). The relative size of the working age population in the total population, relative to the national average, increased in all provinces, with Newfoundland enjoying a particularly large increase (from 94.3 per cent to 104.0 per cent of the national average). The employment rate, or proportion of the working age population with jobs, increased in all Atlantic provinces relative to the national average over the 1984-2002 period. The increase was particularly large in New Brunswick, up 9.6 percentage points from 82.2 per cent of the national average in 1984 to 91.9 per cent in 2002.

B. Trends in Output per Worker

In contrast to Atlantic Canada's improving relative employment/total population ratio, the region's relative productivity performance deteriorated over the 1984-2002 period. GDP per worker, as a proportion of the national average, fell 3.6 percentage points from 86.4 per cent in 1984 to 82.8 per cent in 2002, offsetting much of the gains in relative living standards accruing from the increased relative employment/total population ratio (Table 1).

Three of the four Atlantic provinces experienced a decline in their total economy productivity level relative to the national average over the 1984-2002 period (Chart 2). The largest decline was in New Brunswick, at 6.6 percentage points, followed by Nova Scotia (3.8 points) and Prince Edward Island (1.5 points from 71.9 to 70.3 per cent). The only exception was Newfoundland, which experienced a 1.8 per cent rise in its relative level of labour productivity. Newfoundland was also the Atlantic province with the highest level of output per worker in 2002, at 93.2 per cent of the national average. It was followed by New Brunswick (81.5 per cent) and Nova Scotia (80.7 per cent). Last by a wide margin was Prince Edward Island (70.3 per cent).

C. Output per Worker Levels by Industry

While the average output per worker in 2001 in Atlantic Canada was 80.8 per cent of the national average,¹ productivity relatives varied greatly by industry. Appendix Table 40B provides estimates of industry productivity relatives for 17 industries based on the North American Industry Classification System (NAICS). Three industries in Atlantic Canada had output per worker levels above the national average in 2001 – public administration (110.5 per cent of the national average), finance, insurance, real estate and renting (107.7 per cent), and information and cultural industries (101.3 per cent). The relative in manufacturing was 76.3 per cent, below the total economy relative.

The 5.5 percentage point relative decline in Atlantic Canada's aggregate output per worker level from 86.3 per cent of the national average in 1987 to 80.8 per cent in 2001 is largely accounted for by relative declines in four sectors (Appendix Table 40D) – retail trade (34.0 per cent), agriculture, forestry, fishing and hunting (23.6 per cent), construction (14.6 per cent), and health care and social assistance (10.6 per cent).

Atlantic Canada's relative output per worker level in manufacturing fell 2.1 percentage points from 78.4 per cent to 76.3 per cent of the national average between 1987 and 2001. This relatively small decline, combined with the small employment share of manufacturing in total employment (11 per cent) meant that manufacturing contributed only 4.1 per cent to the relative productivity decline.

While the manufacturing sector was responsible for little of the decline in Atlantic Canada's aggregate productivity level relative to the national average between 1987 and 2001, the closing of the gap between the level of output per worker in manufacturing in Atlantic Canada and the national average would still continue significantly to improve the region's aggregate labour productivity level. For example, if the gap had gone from 21.6 points in 1987 (78.4 per cent of the national level) to zero by 2001, overall output per worker *ceteris paribus*, would have improved 2.4 percentage points from 86.3 per cent to 88.7 per cent of the national average, potentially eliminating 18 per cent of the aggregate labour productivity gap.

¹ Because average weekly hours in Atlantic Canada were above the national average, output per hour in Atlantic Canada, at 79.4 per cent of the national average, was less than output per worker (see Appendix Table 34B).

III Characteristics of Manufacturing in the Atlantic Provinces

This section of the report provides an overview of the characteristics of the manufacturing sector in Atlantic Canada and compares the characteristics to the national average. It looks at output, employment, hours worked, and the size distribution of employment.

A. Output

1) Relative importance of manufacturing output in the total economy

The role of manufacturing in the Atlantic Canada economy is considerably less important than at the national level. In 2002, manufacturing accounted for 10.8 per cent of real value added or Gross Domestic Product in Atlantic Canada, compared to 16.9 per cent in Canada (Table 3 and Chart 11).

Within Atlantic Canada, there are also considerable differences in the relative importance of manufacturing output, ranging in 2002 from a high of 14.8 per cent in New Brunswick, to a low of 5.7 per cent in Newfoundland, with Nova Scotia at 10.4 and Prince Edward Island at 10.2 (Chart 12).

Over the 1984-2002 period for which national accounts data are available on real output data by province and by industry, the movement in the relative importance of manufacturing output in Atlantic Canada followed the national trend (Chart 11). Over the total period, there was little change in the manufacturing sector's share of total output. However, within the period, after stability in the second half of the 1980s, there was a fall in the relative importance of manufacturing output in total output in the early 1990s due to the recession, which hits the cyclically sensitive manufacturing sector harder than other sectors. The manufacturing share of output rose in both Canada and Atlantic Canada in the mid and late 1990s as the manufacturing sector recovered, then fell in 2001 with the economic slowdown of that year.

Despite the overall similarity of trends in the share of manufacturing output in total economy output for Atlantic Canada and Canada, trends at the provincial level were not similar (Chart 12). In Newfoundland, the share has been on a more or less continual decline since 1989. In contrast, in PEI the share has experienced a continuous increase since 1984. In Nova Scotia, the share fell steadily in the second half of the 1980s, but has increased in the 1990s. In New Brunswick, the share has also risen in the 1990s.

2) Manufacturing output growth

Over the 1984-2002 period for which real output data by province and by industry are available, real output in manufacturing grew at a slower rate in Atlantic Canada than at the national average: 2.3 per cent per year versus 2.7 per cent (Table 3, Charts 60 and 64). But there was great divergence in manufacturing output growth within Atlantic Canada,

with the growth rate in two provinces greatly exceeding the national average and in the other two provinces being well below average. Prince Edward Island's manufacturing sector enjoyed a very rapid average annual growth rate of 7.9 per cent between 1984 and 2002, while that in New Brunswick advanced at an above average 3.3 per cent.² In contrast, manufacturing output grew at only a 1.9 per cent rate in Nova Scotia, while it fell at a 0.5 per cent rate in Newfoundland.

3) Atlantic Canada's share of national manufacturing output

Given the slower growth in manufacturing output in Atlantic Canada relative to the national average, the region's share of the national total fell from 3.9 per cent in 1984 to 3.6 per cent in 2002, with all of the decline taking place in the 1990s (Table 3, Chart 6). Given the above average manufacturing output growth over the 1984-2002 period in Prince Edward Island and New Brunswick, the shares of these two provinces in the national total increased in relative importance, the former from 0.08 per cent to 0.18 per cent and the latter from 1.44 per cent to 1.60 per cent (Table 3, Charts 8 and 10). With below average manufacturing output growth in Newfoundland and Nova Scotia, the output shares of these two provinces fell between 1984 and 2002, from 0.78 per cent to 0.44 per cent in the case of Newfoundland and from 1.61 per cent to 1.38 per cent in the case of Nova Scotia (Table 3, Charts 7 and 9).

4) Distribution of manufacturing output by industry

The distribution of manufacturing output by industry in Atlantic Canada differs significantly from the national average, with resource-related manufacturing industries of much greater importance. Unfortunately, data based on the new North American Industry Classification System (NAICS) provides much less industry detail than the old Standard Industrial Classification (SIC), which was phased out in the late 1990s. This development appears to reflect changes in Statistics Canada confidentiality requirements. According to SIC estimates for 1998 (Appendix Table 16A), the four largest two-digit industries in Atlantic Canada (proportion of total output in brackets) were food industries (25.6 per cent), wood (8.0 per cent), paper (7.5 per cent), and transportation equipment (8.0 per cent). The first three of these sectors were much more important in Atlantic Canada than at the national level, accounting for 41.1 per cent of total manufacturing output versus 20.5 per cent at the national level. Transportation equipment, on the other hand, was less than half as important in Atlantic Canada as at the national level (7.99 per cent compared to 17.7 per cent).

Output data at the two-digit level based on NAICS are only available for a very small number of manufacturing industries for Atlantic Canada, and slightly more at the national level. Table 3A shows that the food industry, which included fish processing, accounted for 24.0 per cent of manufacturing output in Atlantic Canada in 2002, compared to 10.0 per cent in Canada. The food industry appears to be the important manufacturing

² Manufacturing output growth was very rapid between 1984 and 1987 in New Brunswick, up 37.4 per cent. Consequently, output growth was considerably slower in the 1987-2002 period (Table 3) than in the 1984-2002 period (1.8 per cent per year compared to 3.3 per cent).

industry in Prince Edward Island (63.3 per cent of output), Newfoundland (38.7 per cent), and Nova Scotia (21.4 per cent). SIC output data for 1998 (Appendix Table 16A) confirms the dominant role of the food industry in these three provinces. In New Brunswick the largest manufacturing industry in terms of output was paper manufacturing (28.3 per cent), with the food second at 18.5 per cent.

B. Employment

1) Manufacturing employment share in the total economy

Like the share of manufacturing output in total economy output, the share of manufacturing employment in total employment is less than the national average in Atlantic Canada. In 2002, manufacturing employment only represented 10.3 per cent of total employment, compared to 15.1 per cent at the national level.

Unlike the share of manufacturing output in total economy output, the share of manufacturing employment in total employment has trended downward over the last 15 years, with most of the decline taking place in the first half of the 1990s when manufacturing employment fell because of the recession (Chart 18). This development occurred in both Atlantic Canada and Canada, showing that the former tracks the national trend in manufacturing employment. There was a rise in the second half of the 1990s.

There are significant differences within Atlantic Canada in terms of the relative importance of manufacturing employment. In Newfoundland, manufacturing employment in 2002 represented only 8.0 per cent of total employment (Table 4, Chart 19), in Prince Edward Island 9.4 per cent, in Nova Scotia 10.7 per cent, and in New Brunswick 11.4 per cent. The manufacturing employment share has been on a downward trend in all provinces except Prince Edward Island. Newfoundland in particular has experienced a large decline of 2.7 percentage points over the 1987-2002 period.

2) Manufacturing employment growth

The pattern of manufacturing employment growth over the 1987-2002 period was similar to that of output. Overall, Atlantic Canada manufacturing productivity growth trailed growth at the national level: 0.2 per cent per year versus 0.9 per cent (Table 4, Chart 63). Prince Edward Island, with manufacturing employment growth at a strong 3.3 per cent per year, lead the Atlantic provinces, followed by New Brunswick (0.4 per cent), Nova Scotia (0.3 per cent), and Newfoundland (-1.1 per cent).

3) Manufacturing employment as a share of national manufacturing employment

Given the slower employment growth in Atlantic Canada relative to the national average, the region's share of national manufacturing employment fell from 5.2 per cent in 1987 to 4.7 per cent in 2002 (Chart 13). All Atlantic provinces except Prince Edward Island experienced declines in their share of Canadian manufacturing employment over the 1987-

2002 period, with the PEI share rising from 0.19 per cent to 0.27 per cent (see Charts 14-17).

4) Employment distribution by two-digit manufacturing sector

Employment in manufacturing in Atlantic Canada, like output, is largely concentrated in resource-related industries. Unfortunately, as is the case for output, the new NAICS data provide a very limited breakdown of employment by industry below the total manufacturing level (Table 4A). One needs to examine the older SIC data to obtain employment by detailed industry. In 1998, the last year for which SIC data are available, out of a total of 105.2 thousand workers in manufacturing in Atlantic Canada (Appendix Table 28A), 31.3 per cent were in food processing, 12.8 per cent in paper products, and 12.3 per cent in wood products. Thus 56.3 per cent of the manufacturing workforce was employed in these three industries in Atlantic Canada, compared to 23.8 per cent at the national level.

Since 1984 the major change in the employment structure in manufacturing in Atlantic Canada has been the growing importance of wood industries (up to 11.0 per cent of manufacturing employment in 2002 from 8.9 per cent in 1987) and decline in food processing (down to 32.8 per cent from 35.6 per cent). The relative importance of employment in transportation equipment also increased from 6.7 per cent (1987) to 7.3 per cent (2002).

As Table 4A shows, while all Atlantic provinces have an industrial structure more oriented to natural resources than the national average, there are important differences among provinces. Nova Scotia has the least natural resource-oriented manufacturing sector among the Atlantic provinces, with relatively more employment in transportation equipment and rubber products industries than the other Atlantic provinces and relatively less employment in food industries. Manufacturing in New Brunswick is oriented toward wood and pulp and paper, with one third of employment in these industries. Manufacturing in Newfoundland is dominated by food processing (54.1 per cent of total employment), primarily fish plants, and paper (9.9 per cent). Prince Edward Island has the second largest (but almost the same as Newfoundland's) share of its manufacturing employment in food processing (54.0 per cent).

C. Total and Average Hours Worked

Average weekly hours in manufacturing are in general slightly longer than at the total economy level due to proportionately fewer part-time workers and more standard 40 hour work weeks. In Canada, average weekly hours in manufacturing were 37.2 in 2002, up from 36.3 in 1987, a rate of growth of 0.15 per cent per year (Table 5).

Average weekly hours for workers in manufacturing in Atlantic Canada were slightly higher than the national average in 2002 at 37.8 and grew at a slightly faster pace over the 1987-2002 period (0.3 per cent) The increase in average weekly hours means that

total hours worked in manufacturing increased at a 0.3 per cent per year faster pace than employment in the 1990s (Charts 20-26). The implication of this development is that hours-based productivity measures will show 0.3 per cent slower growth than persons employed-based productivity estimates. This is a relatively small difference so the distinction between trends in output per hour and output per worker in manufacturing in Atlantic Canada, as in Canada in the 1990s is not of great importance.

D. Capital Stock

The capital stock is a key component of the production process. In general, capital stock growth has been slower in Atlantic Canada than in Canada in the past decade and one-half (Table 6). At the total economy level, the capital stock, defined on a net basis using a geometric depreciation assumption, advanced at only a 2.12 per cent average annual rate over the 1984-2001 period in Atlantic Canada, compared to 2.64 per cent in Canada (Appendix Tables 50 and 51).

For manufacturing, the pattern was similar, with the capital stock in Atlantic Canada increasing at 1.30 per cent per year, compared to 2.28 per cent for the whole country (Chart 59). Given relative growth rates, Atlantic Canada's share of Canada's total economy and manufacturing capital stock has fallen over the last 15 years (Table 6 and Chart 41). This trend is also true for all Atlantic provinces except PEI (Charts 42-45).

The relative importance of the manufacturing capital stock in the total capital stock has been relatively stable between 1984 and 2001 at the national and Atlantic Canada levels (Chart 46), although there was large variation within the period. The share increased significantly in PEI, but was relatively stable in the other Atlantic provinces (Chart 47).

Unfortunately, capital stock data for Atlantic Canada are unavailable at the three digit NAICS level due to confidentiality regulations.

E. Size Distribution and Average Size of Firms and Establishments

It is often said that small and medium sized businesses are relatively more important in Atlantic Canada than at the national level. This observation is supported by the data on the relative distribution of establishments in manufacturing by employment range size. In 1999, out of 1,635 manufacturing establishments in Atlantic Canada, 75.2 per cent had less than 50 employees, compared to 72.7 per cent at the national level (Appendix Table 55). The proportion of establishments with 200 employees or more in Atlantic Canada was almost identical to the national level (6.1 per cent versus 6.0 per cent) so there were relatively less medium-sized establishments (50-200 employees) in Atlantic Canada than in Canada. In PEI, Newfoundland, and Nova Scotia, over 76 per cent of establishments had less than 50 employees. Only in New Brunswick was the proportion of establishments with less than 50 employees at the national average.

In Atlantic Canada in 1999 there were 98 manufacturing establishments with 200 or more employees (Appendix Table 56). The provincial distribution was the following: Nova Scotia (39), New Brunswick (40), Newfoundland (16), PEI (3). The five industries with the largest number of large establishments were food (35), paper and paper manufacturing (18), transportation equipment (7) as well as fabricated metal products (7), and wood products (12) (Appendix Table 56). All other industries each had less than four establishments with 200 or more employees.

Evidence of the size disadvantage of manufacturing in Atlantic Canada across a number of variables is provided in Table 2. The number of total employees per establishment in 1999 in Atlantic Canada was 89.4 per cent of the national average (Charts 52, 53 and 56), the value of shipments per establishment was 72.2 per cent, and the value added per establishment was 64.4 per cent (Charts 50-52). Appendix Table 6B shows that there has been a downward trend in the relative values of these variables.

There are also significant size variations in manufacturing operations within Atlantic Canada, with Newfoundland and PEI having in general smaller establishments.

IV Manufacturing Productivity in the Atlantic Provinces

A. Labour Productivity

1) Manufacturing output per worker levels and growth rates

Appendix Tables 40 to 45 provide data on real value added per worker in the total economy, manufacturing, and in the three-digit manufacturing industries for which data are available for Canada, Atlantic Canada, and the four Atlantic provinces for the 1987-2001 period. Appendix Tables 41A to 45A provide data on real value added per worker as a percentage of the national average for Atlantic Canada and the Atlantic provinces.

In 2002, real value added per worker in manufacturing in Atlantic Canada was \$54,597 (\$1997), or 77.0 per cent of Canadian average (Table 7). This was below the total economy output per worker productivity relative of 82.8 per cent. Out of the 17 two-digit NAICS industries, manufacturing ranked 12th in terms of output per worker (Appendix Table 40B).

Relative output per worker in manufacturing in Atlantic Canada has shown no trend. At 77.0 per cent of the national average in 2002, it was down from 78.4 per cent in 1987, but up from 76.3 per cent in 2001 and from the long-run average of 74.0 per cent over the 1987-2001 period (Table 7, Charts 27-31).

Because total economy labour productivity has been declining in Atlantic Canada over the 1987-2002 period relative to the national average (from 86 per cent in 1987 to 82.8

per cent in 2002 as shown in Table 1), the productivity of the Atlantic Canada manufacturing sector relative to the total economy has risen, from 93.9 per cent in 1987 to 104.2 per cent in 2002 (Charts 32-33).

In addition to data on real value added per worker from the national accounts, a second source of data on relative productivity levels, albeit in nominal terms, is Statistics Canada's publication *Manufacturing Industries in Canada*. This publication is based on a large annual survey of Canadian manufacturers. According to this source, the total activity value added per employee in manufacturing, expressed in current dollars, in Atlantic Canada in 1999 (the last year for which data were available at the time this report was prepared) was 72.0 per cent of the national average (Appendix Table 6B), very close to the relative productivity ratio of value added to employed workers, expressed in 1997 constant dollars, of 72.8.

The growth rate of output per worker in manufacturing over the 1987-2002 period at 1.6 per cent per year was slightly below the national growth rate (1.7 per cent), explaining the fall in the region's relative productivity level.

2) Manufacturing output per worker levels by province

Within Atlantic Canada, in 2002, real value added per worker in manufacturing ranged from a high of \$66,909 (\$1997) in New Brunswick to a low of \$42,093 in Newfoundland, with PEI and Nova Scotia having levels of \$48,206 and \$49,564 respectively. Consequently, manufacturing productivity in New Brunswick is much closer the national average (94.4 per cent in 2002) than in the other Atlantic provinces: Newfoundland (59.4 per cent), Prince Edward Island (68.0 per cent), and Nova Scotia (69.9 per cent) (Table 7, Charts 27-31).

Over the 1987-2002 period, there has been a downward trend in relative manufacturing labour productivity in Newfoundland, an upward trend in Prince Edward Island, with little or no trend in Nova Scotia and New Brunswick. These developments of course reflected relative productivity growth rates. Prince Edward Island recorded the fastest output per worker growth rate over the 1987-2002 period at 4.0 per cent, followed by Nova Scotia (2.0 per cent) and New Brunswick (1.4 per cent), with Newfoundland well behind (0.3 per cent) (Chart 61).

Data from the Survey of Manufacturers tells a somewhat different story of manufacturing productivity levels by province relative to the national average (Appendix Tables 2B-5B). In 1999, New Brunswick still had the highest relative productivity level of the four Atlantic provinces, but at 75.5 per cent of the national it was well below the 88.9 per cent recorded in the national accounts output data. The three other Atlantic provinces all had productivity relatives higher than found in the national accounts estimates.

3) Manufacturing output per worker levels at the three-digit NAICS level

The problem of low manufacturing productivity in Atlantic Canada relative to the national average affects all manufacturing industries. For example, for the SIC data which end in 1998 (NAICS data to 2001 provide much less industry detail) no manufacturing industry at the two-digit level in the region had output per worker levels equal to the national average. For the 10 industries for which data are available (Appendix Table 40A), the best performance relative to the national average was in wood (86.1 per cent), followed by fabricated metal products (84.0 per cent). Relative productivity levels in all other industries were below Atlantic Canada's overall average of 75.2 per cent of the national average productivity level in manufacturing: non-metallic mineral products (72.8 per cent), transportation equipment (57.0 per cent), food (56.9 per cent), beverage (55.5 per cent), plastic products (52.5 per cent), paper and allied products (49.3 per cent), and chemical products (27.7 per cent).

4) Output per hour levels and growth rates

Differences between relative output per hour and output per worker productivity levels for Atlantic Canada, as a proportion of the national average, are small. In 2002, the former was 75.6 per cent (Table 8), the latter 77.0 per cent reflecting 1.6 per cent higher average weekly hours in Atlantic Canada than in Canada (37.8 versus 37.2 per cent) (Table 5, Charts 34-38).

Output per hour is a superior productivity measure over output per worker because it controls for changes in average weekly hours. It should be noted however that since there have been no major changes in average weekly hours over the past 15 years, the two productivity measures tell basically the same story (Compare Charts 27-33 and Charts 34-40).

Over the 1987-2002 period, output per hour in manufacturing advanced at a 1.3 per cent average annual rate in Atlantic Canada compared to 1.5 per cent at the national level. As was the case for output per worker growth, Prince Edward Island recorded the strongest growth at 3.5 per cent per year, followed by Nova Scotia (1.9 per cent) and New Brunswick (1.1 per cent). Newfoundland experienced negative growth over the 1987-2002 period (-0.2 per cent) (Chart 62).

B. Capital Productivity

Capital productivity is defined as the amount of output produced, measured as value added in constant 1997 dollars, per unit of capital input, measured as thousands of constant 1997 dollars of the net capital stock.

In 2001, for every 1000 dollars of capital stock, the manufacturing sector in Atlantic Canada produced value added of \$433 (Table 9). This compares with an amount of \$792 of value added for Canadian manufacturing, meaning capital productivity in manufacturing in

Atlantic Canada in 2001 was only 54.7 per cent of the national average. The concentration of Atlantic Canada manufacturing in capital-intensive resource industries may account for this low capital productivity, as capital-intensive industries tend to have low levels of capital productivity and high levels of labour productivity.

Over the 1987-2001 period, capital productivity advanced at a slightly faster pace in Atlantic Canada than at the national average (0.9 per cent versus 0.6 per cent), improving the region's relative level from 52.4 per cent in 1987.

In three of the four Atlantic provinces in 2001, the relative manufacturing capital productivity level was well below the national average: Newfoundland (48.2 per cent of the national average), Nova Scotia (56.2 per cent), and New Brunswick (52.6 per cent). In contrast, Prince Edward Island had a level of capital productivity in manufacturing above the national average (113.0 per cent).

C. Total Factor Productivity

Total factor productivity (TFP) growth is defined as the growth rate of output minus the growth rate on an index of inputs (capital and labour) where the weights of the inputs are their income shares. It is calculated from indexes of output, labour input (hours) and capital stock and income shares of value added.

TFP growth in manufacturing in Atlantic Canada over the 1987-2001 period advanced at a 0.8 per cent average annual rate, slightly below the national average of 1.1 per cent (Table 10). TFP growth was fastest in Prince Edward Island at 2.1 per cent, followed by Nova Scotia (1.4 per cent), New Brunswick (0.3 per cent), and Newfoundland (0.1 per cent) (Charts 48-49 and 57).

The relative TFP level can be calculated as the weighted average of the relative levels of labour and capital productivity. For example, in 1987 the level of labour productivity (output per hour) in manufacturing in Atlantic Canada was 78.4 per cent of the national average and the level of capital productivity 52.4 per cent. As about one half of value added accrued to labour and one half to capital, the factors shares were both roughly 0.5, the relative level of TFP was 67.9 per cent. TFP growth rates for the 1987-2001 period can then be applied to this relative level to obtain estimates for other years (Table 11).

In 2001, the relative TFP level of the Atlantic Canada manufacturing sector was 65.0 per cent of the national average, and had fallen at a 0.3 per cent average annual rate per year from 67.9 per cent in 1987. The level of TFP was highest in Prince Edward Island (88.1 per cent of the national level due to high capital productivity) and lowest in Newfoundland (56.1 per cent) with New Brunswick (70.9 per cent) and Nova Scotia (62.5 per cent) between the two.

V Explanations of the Atlantic Canada-Canada Manufacturing Productivity Gap

The above analysis has shown that labour, capital, and total factor productivity growth rates in manufacturing in Atlantic Canada over the 1987-2002 period were more or less comparable to the national average. From this growth-rate perspective, the Atlantic Canada manufacturing sector does not have a productivity problem. But labour, capital, and total factor productivity levels in manufacturing in Atlantic Canada are well below the national average.

Atlantic Canada's productivity challenge in the manufacturing sector (and in most other sectors as well) is thus to attain national productivity levels. To meet this challenge, the causes of the manufacturing productivity gap between Canada and Atlantic Canada must be identified. This section of the report makes an initial stab in this direction.

A. Industrial Structure and Intersectoral Shifts

A region's industrial structure can affect its relative productivity level. If the region has a disproportionate share of output and employment in low productivity level sectors, its overall productivity level will be lower than a region with a smaller share of the low-productivity activity even if the industry-specific productivity levels are the same. For example, historically one reason for lower labour productivity levels in Quebec manufacturing relative to that in Ontario has been the orientation of Quebec's manufacturing structure toward the low-productivity textile and clothing sectors and the concentration of high-productivity steel and auto sector jobs in Ontario.

Unfortunately, because complete information on employment and output at the detailed industry level are unavailable because of confidentiality reasons for the individual Atlantic provinces and the Atlantic provinces aggregate, it is difficult to calculate what the manufacturing labour productivity level would be in Atlantic Canada if it had the same employment and output structure as the national average.

However, it appears that at the two-digit SIC level, the employment and output structure of manufacturing in Atlantic Canada cannot account for the region's lower level of labour productivity relative to the national average. Manufacturing employment and output in Atlantic Canada is disproportionately concentrated in three sectors: food products, wood and paper and allied products. Yet at the national level, only one of these three manufacturing industries (wood) has a labour productivity level well below the average for manufacturing, with the other two either slightly below the average (paper) or above the average (food products). In all three industries, the relative output per hour level in Atlantic Canada's was below the national average and in two industries very much below – food (56.0 per cent) and paper (48.4 per cent) (Appendix Table 34A).

A calculation based on incomplete employment data (Appendix Table 28A) can be used to determine what the national average output per worker would be if Atlantic

Canada's manufacturing employment structure applied at the national level. This calculation reveals that Canada's level of output per worker in manufacturing would be 0.2 per cent higher with the Atlantic Canada employment structure. Thus it is fair to conclude that at least at the two-digit SIC level, Atlantic Canada's resource-oriented employment structure cannot account for lower productivity levels in manufacturing. The Canada-Atlantic Canada manufacturing productivity gap reflects differences in industry-specific productivity levels.

B. Capital Intensity of Production

As a general rule, the greater the amount of capital a worker has to work with, or the capital intensity of production, the greater the quantity of output he or she is able to produce. The capital intensity of production is measured with the capital-labour ratio, the value of the net capital stock, expressed in constant 1997 dollars, per person employed or per hour worked.

In 2001, each hour worked in manufacturing in Atlantic Canada, on average, had associated with it capital stock valued at \$63.2 (1997 dollars) (Table 12). The national average for manufacturing was only \$46.2 so the capital intensity of production in manufacturing in the region was 136.9 per cent of the national average. In all years over the 1987-2001 period, manufacturing in Atlantic Canada was more capital intensive than the national average.

Capital-labour ratio growth was slightly slower in Atlantic Canada than at the national average over the 1987-2001 period: 1.0 per cent per year versus 1.1 per cent (Chart 58). Consequently, in 1987, the relative capital-labour ratio of Atlantic Canada's manufacturing sector was even higher: 137.9 per cent.

Three of the four Atlantic provinces in 2001 had capital-labour ratios in manufacturing above the national average, from 171.3 per cent in New Brunswick, to 130.3 per cent in Newfoundland and 121.4 per cent in Nova Scotia. In contrast, Prince Edward Island had a capital-labour ratio in manufacturing at only 51.5 per cent of the national average.

Resource-based manufacturing industries tend to be more capital intensive than non-resource-based manufacturing industries. Atlantic Canada's above-average capital intensity in manufacturing may be explained by the concentration of employment in resource-based industries. Unfortunately, capital stock data at the industry level are not available for the Atlantic provinces so it is not possible to compare capital intensity between Canada and Atlantic Canada at this level of detail.

Given that manufacturing in Atlantic Canada is more, not less, capital intensive than the national average, low levels of capital intensity appear not to explain the lower productivity levels relative to the national average.

C. Quality of Human Resources

The greater the educational and skills level of the labour force, the greater the productivity levels and growth rates. There is some evidence that this may be a factor in explaining lower productivity levels in Atlantic Canada as average educational attainment in Atlantic Canada is below the national average.

The Centre for the Study of Living Standards has obtained from Statistics Canada's Labour Force Survey a special run on the educational attainment of employed persons in manufacturing in Atlantic Canada (Table 13). The average number of years of schooling for workers in manufacturing in 2001 in Atlantic Canada was 12.6, 97.6 per cent of the national average. Between 1984 and 2001 average educational attainment advanced at a 0.81 per cent average annual pace in Atlantic Canada, compared to 0.65 per cent in Canada, resulting in an improvement in the region's relative position from 94.9 per cent of the national average in 1984.

There was significant variation in educational attainment in manufacturing with Atlantic Canada. Nova Scotia had the most educated manufacturing workforce in 2001 at 99.3 per cent of the national average, followed by Prince Edward Island (97.8 per cent), New Brunswick (97.0 per cent), and finally Newfoundland (94.9 per cent).

Another source of data on educational attainment is the census. Using the 1996 census micro-data tapes, the Centre for the Study of Living Standards has calculated the distribution of the labour force in manufacturing for 10 educational categories, which are in turn aggregated into three major categories. As was the case in the LFS data, the manufacturing labour force in Atlantic Canada had lower average educational attainment than the rest of the country. In 1996, 62.5 per cent of the manufacturing labour force in Atlantic Canada was in the bottom category, compared to 59.0 per cent in the rest of Canada, while 5.9 per cent was in the top category, compared to 10.1 per cent in the rest of Canada. All the Atlantic provinces conformed to this general pattern for both the bottom and top educational categories except Nova Scotia which had a smaller proportion of poorly educated than the national average.

The low educational attainment of workers in manufacturing in Atlantic Canada relative to the national average may account for some of the Canada-Atlantic Canada manufacturing productivity gap. However, since low educational attainment in this sector is relatively no worse than the overall economy, this variable cannot account for the greater gap in this sector compared to the gap for the total economy.

D. Innovation

Productivity in the long run is determined by technical change and innovation. One measure of a region's ability to innovate and develop new products and processes is the resources it devotes to research and development (R&D). In this regard, Atlantic Canada is lagging. In 2000, the last year for which information is available, Atlantic Canada

accounted for only 3.2 per cent of Canada's general domestic expenditure on R&D, well below its population, employment and output shares (Appendix Table 66).

The proportion of R&D performer by the business enterprise sector, which it can be argued is more relevant for manufacturing productivity than total R&D, was even smaller, a mere 1.1 per cent of the national total (Table 14). This represented 0.20 per cent of GDP compared to 1.01 per cent at the national level. In other words, the R&D-intensity of business enterprises in Atlantic Canada was only 18.2 per cent of the national average.

Over the 1984-2000 period, the growth rate of nominal business enterprise R&D expenditures in Atlantic Canada was 8.0 per cent per year, compared to 8.7 per cent for Canada. In addition to Atlantic Canada's traditionally low R&D share, the region appears to be falling further behind the rest of the country in the technological race, as least as proxied by R&D trends.

Within Atlantic Canada, there are also significant differences in the R&D intensity of business enterprises. Nova Scotia is the most R&D-intensive of the Atlantic provinces, at 24.6 per cent of the national average, followed by New Brunswick (15.3 per cent), Prince Edward Island (13.7 per cent), and Newfoundland (12.2 per cent).

Surveys of technology use in manufacturing conducted by Statistics Canada also show that Atlantic Canada is lagging in the use of modern technologies (ACOA, 1999). For example, in 1993, the proportion of manufacturing establishments that used no technologies was 74.2 per cent in the region compared to the national average of 65.1 per cent. Concerning the functional use of technology, Atlantic Canadian manufacturing establishments in 1993 had below average use in the following areas: design and engineering, fabrication and assembly, automated material handling, inspection and communications, manufacturing information systems, and integration and control.

The technological revolution is concentrated in two manufacturing sectors – machinery and electrical and electronic products. Unfortunately, Atlantic Canada is very deficient in these sectors. In 1998, only 3.0 per cent of manufacturing employment in the region was in these high-tech sectors, compared to 10.9 per cent for Canada (Appendix Table 28A).

Moreover, the region's machinery sector experienced a large fall in output (Appendix Table 17A) in the 1990s (output data for the electrical and electronic sector are not available). The employment picture in these two key sectors in the 1990s also shows under-performance relative to the national average. The machinery industry saw a 1.5 per cent per year decline in employment over the 1989-98 period, compared to an increase of 0.5 per cent at the national level. The comparable figures for employment growth in the electric and electronic sector were -2.4 per cent and -1.0 per cent. Atlantic Canada is not a haven for the dynamic high-tech manufacturing sector. This constrains productivity growth as these two sectors have the fastest productivity growth rates.

E. Other factors

1) Limited economies of scale and scope from the small size of operations

It was noted earlier that the average size of manufacturing establishments was much lower in Atlantic Canada than in the rest of the country, with average shipments per establishment 72.2 per cent of the national average and average value added per establishment only 64.4 per cent in 1999 (Charts 54 and 55). This structural feature of the region's manufacturing sector may account for a significant part of the Canada-Atlantic Canada manufacturing productivity gap because of the fewer economies of scale and scope in Atlantic Canada. In manufacturing, larger establishments can obtain reduced costs (and higher productivity) through longer production runs and better spreading of overhead costs.

Two strands of evidence support this hypothesis. First, it is generally recognized that economies of scale tend to be more important in manufacturing than in other sectors. This may explain why the Atlantic Canada-Canada productivity gap is significantly greater in manufacturing than in the vast majority of other sectors. Second, plant size is smaller in Newfoundland and PEI than in Nova Scotia and New Brunswick and it is in these first two provinces that the manufacturing productivity gap is greatest.

2) Seasonality

Operations in resource-based manufacturing sectors such as food and fish processing and sawmills tend to be seasonal. Given that resource-based sectors dominate manufacturing in Atlantic Canada, this greater seasonality of operations may have negative implications for productivity.

Labour is a variable input representing a flow of services and in theory it can be adjusted to correspond to actual labour requirements. Thus seasonality of operations should in principle have no effect on labour productivity, although if there are barriers to adjustment or lags in the adjustment process there may be some productivity effects.

On the other hand, the capital stock is a stock or fixed input and cannot be adjusted to the ebb and flow of seasonal capital services requirements. This means that buildings and machinery in resource-based manufacturing industries will sit unused during seasonal downtime, with a negative effect on capital productivity. This factor may explain part of the very low relative level of capital productivity in manufacturing in Atlantic Canada, 54.7 per cent of the national average in 2002.

3) Additional factors

Manufacturing productivity can be affected by such factors as taxes, public infrastructure, and entrepreneurship. These factors do not appear to account for the Canada-Atlantic Canada manufacturing productivity gap. Corporate tax rates in Atlantic Canada are competitive to those in other Canadian jurisdictions. Indeed, once subsidy programs to

attract industry to Atlantic Canada are factored in, the net effective tax rate may be lower in the region.

Atlantic Canada's public infrastructure (airports, roads, water) is not appreciably worse than the national average, although the lack of a complete four-lane divided highway linking New Brunswick with Quebec may increase trucking costs. In any case, it appears unlikely that any differences in infrastructure quality that do exist could account for a 25 per cent manufacturing productivity gap.

A supply of entrepreneurs willing to take risks is needed for a dynamic economy. But Atlantic Canada has proportionately as many persons acting as entrepreneurs as the national average so a lack of entrepreneurship does not appear to be impeding productivity performance. According to the ACOA report *The State of Small Business and Entrepreneurship in Atlantic Canada, 1998*, the business entry rate in Atlantic Canada in the 1990s exceeded the national average (19.4 per cent versus 14.9 per cent for the 1990-95 period).

VI Regression Analysis

This section of the paper provides an exploratory analysis of trends in the Canada-Atlantic Canada manufacturing productivity gap over time through regression analysis. Regression analysis requires consistent data series for a sufficiently long time period. The proposed model and data sources are briefly described below and are followed by the regression results.

A. The Model

The major determinants of the Canada-Atlantic Canada productivity gap in manufacturing identified thus far are the gaps between Canada and Atlantic Canada in the following variables: educational attainment; capital intensity, as measured by the capital-labour ratio; the intensity of R&D activity and innovation; and economies of scale in production. To account for differences in the business cycle between the Atlantic Canada region and Canada as a whole it is also necessary to include in a regression model a cyclical variable, namely the gap in the manufacturing unemployment rate between Canada and Atlantic Canada. The regression model can be written formally as

$$(1)(\text{PROD}_A / \text{PROD}_C) = \beta_1 + \beta_2(\text{EDU}_A / \text{EDU}_C) + \beta_3(\text{CAP}_A / \text{CAP}_C) + \beta_4(\text{INN}_A / \text{INN}_C) + \beta_5(\text{EMP}_A / \text{EMP}_C) + \beta_6(\text{UR}_A / \text{UR}_C)$$

where a subscript C indicates that the variable is for Canada and a subscript A indicates that the variable is for Atlantic Canada or an Atlantic Canadian province. PROD refers to productivity, as measured by output per hour, in manufacturing; EDU is educational attainment, as measured by average years of schooling per employed person in

manufacturing; CAP is the value of capital per hour worked in manufacturing (the capital-labour ratio); INN is the proportion of GDP spent on R&D by all funders to be performed by the business enterprise sector; EMP is the average number of employees per manufacturing establishment, a proxy for economies of scale; and UR is the unemployment rate in manufacturing, included as discussed above to account for differences in production cycles across regions.

The β s are the parameters to be estimated, and measure the magnitude with which changes in the individual determinants of the productivity gap change the productivity gap itself. It is expected that each of these parameters will have a positive sign so that, for example, as the gap between Canada's and Atlantic Canada's educational attainment decreases so too should the gap between their respective levels of output per hour in manufacturing.

It should be mentioned that all the variables are for the manufacturing sector with the exception of R&D intensity, which is not available by industry for a sufficiently long time period nor by industry and province for that matter. However, the majority of business sector enterprises undertaking R&D are probably doing so within the manufacturing industry, at least to the extent that the manufacturing industry largely determines the trend of R&D undertaken by business enterprises. In this sense, the total business enterprise sector R&D investment intensity can be considered a reliable proxy for manufacturing R&D investment intensity.

This model omits two potentially important variables. The first is the seasonality of production, which is presently assumed constant across regions. This assumption may not accurately reflect reality, but the estimation biases caused by its omission are likely to be slight, especially because annual data are being used. Likewise, no variable has been included to account for differences in the industrial structure of the overall manufacturing sectors of Canada and Atlantic Canada. This omission is likely to cause few estimation biases for two reasons. First of all, as with seasonality, the variables already included in the model are expected to explain enough of the productivity gap that the inclusion of an industrial structure variable would not add significantly to the analysis and so would not affect any conclusions. Secondly, industrial structure is likely to be highly correlated with capital intensity, so that the inclusion of both variables in the model would present more severe estimation problems in the form of multicollinearity. Diagnostic tests for model specification errors will be undertaken to determine the degree of confidence with which it can be asserted that these omissions will not cause estimation biases.

Two approaches are used in the estimation. The first approach is to use time series data for one region, so that the regression will attempt to explain changes in the Canada-Atlantic Canada manufacturing productivity gap over time. Five equations are estimated, one for Atlantic Canada and one for each Atlantic province. The second approach is to use pooled data, that is, to pool the time series for each of the four Atlantic provinces. The regression would then simultaneously attempt to explain changes in the Canada-Newfoundland, Canada-PEI, Canada-Nova Scotia and Canada-New Brunswick productivity gaps over time. It is also possible to include data for other provinces in this type of

approach. Three equations are estimated with pooled data, one for the four Atlantic provinces, one for four Atlantic provinces with correction for autocorrelation, and one for the 10 Canadian provinces with corrections for autocorrelation. With the data described below it is possible to attempt each of these approaches.

B. The Data

Since we would like both the most recent data available and the longest time series possible, it is necessary to link in 1987 the SIC-based hours in manufacturing series to the NAICS-based hours in manufacturing series. This is achieved by allowing the NAICS series to grow between 1984 and 1987 by the same annual rates of change as the SIC series, thereby arriving a continuous series for the 1984-1999 period. Then, using the 1984-1999 real manufacturing GDP series, we can calculate relative labour productivity levels between Atlantic provinces and Canada. For the four Atlantic provinces, Canada and Atlantic Canada, these series are shown in Appendix Table 67, which shows the productivity gap between Canada and Atlantic Canada growing between 1984 and 1999, as the relative labour productivity level of the Atlantic provinces went from 78.0 per cent to 71.8 per cent of that of Canada. Atlantic Canada hence had a lower level of output per hour than Canada in 1984 (\$21.40 versus \$27.45, all in constant 1997 dollars) but also experienced slower growth in output per hour over the 1984-1999 period.

The data for average years of schooling are shown in Table 13 and Appendix Table 68. Although Atlantic Canada has had consistently lower years of schooling per person employed in manufacturing than Canada, educational attainment has grown more rapidly in Atlantic Canada so that the gap has actually narrowed over time. This holds true for all four Atlantic provinces individually, although the gaps have not continuously narrowed between 1984 and 1999.

For the capital-labour ratios it is again necessary to link SIC and NAICS series in order to arrive at consistent time series. Again, the link takes place in 1987, so that the NAICS series takes the growth of the SIC series only for 1984-1987. As shown in Table 12 and Appendix Table 69, Atlantic Canada as a whole and all the Atlantic provinces except PEI have a higher capital intensity in manufacturing than Canada. However, this gap has narrowed over the 1984 to 1999 period.

R&D intensity, economies of scale and the unemployment rate in manufacturing are shown in Appendix Tables 70, 71, and 72 respectively. Atlantic Canada has a much smaller R&D investment intensity than Canada, and this gap has not changed much between 1984 and 1999. Relative R&D intensity in Atlantic Canada was 18.7 per cent of the national average in 1984 and 18.6 per cent in 1999. A similar trend can be seen in the average number of employees per manufacturing establishment, with Atlantic Canada starting at 87.5 per cent of the national average in 1984, coming close to the national average in 1991 at 99.3 per cent before declining to 89.4 in 1999. The unemployment rate in manufacturing is consistently higher in the Atlantic provinces compared to Canada, but since this gap is included to allow for differences in cyclicalities, only its trend over time is of significance.

The unemployment rate gap has been rising significantly over the 1984-1999 period, going from 173.0 per cent of the national average to 231.0 per cent in 1999.

Productivity and capital intensity data are available only as far back as 1984, and R&D and economies of scale data are only available as recently as 1999. This leaves 16 years of data, and so 16 observations for the Canada-Atlantic Canada and individual province time series regressions, and 64 observations for the pooled regression of the four Canada-Atlantic provinces series. There are 160 observations for the equations with all ten provinces.

C. Results

Table 15 presents the results for all eight equations, which are discussed briefly below. Overall, the results are fairly disappointing, with few statistically significant estimates and some with an unexpected sign.

For the Canada-Atlantic Canada regression (equation 1) only the R&D coefficient estimate is statistically significant (at the 5 per cent level), but it has an unexpected negative sign. This implies that as R&D spending as a share of GDP in Atlantic provinces, relative to the national average, increases relative to the national average, labour productivity in Atlantic provinces goes down relative to the national average, a counter-intuitive result. Nonetheless, it is a result confirmed by the individual regressions for each of the Atlantic provinces except Newfoundland (equations 3-5). But the t-statistics associated with these regression coefficients indicate that none of them are statistically different from zero. The coefficient for relative educational attainment in equation 1 also has a negative sign, yet it is not statistically different from zero.

Other results from the Canada-Atlantic Canada regression are only a little more encouraging. The coefficients for the capital intensity, and economies of scale gaps are each of the expected sign, although they are not statistically significant. For example, if Atlantic Provinces saw their gap in economies of scale reduced by one percentage point, the labour productivity gap would only be reduced by 0.06 percentage points. The R-square value of 0.655 is also encouraging, implying that 66 per cent of the variation in the productivity gap is explained by variation in the independent variables included in the model.

For individual Atlantic provinces (equations 2-5), the capital intensity coefficient seems to be the most important since it is the only statistically significant coefficient in Newfoundland, Prince Edward Island and New Brunswick. It also has the expected positive sign. In Newfoundland for example, a 0.41 percentage point rise in relative labour productivity will be associated on average with a one percentage point rise in relative capital intensity.

We used a F-statistic to test the significance of the model. This test is based on the hypothesis that all the true regression coefficients are equal to zero (not statistically significant) and the p-value of this test gives the probability that this hypothesis is true. The

models for Atlantic provinces, Newfoundland and Prince Edward Island are statistically significant at the 5 per cent level, which means it is not very likely that all the coefficients will be equal to zero. On the other hand, the models for New Brunswick and Nova Scotia are not as statistically significant, since the F-statistic p-values associated to them are much higher, indicating the hypothesis that all coefficients are equal to zero is more likely to be true.

We also tested for mis-specification, that is, inappropriate variables have been included, important variables have been omitted, the functional form is not adequate, or some of the regression assumptions have been violated. However, as discussed above, based on the theoretical and intuitive determinants of productivity only two variables are missing from the model that are potentially relevant, and the biases associated with them should be slight. This is confirmed by employing Ramsey's RESET test for model mis-specification: in each case the null hypothesis of a correct specification cannot be rejected with the exception of the Atlantic provinces pooled regression.

A problem with equations 1-5 for the manufacturing productivity gap for Atlantic Canada and the individual Atlantic provinces is that there are not many observations available, namely 16 for 16 years of data (1984-1999). This can be remedied by pooling observations for the four Atlantic provinces, giving 64 observations. These results are shown in equation 6 and largely confirm those for the individual provinces, and the statistical significance of the estimates has improved. However, the Durbin-Watson statistic, with a value of 0.709, suggests that there is significant positive autocorrelation. Note that a Durbin-Watson statistic close to two indicates that there is no autocorrelation while a statistic equal to 0 indicates perfect autocorrelation. Transforming the data to take into account the existence of autocorrelation slightly improved results (equation 7), showing no signs of autocorrelation (the Durbin-Watson statistics is now 1.84). The only point of divergence with the results discussed above is a statistically insignificant but positive estimated coefficient for the educational attainment gap. This implies that as relative educational attainment in Atlantic provinces rises, relative labour productivity will rise as well, which is what we would expect.

As a final regression exercise (equation 8) it is useful to determine if the results discussed above apply equally to other Canadian provinces. Pooling data for all provinces for the 1984-1999 period leads to the estimates presented in the final column of Table 15. Note that the results were corrected for autocorrelation. There are a few notable differences between the Atlantic provinces pooled regression results and the ten Canadian provinces regression results. The most notable one regards the relative R&D coefficient. First, the coefficient is positive, which is what we would expect. Relative labour productivity rises as relative R&D intensity rises. Second, it is statistically significant (at the 1 per cent level), which was not the case in the Atlantic provinces pooled regression. This result suggests that although relative R&D intensity is not important in explaining trends in the labour productivity gap in manufacturing in the Atlantic provinces, it is important at the Canadian level (when all ten provinces are considered). Another notable difference is the magnitude of the capital intensity coefficient, which has been reduced by 50 per cent. Capital intensity seems to be less important in explaining the productivity gap in manufacturing at the

Canadian level. Its statistical significance remains very high at the 1 per cent level. The economies of scale coefficient has the expected sign but is still not statistically different from zero. The educational attainment coefficient takes on a negative sign and is still not significantly different from zero.

D. Summary of Regression Results

It should first be stressed that the regression results are intended to explain trends in the Canada-Atlantic Canada manufacturing productivity gap over time and not explain the gap at a point in time. Unfortunately, we do not have sufficient degrees of freedom for a given year to use cross-section regressions.

Overall the results provide limited statistical confirmation that trends in the Canada-Atlantic Canada productivity gap in manufacturing are driven by differences in education and skills of the workforce, economies of scale in production and the intensity of innovative activity. Relative capital intensity of Atlantic provinces seems to be the most important factor affecting the gap. As we saw, the Atlantic provinces already have capital intensities higher than the national average but these were declining during the 1984-1999 period. According to this result, the maintenance of present capital intensity levels in Atlantic provinces will partially prevent a widening of the manufacturing labour productivity gap between them and the national average.

Relative R&D intensity does not appear to be very important in explaining trends in the manufacturing labour productivity gap between Canada and the Atlantic provinces, and yet, the structural nature of the productivity gap probably emanates from a long-term technological deficiency in Atlantic Canada, whereby the level of technology embedded in the capital stock is much lower in Atlantic Canada than in Canada as a whole. Therefore, taking into account the quality of the capital stock in Atlantic provinces, the relative capital intensity may be lower than the Canadian average although the raw data show it is above it. A reversal of this deficiency would require far more than R&D investment intensity equal to the national level, such as an investment intensity sustained well above the national level for several years and increased openness to technological spillovers from other regions and countries, whether embedded in capital or in the form of implementing ideas and processes developed elsewhere.

And finally, it has not been possible to include industrial structure or seasonality variables in the regression analysis, but on theoretical and intuitive grounds it is possible to say that these as well play some role in the Canada-Atlantic Canada manufacturing productivity gap.

VII Conclusion

This report has identified a large and persistent gap in the level of labour productivity between Canada and Atlantic Canada over the 1984-2002 period. The gaps in capital productivity and total factor productivity between the two are even larger.

This report identifies four factors that may account for the Canada-Atlantic Canada manufacturing productivity gap: lower intensity of innovative effort, particularly in high tech sectors; the smaller scale of manufacturing production; lower educational attainment of the labour force; and the greater seasonality of operations. It is likely that the first factor is the most important.

In terms of trends in the gap over time, developments in the capital-labour ratio were revealed by regression analysis to be the most important factor, although the higher capital-labour ratios in Atlantic Canada suggest that this factor does not explain the level of the gap.

A key limitation of the analysis is the lack of data on manufacturing capital stock by industry for the Atlantic provinces as well as the lack of output and employment data based on NAICS for manufacturing industries.

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The Canada-Atlantic Canada Manufacturing Productivity Gap: A Detailed Analysis

List of Tables

- Table 1: Decomposition of GDP per Capita into Labour Productivity and Labour Market Components, 1984-2002
- Table 2: Absolute and Relative Size of Manufacturing Operations in Canada, Atlantic Canada, Newfoundland, PEI, Nova Scotia and New Brunswick, 1999
- Table 3: Real Manufacturing Output (in millions of 1997 dollars) in Canada and the Atlantic Provinces, 1984-2002
- Table 3A: Share of GDP by Two-Digit Manufacturing Industries for Canada Newfoundland, PEI, Nova Scotia and New Brunswick, 2002
- Table 4: Manufacturing Employment (in thousands of workers) in Canada and the Atlantic Provinces, 1987-2002
- Table 4A: Share of Employment by Three-Digit Manufacturing Industries for Canada Newfoundland, PEI, Nova Scotia and New Brunswick, based on LFS, 2002
- Table 5: Manufacturing Average Weekly Hours Worked in Canada and the Atlantic Provinces, 1987-2002
- Table 6: Manufacturing End-Year Net Capital Stock (in thousands of 1997 dollars) in Canada and Atlantic Provinces, 1984-2002
- Table 7: Manufacturing Real GDP per Worker (in 1997 dollars) in Canada and the Atlantic Provinces, 1987-2002
- Table 8: Manufacturing Real GDP per Hour Worked (in 1997 dollars) in Canada and Atlantic Provinces, 1987-2002
- Table 9: Manufacturing Real GDP per \$1,000 of Capital Stock (in 1997 dollars) in Canada and Atlantic Provinces, 1984-2001
- Table 10: Indexes of Total Factor Productivity (1987=100) in Manufacturing and All Industries in Canada and the Atlantic Provinces, 1987-2001
- Table 11: Relative Total Factor Productivity Levels (Atlantic Provinces as a percentage of Canada) in Atlantic Provinces, 1987-2002
- Table 12: Manufacturing Capital Stock per Hour Worked (in 1997 dollars) in Canada and Atlantic Provinces, 1987-2002
- Table 13: Average Years of Schooling for Employed Persons in Manufacturing, 1984-2001
- Table 14: Nominal share of R&D investment in GDP, %, (natural sciences and engineering, all funders, performed by the business enterprise sector)
- Table 15: Regression Results for the Atlantic Provinces Manufacturing Labour Productivity Gap Model

List of Charts

- Chart 1: Real GDP per Capita in Atlantic Provinces as a Percentage of Canada, 1984-2001
- Chart 2: Real GDP per Worker in Atlantic Provinces as a Percentage of Canada, 1984-2001
- Chart 3: Employment to Population Ratio in Atlantic Provinces as a Percentage of Canada, 1984-2001

- Chart 4: Working Age Population to Total Population Ratio in Atlantic Provinces as a Percentage of Canada, 1984-2001
- Chart 5: Employment to Working Age Population Ratio in Atlantic Provinces as a Percentage of Canada, 1984-2001
- Chart 6: Manufacturing and All Industries Output in Atlantic Provinces as a Percentage of Canada, 1984-2001
- Chart 7: Manufacturing and All Industries Output in Newfoundland as a Percentage of Canada, 1984-2001
- Chart 8: Manufacturing and All Industries Output in Prince Edward Island, as a Percentage of Canada, 1984-2001
- Chart 9: Manufacturing and All Industries Output in Nova Scotia as a Percentage of Canada, 1984-2001
- Chart 10: Manufacturing and All Industries Output in New Brunswick as a Percentage of Canada, 1984-2001
- Chart 11: Manufacturing GDP as a Percentage of All Industries GDP in Canada and Atlantic Provinces, 1984-2001
- Chart 12: Manufacturing GDP as a Percentage of All Industries GDP in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, 1984-2001
- Chart 13: Total Employment in Manufacturing and All Industries in Atlantic Provinces as a Percentage of Canada, 1987-2001
- Chart 14: Total Employment in Manufacturing and All Industries in Newfoundland as a Percentage of Canada, 1987-2001
- Chart 15: Total Employment in Manufacturing and All Industries in Prince Edward Island as a Percentage of Canada, 1987-2001
- Chart 16: Total Employment in Manufacturing and All Industries in Nova Scotia as a Percentage of Canada, 1987-2001
- Chart 17: Total Employment in Manufacturing and All Industries in New Brunswick as a Percentage of Canada, 1987-2001
- Chart 18: Manufacturing Employment as a Share of All Industries in Canada and Atlantic Provinces, 1987-2001
- Chart 19: Manufacturing Employment as a Share of All Industries in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, 1987-2001
- Chart 20: Total Weekly Hours Worked in Manufacturing and All Industries in Atlantic provinces as a Percentage of Canada, 1987-2001
- Chart 21: Total Weekly Hours Worked in Manufacturing and All Industries in Newfoundland as a Percentage of Canada, 1987-2001
- Chart 22: Total Weekly Hours Worked in Manufacturing and All Industries in Prince Edward Island as a Percentage of Canada, 1987-2001
- Chart 23: Total Weekly Hours Worked in Manufacturing and All Industries in Nova Scotia as a Percentage of Canada, 1987-2001
- Chart 24: Total Weekly Hours Worked in Manufacturing and All Industries in New Brunswick as a Percentage of Canada, 1987-2001
- Chart 25: Manufacturing Hours Worked as a Percentage of All Industries Hours Worked in Canada and Atlantic provinces, 1987-2001
- Chart 26: Manufacturing Hours Worked as a Percentage of All Industries Hours Worked in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, 1987-2001

- Chart 27: Real GDP per Worker in Manufacturing and All Industries in Atlantic Provinces as a Proportion of Canada, 1987-2001
- Chart 28: Real GDP per Worker in Manufacturing and All Industries in Newfoundland as a Proportion of Canada, 1987-2001
- Chart 29: Real GDP per Worker in Manufacturing and All Industries in Prince Edward Island as a Proportion of Canada, 1987-2001
- Chart 30: Real GDP per Worker in Manufacturing and All Industries in Nova Scotia as a Proportion of Canada, 1987-2001
- Chart 31: Real GDP per Worker in Manufacturing and All Industries in New Brunswick as a Proportion of Canada, 1987-2001
- Chart 32: Real GDP per Worker in Manufacturing as a Proportion of All Industries in Canada and Atlantic Provinces, 1987-2001
- Chart 33: Real GDP per Worker in Manufacturing as a Proportion of All Industries in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, 1987-2001
- Chart 34: Real GDP per Hour in Manufacturing and All Industries in Atlantic provinces as a Percentage of Canada, 1987-2001
- Chart 35: Real GDP per Hour in Manufacturing and All Industries in Newfoundland as a Percentage of Canada, 1987-2001
- Chart 36: Real GDP per Hour in Manufacturing and All Industries in Prince Edward Island as a Percentage of Canada, 1987-2001
- Chart 37: Real GDP per Hour in Manufacturing and All Industries in Nova Scotia as a Percentage of Canada, 1987-2001
- Chart 38: Real GDP per Hour in Manufacturing and All Industries in New Brunswick as a Percentage
- Chart 39: Manufacturing Real GDP per Hour Worked as a Percentage of All Industries in Canada and Atlantic Provinces, 1987-2001
- Chart 40: Manufacturing Real GDP per Hour Worked as a Percentage of Newfoundland, PrinceEdward Island, Nova Scotia, and New brunswick, 1987-2001
- Chart 41: Manufacturing and All Industries Capital Stock in Newfoundland as a Percentage of Canada, 1984-2001
- Chart 42: Manufacturing and All Industries Capital Stock in Prince Edward Island as a Percentage of Canada, 1984-2001
- Chart 43: Manufacturing and All Industries Capital Stock in Nova Scotia as a Percentage of Canada, 1984-2001
- Chart 44: Manufacturing and All Industries Capital Stock in New Brunswick as a Percentage of Canada, 1984-2001
- Chart 45: Manufacturing and All Industries Capital Stock in New Brunswick as a Percentage of Canada, 1984-2001
- Chart 46: Manufacturing Capital Stock as a Percentage of All Industries Capital Stock in Canada and Atlantic provinces, 1984-2001
- Chart 47: Manufacturing Capital Stock as a Percentage of All Industries Capital Stock in Canada and Atlantic provinces, 1984-2001
- Chart 48: Trends in Total Factor Productivity in Manufacturing in Canada and Atlantic Provinces, 1987-2001

- Chart 49: Trends in Total Factor Productivity in Manufacturing in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, 1987-2001
- Chart 50: Value of Shipments per Manufacturing Establishment in Atlantic Canada as a Proportion of Canada, 1970-1999
- Chart 51: Total Activity Value Added per Manufacturing Establishment in Atlantic Canada as a Proportion of Canada, 1970-1999
- Chart 52: Total Employees per Manufacturing Establishment in Atlantic Canada as a Proportion of Canada, 1970-1999
- Chart 53: Total Employees per Manufacturing Establishment in Atlantic Provinces as a Proportion of Canada, 1999
- Chart 54: Value of Shipments of Goods per Manufacturing Establishment in Atlantic Provinces as a Proportion of Canada, 1999
- Chart 55: Total Activity Value Added per Manufacturing Establishment in Atlantic Provinces as a Proportion of Canada, 1999
- Chart 56: Total Employees per Manufacturing Establishment in Canada and Atlantic Provinces, 1999
- Chart 57: Manufacturing Total Factor Productivity Growth in Canada and the Atlantic Provinces, 1987-2001
- Chart 58: Manufacturing Capital Stock per Hour Worked Ratio Growth in Canada and the Atlantic Provinces, 1987-2001
- Chart 59: Manufacturing End-Year Net Capital Stock Growth in Canada and the Atlantic Provinces, 1984-2001
- Chart 60: Manufacturing Real GDP Growth in Canada and the Atlantic Provinces, 1984-2001
- Chart 61: Manufacturing Real GDP per Worker Growth in Canada and the Atlantic Provinces, 1987-01
- Chart 62: Manufacturing Real GDP per Hour Growth in Canada and the Atlantic Provinces, 1987-2001
- Chart 63: Manufacturing Employment Growth in Canada and the Atlantic Provinces, 1987-2001
- Chart 64: Manufacturing Real GDP Growth in Canada and the Atlantic Provinces, 1987-2001

Table 1: Decomposition of GDP per Capita into Labour Productivity and Labour Market Components, 1984-2002

	Canada				Atlantic Canada				Newfoundland			
	1984	1989	2002	1984- 2002 Change	1984	1989	2002	1984- 2002 Change	1984	1989	2002	1984- 2002 Change
Real GDP	\$586,802	\$703,946	\$977,049	\$390,247	\$36,922	\$42,642	\$55,299	\$18,377	\$8,502	\$9,539	\$12,610	\$4,108
Population	25,607,555	27,286,239	31,413,990	5,806,435	2,304,959	2,345,660	2,372,925	67,966	580,179	576,412	531,595	-48,584
Working Age Population	19,598.0	20,901.9	24,945.1	5,347	1,710.0	1,786.7	1,914	204	418.6	435.6	439.0	20
Employment	11,300.0	12,986.4	15,441.8	4,142	823.1	939.5	1,055	232	179.1	206.2	213.9	35
GDP per Capita	\$22,915	\$25,799	\$31,102	\$8,187	\$16,019	\$18,179	\$23,304	\$7,286	\$14,654	\$16,548	\$23,721	\$9,066
GDP per Worker	\$51,929	\$54,206	\$63,273	\$11,344	\$44,857	\$45,388	\$52,416	\$7,559	\$47,471	\$46,258	\$58,951	\$11,480
Employment of Population Ratio	44.1	47.6	49.2	5.0	35.7	40.1	44.5	8.7	30.9	35.8	40.2	9.4
Working age population to total population ratio	76.5	76.6	79.4	2.9	74.2	76.2	80.7	6.5	72.2	75.6	82.6	10.4
Employment to working age population ratio	57.7	62.1	61.9	4.2	48.1	52.6	55.1	7.0	42.8	47.3	48.7	5.9
As a Percentage of Canada												
Real GDP				6.29	6.06	5.66	-0.6	1.45	1.36	1.29	-0.2	
Population				9.00	8.60	7.55	-1.4	2.27	2.11	1.69	-0.6	
Working Age Population				8.73	8.55	7.67	-1.1	2.14	2.08	1.76	-0.4	
Employment				7.28	7.23	6.83	-0.5	1.58	1.59	1.39	-0.2	
GDP per Capita				69.9	70.5	74.9	5.0	64.0	64.1	76.3	12.3	
GDP per Worker				86.4	83.7	82.8	-3.5	91.4	85.3	93.2	1.8	
Employment of Population Ratio				80.9	84.2	90.4	9.5	70.0	75.2	81.9	11.9	
Working age population to total population ratio				96.9	99.4	101.6	4.6	94.3	98.7	104.0	9.7	
Employment to working age population ratio				83.5	84.6	89.0	5.6	74.2	76.2	78.7	4.5	

Table 1 cont'd: Decomposition of GDP per Capita into Labour Productivity and Labour Market Components, 1984-2001

	Prince Edward Island				Nova Scotia				New Brunswick			
	1984	1989	2002	1984-2002 Change	1984	1989	2002	1984-2002 Change	1984	1989	2002	1984-2002 Change
Real GDP	\$1,855	\$2,178	\$2,987	\$1,132	\$14,908	\$17,011	\$21,887	\$6,979	\$11,658	\$13,915	\$17,816	\$6,159
Population	126,614	130,093	139,913	13,299	877,147	903,911	944,765	67,618	721,019	735,244	756,652	35,633
Working Age Population	94.1	97.5	111.8	17.7	659.8	691.0	755.6	95.8	537.5	562.6	607.6	70.1
Employment	49.7	54.9	67.1	17.4	339.4	382.1	428.4	89.0	254.9	296.3	345.6	90.7
GDP per Capita	\$14,649	\$16,742	\$21,346	\$6,697	\$16,996	\$18,819	\$23,166	\$6,170	\$16,168	\$18,926	\$23,546	\$7,378
GDP per Worker	\$37,320	\$39,672	\$44,510	\$7,190	\$43,924	\$44,519	\$51,089	\$7,165	\$45,734	\$46,963	\$51,552	\$5,818
Employment of Population Ratio	39.3	42.2	48.0	8.7	38.7	42.3	45.3	6.7	35.4	40.3	45.7	10.3
Working age population to total population ratio	74.3	74.9	79.9	5.6	75.2	76.4	80.0	4.8	74.5	76.5	80.3	5.8
Employment to working age population ratio	52.8	56.3	60.0	7.2	51.4	55.3	56.7	5.3	47.4	52.7	56.9	9.5
As a Percentage of Canada												
Real GDP	0.32	0.31	0.31	0.0	2.54	2.42	2.24	-0.3	1.99	1.98	1.82	-0.2
Population	0.49	0.48	0.45	0.0	3.43	3.31	3.01	-0.4	2.82	2.69	2.41	-0.4
Working Age Population	0.48	0.47	0.45	0.0	3.37	3.31	3.03	-0.3	2.74	2.69	2.44	-0.3
Employment	0.44	0.42	0.43	0.0	3.00	2.94	2.77	-0.2	2.26	2.28	2.24	0.0
GDP per Capita	63.9	64.9	68.6	4.7	74.2	72.9	74.5	0.3	70.6	73.4	75.7	5.1
GDP per Worker	71.9	73.2	70.3	-1.5	84.6	82.1	80.7	-3.8	88.1	86.6	81.5	-6.6
Employment of Population Ratio	89.0	88.7	97.6	8.6	87.7	88.8	92.2	4.6	80.1	84.7	92.9	12.8
Working age population to total population ratio	97.1	97.8	100.6	3.5	98.3	99.8	100.7	2.4	97.4	99.9	101.1	3.7

Employment to working age population ratio 91.6 90.6 97.0 5.4 89.2 89.0 91.6 2.4 82.2 84.8 91.9 9.6

Sources: Population: CANSIM II Table 051-0001, January 15, 2003. GDP: CANSIM II Table 379-0017 for Canada and Table 379-0025 for the Provinces. January 15, 2003. Working Age Population and Employment: Statistics Canada, Labour Force Historical Review, 2001(R), Cat. No. 71F0004XCB.

	Canada	AP	NF	PEI	NS	NB
	Absolute					
Production and related workers per Establishment	49.9	46.2	46.0	29.3	47.9	48.4
Total employees per Establishment	63.6	56.9	55.2	36.6	59.3	59.9
Value of shipments of goods per Establishment (000s current\$)	\$ 16,388.22	\$ 11,825.38	\$ 7,574.62	\$ 7,196.50	\$ 11,720.50	\$ 14,891.64
Total Activity Value added per Establishment (000s current \$)	\$ 7,333.35	\$ 4,719.20	\$ 4,311.15	\$ 2,602.80	\$ 4,899.84	\$ 5,211.20
Total Activity Value added per Employee (in current \$)	\$ 115,289.68	\$ 82,952.40	\$ 78,062.54	\$ 71,044.09	\$ 82,582.34	\$ 87,045.05
	Relative (percentage of national average)					
Production and related workers per Establishment	100	92.5	92.2	58.7	96.1	97.1
Total employees per Establishment	100	89.4	86.8	57.6	93.3	94.1
Value of shipments of goods per Establishment	100	72.2	46.2	43.9	71.5	90.9
Total Activity Value added per Establishment	100	64.4	58.8	35.5	66.8	71.1
Total Activity Value added per Employee	100	72.0	67.7	61.6	71.6	75.5
Source: Statistics Canada, Manufacturing Industries in Canada: National and Provincial Areas, 1999						
Cat. 31-203-XPB., June 2002						

Table 3: Real Manufacturing Output (in millions of 1997 dollars) in Canada and the Atlantic Provinces, 1984-2002

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1984	101,583	3,965	791	77	1,633	1,464
1985	106,691	4,040	694	88	1,614	1,644
1986	107,818	4,258	797	92	1,625	1,744
1987	112,720	4,556	815	104	1,626	2,011
1988	120,081	4,514	945	117	1,562	1,891
1989	122,043	4,596	964	117	1,606	1,910
1990	117,557	4,304	878	120	1,544	1,762
1991	109,277	4,419	815	127	1,683	1,793
1992	110,920	4,365	670	136	1,671	1,888
1993	116,993	4,419	718	133	1,660	1,908
1994	125,808	4,498	708	155	1,648	1,988
1995	132,114	4,820	705	185	1,772	2,158
1996	133,559	4,746	648	169	1,768	2,160
1997	142,275	4,983	653	205	1,905	2,220
1998	149,386	5,238	663	249	1,956	2,370
1999	160,158	5,710	767	262	2,158	2,524
2000	168,829	5,789	772	276	2,181	2,560
2001	160,939	5,681	732	282	2,133	2,534
2002	164,941	5,946	724	304	2,275	2,643
Average annual growth rate, %						
1984-02	2.73	2.28	-0.49	7.91	1.86	3.33
1987-02	2.57	1.79	-0.78	7.39	2.26	1.84
1984-89	3.74	3.00	4.02	8.73	-0.33	5.45
1989-02	2.34	2.00	-2.18	7.59	2.72	2.53
As a Share of the Canadian Manufacturing Sector						
1984	100	3.90	0.78	0.08	1.61	1.44
1985	100	3.79	0.65	0.08	1.51	1.54
1986	100	3.95	0.74	0.09	1.51	1.62
1987	100	4.04	0.72	0.09	1.44	1.78
1988	100	3.76	0.79	0.10	1.30	1.57
1989	100	3.77	0.79	0.10	1.32	1.56
1990	100	3.66	0.75	0.10	1.31	1.50
1991	100	4.04	0.75	0.12	1.54	1.64
1992	100	3.93	0.60	0.12	1.51	1.70
1993	100	3.78	0.61	0.11	1.42	1.63
1994	100	3.58	0.56	0.12	1.31	1.58
1995	100	3.65	0.53	0.14	1.34	1.63
1996	100	3.55	0.49	0.13	1.32	1.62
1997	100	3.50	0.46	0.14	1.34	1.56
1998	100	3.51	0.44	0.17	1.31	1.59
1999	100	3.57	0.48	0.16	1.35	1.58
2000	100	3.43	0.46	0.16	1.29	1.52
2001	100	3.53	0.45	0.18	1.33	1.57
2002	100	3.60	0.44	0.18	1.38	1.60
As a Share of the National or Provincial Real GDP						
1984	17.31	10.74	9.31	4.16	10.95	12.56
1985	17.31	10.60	8.14	4.66	10.38	13.51
1986	17.02	10.80	9.17	4.71	10.14	13.67

1987	17.12	11.22	9.20	5.17	9.94	15.04
1988	17.47	10.73	10.01	5.40	9.29	13.83
1989	17.34	10.78	10.10	5.39	9.44	13.72
1990	16.61	10.06	9.24	5.53	8.97	12.67
1991	15.67	10.42	8.85	5.88	9.80	12.94
1992	15.77	10.31	7.44	6.22	9.69	13.60
1993	16.24	10.37	7.90	6.05	9.59	13.60
1994	16.71	10.31	7.52	6.70	9.41	13.82
1995	17.10	10.78	7.40	7.55	9.92	14.54
1996	17.04	10.60	7.03	6.71	9.88	14.26
1997	17.42	10.93	6.94	8.13	10.37	14.54
1998	17.59	11.00	6.59	9.49	10.25	14.93
1999	17.92	11.33	7.16	9.58	10.73	14.99
2000	18.04	11.16	6.87	9.78	10.58	14.88
2001	16.97	10.80	6.44	9.97	10.11	14.64
2002	16.85	10.75	5.74	10.17	10.39	14.83

Source: Unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis

Table 3A: Share of GDP by Two-Digit Manufacturing Industries for Canada, Newfoundland, PEI, Nova Scotia and New Brunswick, 2002

		Canada	Atlantic Provinces	Newfound- land	Prince Edward Island	Nova Scotia	New Brunswick
3A	MANUFACTURING	100	100	100	100	100	100
311	Food Manufacturing	10.02	24.00	38.67	63.25	21.35	17.76
312	Beverage and Tobacco Product Manufacturing	3.03	na	7.80	na	3.92	2.74
3130	Textile Mills	0.71	na	na	na	na	na
3140	Textile Product Mills	0.52	na	na	na	na	0.11
315	Clothing Manufacturing	1.69	na	na	na	na	na
316	Leather and Allied Product Manufacturing	0.17	na	na	na	na	na
321	Wood Product Manufacturing	6.64	na	3.54	na	7.64	19.13
322	Paper Manufacturing	6.86	na	na	na	14.43	28.50
323	Printing and Related Support Activities	2.52	na	0.41	1.19	na	na
324	Petroleum and Coal Products Manufacturing	1.12	na	na	na	na	na
325	Chemical Manufacturing	8.85	na	na	4.45	na	na
326	Plastics and Rubber Products Manufacturing	5.63	na	na	na	12.39	na
327	Non-Metallic Mineral Product Manufacturing	2.71	na	1.71	1.42	na	na
331	Primary Metal Manufacturing	6.79	na	na	na	na	na
332	Fabricated Metal Products Manufacturing	6.97	na	4.85	na	4.28	4.17
333	Machinery Manufacturing	6.01	na	na	na	1.52	2.60
334	Computer and Electronic Product Manufacturing	6.12	na	1.55	na	na	0.36
335	Electrical Equipment, Appliance and Component Manufacturing	2.28	na	0.33	na	na	na
336	Transportation Equipment Manufacturing	17.03	na	na	13.76	16.67	na
337	Furniture and Related Product Manufacturing	2.98	na	na	na	na	na
339	Miscellaneous Manufacturing	1.35	na	0.79	na	na	na

Source: Unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis

Table 4: Manufacturing Employment (in thousands of workers) in Canada and the Atlantic Provinces, 1987-2002

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1987	2,039.9	105.2	20.3	3.9	43.8	37.2
1988	2,104.4	114.9	23.2	4.4	47.2	40.1
1989	2,129.7	113.9	24.2	4.2	47.7	37.8
1990	2,052.6	106.9	21.1	4.7	43.7	37.4
1991	1,891.8	98.6	19.1	4.3	42.0	33.2
1992	1,821.5	93.6	16.0	4.3	38.9	34.4
1993	1,786.4	91.9	15.9	3.7	36.2	36.1
1994	1,820.3	87.3	13.1	4.3	35.7	34.2
1995	1,905.5	93.9	11.8	4.6	40.1	37.4
1996	1,931.2	90.8	13.0	5.1	37.1	35.6
1997	2,022.4	94.6	15.6	5.4	37.6	36.0
1998	2,113.8	100.2	16.0	5.6	42.0	36.6
1999	2,217.4	108.6	18.1	6.2	45.0	39.3
2000	2,280.2	107.2	16.0	6.5	43.5	41.2
2001	2,274.5	105.2	16.3	6.3	43.6	39.0
2002	2326.1	108.9	17.2	6.3	45.9	39.5
Average annual growth rate, %						
1987-02	0.88	0.23	-1.10	3.25	0.31	0.40
1987-89	2.18	4.05	9.18	3.77	4.36	0.80
1989-02	0.68	-0.34	-2.59	3.17	-0.30	0.34
As a Share of the Canadian Manufacturing Sector						
1987	100	5.16	1.00	0.19	2.15	1.82
1988	100	5.46	1.10	0.21	2.24	1.91
1989	100	5.35	1.14	0.20	2.24	1.77
1990	100	5.21	1.03	0.23	2.13	1.82
1991	100	5.21	1.01	0.23	2.22	1.75
1992	100	5.14	0.88	0.24	2.14	1.89
1993	100	5.14	0.89	0.21	2.03	2.02
1994	100	4.80	0.72	0.24	1.96	1.88
1995	100	4.93	0.62	0.24	2.10	1.96
1996	100	4.70	0.67	0.26	1.92	1.84
1997	100	4.68	0.77	0.27	1.86	1.78
1998	100	4.74	0.76	0.26	1.99	1.73
1999	100	4.90	0.82	0.28	2.03	1.77
2000	100	4.70	0.70	0.29	1.91	1.81
2001	100	4.63	0.72	0.28	1.92	1.71
2002	100	4.68	0.74	0.27	1.97	1.70
As a Share of the National or Provincial Real GDP						
1987	16.56	11.95	10.72	7.33	12.23	13.31
1988	16.56	12.53	11.66	8.06	12.64	13.83
1989	16.40	12.12	11.74	7.65	12.48	12.76
1990	15.69	11.27	10.17	8.58	11.31	12.47
1991	14.72	10.57	9.34	8.07	11.02	11.28
1992	14.28	10.24	8.27	8.04	10.50	11.58
1993	13.89	10.04	8.29	6.80	9.84	11.97
1994	13.88	9.48	6.82	7.76	9.56	11.39
1995	14.27	10.00	6.07	8.03	10.63	12.07
1996	14.34	9.76	6.95	8.66	9.81	11.63
1997	14.68	10.03	8.24	9.12	9.78	11.59
1998	14.95	10.32	8.24	9.27	10.53	11.52
1999	15.26	10.83	8.83	10.11	11.01	11.97

2000	15.29	10.48	7.82	10.08	10.37	12.32
2001	15.09	10.17	7.71	9.56	10.30	11.66
2002	15.09	10.32	8.04	9.39	10.71	11.43

Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics.

Table 4A: Share of Employment by Three-Digit Manufacturing Industries for Canada Newfoundland, PEI, Nova Scotia and New Brunswick, based on LFS, 2002

	Canada	Atlantic Provinces	Newfound-land	Prince Edward Island	Nova Scotia	New Brunswick
3A Manufacturing	100	100	100	100	100	100
311 Food Manufacturing	11.05	32.78	54.07	53.97	26.80	27.09
312 Beverage and Tobacco Product Manufacturing	1.61	2.02	3.49	3.17	1.09	2.28
3130 Textile Mills	0.92	na	na	na	na	1.52
3140 Textile Product Mills	1.07	na	na	na	2.61	na
315 Clothing Manufacturing	4.08	na	na	na	1.31	1.77
316 Leather and Allied Product Manufacturing	0.42	na	na	na	na	na
321 Wood Product Manufacturing	7.62	11.02	4.65	4.76	8.50	17.72
322 Paper Manufacturing	4.69	na	9.88	na	8.71	13.92
323 Printing and Related Support Activities	4.50	na	0.00	3.17	3.27	1.27
324 Petroleum and Coal Products Manufacturing	0.72	na	6.40	na	1.53	2.28
325 Chemical Manufacturing	5.41	na	na	6.35	1.96	1.52
326 Plastics and Rubber Products Manufacturing	5.69	na	na	na	12.85	2.53
327 Non-Metallic Mineral Product Manufacturing	2.30	na	na	na	4.14	3.54
331 Primary Metal Manufacturing	4.45	na	na	na	na	2.78
332 Fabricated Metal Products Manufacturing	7.69	na	na	na	5.45	6.33
333 Machinery Manufacturing	5.59	na	na	na	1.53	2.53
334 Computer and Electronic Product Manufacturing	5.54	na	na	na	2.83	1.27
335 Electrical Equipment, Appliance and Component Manufacturing	2.65	na	na	na	1.09	na
336 Transportation Equipment Manufacturing	14.50	7.25	5.23	14.29	10.68	3.04
337 Furniture and Related Product Manufacturing	5.24	na	na	3.17	1.31	3.29
339 Miscellaneous Manufacturing	4.26	na	na	na	3.05	3.80

Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics.

Table 5: Manufacturing Average Weekly Hours Worked in Canada and the Atlantic Provinces, 1987-2002

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1987	36.3	36.3	34.6	37.4	36.5	36.9
1988	37.4	37.3	36.6	39.9	37.0	37.8
1989	37.7	37.3	35.1	37.5	38.0	37.7
1990	36.9	36.9	35.7	37.7	37.7	36.6
1991	36.5	36.1	34.9	36.8	36.2	36.6
1992	36.2	36.2	34.6	37.5	36.1	36.9
1993	37.3	36.4	33.9	37.4	36.8	37.1
1994	37.7	37.4	35.4	37.8	36.8	38.8
1995	37.3	38.0	36.1	40.2	37.4	39.0
1996	37.6	38.2	38.0	38.7	37.8	38.8
1997	37.7	38.0	36.9	39.7	37.7	38.4
1998	37.2	37.9	37.0	38.7	37.5	38.5
1999	37.9	38.4	37.3	41.0	37.7	39.2
2000	38.1	38.2	36.5	39.8	38.1	38.8
2001	37.2	37.9	37.6	40.1	37.7	37.9
2002	37.2	37.8	37.1	40.5	37.0	38.7
Average annual growth rate, %						
1987-02	0.15	0.28	0.47	0.53	0.09	0.32
1987-89	1.94	1.32	0.67	0.12	2.05	1.11
1989-02	-0.12	0.12	0.44	0.59	-0.20	0.19
As a Proportion of the Canadian Manufacturing Sector						
1987	100	99.93	95.26	102.93	100.45	101.56
1988	100	99.81	97.88	106.73	99.01	101.10
1989	100	98.71	92.88	99.29	100.66	99.90
1990	100	99.89	96.64	102.16	102.00	98.98
1991	100	99.00	95.74	100.92	99.26	100.30
1992	100	100.10	95.64	103.81	99.89	101.95
1993	100	97.68	90.99	100.18	98.55	99.50
1994	100	99.34	93.90	100.44	97.79	102.89
1995	100	101.78	96.78	107.57	100.06	104.50
1996	100	101.79	101.06	102.97	100.57	103.16
1997	100	100.79	97.91	105.43	100.14	102.02
1998	100	101.64	99.29	103.86	100.83	103.26
1999	100	101.33	98.60	108.41	99.59	103.47
2000	100	100.43	95.86	104.68	100.12	101.88
2001	100	101.92	101.21	107.81	101.35	101.90
2002	100	101.81	99.94	108.92	99.58	104.08
As a Proportion of the National or Provincial Real GDP						
1987	106.52	106.24	100.29	108.21	107.34	108.20
1988	107.91	107.18	103.83	112.11	106.76	109.38
1989	107.60	106.32	100.95	106.25	107.93	107.71
1990	106.93	106.23	102.89	105.40	108.53	105.71
1991	107.69	106.44	102.69	106.25	107.32	107.65
1992	108.48	107.92	104.37	110.89	108.13	108.68
1993	110.46	108.23	103.35	110.53	109.58	108.18
1994	110.12	109.51	106.66	109.03	108.43	110.86
1995	109.97	111.56	108.59	115.02	110.68	112.17
1996	109.95	111.22	112.33	109.09	111.00	110.86
1997	110.13	110.04	108.25	112.42	110.44	109.70
1998	109.85	110.30	108.90	111.49	110.28	110.48
1999	110.67	110.90	106.87	117.32	110.68	112.04

2000	110.47	109.68	104.11	112.17	111.57	109.27
2001	110.03	110.25	108.78	114.33	111.32	109.03
2002	111.10	111.42	108.68	117.08	111.06	112.13

Source: Unpublished Employment and Hours data provided by Statistics Canada Division of Labour Statistics.

Table 6: Manufacturing End-Year Net Capital Stock (in millions of 1997 dollars) in Canada and Atlantic Provinces, 1984-2002

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1984	141,758	10,567	1,920	102	4,231	4,314
1985	144,336	10,696	1,992	121	4,165	4,418
1986	149,059	10,751	2,075	130	4,107	4,439
1987	153,775	10,926	2,120	132	4,223	4,452
1988	160,279	11,528	2,161	139	4,535	4,693
1989	168,797	12,296	2,178	140	4,773	5,206
1990	175,005	12,362	2,148	160	4,848	5,206
1991	178,088	12,252	2,125	225	4,732	5,170
1992	177,512	11,875	2,058	217	4,600	5,000
1993	176,202	11,458	1,979	210	4,427	4,842
1994	177,062	11,144	1,908	205	4,275	4,755
1995	179,509	11,097	1,873	217	4,187	4,820
1996	182,571	11,274	1,837	233	4,216	4,988
1997	187,539	11,908	1,836	245	4,798	5,029
1998	192,015	12,078	1,891	282	4,764	5,141
1999	196,893	12,574	1,898	301	4,787	5,587
2000	202,953	13,101	1,919	302	4,829	6,051
2001	203,236	13,112	1,920	316	4,793	6,083
2002	203,006	na	1,915	325	4,766	na
Average annual growth rate, %						
1984-02	2.02	1.28	-0.01	6.67	0.66	2.04
1984-89	3.55	3.08	2.55	6.64	2.44	3.83
1989-02	1.43	0.54	-0.98	6.69	-0.01	1.31
As a Share of the Canadian Manufacturing Sector						
1984	100	7.45	1.35	0.07	2.98	3.04
1985	100	7.41	1.38	0.08	2.89	3.06
1986	100	7.21	1.39	0.09	2.76	2.98
1987	100	7.11	1.38	0.09	2.75	2.89
1988	100	7.19	1.35	0.09	2.83	2.93
1989	100	7.28	1.29	0.08	2.83	3.08
1990	100	7.06	1.23	0.09	2.77	2.97
1991	100	6.88	1.19	0.13	2.66	2.90
1992	100	6.69	1.16	0.12	2.59	2.82
1993	100	6.50	1.12	0.12	2.51	2.75
1994	100	6.29	1.08	0.12	2.41	2.69
1995	100	6.18	1.04	0.12	2.33	2.69
1996	100	6.18	1.01	0.13	2.31	2.73
1997	100	6.35	0.98	0.13	2.56	2.68
1998	100	6.29	0.98	0.15	2.48	2.68
1999	100	6.39	0.96	0.15	2.43	2.84
2000	100	6.46	0.95	0.15	2.38	2.98
2001	100	6.45	0.94	0.16	2.36	2.99
2002	100	na	0.94	0.16	2.35	na

As a Share of All Industries Capital Stock

1984	12.75	12.03	7.45	2.93	13.58	15.72
1985	12.63	11.85	7.46	3.42	12.98	15.80
1986	12.74	11.66	7.56	3.59	12.52	15.68
1987	12.80	11.68	7.60	3.55	12.69	15.50
1988	12.92	12.06	7.63	3.63	13.29	15.99
1989	13.16	12.53	7.59	3.53	13.57	17.19
1990	13.26	12.36	7.42	3.93	13.47	16.77
1991	13.19	12.03	7.25	5.33	12.92	16.29
1992	12.92	11.51	6.92	5.02	12.48	15.51
1993	12.63	10.96	6.48	4.74	11.94	14.90
1994	12.44	10.48	6.03	4.46	11.46	14.52
1995	12.36	10.24	5.72	4.50	11.17	14.46
1996	12.32	10.25	5.53	4.61	11.20	14.65
1997	12.29	10.61	5.41	4.74	12.42	14.58
1998	12.23	10.51	5.47	5.35	11.95	14.57
1999	12.15	10.49	5.29	5.57	11.46	15.20
2000	12.10	10.60	5.20	5.46	11.24	15.85
2001	11.76	10.39	5.11	5.58	10.82	15.73
2002	11.46	na	5.02	5.65	10.49	na

Source: Based on Statistics Canada, unpublished capital stock data provided to CSLS by the Division of Fixed Assets
Note: Bold font indicates that the growth rate is for 2001.

Table 7: Manufacturing Real GDP per Worker (in 1997 dollars) in Canada and the Atlantic Provinces, 1987-2002

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1987	55,258	43,307	40,133	26,744	37,121	54,059
1988	57,062	39,290	40,728	26,591	33,087	47,152
1989	57,305	40,351	39,818	27,929	33,660	50,516
1990	57,272	40,263	41,626	25,511	35,341	47,099
1991	57,764	44,812	42,681	29,512	40,074	54,015
1992	60,895	46,629	41,844	31,581	42,961	54,884
1993	65,491	48,087	45,145	36,027	45,865	52,848
1994	69,114	51,523	54,008	35,930	46,165	58,126
1995	69,333	51,326	59,729	40,261	44,177	57,701
1996	69,159	52,264	49,838	33,216	47,655	60,683
1997	70,350	52,675	41,859	37,963	50,668	61,667
1998	70,672	52,271	41,413	44,446	46,579	64,749
1999	72,228	52,581	42,354	42,177	47,956	64,229
2000	74,041	54,006	48,263	42,523	50,133	62,136
2001	70,758	54,002	44,920	44,825	48,917	64,964
2002	70,909	54,597	42,093	48,206	49,564	66,909
Average annual growth rate, %						
1987-02	1.68	1.56	0.32	4.01	1.95	1.43
1987-89	1.84	-3.47	-0.39	2.19	-4.78	-3.33
1989-02	1.65	2.35	0.43	4.29	3.02	2.19
As a Proportion of the Canadian Manufacturing Sector						
1987	100	78.37	72.63	48.40	67.18	97.83
1988	100	68.85	71.38	46.60	57.98	82.63
1989	100	70.41	69.48	48.74	58.74	88.15
1990	100	70.30	72.68	44.54	61.71	82.24
1991	100	77.58	73.89	51.09	69.38	93.51
1992	100	76.57	68.71	51.86	70.55	90.13
1993	100	73.43	68.93	55.01	70.03	80.69
1994	100	74.55	78.14	51.99	66.80	84.10
1995	100	74.03	86.15	58.07	63.72	83.22
1996	100	75.57	72.06	48.03	68.91	87.74
1997	100	74.88	59.50	53.96	72.02	87.66
1998	100	73.96	58.60	62.89	65.91	91.62
1999	100	72.80	58.64	58.39	66.39	88.93
2000	100	72.94	65.18	57.43	67.71	83.92
2001	100	76.32	63.48	63.35	69.13	91.81
2002	100	77.00	59.36	67.98	69.90	94.36
As a Proportion of the National or Provincial Real GDP						
1987	103.41	93.89	85.83	70.56	81.26	113.02
1988	105.50	85.63	85.88	67.06	73.51	100.05
1989	105.73	88.90	86.08	70.40	75.61	107.57
1990	105.90	89.23	90.78	64.52	79.33	101.56
1991	106.43	98.62	94.85	72.93	88.89	114.67
1992	110.47	100.74	89.92	77.33	92.23	117.43
1993	116.85	103.29	95.37	88.89	97.43	113.63
1994	120.34	108.80	110.30	86.33	98.39	121.27
1995	119.84	107.79	121.78	94.04	93.24	120.47

1996	118.80	108.55	101.13	77.48	100.66	122.68
1997	118.64	109.04	84.24	89.16	105.94	125.47
1998	117.65	106.59	79.95	102.40	97.39	129.63
1999	117.40	104.67	81.10	94.74	97.38	125.22
2000	117.96	106.50	87.86	97.09	102.07	120.76
2001	112.47	106.25	83.50	104.25	98.18	125.51
2002	111.63	104.16	71.40	108.31	97.02	129.79

Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Table 8: Manufacturing Real GDP per Hour Worked (in 1997 dollars) in Canada and Atlantic Provinces, 1987-2002

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1987	29.26	22.95	22.31	13.76	19.57	28.19
1988	29.36	20.26	21.41	12.82	17.20	24.00
1989	29.20	20.83	21.84	14.33	17.04	25.76
1990	29.81	20.98	22.42	13.00	18.03	24.77
1991	30.45	23.86	23.50	15.42	21.28	28.39
1992	32.39	24.77	23.27	16.18	22.87	28.63
1993	33.76	25.37	25.57	18.54	23.99	27.38
1994	35.28	26.48	29.36	18.26	24.10	28.84
1995	35.70	25.97	31.78	19.27	22.74	28.43
1996	35.40	26.28	25.24	16.51	24.25	30.11
1997	35.92	26.69	21.83	18.39	25.84	30.87
1998	36.49	26.56	21.54	22.10	23.86	32.38
1999	36.70	26.36	21.82	19.77	24.47	31.54
2000	37.41	27.17	25.44	20.52	25.30	30.81
2001	36.62	27.42	22.97	21.52	24.98	32.99
2002	36.70	27.75	21.80	22.90	25.76	33.27
Average annual growth rate, %						
1987-02	1.52	1.28	-0.15	3.46	1.85	1.11
1987-89	-0.11	-4.73	-1.05	2.07	-6.69	-4.40
1989-02	1.77	2.23	-0.02	3.67	3.23	1.99
As a Proportion of the Canadian Manufacturing Sector						
1987	100	78.43	76.25	47.02	66.87	96.33
1988	100	68.99	72.92	43.66	58.56	81.74
1989	100	71.34	74.81	49.09	58.35	88.24
1990	100	70.38	75.21	43.60	60.50	83.09
1991	100	78.36	77.17	50.63	69.89	93.23
1992	100	76.50	71.85	49.96	70.63	88.40
1993	100	75.17	75.76	54.91	71.06	81.10
1994	100	75.05	83.22	51.76	68.31	81.74
1995	100	72.73	89.01	53.98	63.68	79.64
1996	100	74.24	71.31	46.64	68.52	85.06
1997	100	74.29	60.77	51.18	71.92	85.92
1998	100	72.77	59.02	60.55	65.37	88.73
1999	100	71.84	59.47	53.87	66.67	85.94

2000	100	72.62	68.00	54.86	67.63	82.38
2001	100	74.88	62.73	58.76	68.21	90.10
2002	100	75.63	59.40	62.41	70.19	90.66

As a Proportion of Real GDP per Hour Worked in All Industries

1987	97.08	88.38	85.58	65.21	75.71	104.46
1988	97.77	79.89	82.72	59.81	68.86	91.46
1989	98.26	83.62	85.27	66.26	70.05	99.87
1990	99.04	84.00	88.24	61.21	73.10	96.08
1991	98.83	92.66	92.37	68.64	82.82	106.52
1992	101.83	93.35	86.15	69.73	85.29	108.05
1993	105.79	95.44	92.28	80.42	88.91	105.04
1994	109.28	99.35	103.41	79.18	90.74	109.38
1995	108.97	96.63	112.14	81.76	84.24	107.40
1996	108.05	97.60	90.03	71.03	90.69	110.66
1997	107.73	99.09	77.82	79.31	95.93	114.38
1998	107.11	96.64	73.42	91.85	88.31	117.34
1999	106.09	94.38	75.89	80.75	87.99	111.77
2000	106.78	97.10	84.40	86.56	91.48	110.51
2001	102.22	96.37	76.76	91.18	88.20	115.11
2002	100.48	93.49	65.70	92.51	87.35	115.75

Source: Unpublished Hours data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Table 9: Manufacturing Real GDP per \$1,000 of Capital Stock (in 1997 dollars) in Canada and Atlantic Provinces, 1984-2002

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1984	716.6	375.3	412.0	759.8	385.9	339.4
1985	739.2	377.7	348.2	723.0	387.5	372.2
1986	723.3	396.1	384.1	708.9	395.8	392.9
1987	733.0	417.0	384.2	793.2	385.0	451.7
1988	749.2	391.6	437.3	840.5	344.4	402.9
1989	723.0	373.8	442.5	837.3	336.4	366.8
1990	671.7	348.2	408.9	751.7	318.5	338.3
1991	613.6	360.6	383.7	564.0	355.7	346.8
1992	624.9	367.5	325.4	624.7	363.3	377.6
1993	664.0	385.7	362.8	636.0	375.0	394.0
1994	710.5	403.6	370.9	752.9	385.5	418.0
1995	736.0	434.3	376.3	854.2	423.1	447.7
1996	731.5	420.9	352.7	727.0	419.3	433.1
1997	758.6	418.5	355.6	837.8	397.0	441.4
1998	778.0	433.7	350.3	882.9	410.7	461.0
1999	813.4	454.1	403.8	867.6	450.8	451.8
2000	831.9	441.9	402.3	914.0	451.6	423.1
2001	791.9	433.3	381.3	895.1	445.0	416.5
2002	812.5	na	378.0	934.2	477.4	na
Average annual growth rate, %						
1984-02	0.70	0.85	-0.48	1.15	1.19	1.21
1984-89	0.18	-0.08	1.44	1.96	-2.71	1.56
1989-02	0.90	1.24	-1.20	0.85	2.73	1.06

As a Proportion of the Canadian Manufacturing Sector

1984	100	52.37	57.50	106.04	53.85	47.37
1985	100	51.09	47.11	97.81	52.43	50.35
1986	100	54.76	53.10	98.01	54.71	54.31
1987	100	56.88	52.42	108.20	52.53	61.63
1988	100	52.27	58.37	112.19	45.97	53.77
1989	100	51.70	61.20	115.80	46.53	50.73
1990	100	51.83	60.87	111.91	47.42	50.37
1991	100	58.77	62.52	91.91	57.97	56.52
1992	100	58.82	52.07	99.97	58.14	60.43
1993	100	58.09	54.64	95.78	56.48	59.34
1994	100	56.81	52.20	105.97	54.25	58.83
1995	100	59.01	51.13	116.07	57.49	60.83
1996	100	57.54	48.21	99.38	57.32	59.20
1997	100	55.16	46.88	110.43	52.34	58.19
1998	100	55.74	45.03	113.49	52.78	59.25
1999	100	55.83	49.65	106.66	55.42	55.54
2000	100	53.12	48.36	109.88	54.29	50.86
2001	100	54.72	48.15	113.03	56.20	52.60
2002	100	na	46.52	114.98	58.75	na

As a Proportion of All Industries Capital Productivity

1984	135.79	89.25	124.83	142.21	80.63	79.89
1985	136.99	89.43	109.06	136.10	79.95	85.54
1986	133.64	92.57	121.30	131.07	80.93	87.21
1987	133.75	96.12	121.06	145.82	78.32	97.02
1988	135.22	89.01	131.20	148.99	69.95	86.51
1989	131.71	86.01	133.07	152.49	69.58	79.85
1990	125.25	81.39	124.40	140.90	66.60	75.57
1991	118.81	86.65	122.08	110.44	75.82	79.42
1992	122.09	89.59	107.50	123.79	77.64	87.65
1993	128.57	94.57	121.90	127.67	80.29	91.32
1994	134.30	98.37	124.65	150.32	82.13	95.16
1995	138.29	105.34	129.37	167.84	88.74	100.56
1996	138.30	103.35	127.10	145.68	88.21	97.33
1997	141.72	103.02	128.22	171.47	83.46	99.71
1998	143.83	104.66	120.33	177.56	85.80	102.44
1999	147.42	108.00	135.52	171.97	93.59	98.59
2000	149.06	105.28	132.15	179.18	94.16	93.88
2001	144.30	103.97	126.11	178.56	93.46	93.07
2002	147.07	na	114.42	180.13	99.05	na

Source: Based on Statistics Canada, unpublished capital stock data provided to CSLS by the Division of Fixed Assets and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis

Note: Bold font indicates that the growth rate is for 2001.

Table 10: Indexes of Total Factor Productivity (1987=100) in Manufacturing and All Industries in Canada and the Atlantic provinces, 1987-2002

Manufacturing

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1987	100	100	100	100	100	100
1988	101.3	91.0	104.3	99.2	88.6	87.1
1989	99.2	90.2	106.0	104.9	87.2	86.3
1990	96.7	87.5	103.4	94.6	87.4	81.3
1991	93.5	95.0	102.6	89.7	100.4	88.2
1992	97.4	97.8	94.2	96.6	105.3	92.3
1993	102.5	101.3	104.2	104.5	109.5	92.1
1994	108.4	105.9	113.1	112.6	111.3	97.4
1995	110.9	108.7	118.6	123.2	113.1	100.0
1996	110.1	107.7	102.1	105.2	116.3	101.3
1997	112.9	108.2	95.2	119.1	117.0	103.6
1998	115.2	109.8	93.9	134.2	114.2	108.4
1999	118.1	111.9	101.3	125.7	121.1	105.9
2000	120.6	112.1	109.4	131.5	123.3	101.3
2001	116.4	111.6	101.1	133.3	121.6	104.1
2002	118.1	na	98.0	140.5	127.8	na

Average annual growth rate, %

1987-02	1.11	0.79	-0.13	2.29	1.65	0.29
1987-89	-0.39	-5.02	2.96	2.40	-6.61	-7.13
1989-02	1.35	1.79	-0.60	2.28	2.98	1.58

All Industries

1987	100	100	100	100	100	100
1988	100.4	99.7	102.4	102.7	98.5	98.7
1989	99.4	98.2	101.7	101.7	96.4	97.2
1990	98.8	97.5	100.7	99.3	96.4	95.9
1991	97.8	97.4	98.4	99.5	97.2	96.1
1992	98.8	98.0	99.1	100.3	99.0	95.1
1993	99.4	97.8	99.3	99.3	99.2	94.5
1994	101.3	98.2	100.4	99.6	98.8	95.9
1995	102.3	98.8	99.1	101.5	100.3	96.8
1996	101.9	98.3	96.2	99.8	99.8	98.0
1997	103.4	98.2	96.2	98.6	100.1	97.3
1998	105.1	100.1	100.8	101.2	100.6	99.2
1999	106.9	101.7	101.1	102.8	102.3	101.2
2000	108.2	101.7	104.5	101.9	101.8	99.7
2001	108.4	102.1	103.8	100.7	102.5	100.6
2002	109.7	105.9	114.2	104.9	105.1	101.8

Average annual growth rate, %

1987-02	0.62	0.38	0.89	0.32	0.33	0.12
1987-89	-0.28	-0.90	0.86	0.83	-1.83	-1.39
1989-02	0.76	0.58	0.89	0.24	0.67	0.35

Source: Unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis, unpublished Total Hours data provided by Statistics Canada Division of Labour Statistics, and unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Note: Bold font indicates that the growth rate is for 2001.

Table 11: Relative Total Factor Productivity Levels in Manufacturing (Atlantic Provinces as a percentage of Canada) in Atlantic provinces, 1987-2002

	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1987	67.9	64.6	77.0	59.8	79.3
1988	61.0	66.5	75.5	52.4	68.2
1989	61.7	69.0	81.4	52.6	69.0
1990	61.4	69.0	75.3	54.1	66.6
1991	68.9	70.8	73.8	64.2	74.8
1992	68.1	62.4	76.4	64.7	75.2
1993	67.1	65.7	78.5	64.0	71.3
1994	66.3	67.4	80.0	61.5	71.3
1995	66.5	69.0	85.5	61.0	71.5
1996	66.4	59.9	73.6	63.2	73.0
1997	65.0	54.5	81.2	62.0	72.8
1998	64.7	52.6	89.7	59.3	74.6
1999	64.3	55.4	81.9	61.3	71.1
2000	63.1	58.6	83.9	61.2	66.7
2001	65.0	56.1	88.1	62.5	70.9
2002	na	53.6	91.7	64.8	na
Average annual growth rate					
1987-02	-0.30	-1.23	1.17	0.53	-0.79
1987-89	-4.65	3.37	2.80	-6.25	-6.76
1989-02	0.44	-1.92	0.92	1.62	0.24

Source: Unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis, unpublished Total Hours data provided by Statistics Canada Division of Labour Statistics, and unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Note: Relative TFP in 1987 was calculated as a weighted average of Relative Real GDP per Hour (Atlantic provinces over Canada) and Relative Real GDP per \$1,000 of capital stock (Atlantic Provinces over Canada). The weights used are 0.51 for relative labour productivity (the labour share of income in manufacturing in Canada in 1997) and 0.49 for relative capital productivity (the capital share of income in manufacturing in Canada in 1997). The estimates for 1987 were then multiplied by the index of relative productivity calculated from the TFP indexes for the 1987-2002 period.

Table 12: Manufacturing Capital Stock per Hour Worked (in 1997 dollars) in Canada and Atlantic Provinces, 1987-2002

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1987	39.91	55.03	58.06	17.34	50.82	62.39
1988	39.19	51.73	48.96	15.25	49.93	59.57
1989	40.38	55.72	49.36	17.12	50.65	70.23
1990	44.38	60.26	54.83	17.29	56.61	73.21
1991	49.63	66.17	61.25	27.33	59.83	81.86
1992	51.83	67.41	71.51	25.90	62.97	75.82
1993	50.84	65.79	70.49	29.15	63.96	69.49
1994	49.66	65.60	79.16	24.25	62.52	68.99
1995	48.51	59.79	84.46	22.56	53.74	63.50
1996	48.39	62.44	71.58	22.71	57.84	69.52
1997	47.35	63.78	61.39	21.95	65.08	69.92
1998	46.91	61.24	61.48	25.03	58.09	70.24
1999	45.11	58.05	54.04	22.78	54.27	69.81
2000	44.97	61.48	63.23	22.45	56.01	72.83
2001	46.24	63.29	60.24	24.04	56.13	79.22
2002	45.16	na	57.66	24.52	53.96	na
Average annual growth rate, %						
1987-02	0.83	1.00	-0.05	2.33	0.40	1.72
1987-89	0.58	0.63	-7.80	-0.66	-0.17	6.09
1989-02	0.86	1.07	1.20	2.80	0.49	1.01
As a Proportion of the Canadian Manufacturing Sector						
1987	100	137.9	145.5	43.5	127.3	156.3
1988	100	132.0	124.9	38.9	127.4	152.0
1989	100	138.0	122.2	42.4	125.4	173.9
1990	100	135.8	123.6	39.0	127.6	165.0
1991	100	133.3	123.4	55.1	120.6	164.9
1992	100	130.1	138.0	50.0	121.5	146.3
1993	100	129.4	138.6	57.3	125.8	136.7
1994	100	132.1	159.4	48.8	125.9	138.9
1995	100	123.2	174.1	46.5	110.8	130.9
1996	100	129.0	147.9	46.9	119.5	143.7
1997	100	134.7	129.6	46.3	137.4	147.7
1998	100	130.6	131.1	53.4	123.8	149.7
1999	100	128.7	119.8	50.5	120.3	154.7
2000	100	136.7	140.6	49.9	124.6	162.0
2001	100	136.9	130.3	52.0	121.4	171.3
2002	100	na	127.7	54.3	119.5	na
As a Proportion of Capital Stock per Hour Worked in All Industries						
1987	72.6	91.9	70.7	44.7	96.7	107.7
1988	72.3	89.8	63.0	40.1	98.4	105.7
1989	74.6	97.2	64.1	43.4	100.7	125.1
1990	79.1	103.2	70.9	43.4	109.8	127.1
1991	83.2	106.9	75.7	62.2	109.2	134.1
1992	83.4	104.2	80.1	56.3	109.9	123.3
1993	82.3	100.9	75.7	63.0	110.7	115.0
1994	81.4	101.0	83.0	52.7	110.5	114.9
1995	78.8	91.7	86.7	48.7	94.9	106.8

1996	78.1	94.4	70.8	48.8	102.8	113.7
1997	76.0	96.2	60.7	46.3	114.9	114.7
1998	74.5	92.3	61.0	51.7	102.9	114.5
1999	72.0	87.4	56.0	47.0	94.0	113.4
2000	71.6	92.2	63.9	48.3	97.2	117.7
2001	70.8	92.7	60.9	51.1	94.4	123.7
2002	68.3	na	57.4	51.4	88.2	na

Source: Unpublished Hours data provided by Statistics Canada Division of Labour Statistics and unpublished capital stock data provided to CSLS by Statistics Canada Division of Fixed Assets Note: Bold font indicates that the growth rate is for 2001.

Table 13: Average Years of Schooling for Employed Persons in Manufacturing, 1984-2001

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1984	11.56	10.98	10.18	10.42	11.30	11.07
1985	11.65	11.04	10.21	10.36	11.32	11.24
1986	11.69	11.17	10.63	11.51	11.30	11.30
1987	11.89	11.48	10.87	11.07	11.80	11.49
1988	11.98	11.57	11.26	11.78	11.74	11.52
1989	12.00	11.72	11.39	11.55	11.89	11.74
1990	12.11	11.80	11.37	10.98	12.14	11.75
1991	12.16	11.79	11.05	11.98	12.03	11.87
1992	12.26	11.95	11.11	10.62	12.30	12.11
1993	12.38	12.14	11.24	11.85	12.50	12.21
1994	12.40	12.15	11.55	12.25	12.32	12.18
1995	12.48	12.21	11.37	12.46	12.45	12.18
1996	12.53	12.34	11.53	12.55	12.62	12.32
1997	12.61	12.37	12.27	11.83	12.58	12.27
1998	12.69	12.52	12.55	11.89	12.62	12.49
1999	12.72	12.45	12.22	11.95	12.58	12.49
2000	12.86	12.60	12.42	12.55	12.67	12.60
2001	12.90	12.60	12.24	12.61	12.82	12.51
Average annual growth rates						
1984-01	0.65	0.81	1.09	1.13	0.74	0.72
1984-89	0.74	1.32	2.27	2.08	1.01	1.18
1989-01	0.61	0.60	0.60	0.74	0.63	0.53
Relative Educational Attainment						
1984	100	94.9	88.1	90.2	97.8	95.7
1985	100	94.8	87.7	88.9	97.2	96.5
1986	100	95.6	90.9	98.5	96.7	96.7
1987	100	96.5	91.4	93.0	99.2	96.6
1988	100	96.6	94.0	98.3	98.0	96.2
1989	100	97.7	95.0	96.3	99.1	97.8
1990	100	97.4	93.9	90.6	100.2	97.1
1991	100	96.9	90.9	98.5	98.9	97.6
1992	100	97.5	90.6	86.6	100.3	98.8
1993	100	98.1	90.7	95.7	101.0	98.6
1994	100	98.0	93.1	98.8	99.4	98.2
1995	100	97.8	91.1	99.9	99.8	97.5
1996	100	98.5	92.0	100.1	100.6	98.3
1997	100	98.1	97.2	93.8	99.7	97.3
1998	100	98.7	98.9	93.7	99.4	98.4

1999	100	97.9	96.0	93.9	98.9	98.2
2000	100	97.9	96.6	97.6	98.5	97.9
2001	100	97.6	94.9	97.8	99.3	97.0

Source: Labour Force Survey unpublished data, July 2002. Average years of schooling for 1990-1999 are calculated by applying the following years of schooling to education levels: 17.5 for "university degree"; 14 for "post-secondary certificate or diploma"; 13 for "some post-secondary"; 12 for "highschool graduate"; 10 for some highschool; and 8 for "0-8 years". Previous to 1990 the Labour Force Survey questionnaire asked a slightly different question, and average years of schooling are calculated by applying the following years of schooling to education levels: 17.5 for "university degree"; 14 for "post-secondary certificate or diploma"; 13 for "some post-secondary"; 12 for "11-13 years"; 9.5 for "9-10 years"; and 8 for "0-8 years". For 1987-1989 there is only one category for 9-13 years, to which has been applied 11.5 years. The relevant classifications are NAICS for 1987-1999 and SIC (1980) for 1984-1986.

Table 14: Nominal Share of R&D Investment in GDP, %, (natural sciences and engineering, all funders, performed by the business enterprise sector), 1984-2000

General Domestic Expenditure on R&D, millions of current dollars

	Canada	Atlantic Provinces	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick
1984	3,022	35	5	1	16	13
1985	3,635	60	6	1	23	30
1986	4,022	69	5	11	28	25
1987	4,341	63	7	3	25	28
1988	4,623	149	9	2	61	77
1989	4,779	130	10	2	38	80
1990	5,169	88	10	2	30	46
1991	5,355	68	10	2	26	30
1992	5,742	73	10	1	33	29
1993	6,424	98	11	2	44	41
1994	7,567	124	12	2	61	49
1995	7,991	130	11	3	64	52
1996	7,997	133	17	3	54	59
1997	8,744	107	14	2	54	37
1998	9,676	123	17	2	63	41
1999	10,228	126	18	4	64	40
2000	11,449	120	18	5	64	33
Average annual growth rate						
1984-00	8.68	8.01	8.34	10.58	9.05	6.00
1984-89	9.60	30.01	14.87	14.87	18.89	43.82
1989-00	8.27	-0.73	5.49	8.69	4.85	-7.73
As a share of Canada						
1984	100	1.16	0.17	0.03	0.53	0.43
1985	100	1.65	0.17	0.03	0.63	0.83
1986	100	1.72	0.12	0.27	0.70	0.62
1987	100	1.45	0.16	0.07	0.58	0.65
1988	100	3.22	0.19	0.04	1.32	1.67
1989	100	2.72	0.21	0.04	0.80	1.67
1990	100	1.70	0.19	0.04	0.58	0.89
1991	100	1.27	0.19	0.04	0.49	0.56
1992	100	1.27	0.17	0.02	0.57	0.51
1993	100	1.53	0.17	0.03	0.68	0.64

1994	100	1.64	0.16	0.03	0.81	0.65
1995	100	1.63	0.14	0.04	0.80	0.65
1996	100	1.66	0.21	0.04	0.68	0.74
1997	100	1.22	0.16	0.02	0.62	0.42
1998	100	1.27	0.18	0.02	0.65	0.42
1999	100	1.23	0.18	0.04	0.63	0.39
2000	100	1.05	0.16	0.04	0.56	0.29

Nominal Share of R&D investment in GDP, %

1984	0.67	0.12	0.08	0.07	0.14	0.15
1985	0.75	0.20	0.09	0.07	0.19	0.32
1986	0.78	0.21	0.07	0.67	0.21	0.24
1987	0.78	0.18	0.09	0.17	0.17	0.24
1988	0.75	0.39	0.11	0.10	0.40	0.62
1989	0.73	0.32	0.11	0.10	0.23	0.61
1990	0.76	0.21	0.11	0.09	0.18	0.34
1991	0.78	0.16	0.10	0.09	0.15	0.22
1992	0.82	0.17	0.10	0.04	0.18	0.21
1993	0.88	0.22	0.11	0.08	0.24	0.28
1994	0.98	0.27	0.12	0.08	0.33	0.32
1995	0.99	0.27	0.10	0.11	0.33	0.32
1996	0.96	0.27	0.16	0.11	0.28	0.35
1997	0.99	0.21	0.13	0.07	0.27	0.22
1998	1.06	0.23	0.15	0.07	0.29	0.23
1999	1.04	0.22	0.15	0.13	0.28	0.21
2000	1.08	0.20	0.13	0.15	0.26	0.16

Average annual growth rate

1984-00	2.97	3.84	4.31	3.81	4.70	2.40
1984-89	1.57	20.78	7.22	6.17	10.75	32.82
1989-00	3.68	-3.72	2.88	2.64	1.80	-10.09

Relative R&D Spending

1984	100	18.6	11.7	10.7	20.8	21.9
1985	100	26.9	12.1	9.2	24.8	42.8
1986	100	26.9	8.8	86.0	26.6	30.5
1987	100	22.8	11.6	22.2	22.3	31.2
1988	100	51.9	14.1	13.9	52.9	82.1
1989	100	44.2	15.3	13.4	32.1	83.9
1990	100	27.7	14.3	12.1	23.2	45.0
1991	100	20.2	13.3	11.4	18.9	28.1
1992	100	20.2	12.8	5.2	22.2	25.2
1993	100	24.5	12.7	9.2	27.2	31.6
1994	100	27.0	11.9	8.1	33.3	32.7
1995	100	26.9	10.5	11.4	33.6	32.2
1996	100	28.2	17.1	11.1	29.0	37.1
1997	100	21.4	13.4	7.2	26.8	22.2
1998	100	21.9	14.4	6.3	27.8	22.0
1999	100	21.1	14.2	12.1	26.7	20.2
2000	100	18.2	12.2	13.7	24.6	15.3

Source: CANSIM II table 358-0001 and 384-0002, July 25 2003.

Table 15: Regression Results for the Atlantic Provinces Manufacturing Labour Productivity Gap Model

Estimated Coefficients (t-statistics in parentheses)	1. Atlantic Provinces as a Percentage of Canada	2. Newfoundland as a Percentage of Canada	3. Prince Edward Island as a Percentage of Canada	4. Nova Scotia as a Percentage of Canada	5. New Brunswick as a Percentage of Canada	6. Pooled Atlantic Provinces	7. Pooled, with correction for auto- correlation	8. All Provinces Pooled, with correction for autocorrelation (1984-1999)
Constant	140.6966 (1.269)	26.18283 (0.215)	7.801905 (0.355)	101.6898 (0.775)	-101.1472 (-0.619)	69.85226 (2.659)*	35.32387 (1.696)***	70.33985 (3.115)*
Educational Attainment Gap	-0.68707 (-0.736)	-0.050999 (-0.045)	0.09559 (0.417)	-0.577136 (-0.416)	1.31011 (0.777)	-0.286857 (-1.107)	0.100614 (0.457)	-0.139886 (- 0.619)
Capital Intensity Gap	0.055848 (0.369)	0.405837 (2.098)***	0.565498 (3.213)*	0.162161 (0.864)	0.235809 (2.228)**	0.316685 (10.039)*	0.298934 (7.853)*	0.19112 (5.506)*
R&D Intensity Gap	-0.203946 (-3.118)**	0.133963 (0.124)	-0.061423 (-1.277)	-0.358995 (-2.474)**	-0.072125 (-1.049)	-0.017994 (-0.329)	-0.05387 (-1.291)	0.11643 (3.606)*
Economies of Scale Gap	0.032228 (0.197)	0.11415 (0.890)	-0.031347 (-0.164)	0.047872 (0.202)	0.169388 (0.283)	-0.052154 (-0.7636)	-0.096957 (-1.223)	0.061074 (0.989)
Unemployment Rate Gap	-0.023165 (-0.667)	-0.051529 (-0.987)	0.032447 (1.063)	0.049707 (0.798)	0.059486 (0.676)	-0.023343 (-1.788)***	-0.006625 (-0.502)	-0.017484 (-1.1438)
R-Square	0.655	0.647	0.632	0.460	0.412	0.826	0.905	0.912
Durbin-Watson d-statistic	2.127	1.578	1.711	1.121	1.744	0.709	1.838	2.125
Prob(F-statistic)	0.035	0.038	0.046	0.221	0.303	0.000	0.000	0.000

* Significant at the 1 percent level

** Significant at the 5 percent level

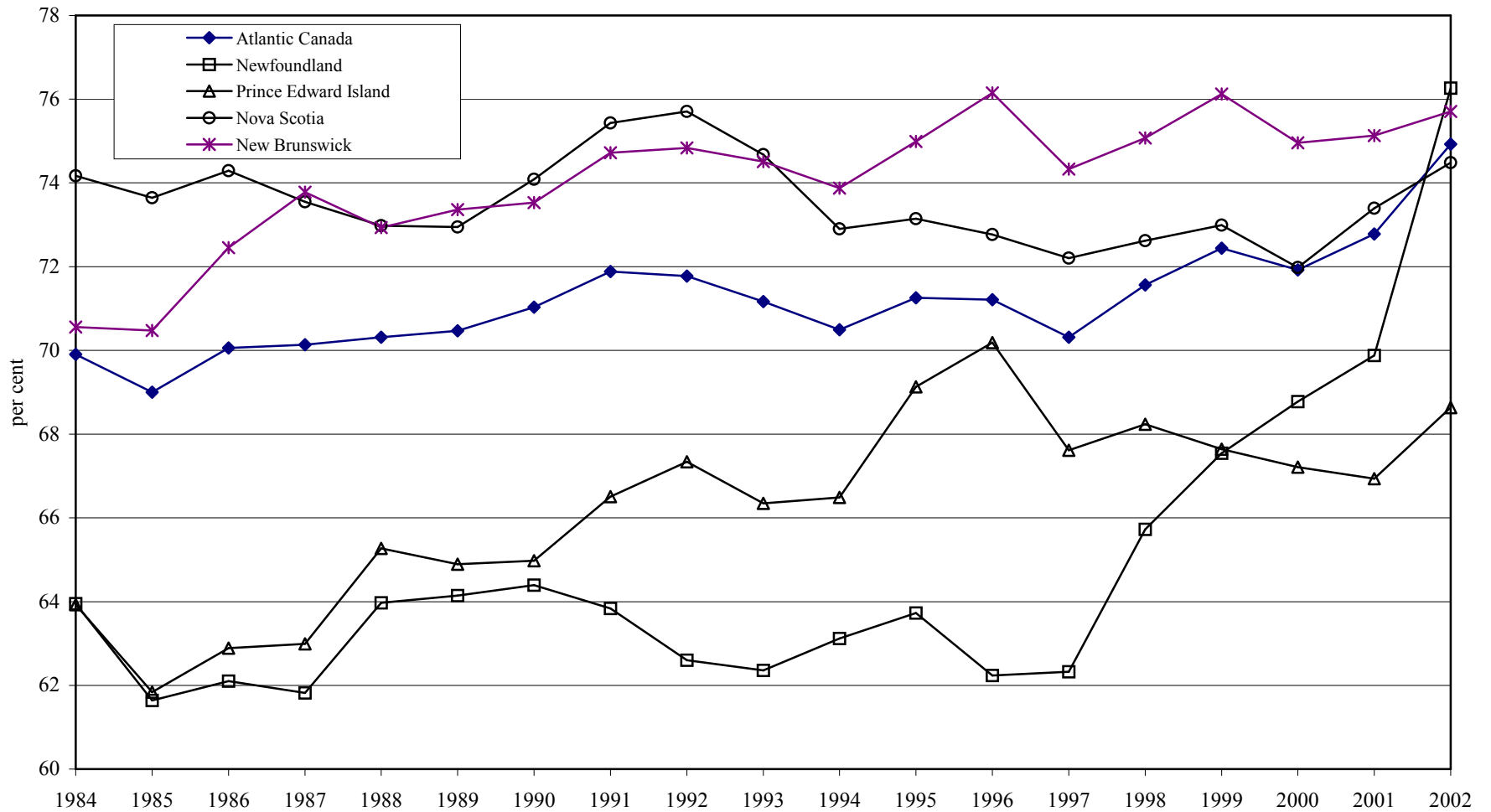
*** Significant at the 10 percent level

In all cases the independent variable is the gap in output per hour in manufacturing.

Pooled, with correction for auto-correlation regression was estimated using the General Least Squares with Eviews statistical software.

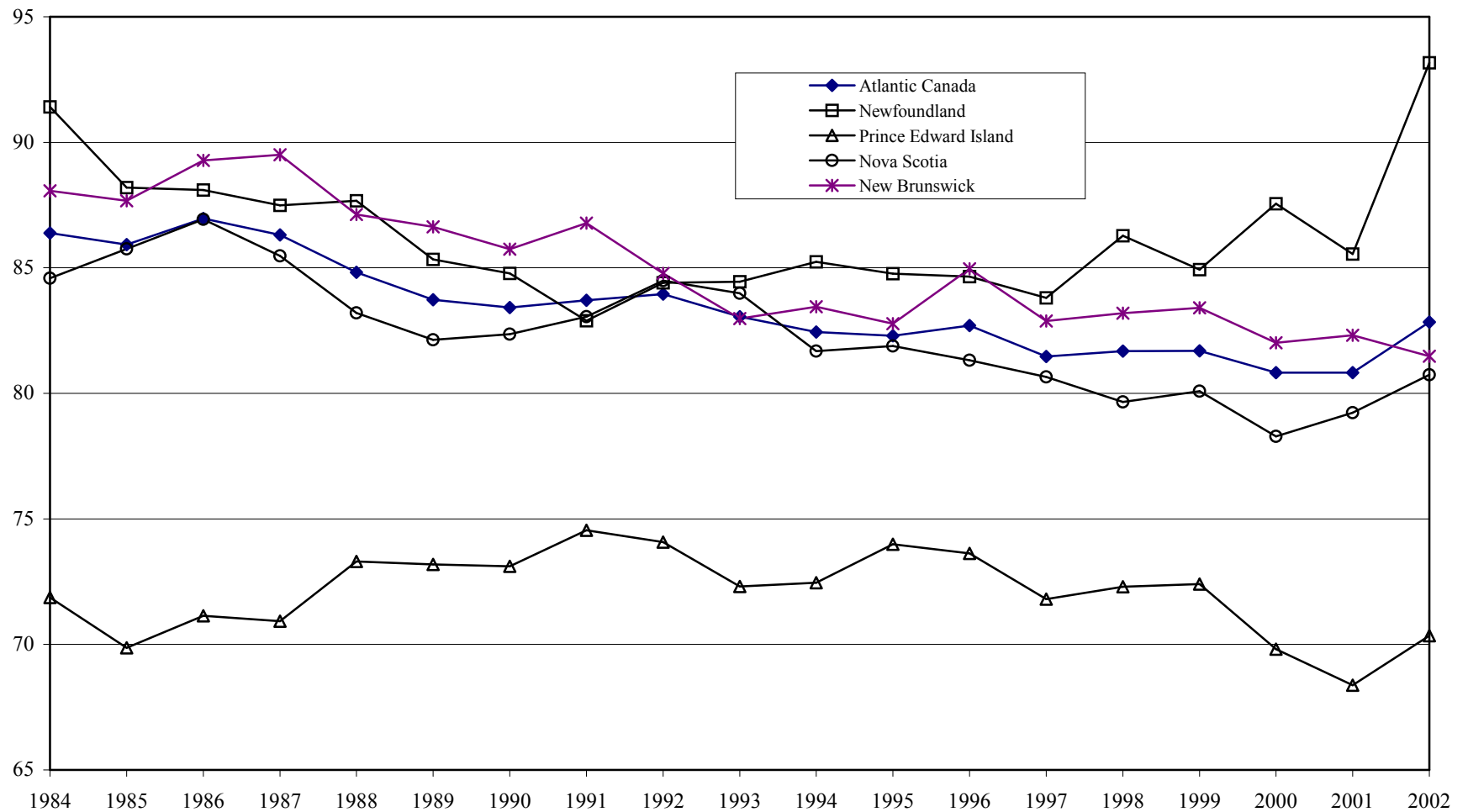
Charts

Chart 1: Real GDP per Capita in Atlantic Provinces as a Percentage of Canada, 1984-2002



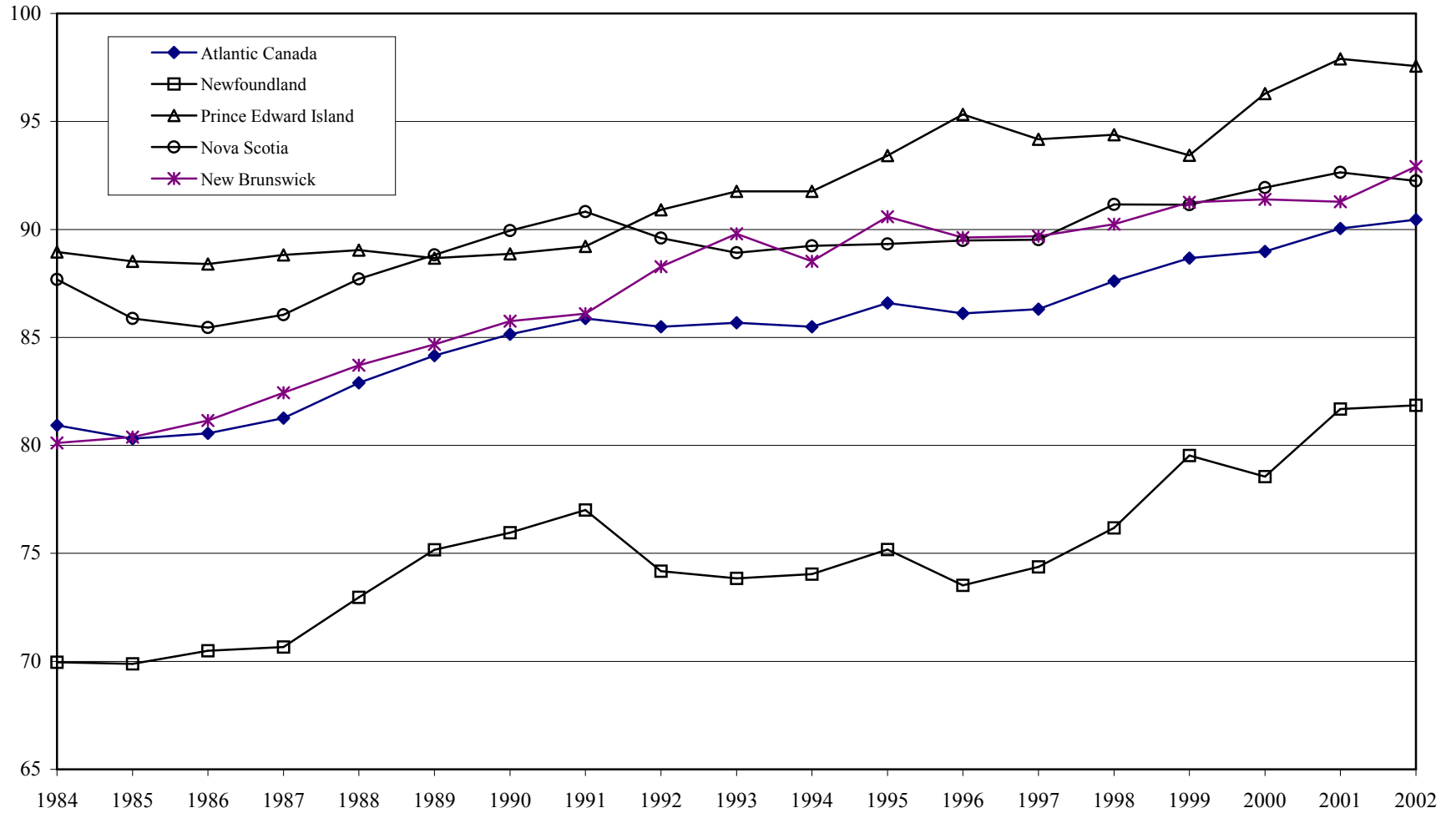
Source: Population: CANSIM II Table 051-0001, July 25, 2003. GDP: CANSIM II Table 379-0017 for Canada and Table 379-0025 for the Provinces. July 25, 2003.

Chart 2: Real GDP per Worker in Atlantic Provinces as a Percentage of Canada, 1984-2002



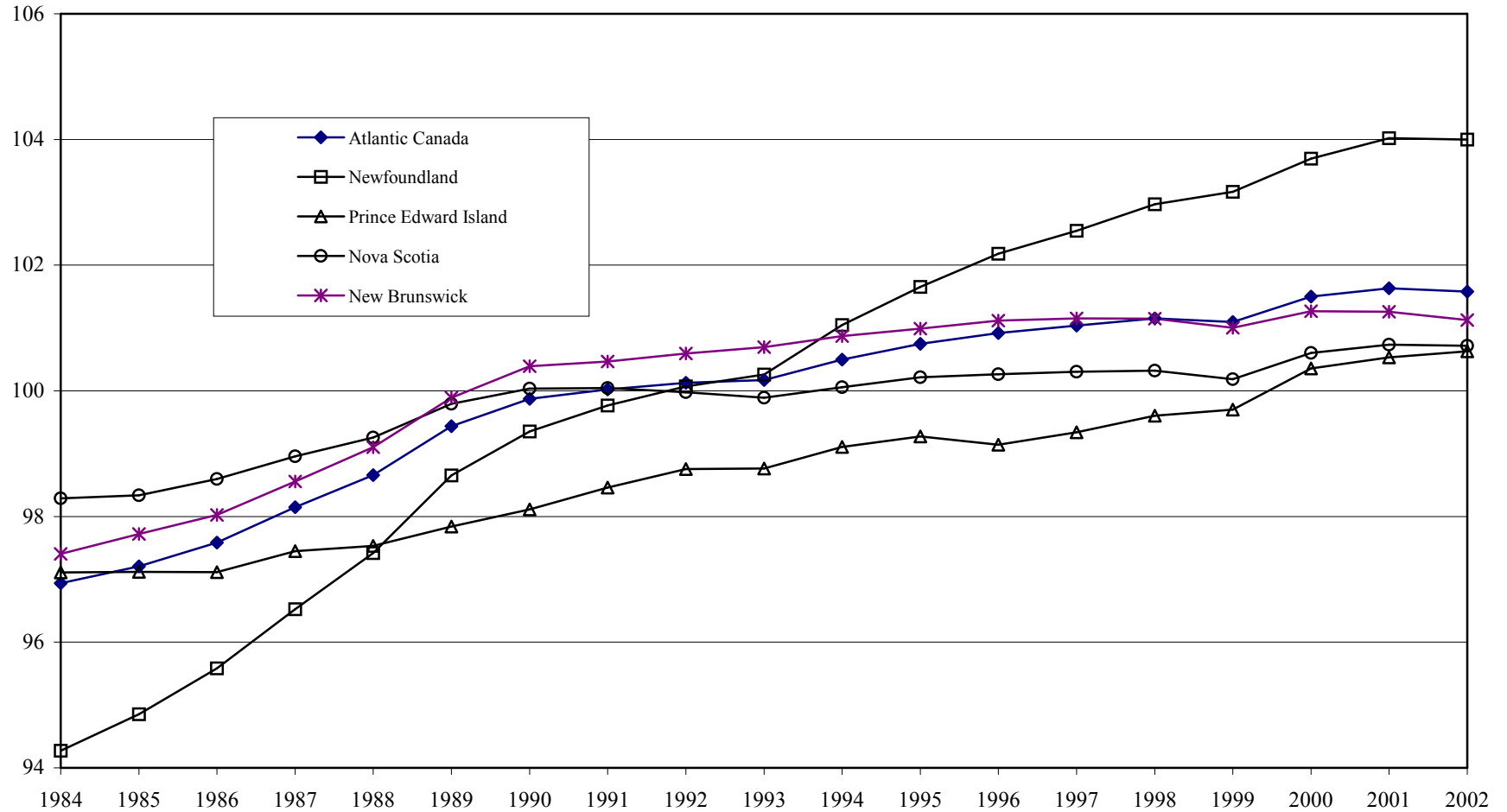
Source: Employment: Statistics Canada, *Labour Force Historical Review*, 2002, Cat. No. 710004XCB. GDP: CANSIM II Table 379-0017 for Canada and Table 379-0025 for the Provinces. July 25, 2003.

Chart 3: Employment to Population Ratio in Atlantic Provinces as a Percentage of Canada, 1984-2002



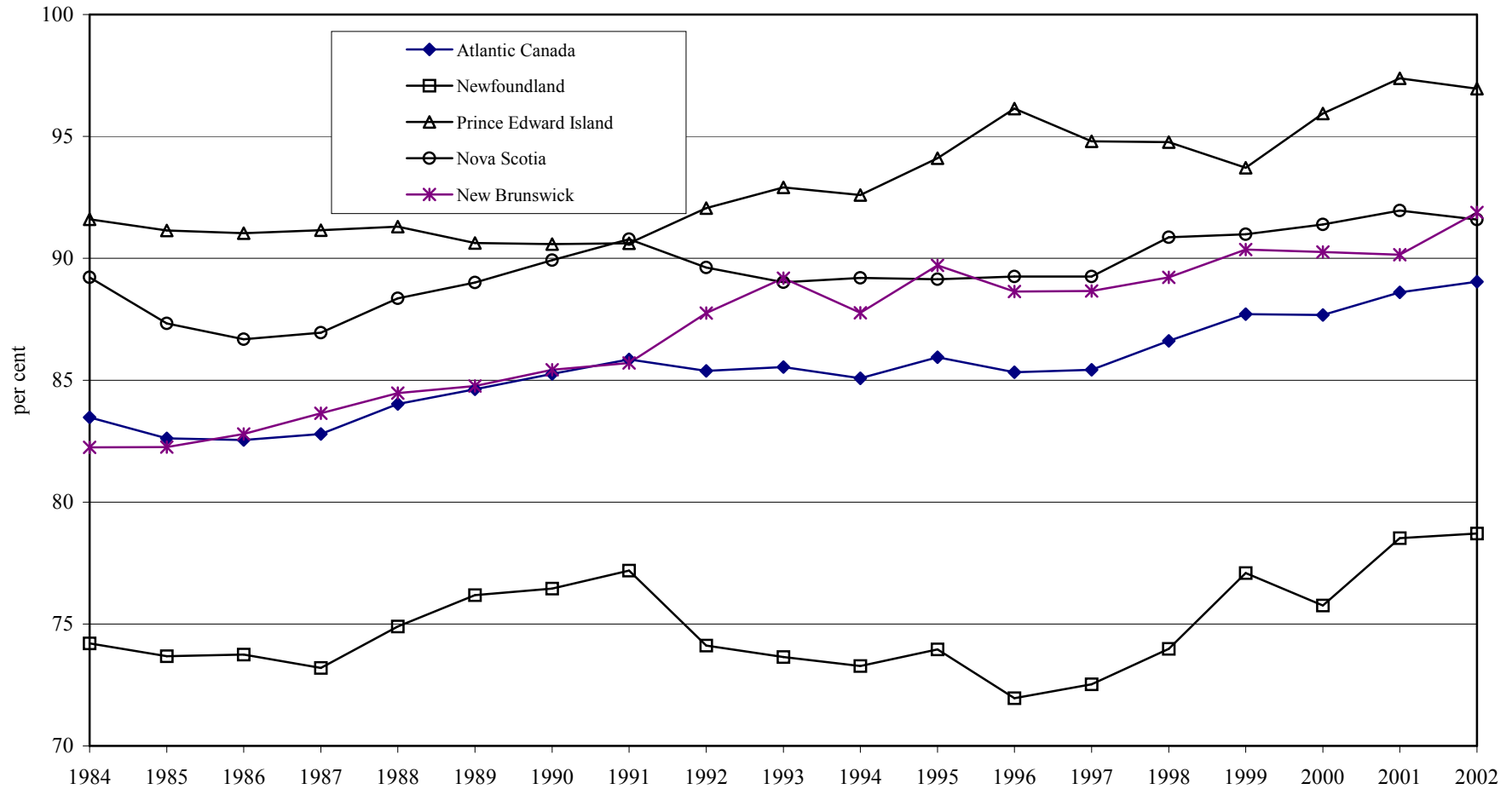
Source: Employment: Statistics Canada, *Labour Force Historical Review*, 2002, Cat. No. 710004XCB. Population: CANSIM II Table 051-0001, July 25, 2003.

Chart 4: Working Age Population to Total Population Ratio in Atlantic Provinces as a Percentage of Canada, 1984-2002



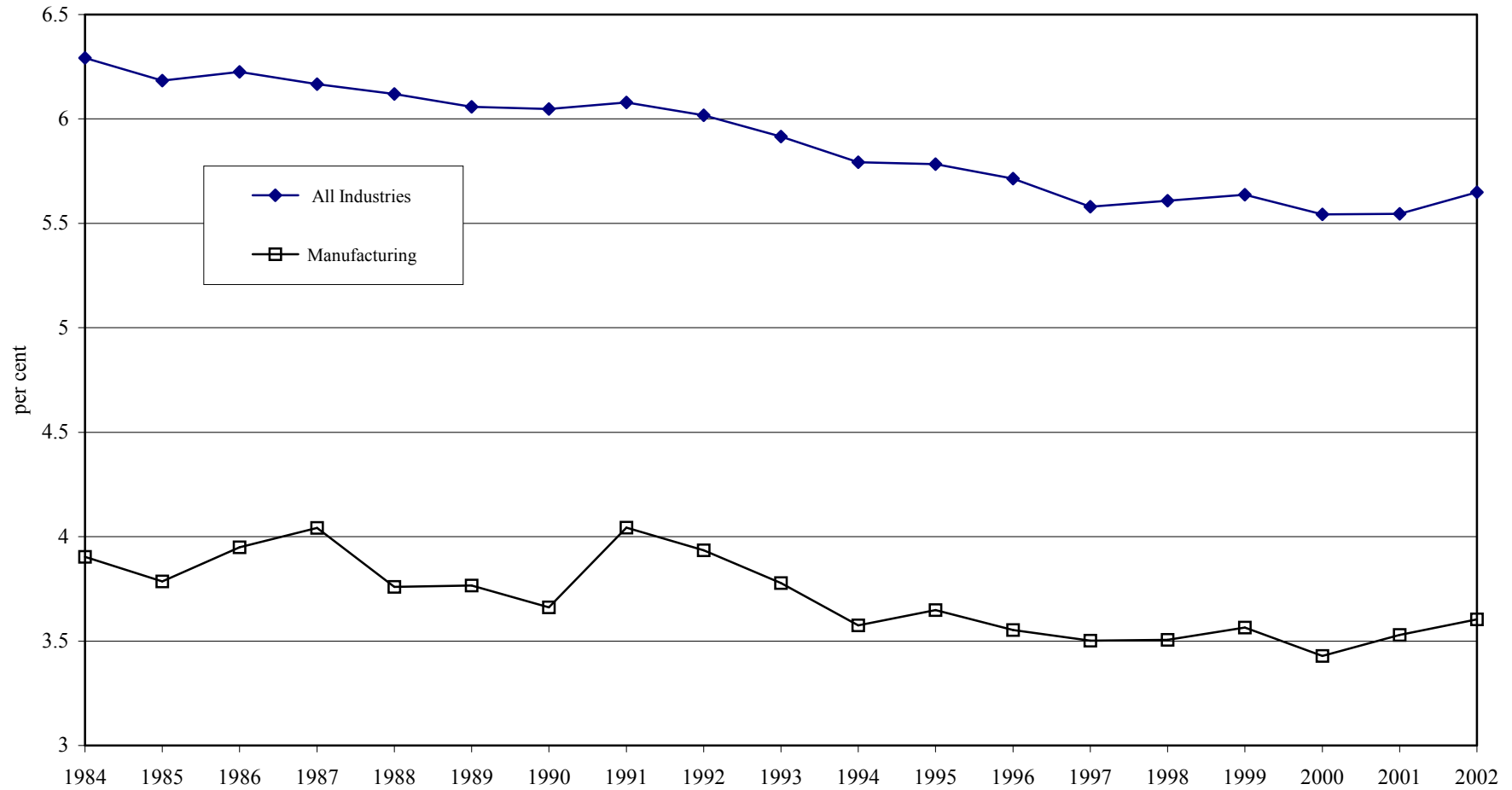
Source: Working Age Population: Statistics Canada, *Labour Force Historical Review*, 2002, Cat. No. 710004XCB. Population: CANSIM II Table 051-0001, July 25, 2003.

Chart 5: Employment to Working Age Population Ratio in Atlantic Provinces as a Percentage of Canada, 1984-2002



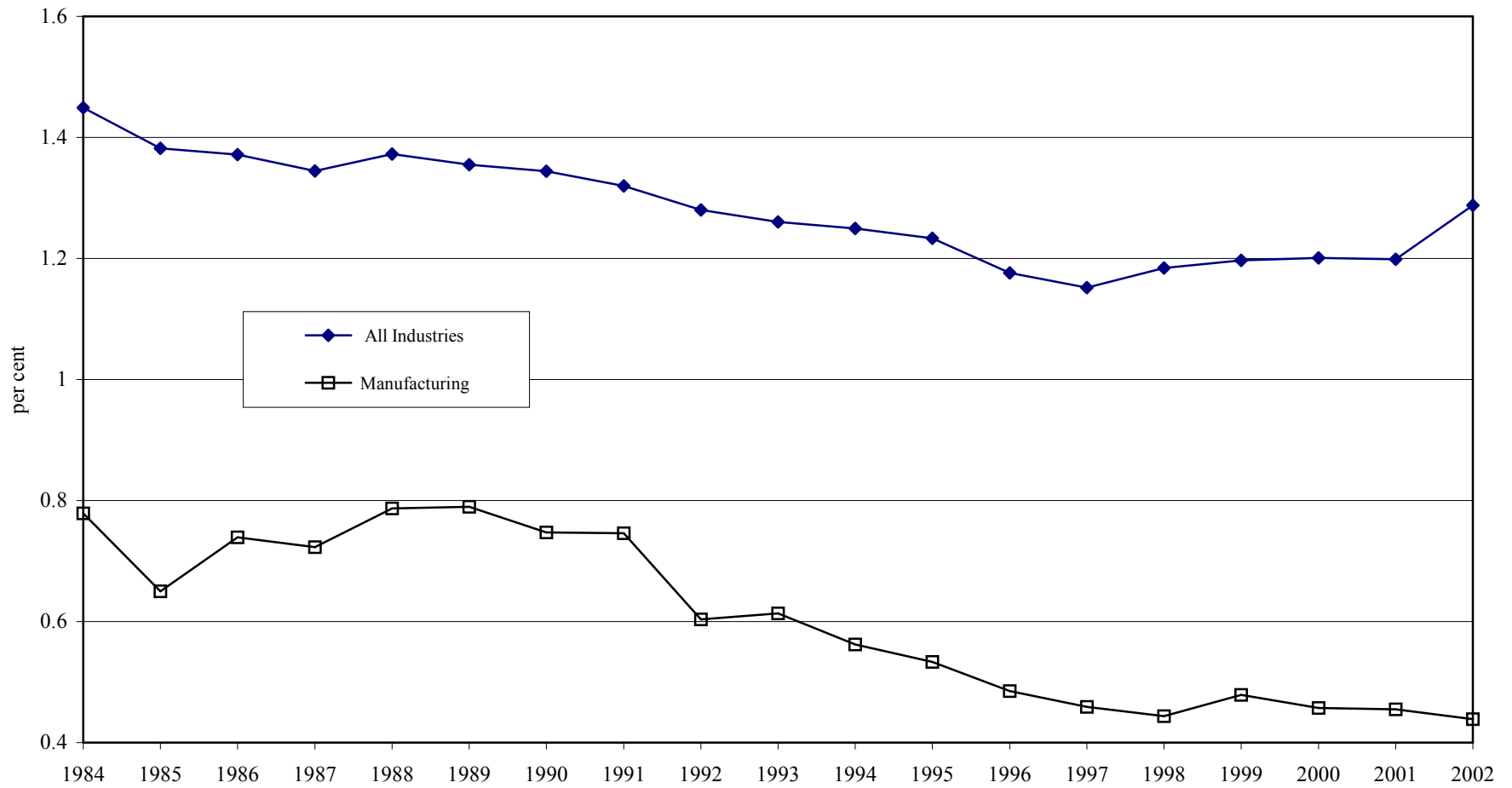
Source: Employment and Working Age Population: Statistics Canada, *Labour Force Historical Review*, 2002, Cat. No. 710004XCB.

Chart 6: Manufacturing and All Industries Output in Atlantic Provinces as a Percentage of Canada, 1984-2002



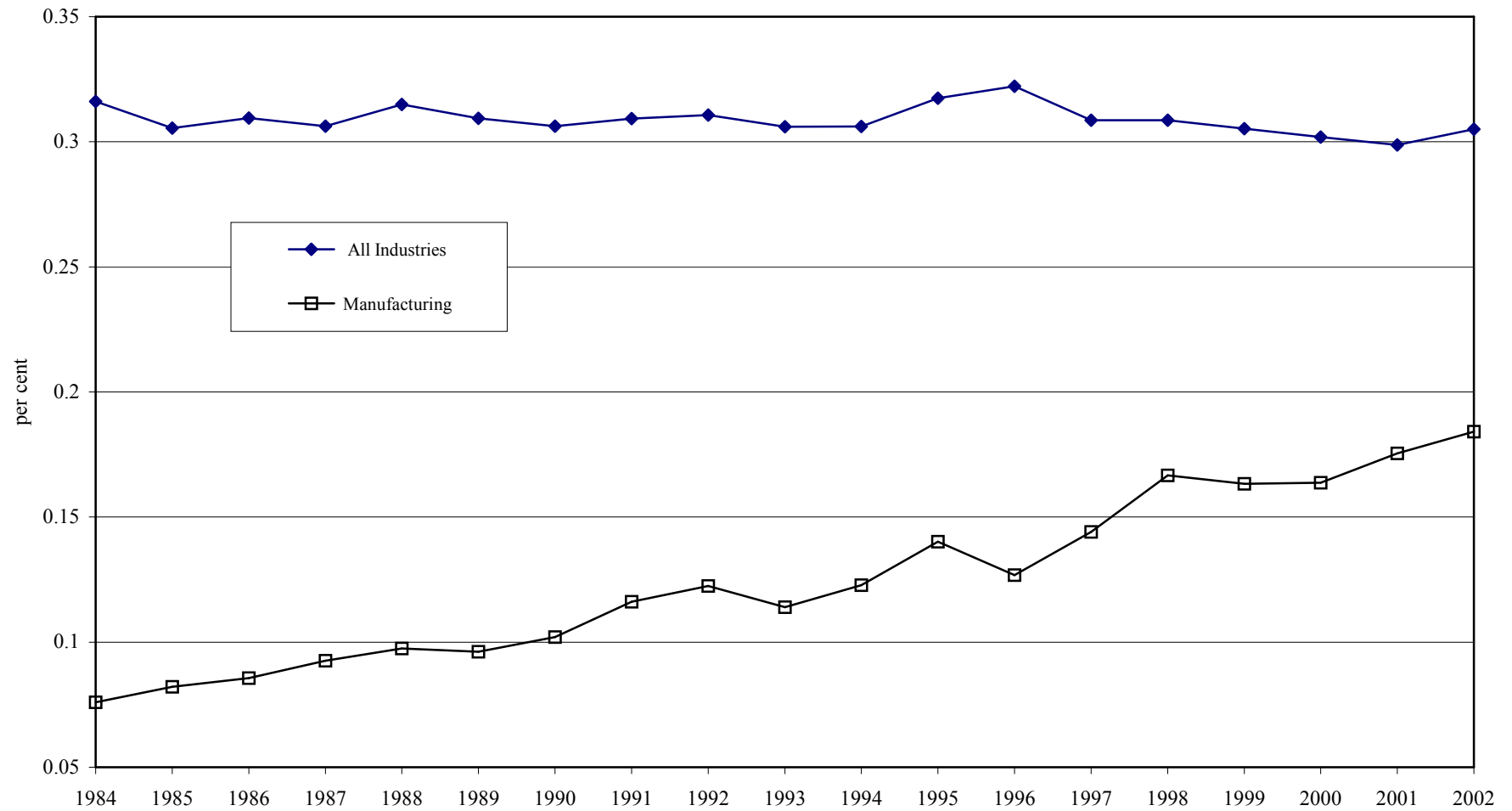
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis.

Chart 7: Manufacturing and All Industries Output in Newfoundland as a Percentage of Canada, 1984-2002



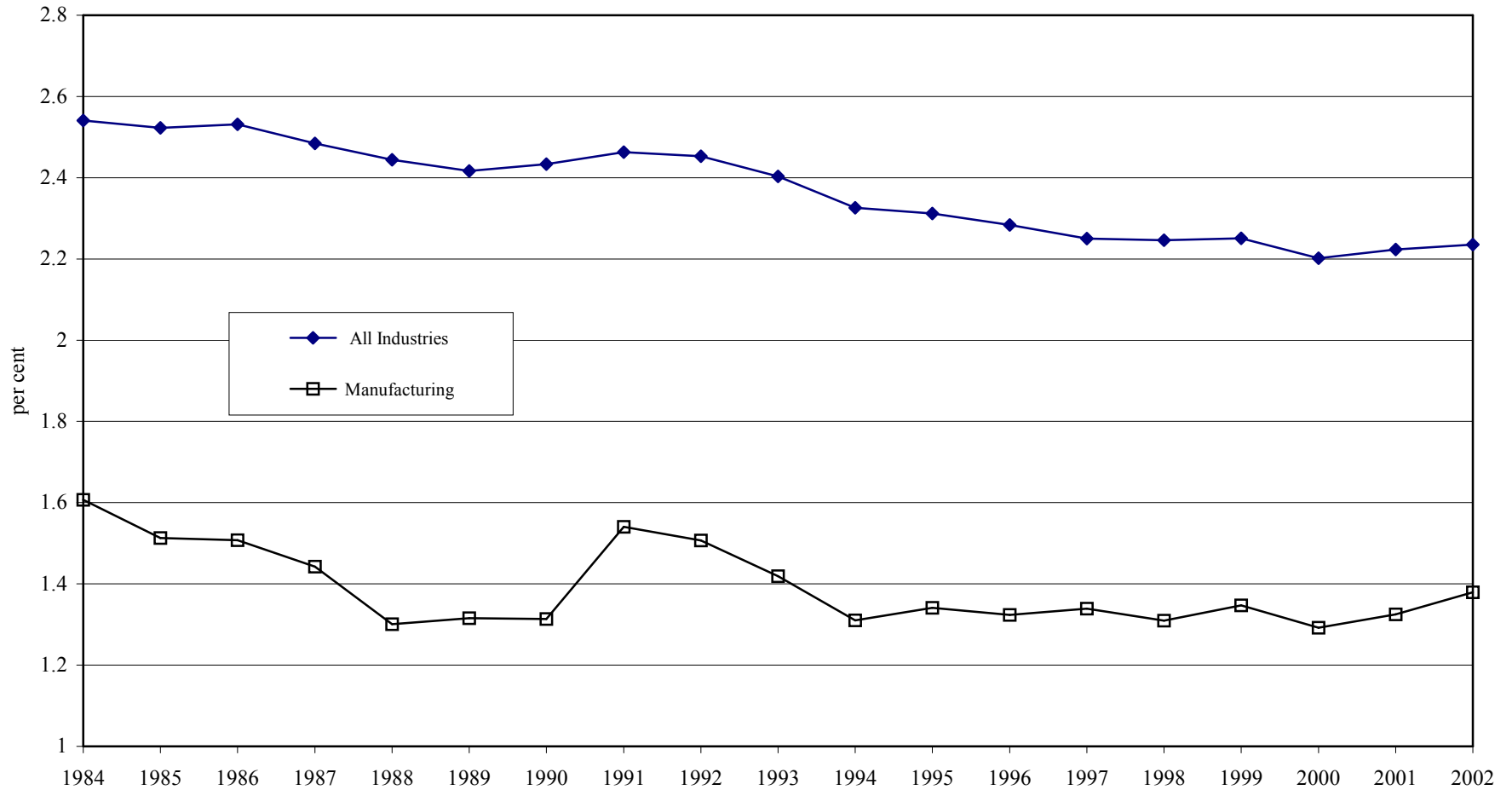
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis.

Chart 8: Manufacturing and All Industries Output in Prince Edward Island, as a Percentage of Canada, 1984-2002



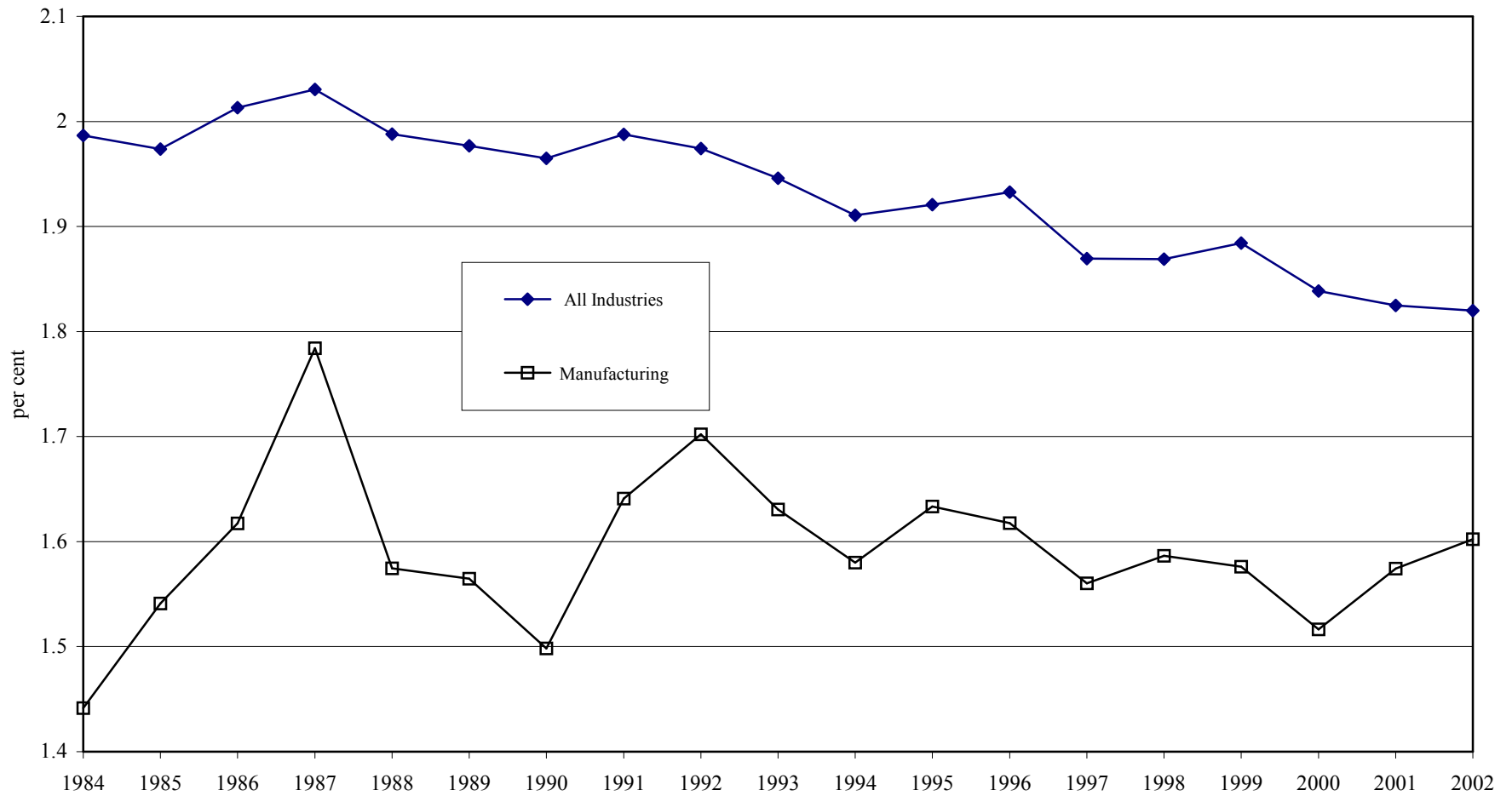
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis.

Chart 9: Manufacturing and All Industries in Nova Scotia as a Percentage of Canada, 1984-2002



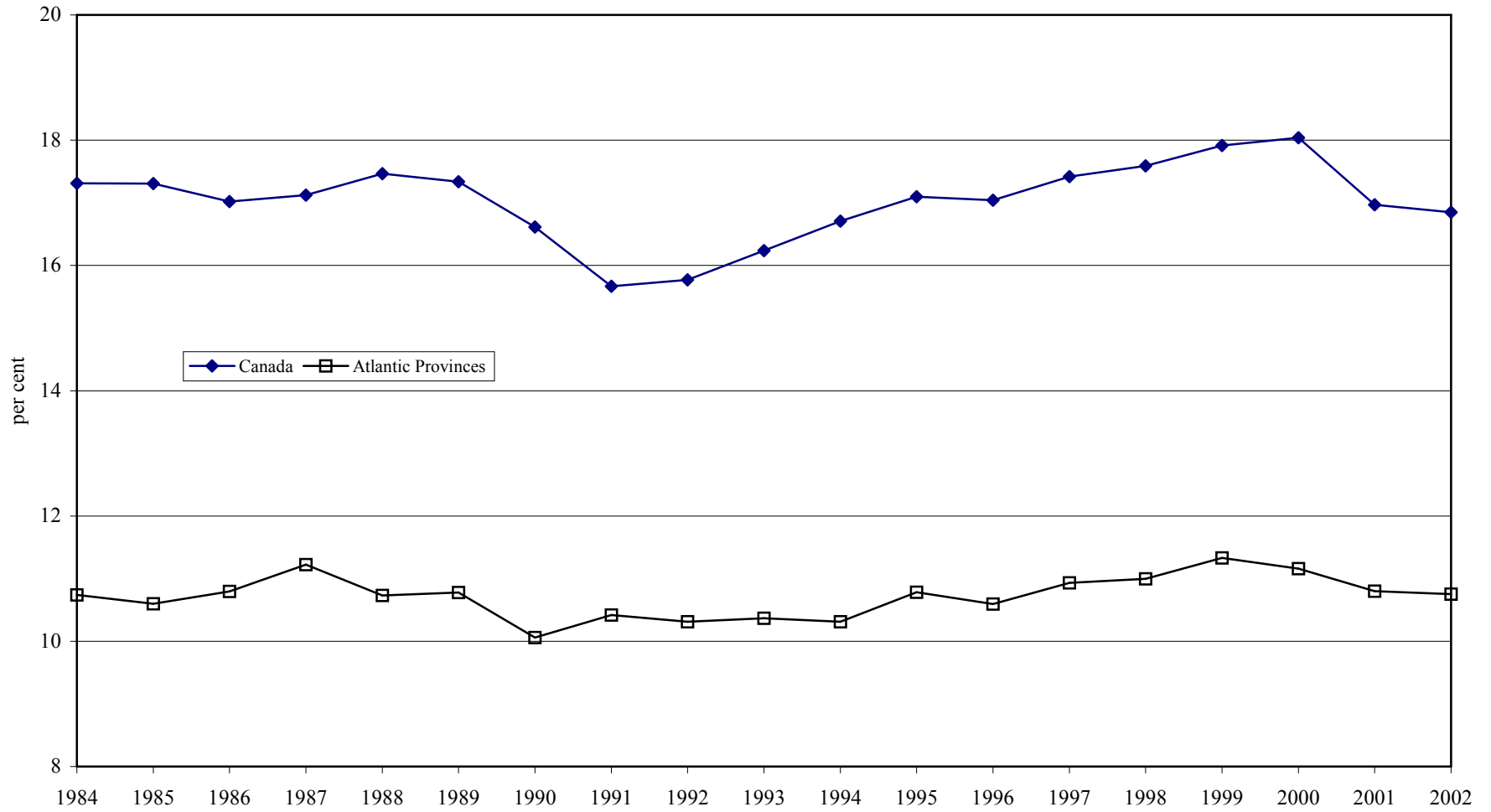
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis.

Chart 10: Manufacturing and All Industries Output in New Brunswick as a Percentage of Canada, 1984-2002



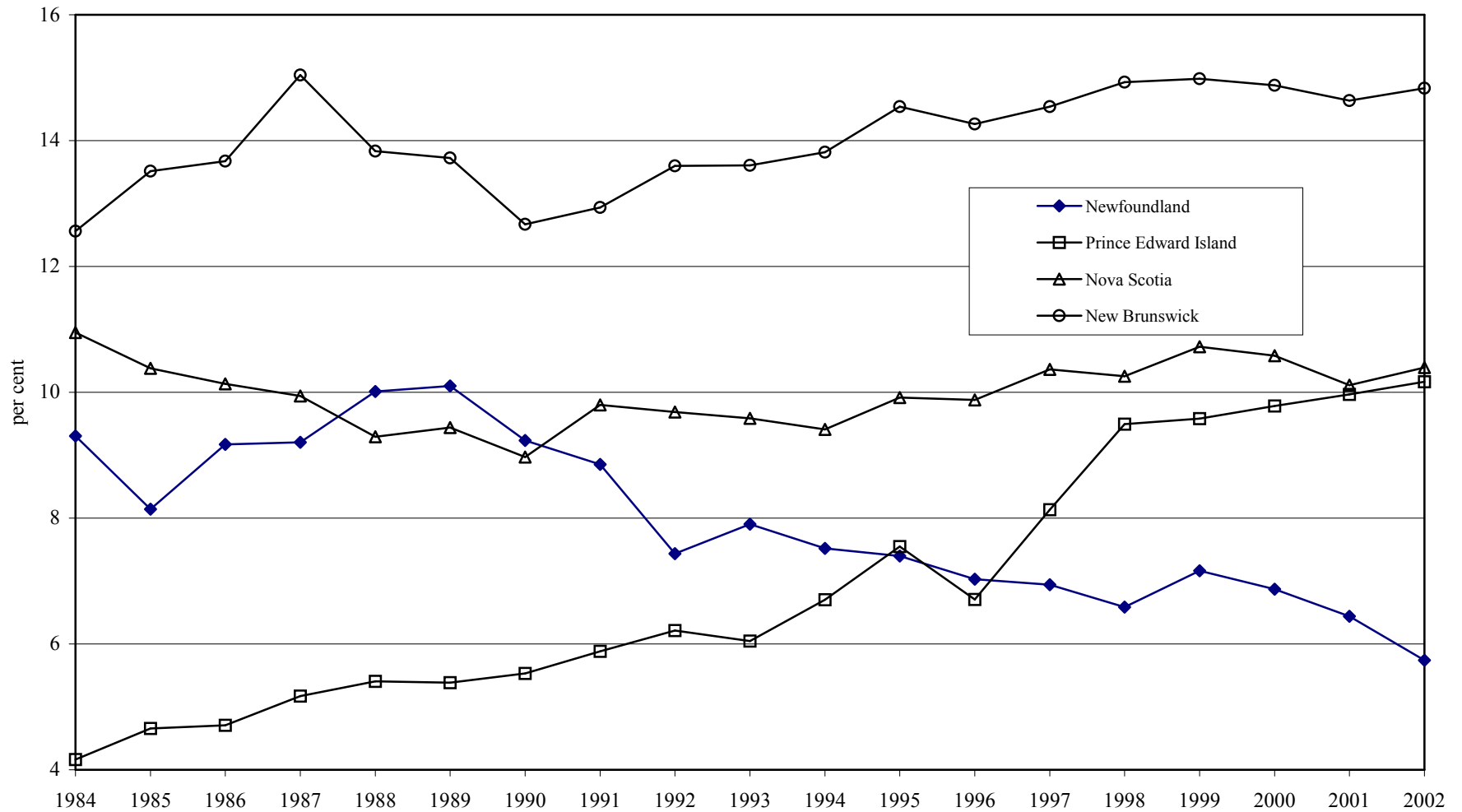
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis.

Chart 11: Manufacturing GDP as a Percentage of All Industries GDP in Canada and Atlantic Provinces, 1984-2002



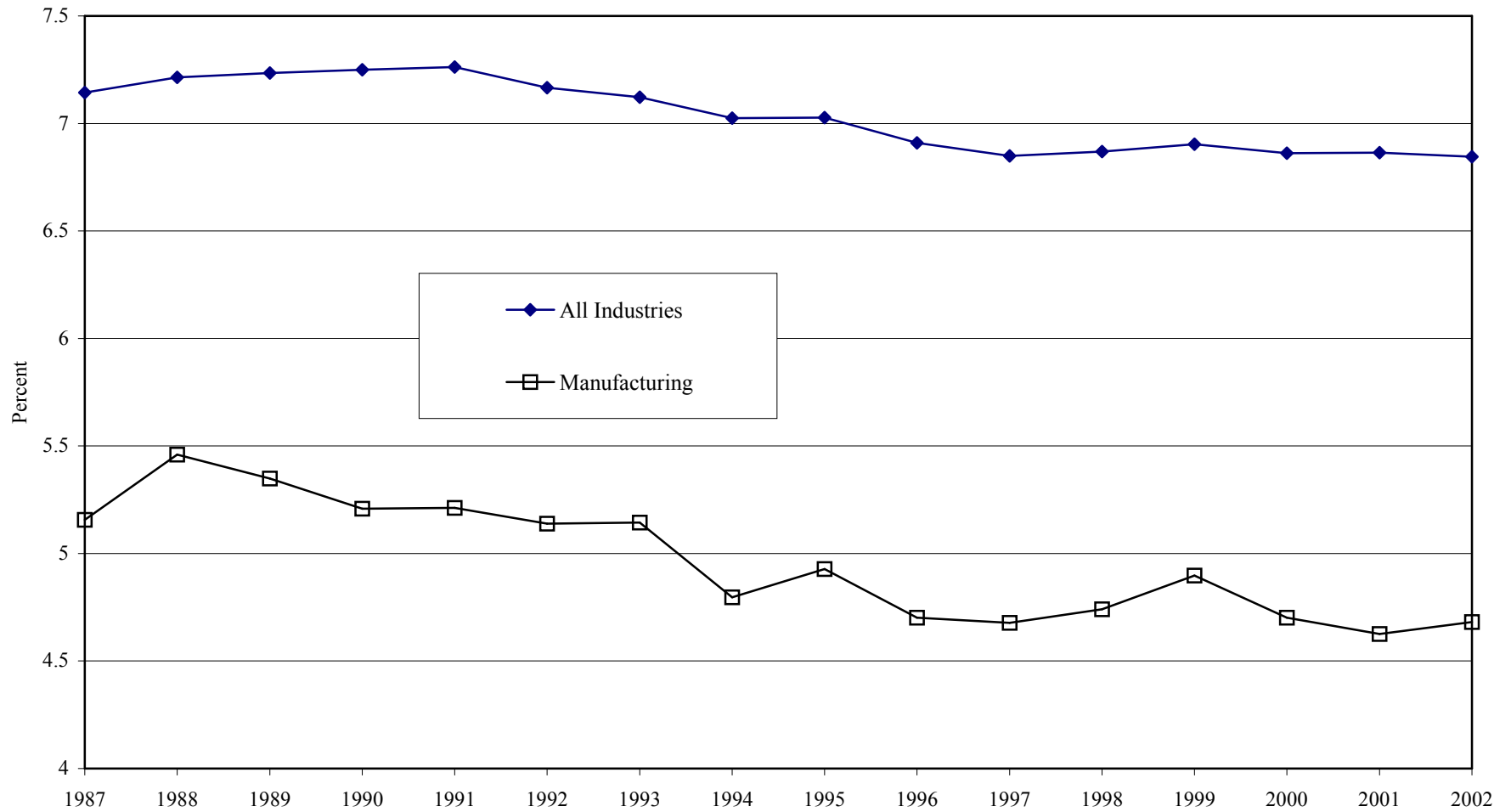
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis.

Chart 12: Manufacturing GDP as a Percentage of All Industries GDP in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, 1984-2002



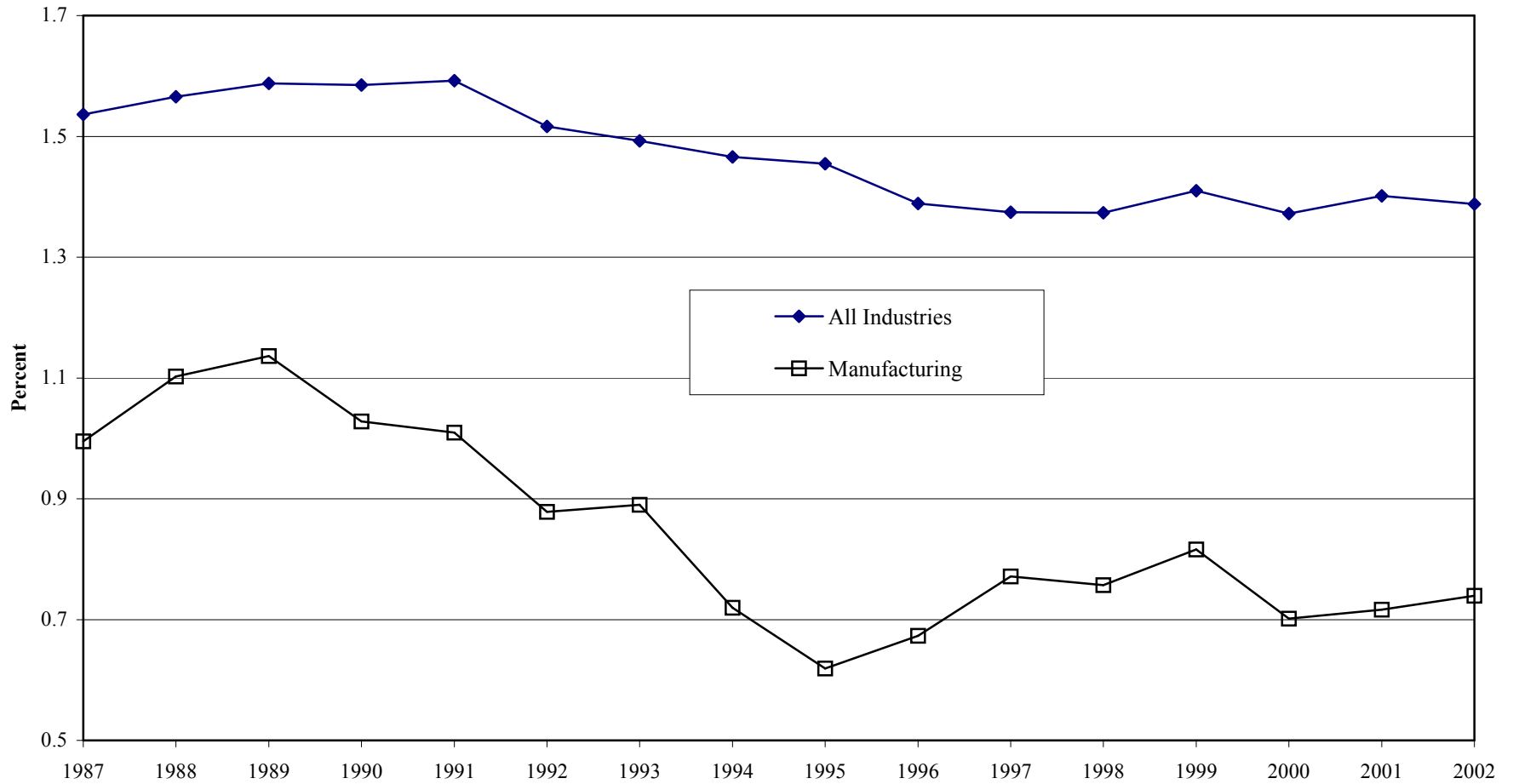
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis.

Chart 13: Total Employment in Manufacturing and All Industries in Atlantic Provinces as a Percentage of Canada, 1987-2002



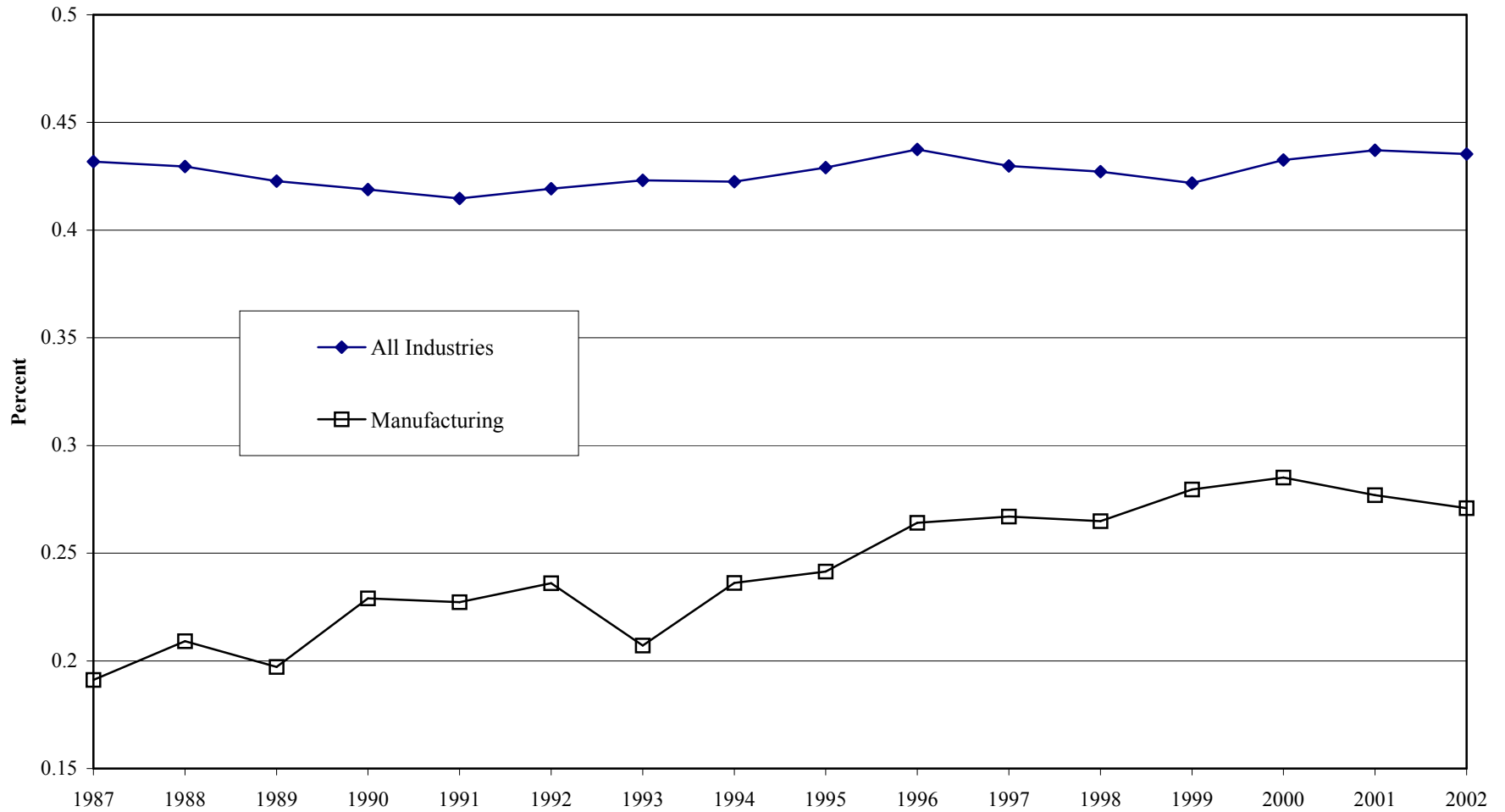
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics.

Chart 14: Total Employment in Manufacturing and All Industries in Newfoundland as a Percentage of Canada, 1987-2002



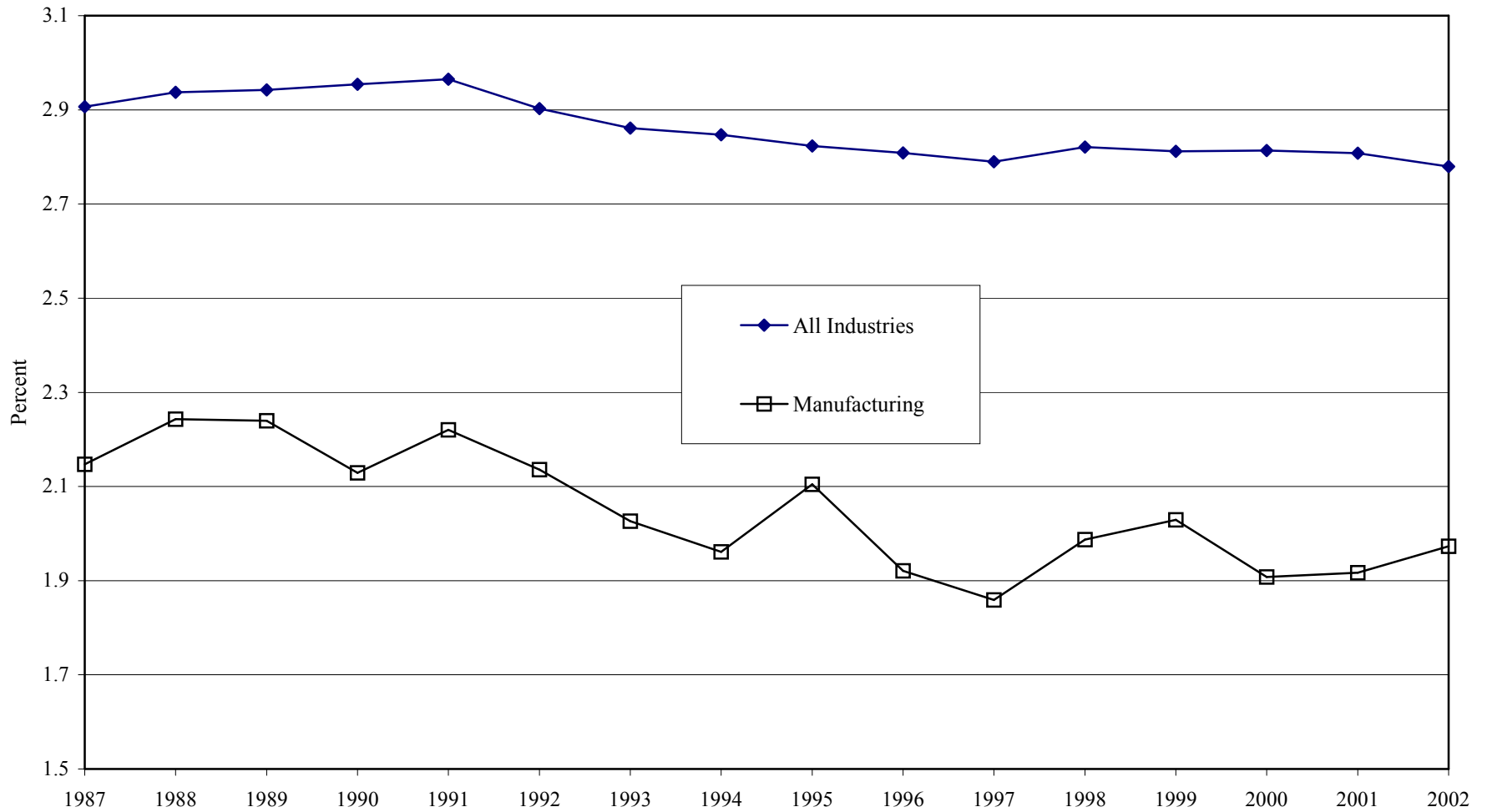
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics.

Chart 15: Total Employment in Manufacturing and All Industries in Prince Edward Island as a Percentage of Canada, 1987-2002



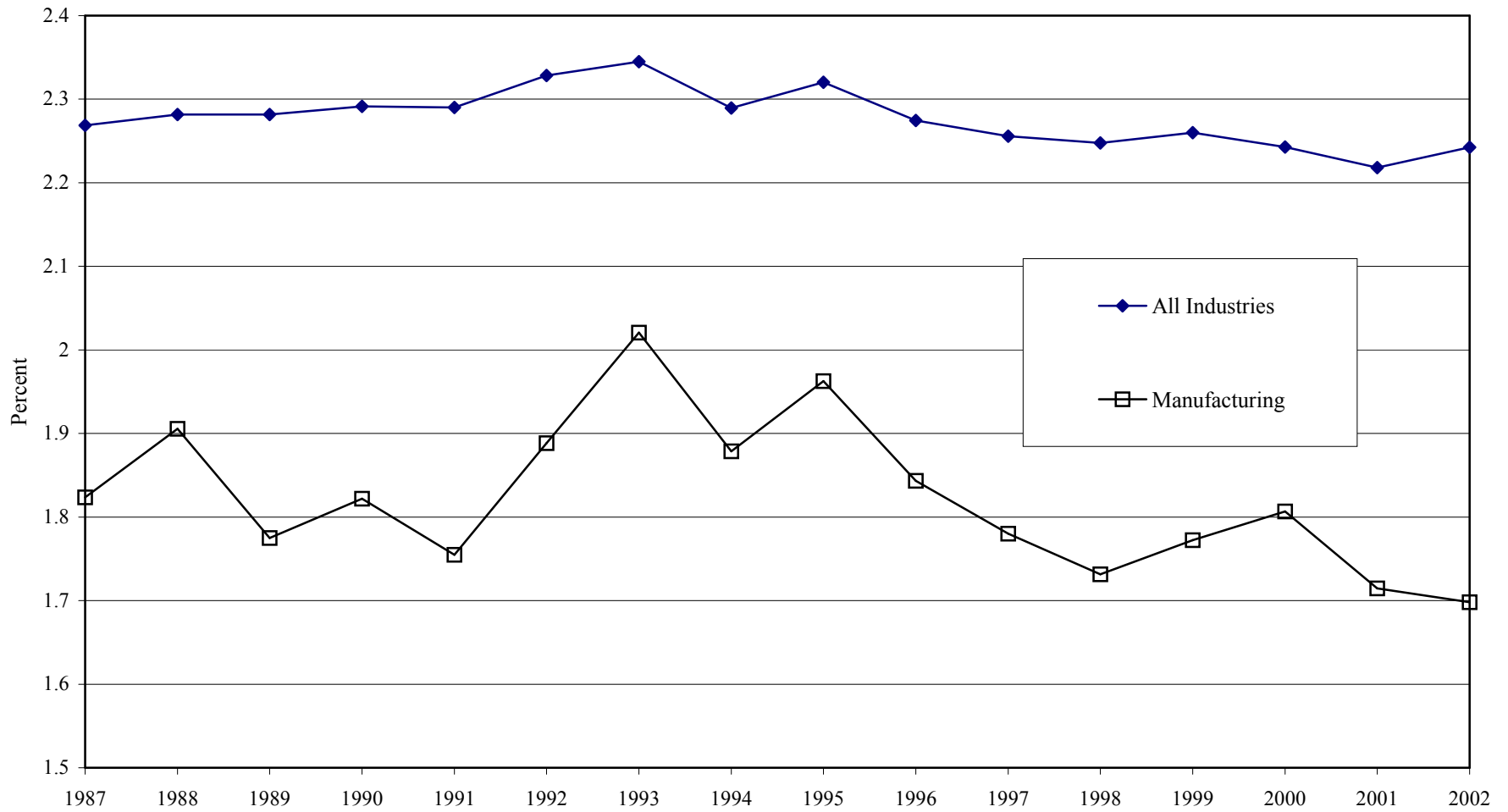
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics.

Chart 16: Total Employment in Manufacturing and All Industries in Nova Scotia as a Percentage of Canada, 1987-2002



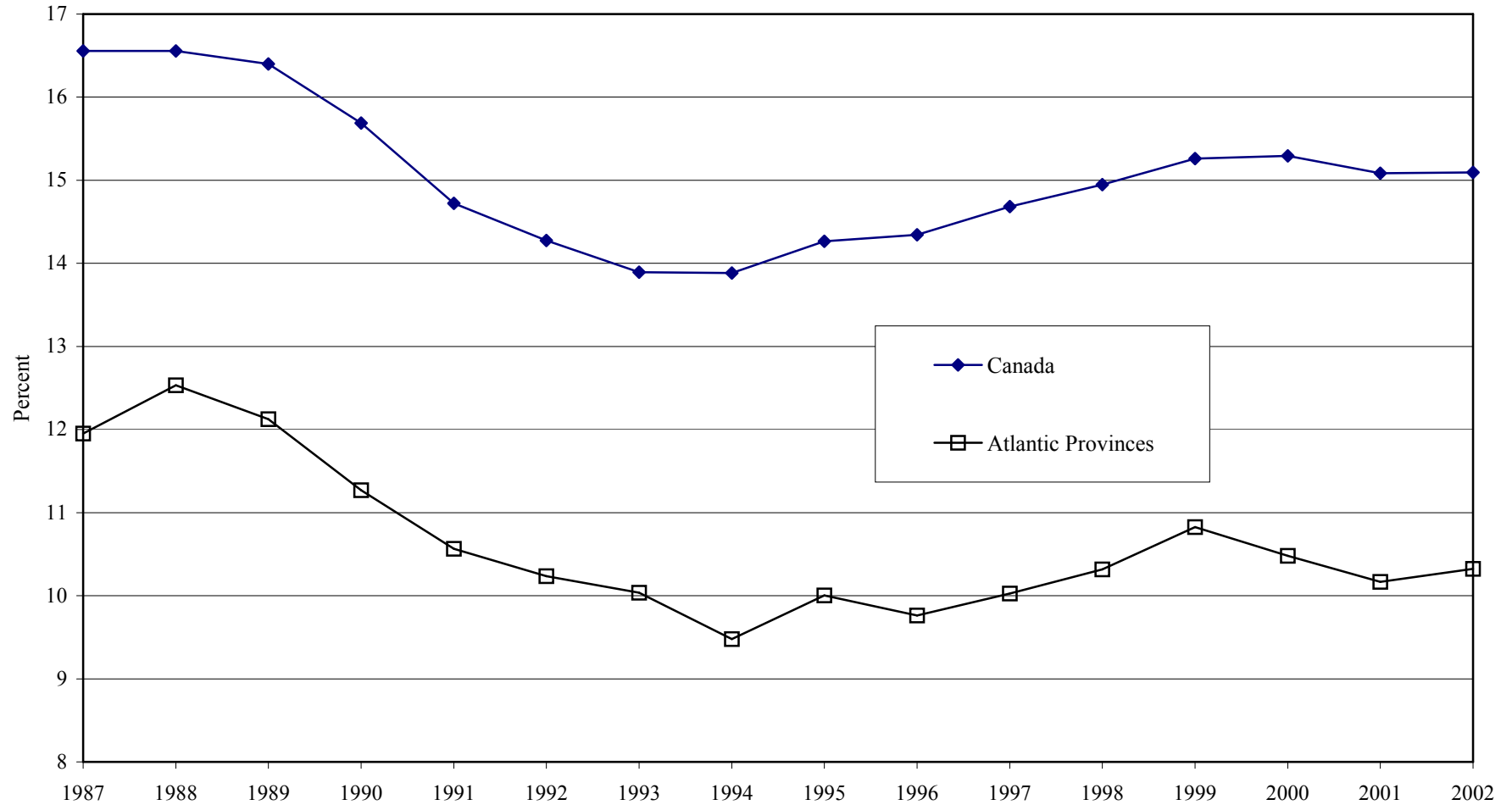
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics.

Chart 17: Total Employment in Manufacturing and All Industries in New Brunswick as a Percentage of Canada, 1987-2002



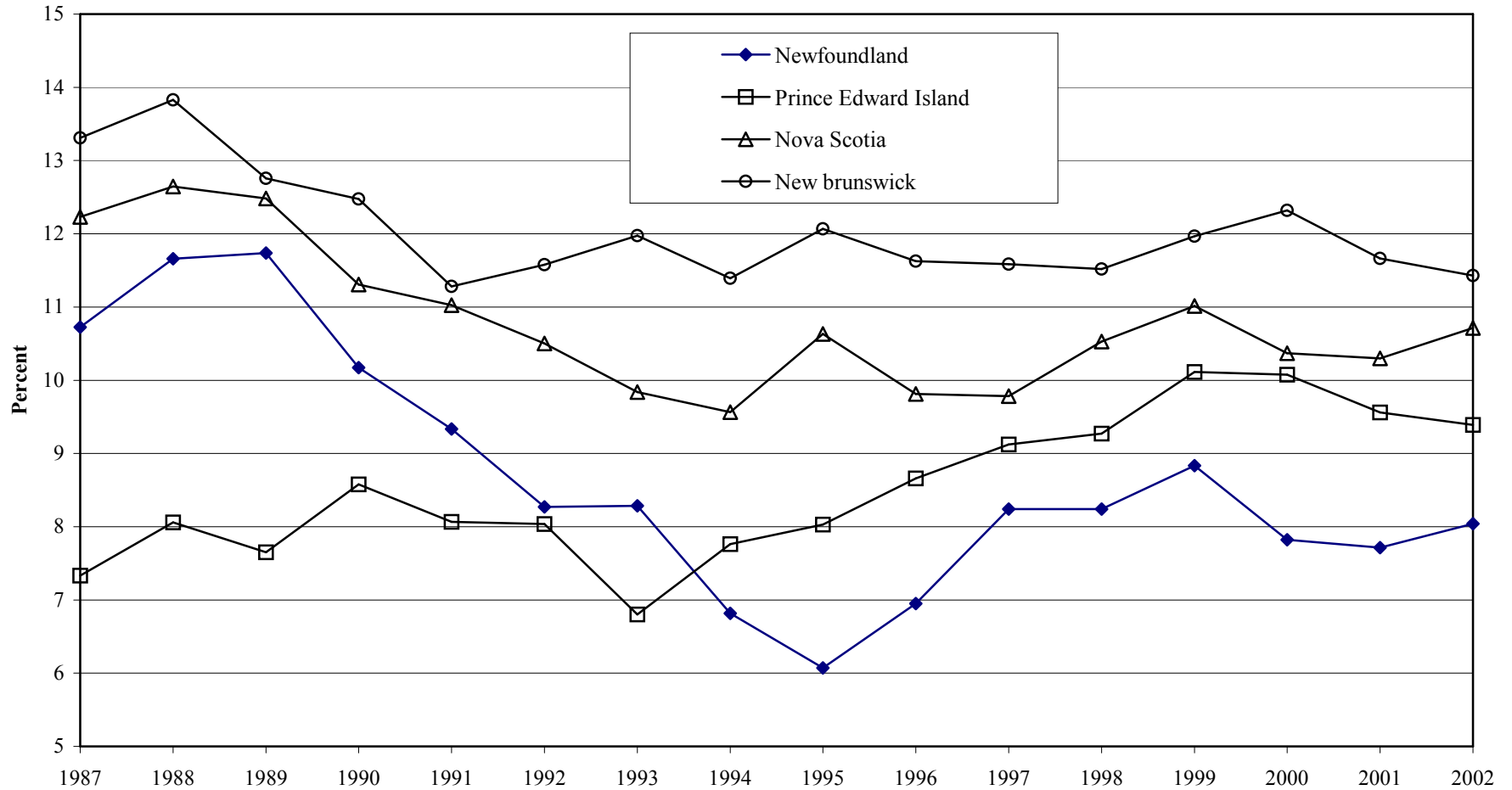
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics.

Chart 18: Manufacturing Employment as a Share of All Industries in Canada and Atlantic Provinces, 1987-2002



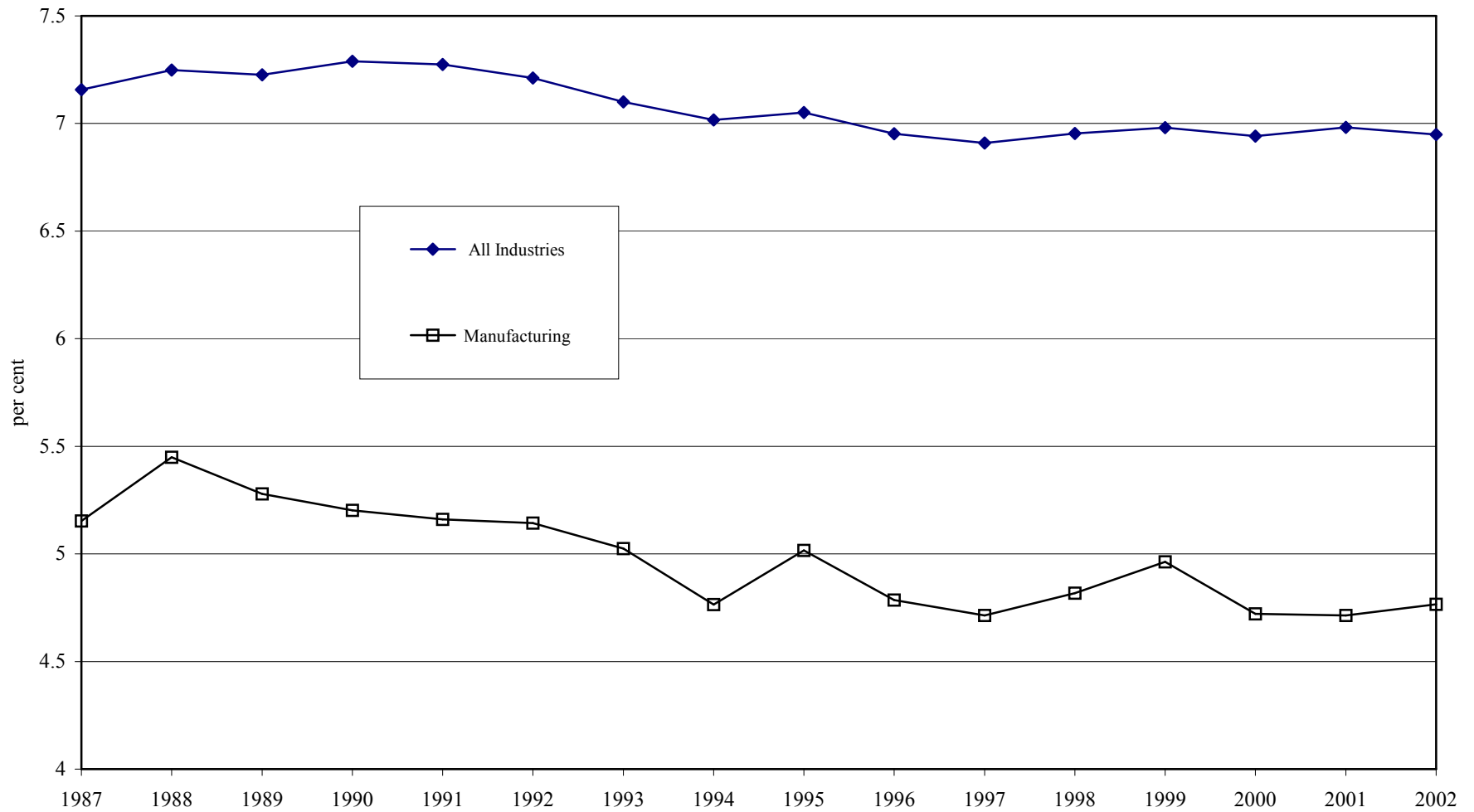
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics.

Chart 19: Manufacturing Employment as a Share of All Industries in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, 1987-2002



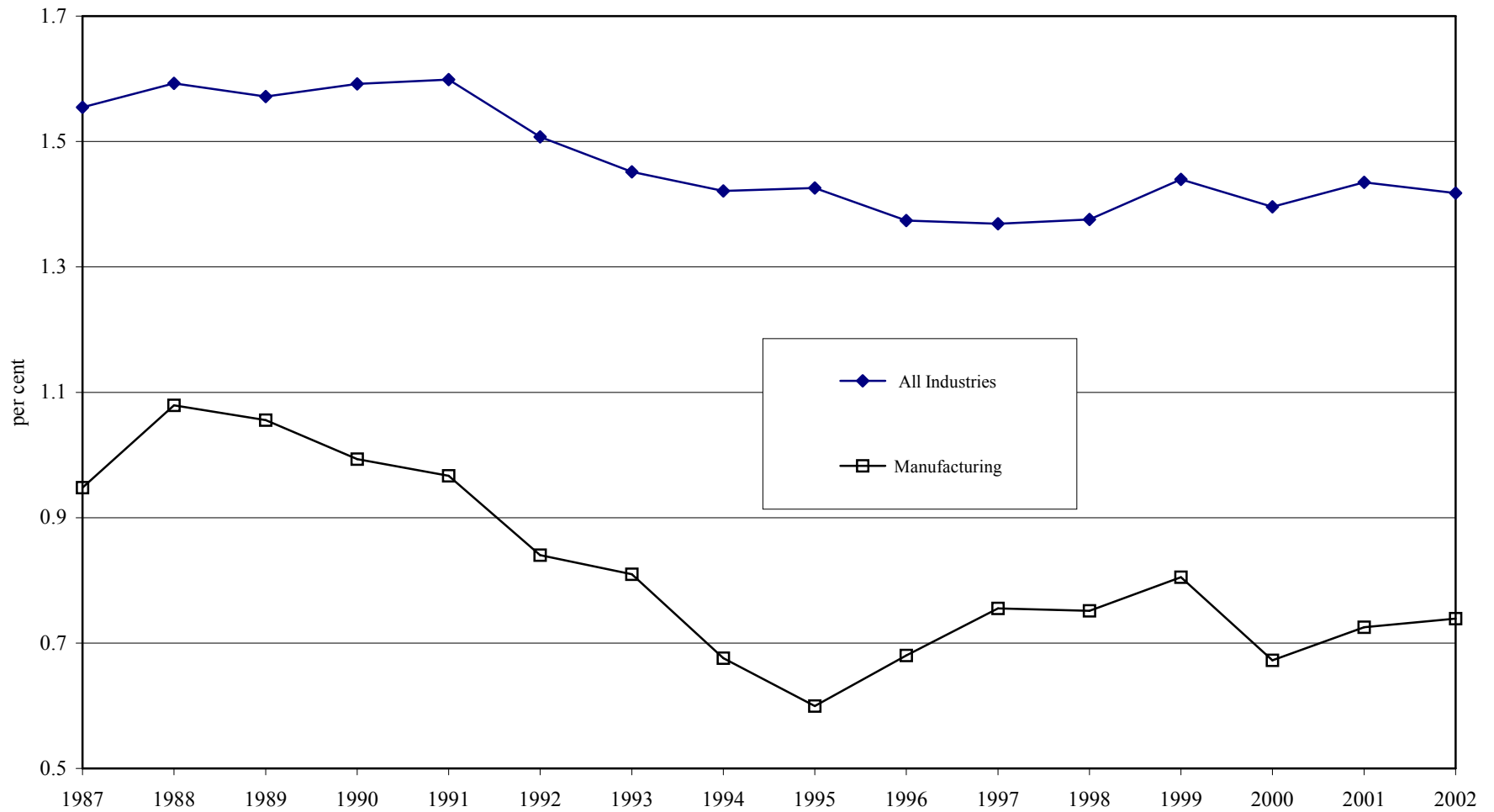
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics.

Chart 20: Total Weekly Hours Worked in Manufacturing and All Industries in Atlantic provinces as a Percentage of Canada, 1987-2002



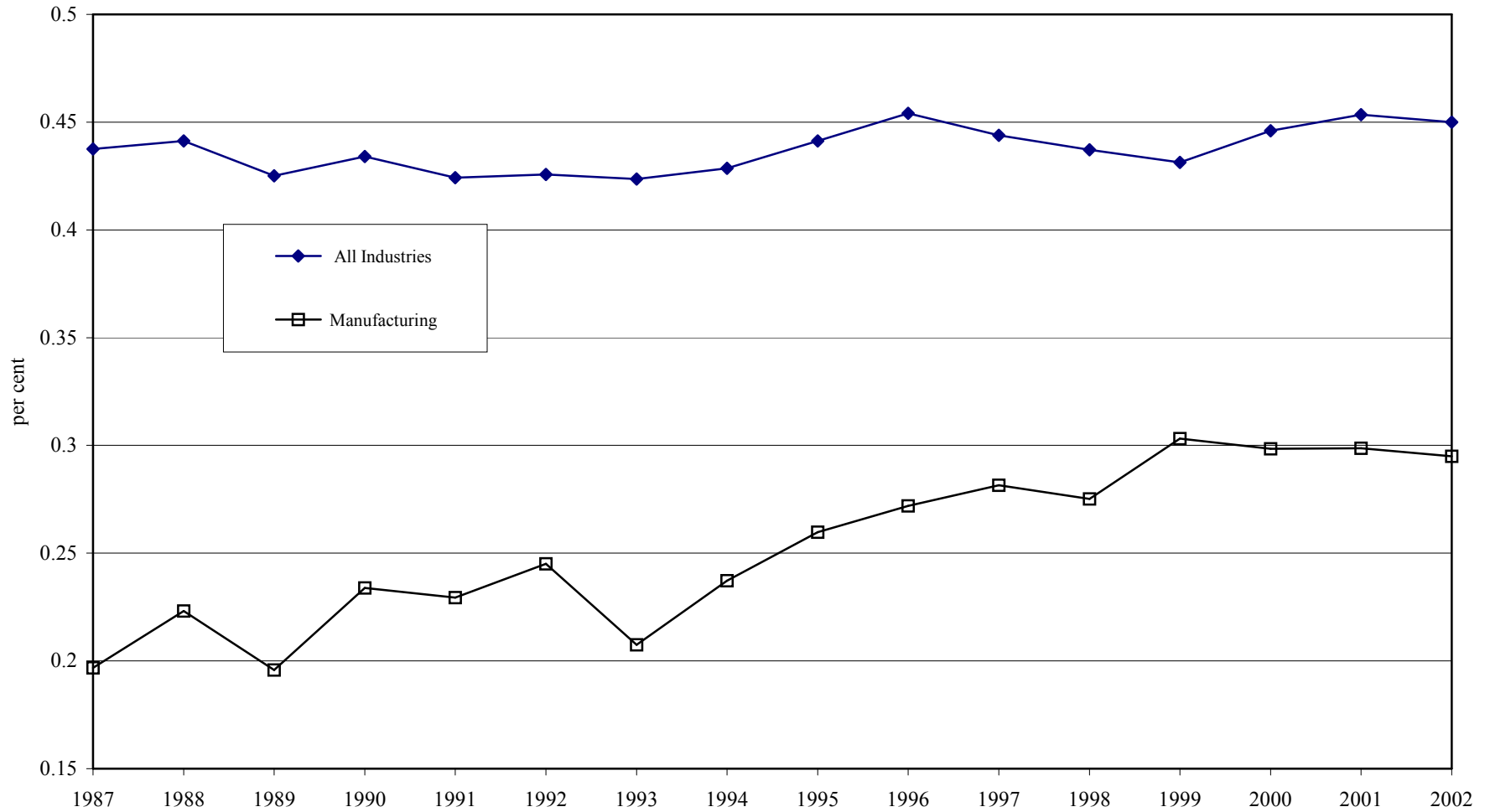
Source: Unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 21: Total Weekly Hours Worked in Manufacturing and All Industries in Newfoundland as a Percentage of Canada, 1987-2002



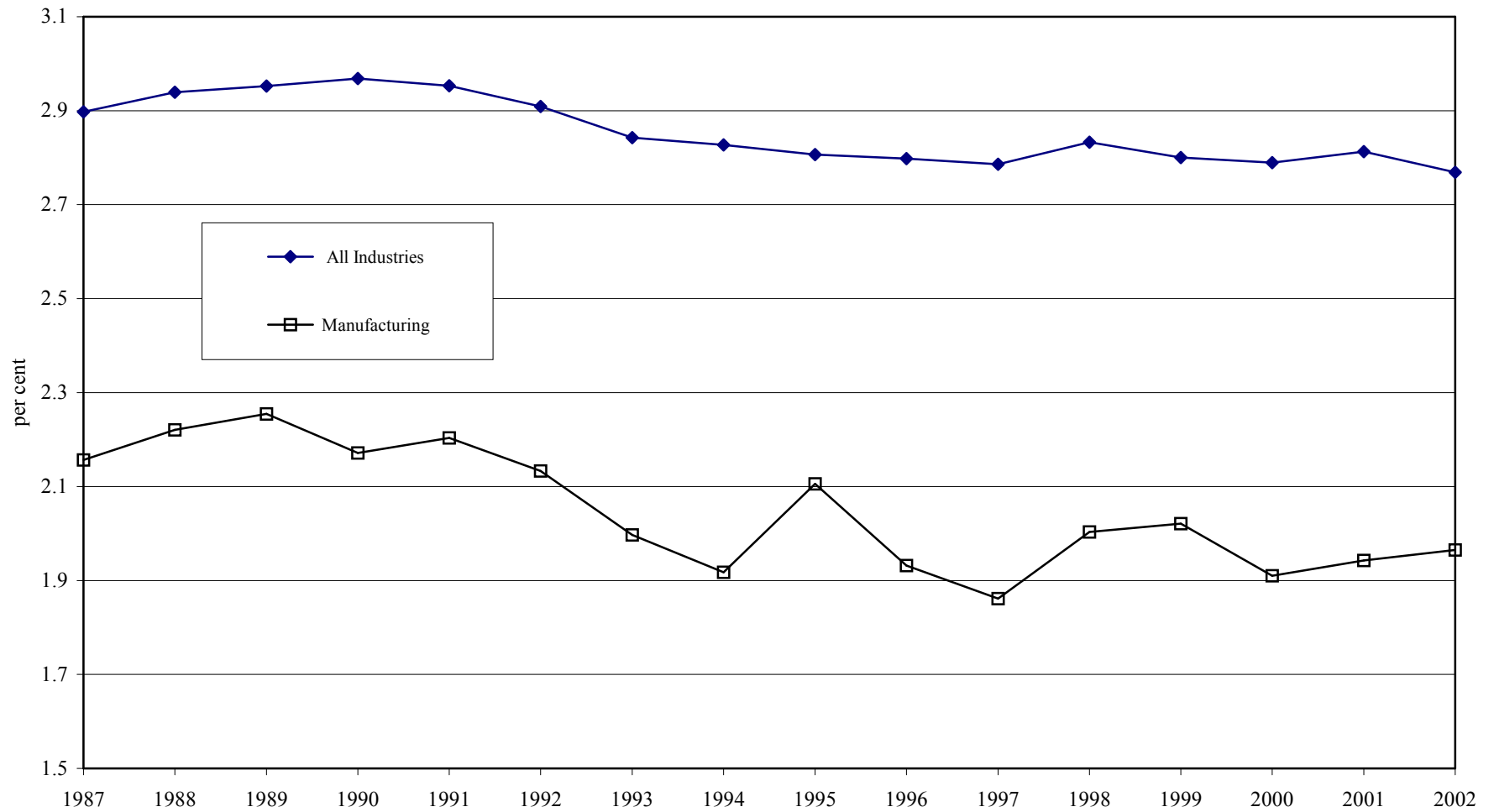
Source: Unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 22: Total Weekly Hours Worked in Manufacturing and All Industries in Prince Edward Island as a Percentage of Canada, 1987-2002



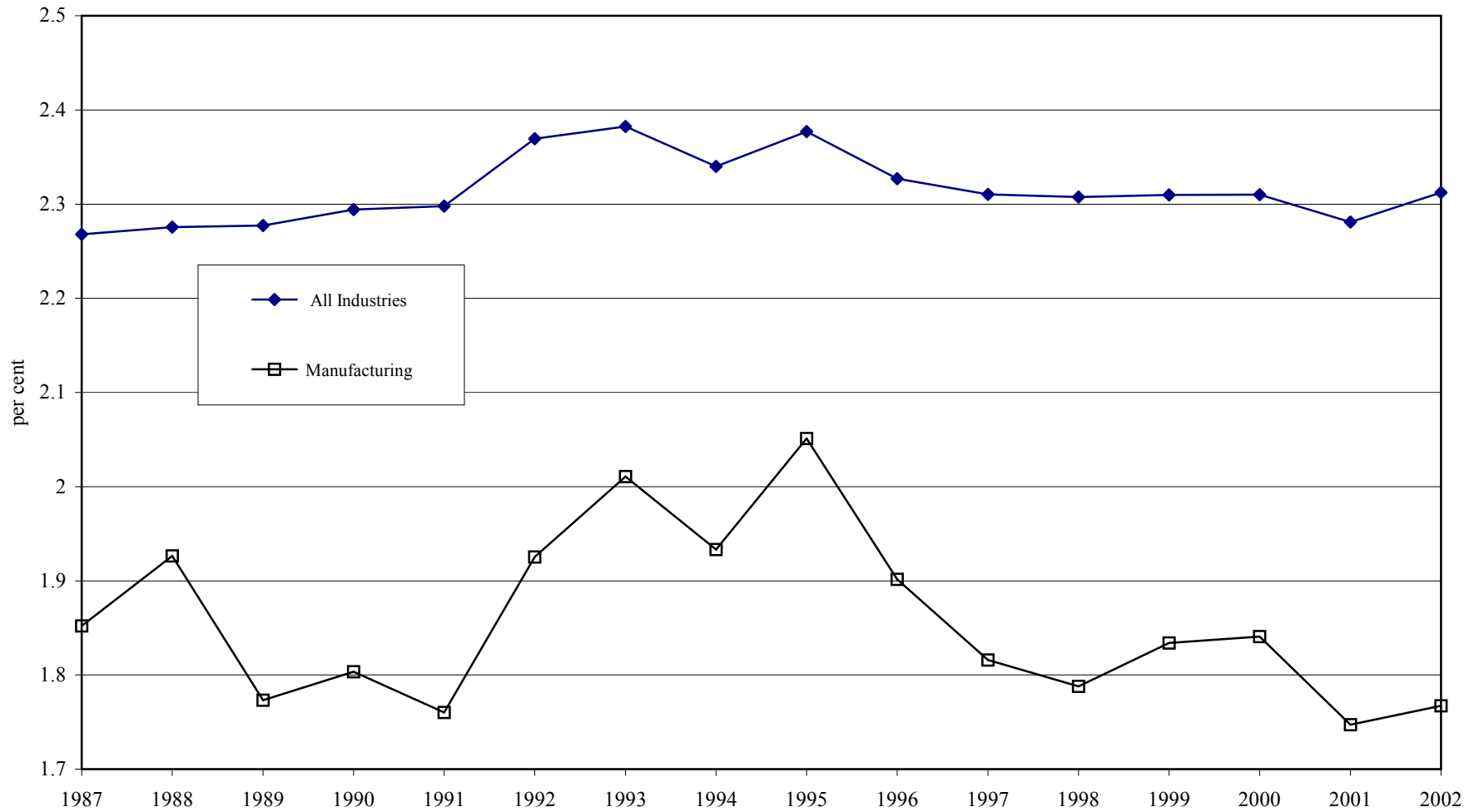
Source: Unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 23: Total Weekly Hours Worked in Manufacturing and All Industries in Nova Scotia as a Percentage of Canada, 1987-2002



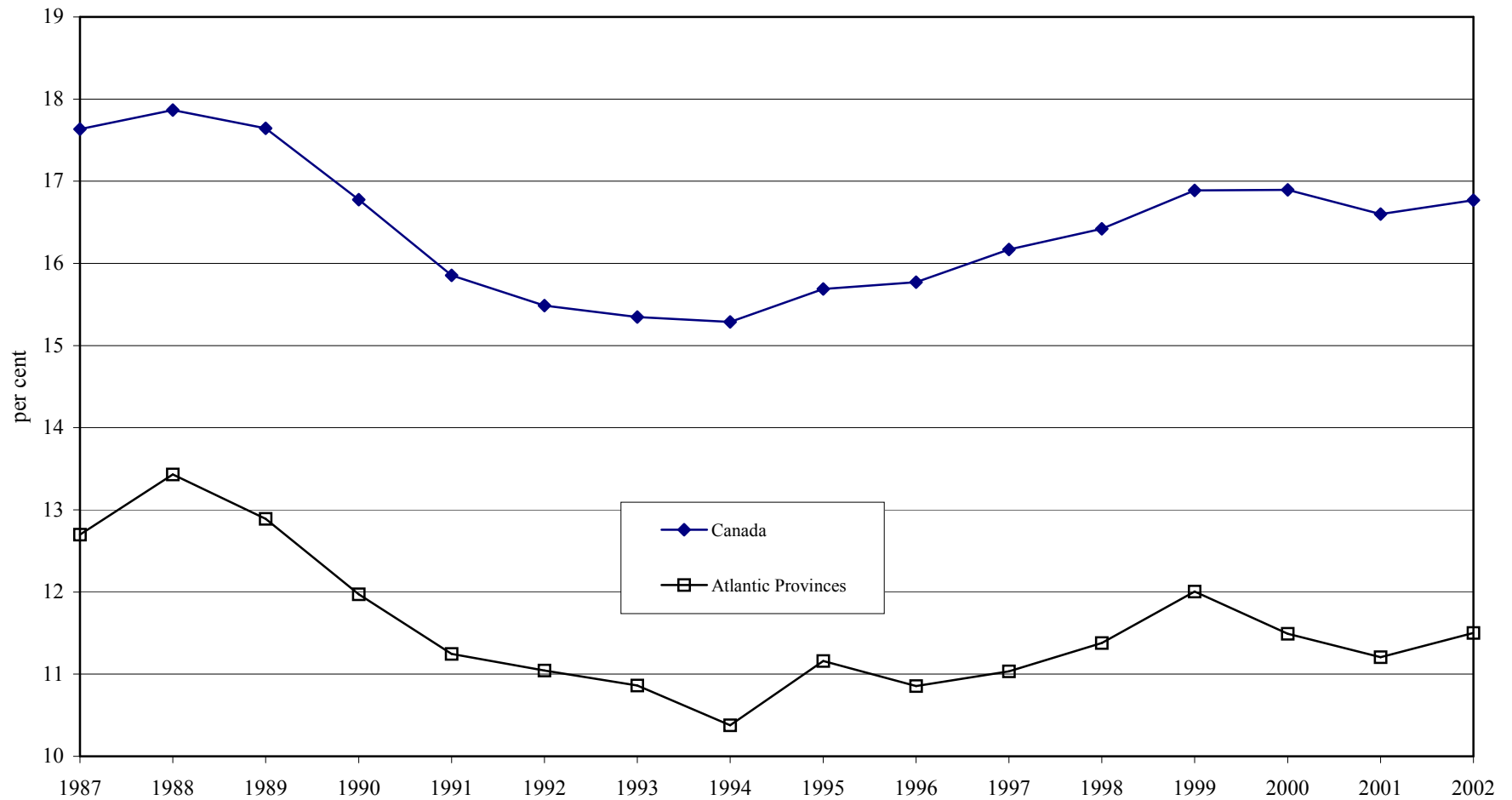
Source: Unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 24: Total Weekly Hours Worked in Manufacturing and All Industries in New Brunswick as a Percentage of Canada, 1987-2002



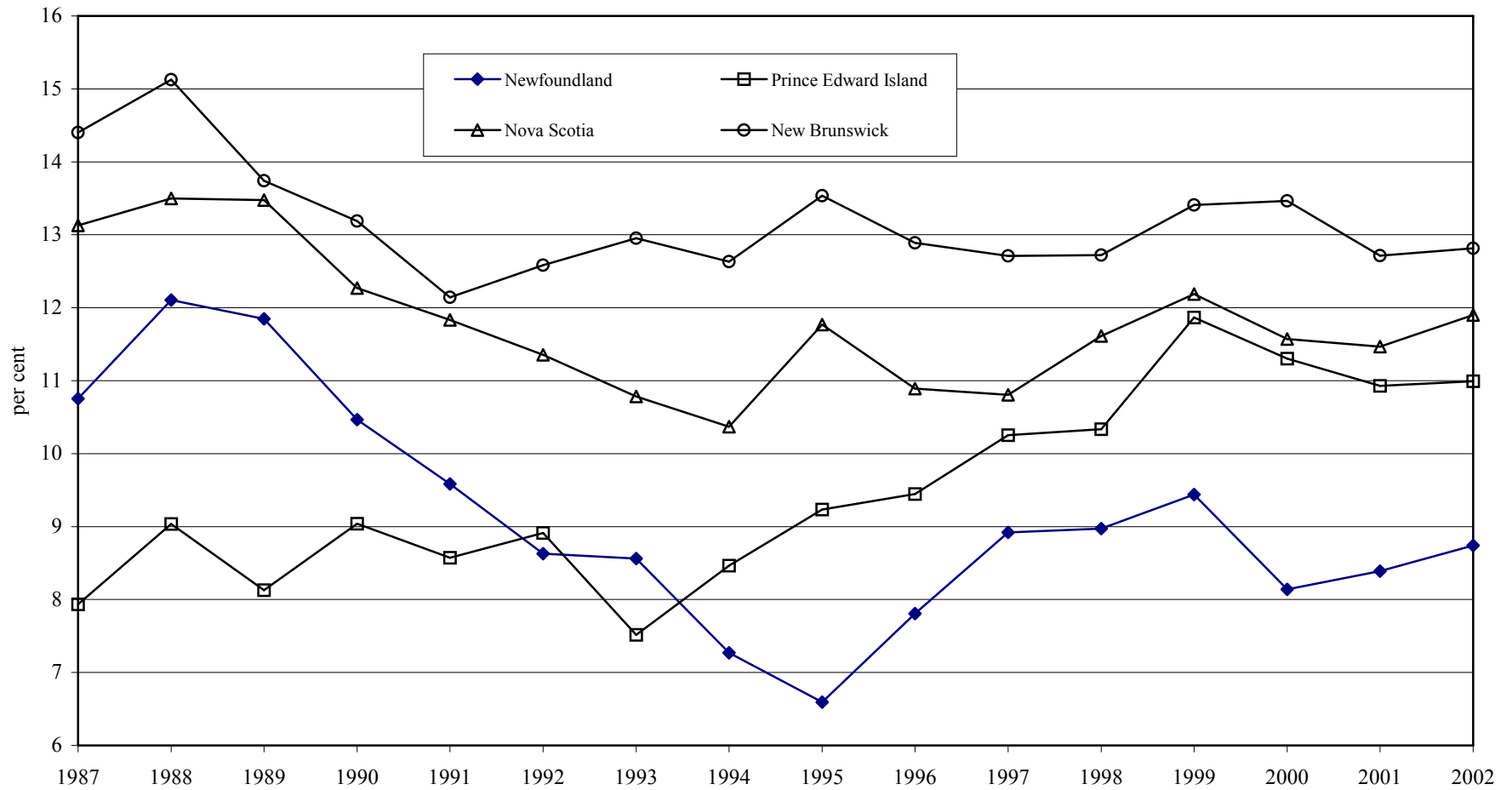
Source: Unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 25: Manufacturing Hours Worked as a Percentage of All Industries Hours Worked in Canada and Atlantic provinces, 1987-2002



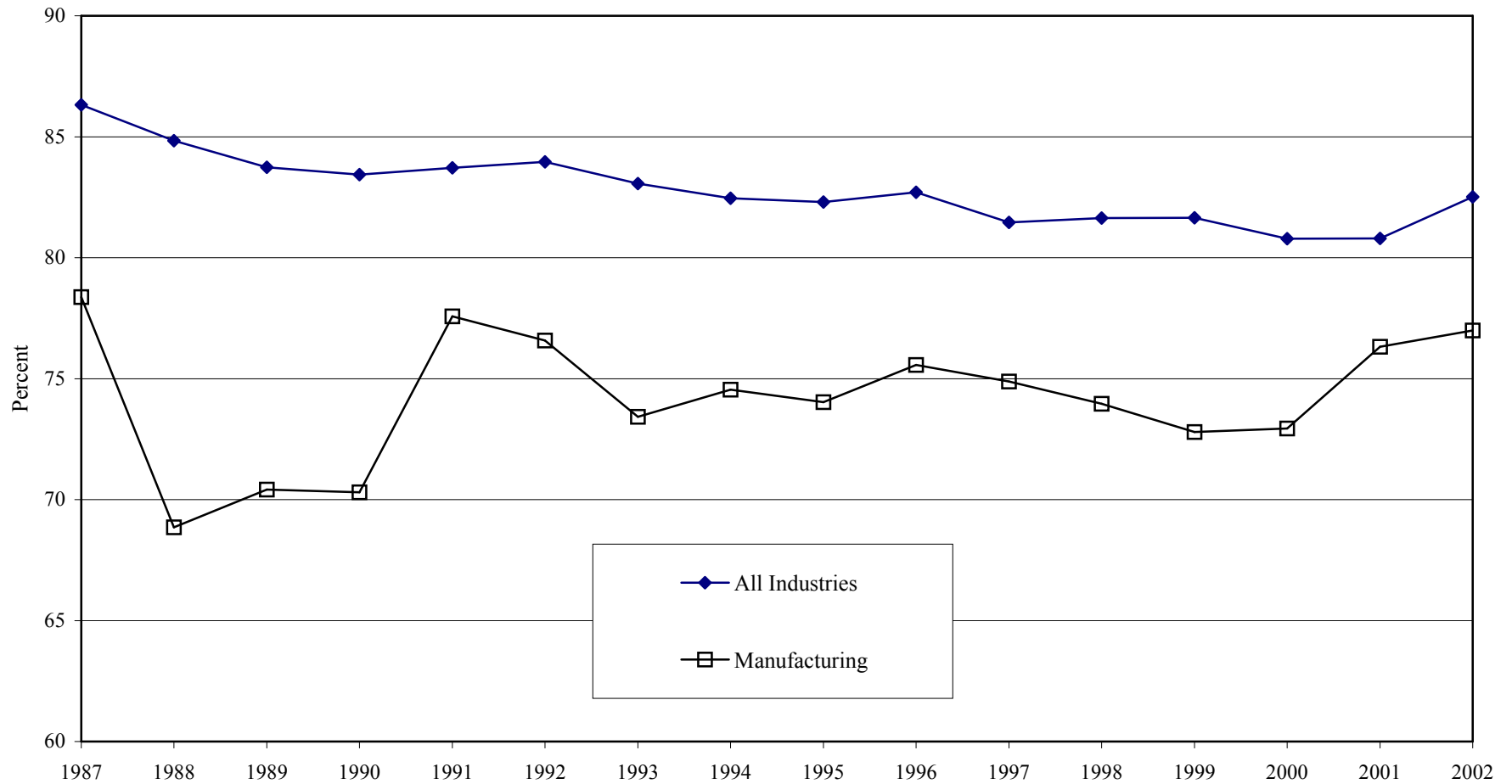
Source: Unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 26: Manufacturing Hours Worked as a Percentage of All Industries Hours Worked in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, 1987-2002



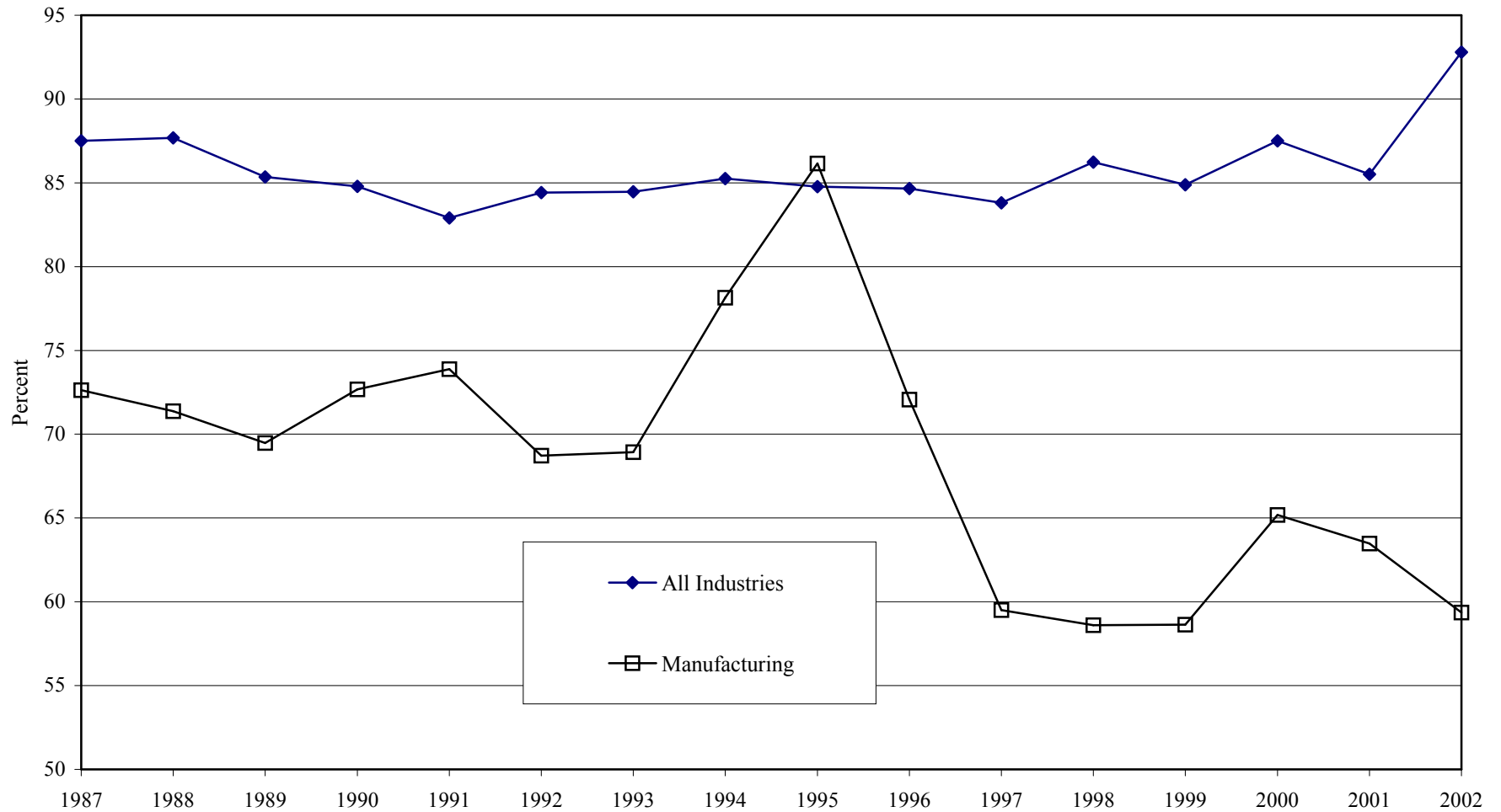
Source: Unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 27: Real GDP per Worker in Manufacturing and All Industries in Atlantic Provinces as a Proportion of Canada, 1987-2002



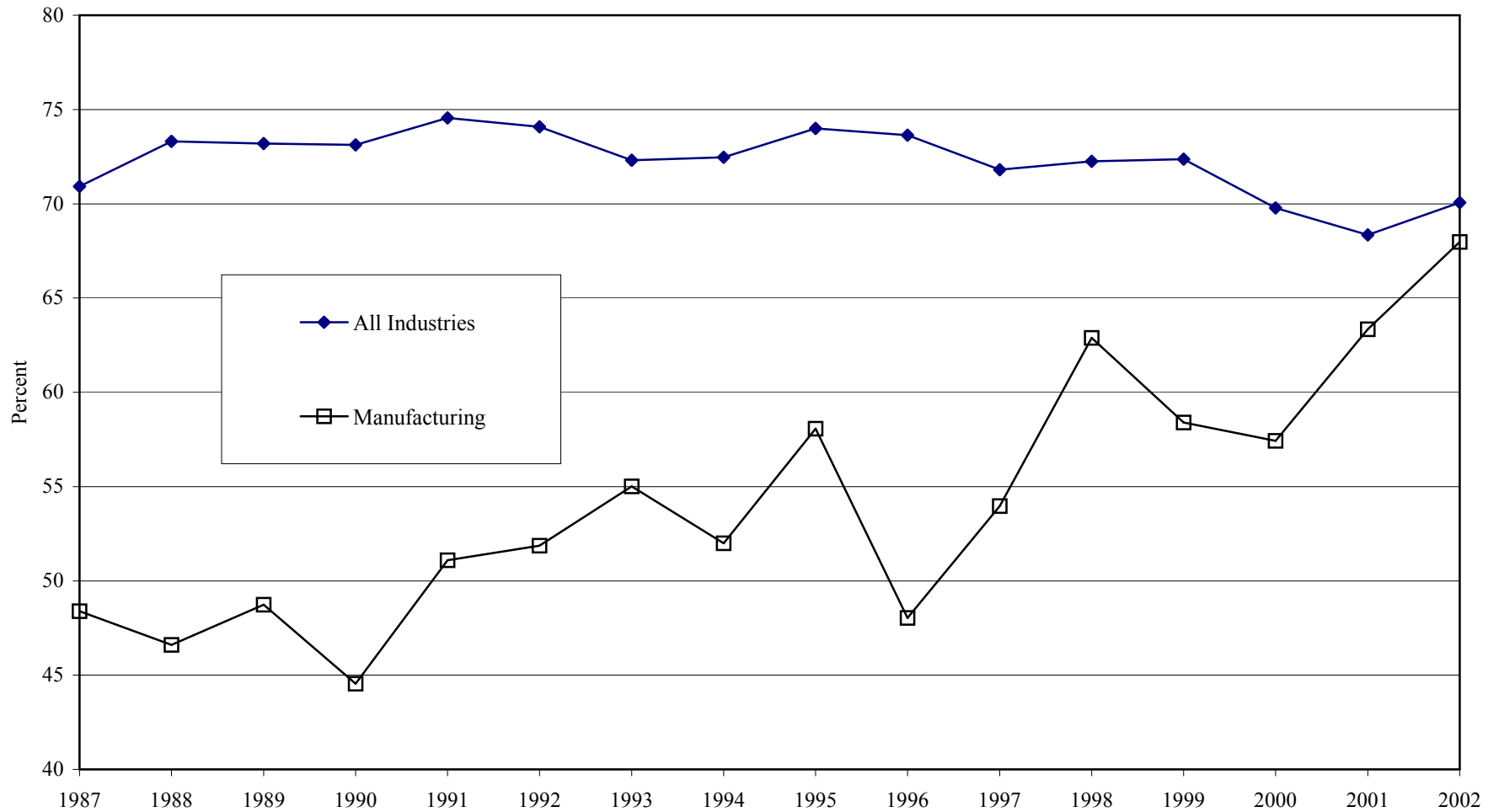
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Chart 28: Real GDP per Worker in Manufacturing and All Industries in Newfoundland as a Proportion of Canada, 1987-2002



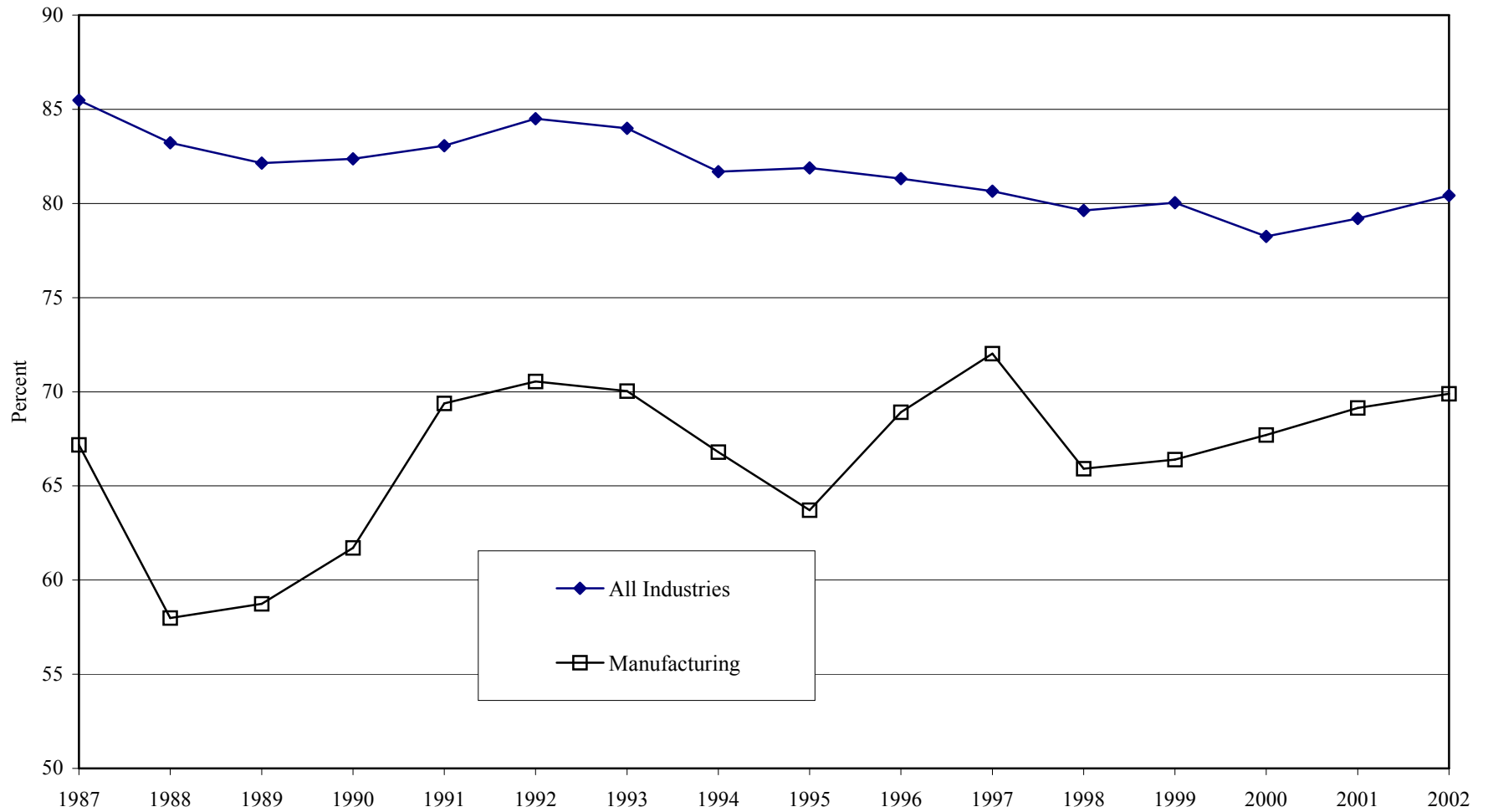
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Chart 29: Real GDP per Worker in Manufacturing and All Industries in Prince Edward Island as a Proportion of Canada, 1987-2002



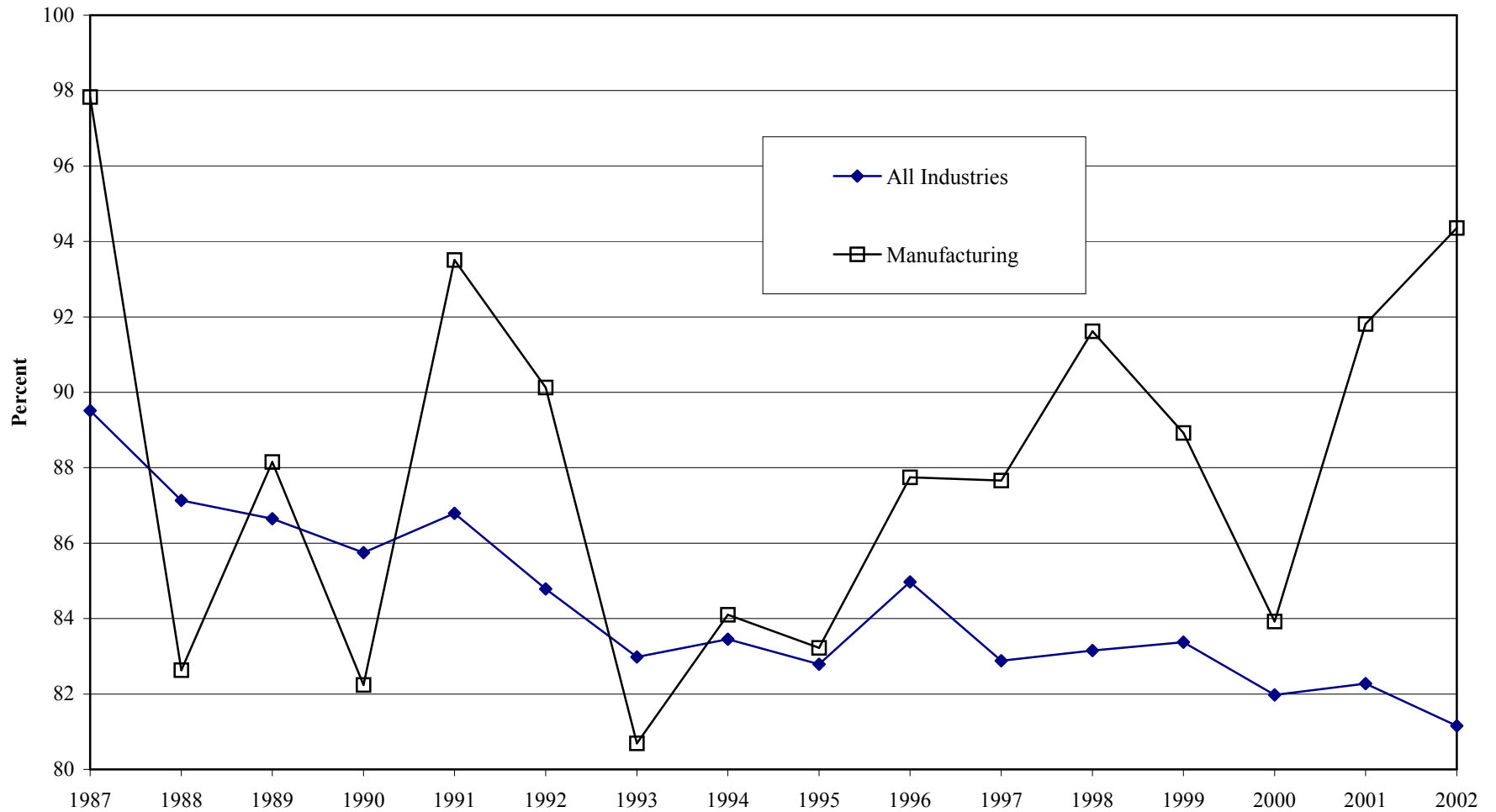
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Chart 30: Real GDP per Worker in Manufacturing and All Industries in Nova Scotia as a Proportion of Canada, 1987-2002



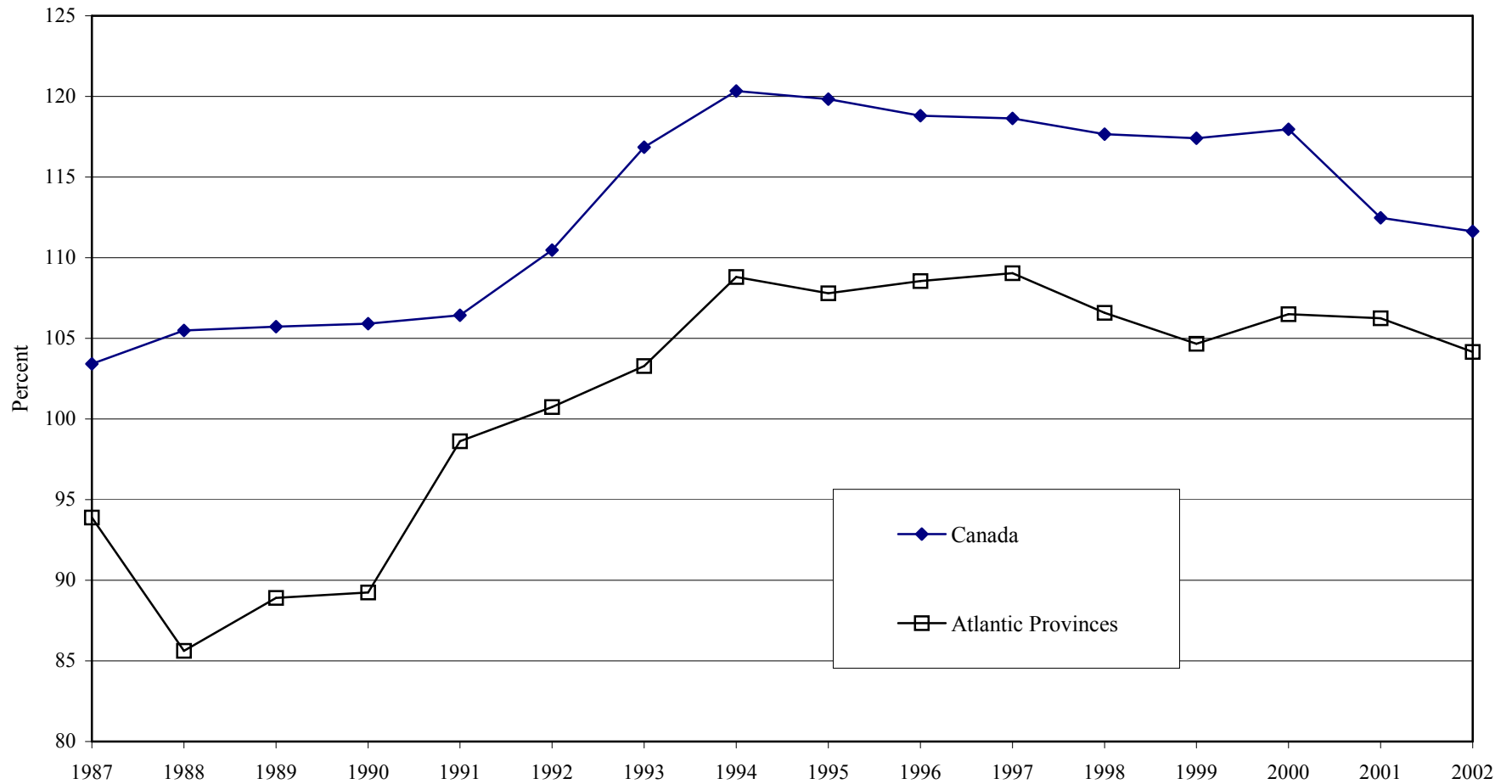
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Chart 31: Real GDP per Worker in Manufacturing and All Industries in New Brunswick as a Proportion of Canada, 1987-2002



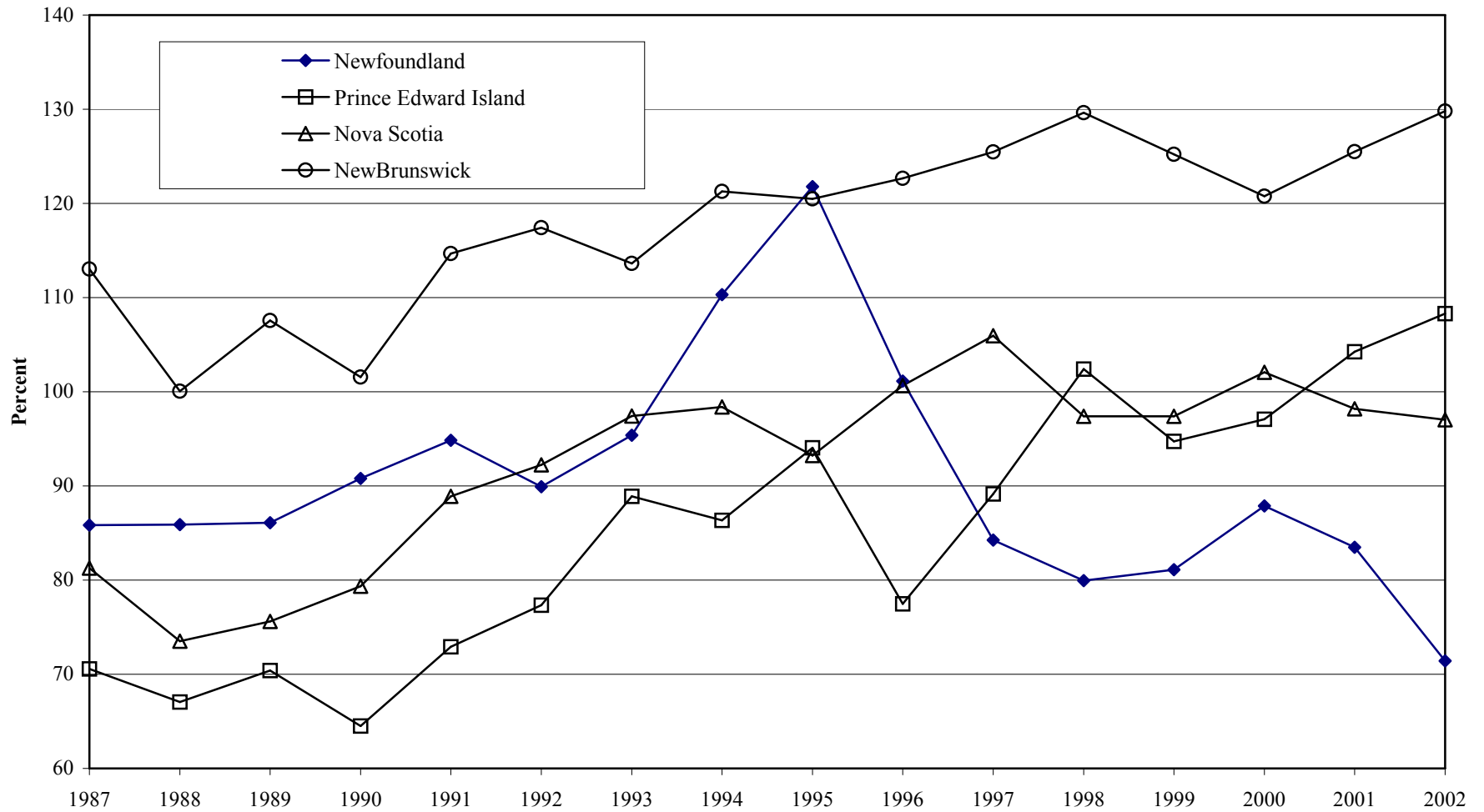
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Chart 32: Real GDP per Worker in Manufacturing as a Proportion of All Industries in Canada and Atlantic Provinces, 1987-2002



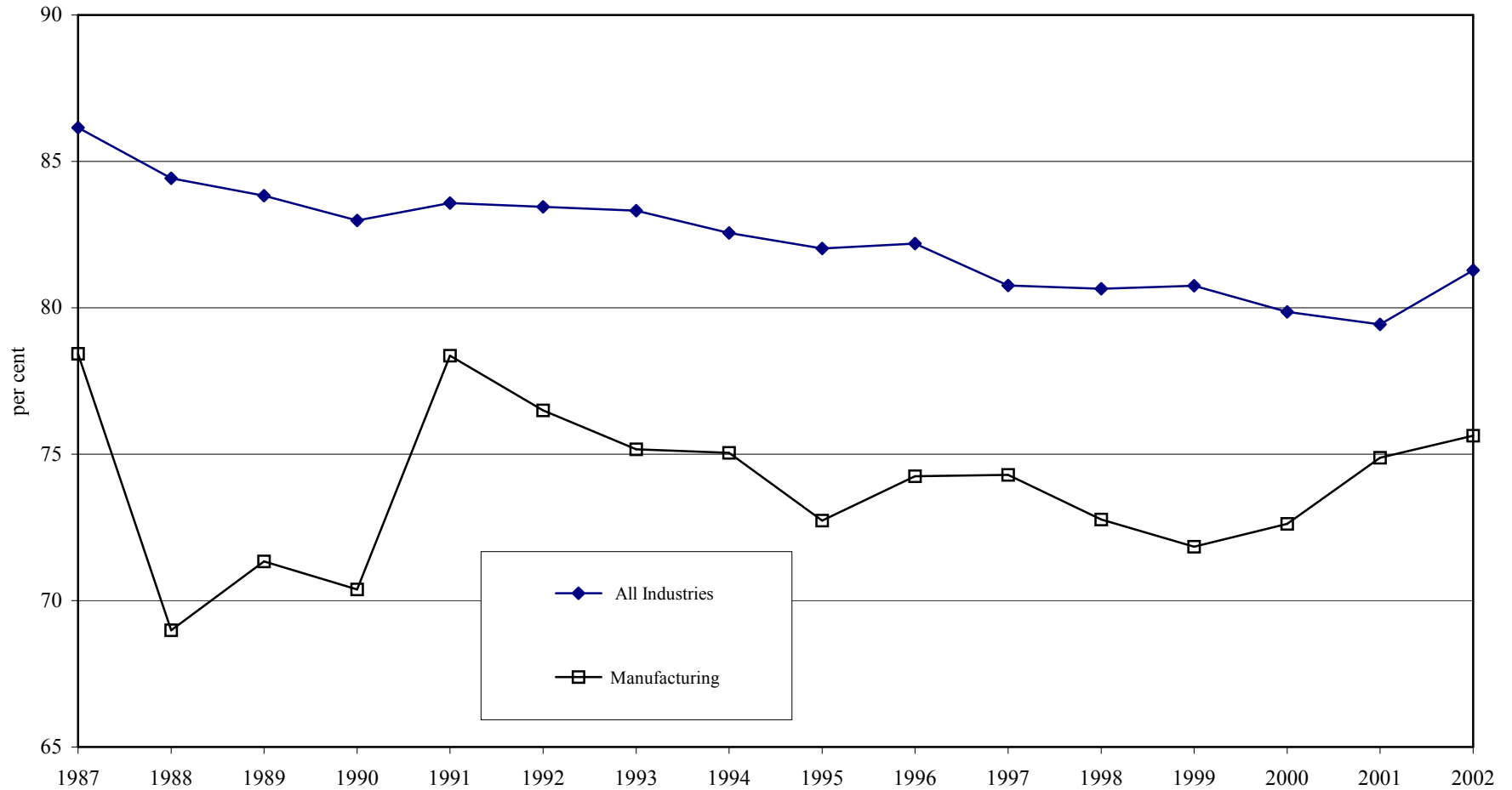
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Chart 33: Real GDP per Worker in Manufacturing as a Proportion of All Industries in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, 1987-2002



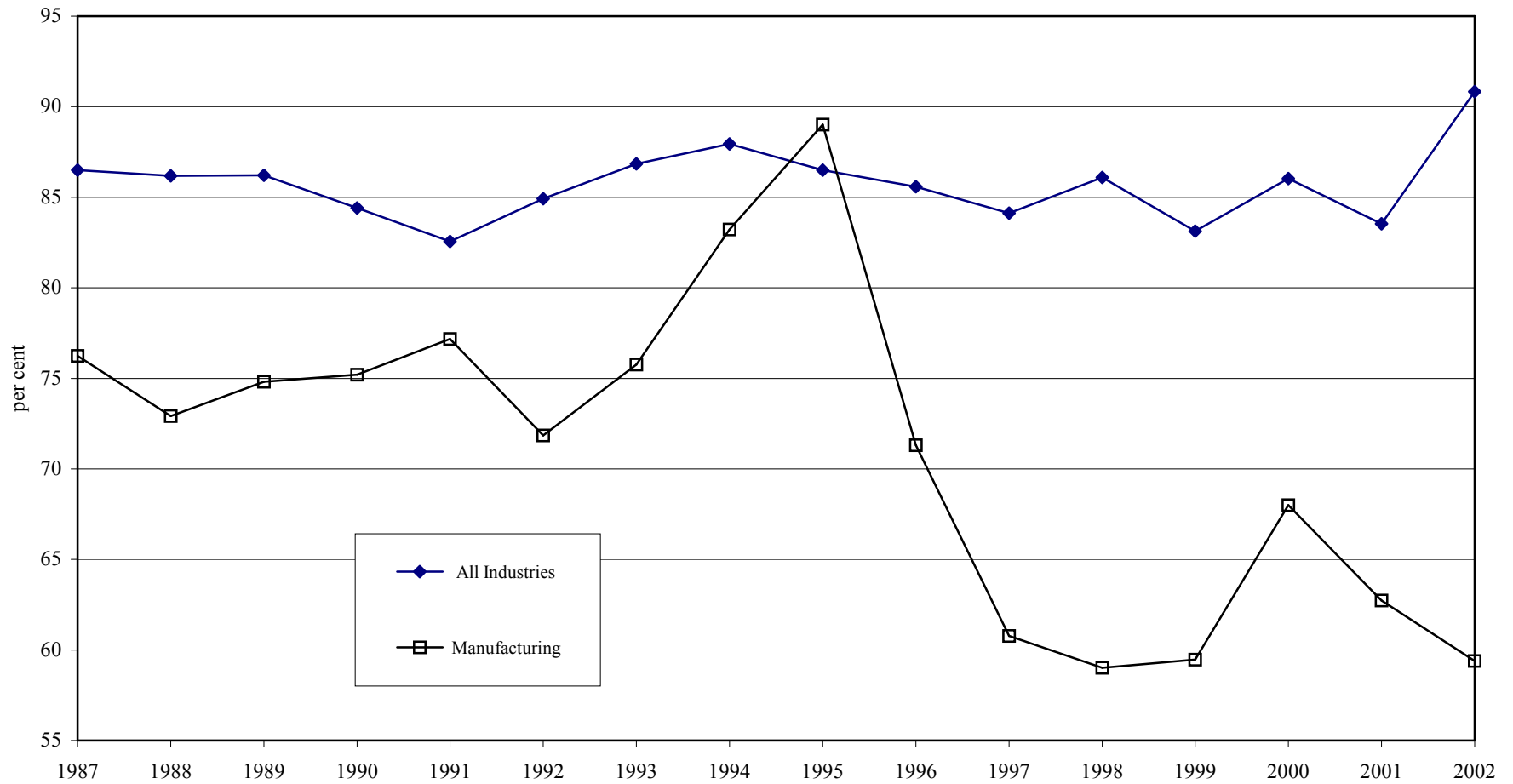
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Chart 34: Real GDP per Hour in Manufacturing and All Industries in Atlantic provinces as a Percentage of Canada, 1987-2002



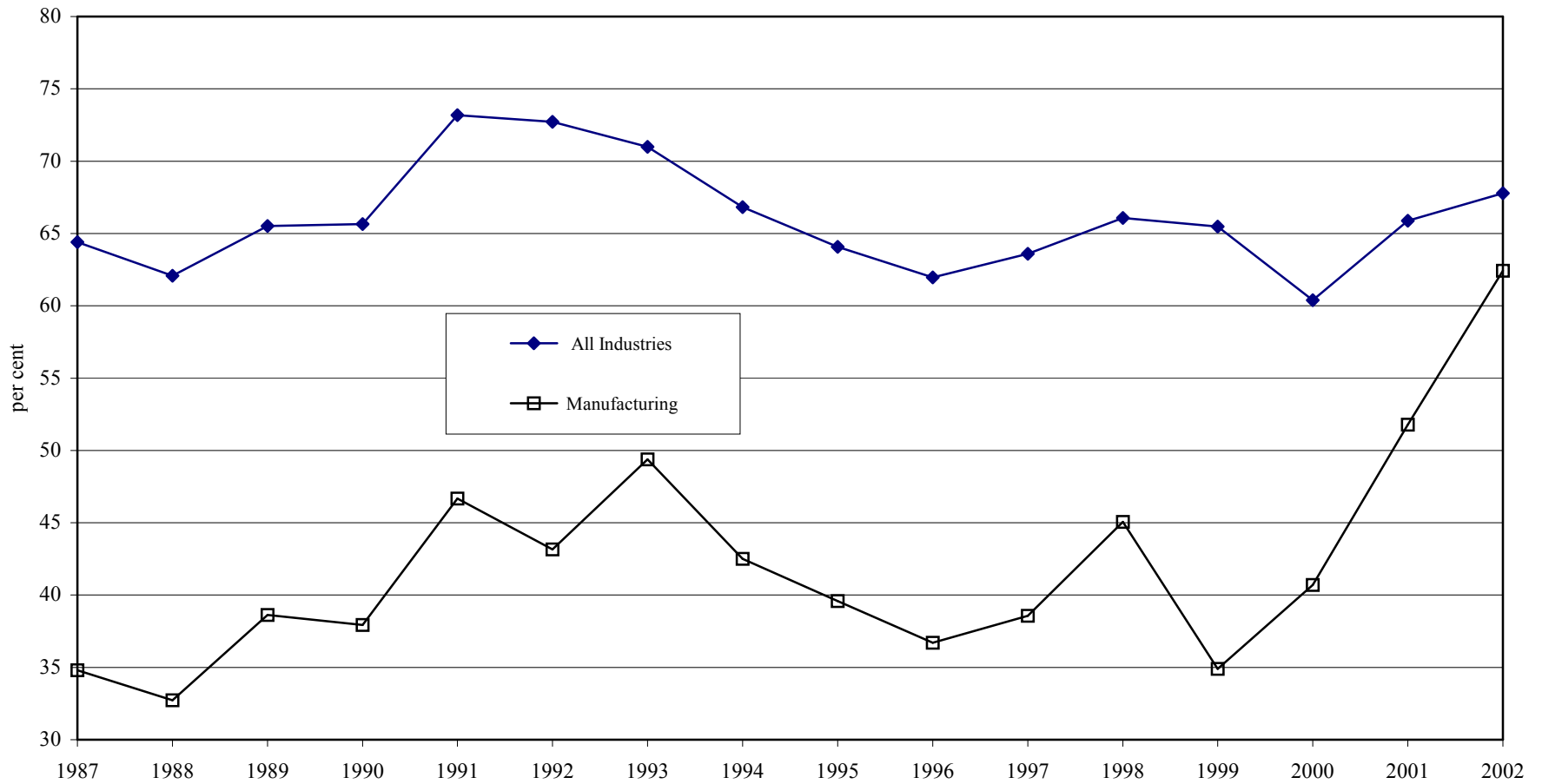
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis and unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 35: Real GDP per Hour in Manufacturing and All Industries in Newfoundland as a Percentage of Canada, 1987-2002



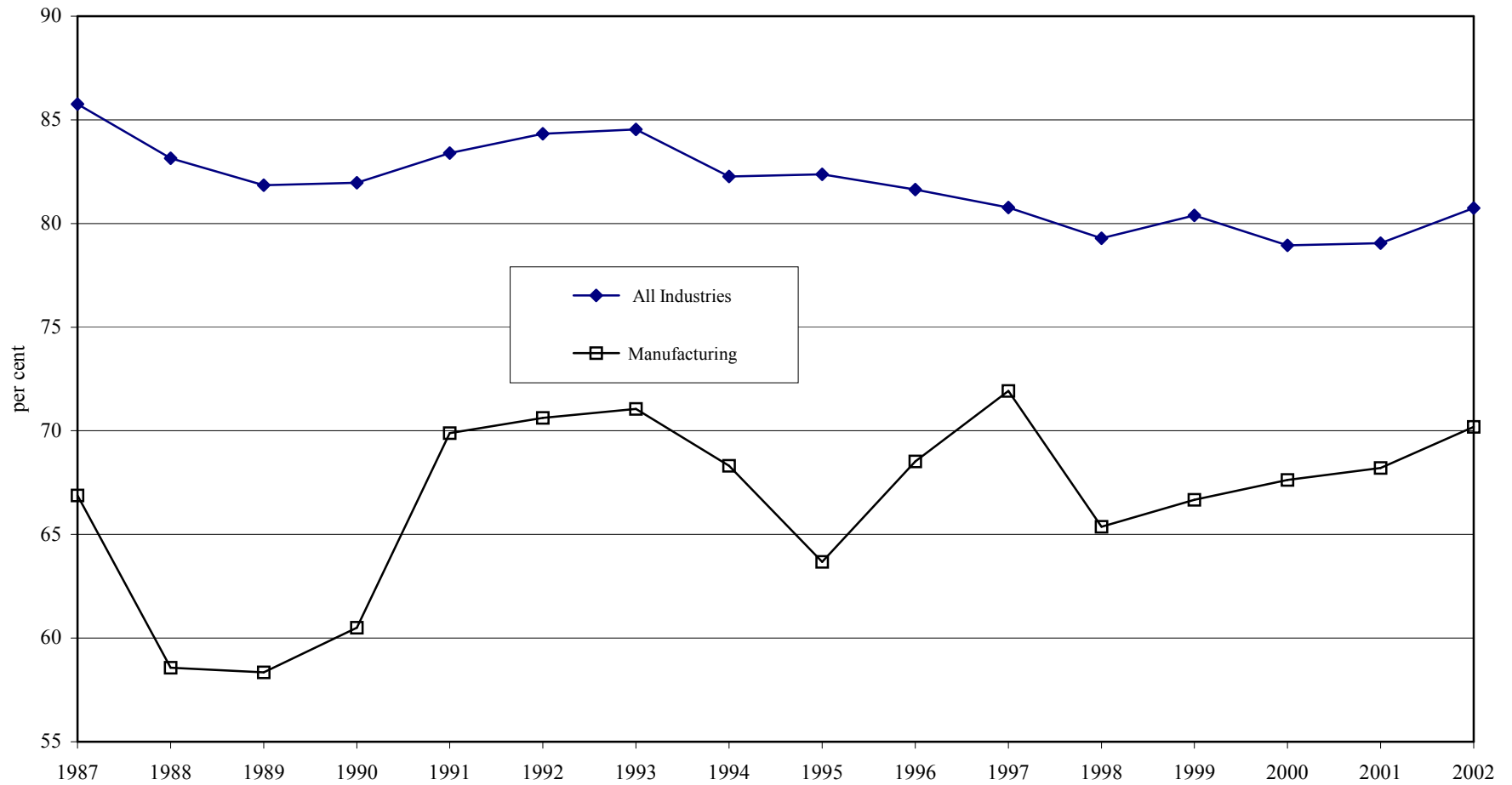
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis and unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 36: Real GDP per Hour in Manufacturing and All Industries in Prince Edward Island as a Percentage of Canada, 1987-2002



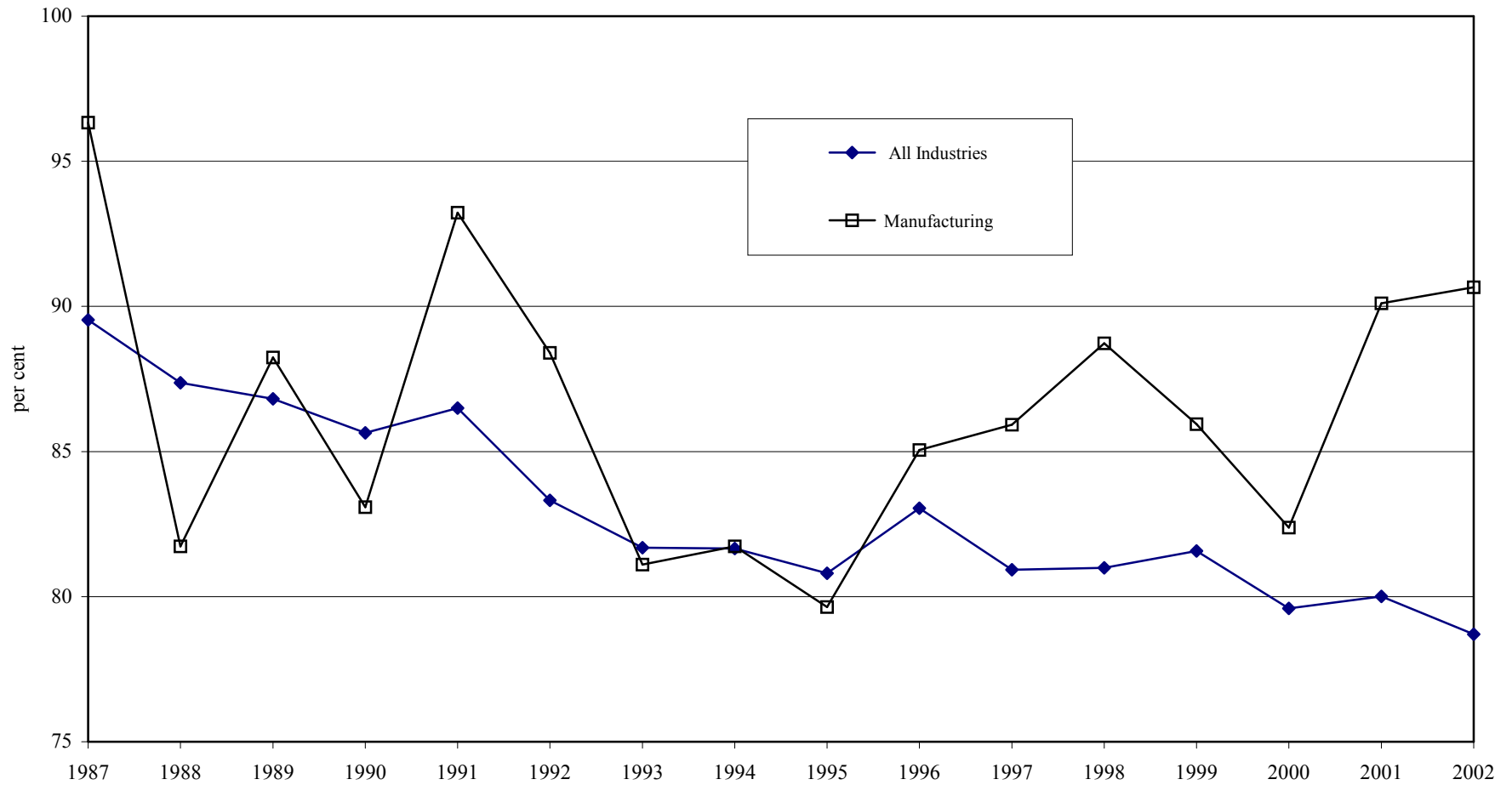
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis and unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 37: Real GDP per Hour in Manufacturing and All Industries in Nova Scotia as a Percentage of Canada, 1987-2002



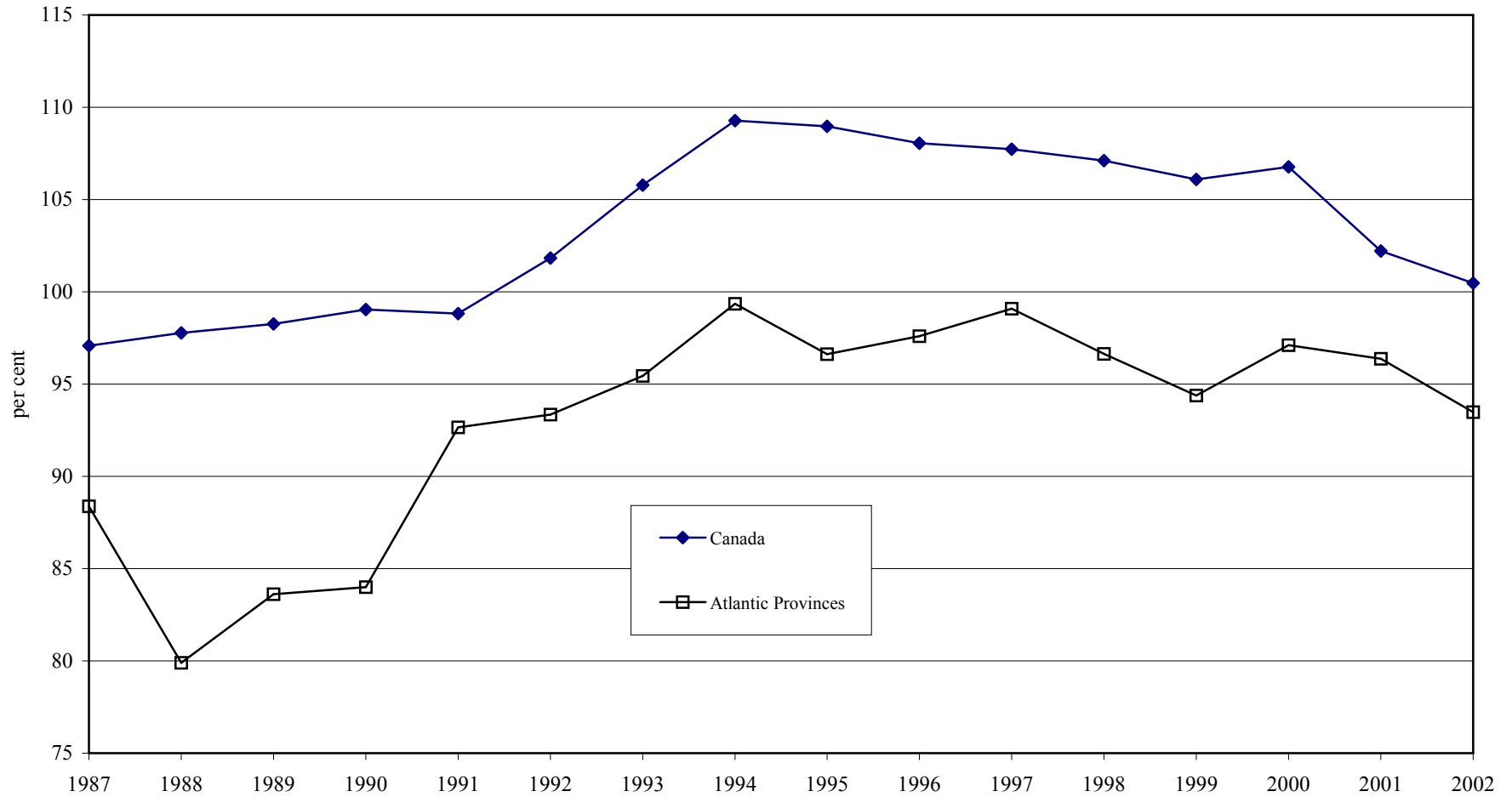
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis and unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 38: Real GDP per Hour in Manufacturing and All Industries in New Brunswick as a Percentage of Canada, 1987-2002



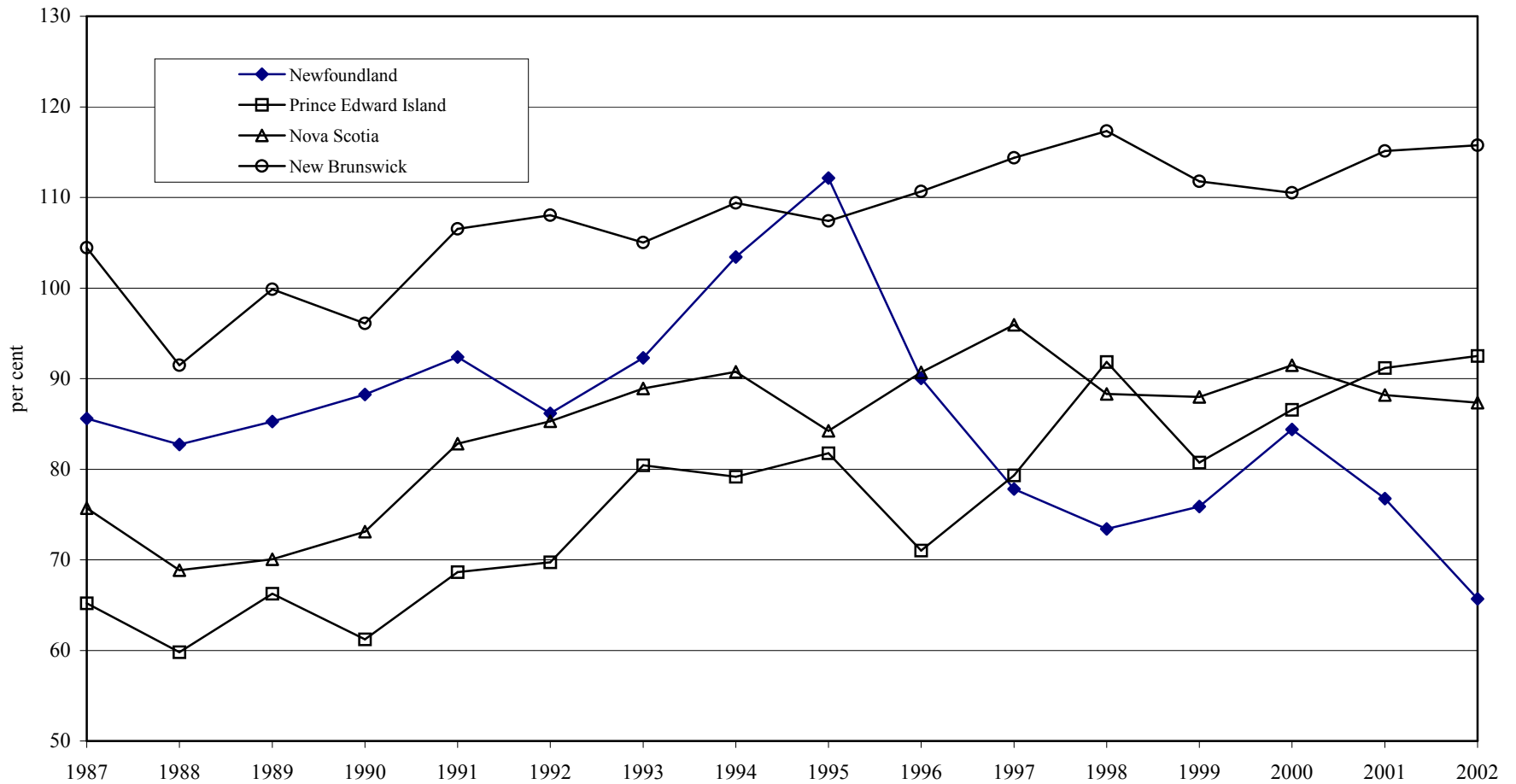
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis and unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 39: Manufacturing Real GDP per Hour Worked as a Percentage of All Industries in Canada and Atlantic Provinces, 1987-2002



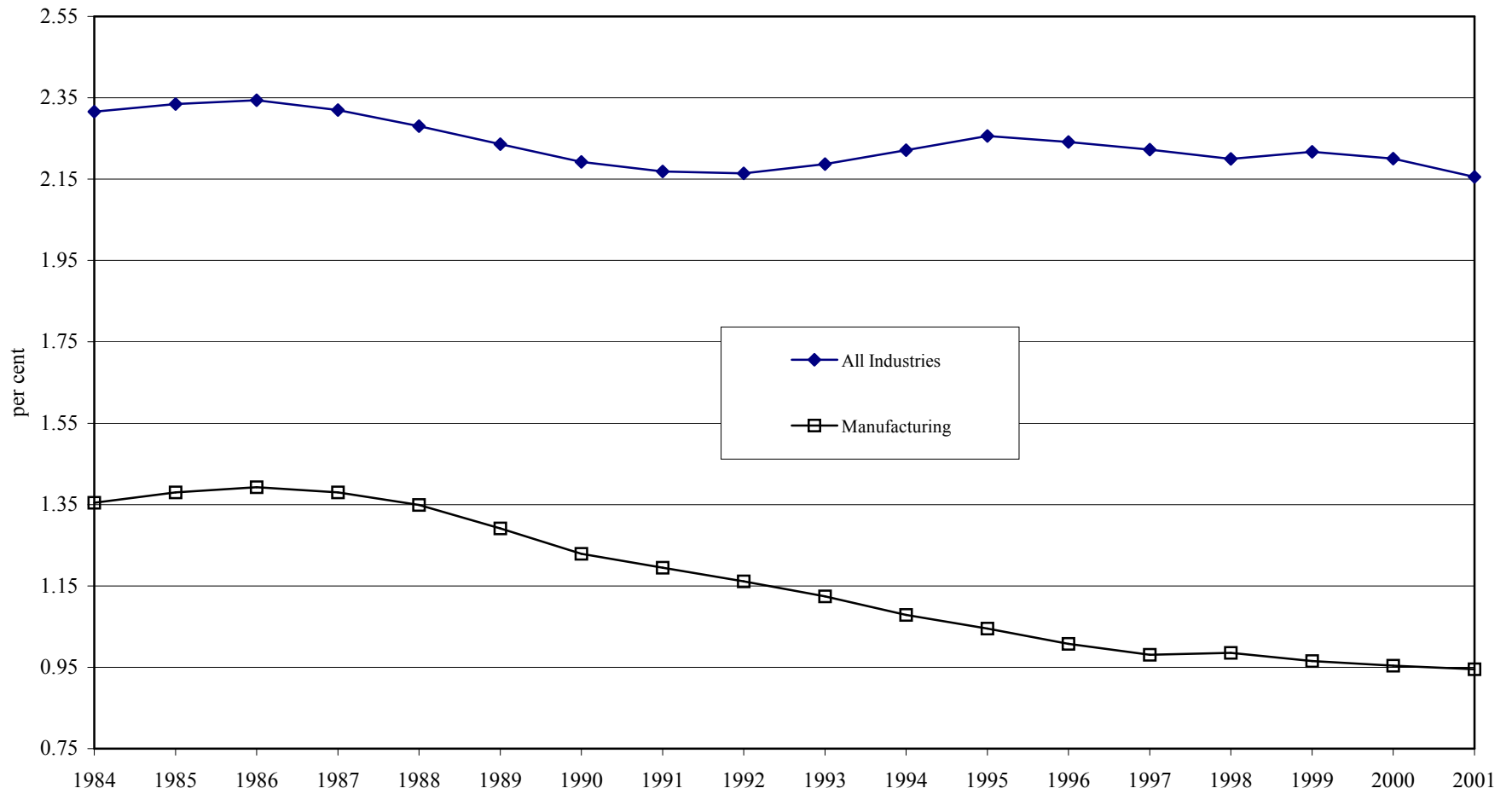
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis and unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 40: Manufacturing Real GDP per Hour Worked as a Percentage of Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick, 1987-2002



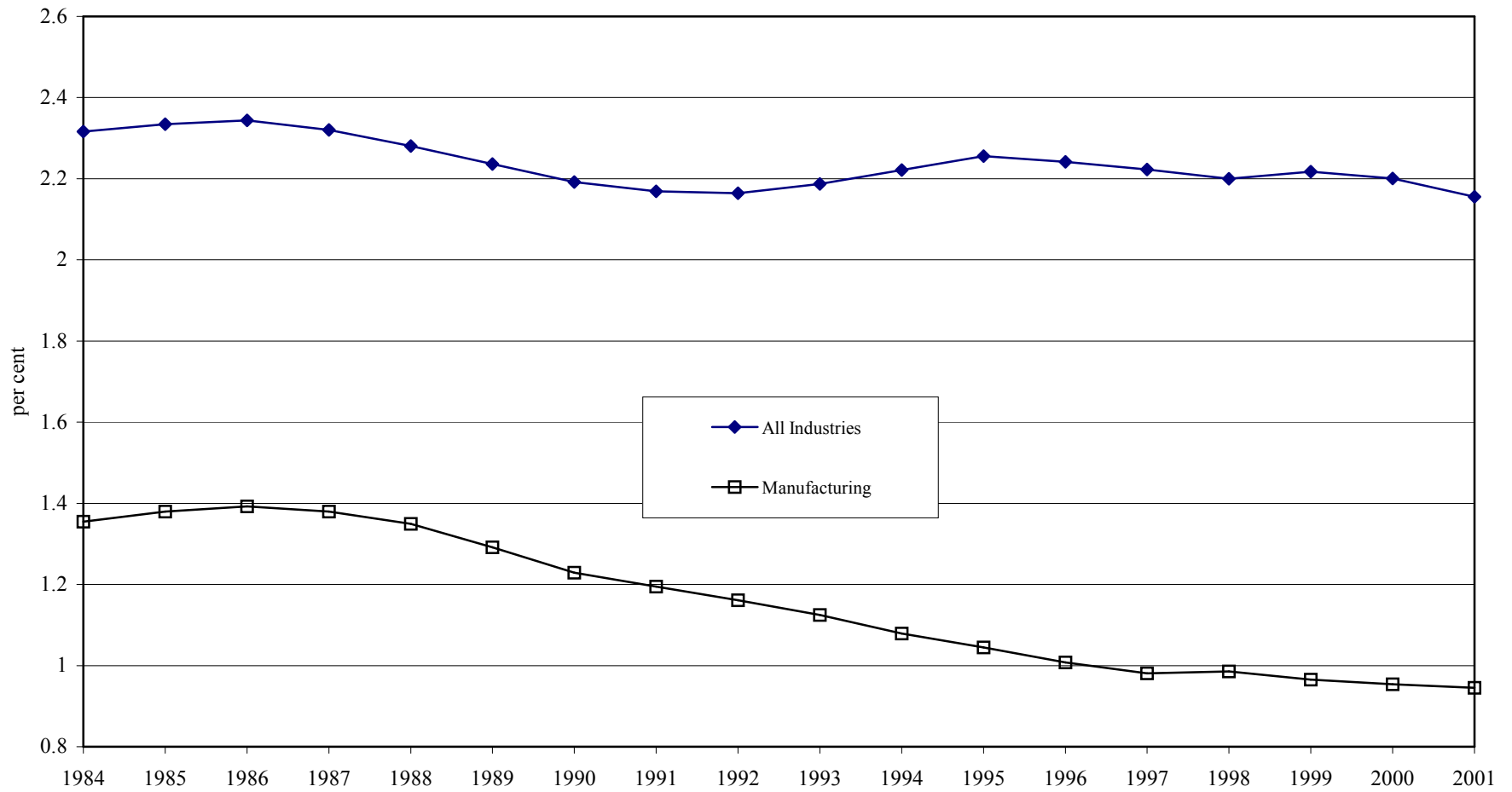
Source: Unpublished GDP data provided by Statistics Canada Division of Industry Measures and Analysis and unpublished Hours data provided by Statistics Canada Division of Labour Statistics.

Chart 41: Manufacturing and All Industries Capital Stock in Newfoundland as a Percentage of Canada, 1984-2001



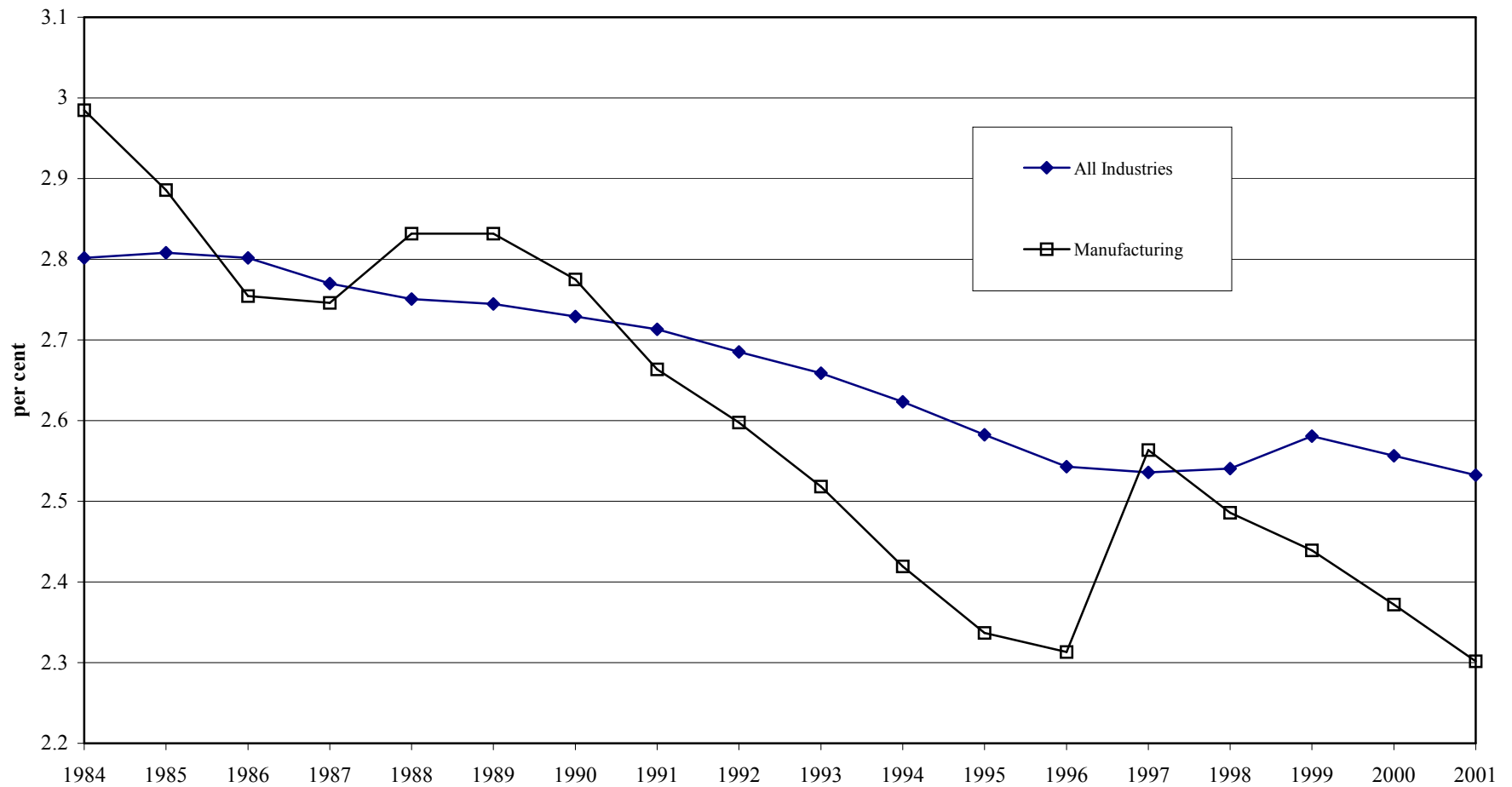
Source: Unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Chart 42: Manufacturing and All Industries Capital Stock in Prince Edward Island as a Percentage of Canada, 1984-2001



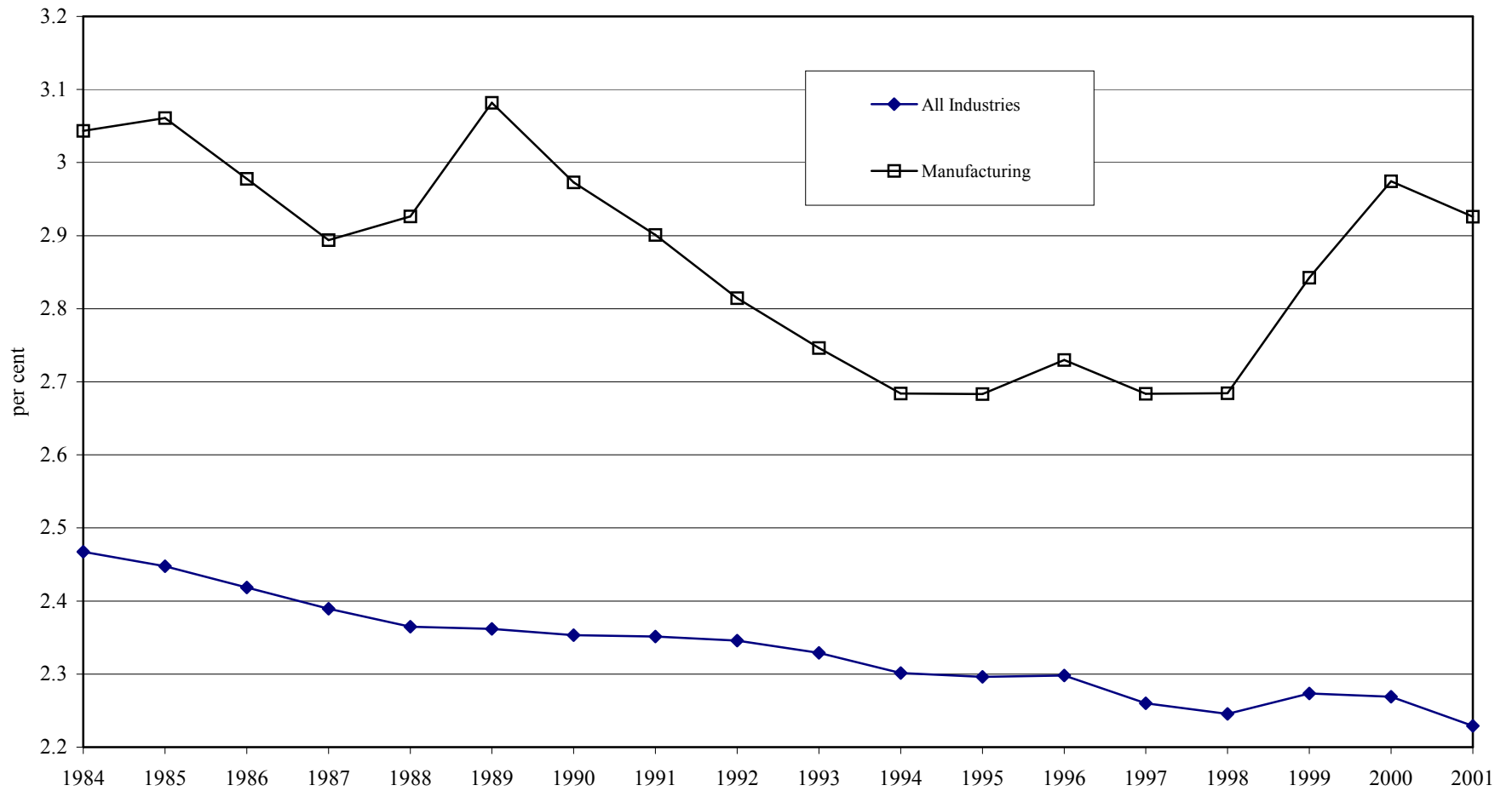
Source: Unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Chart 43: Manufacturing and All Industries Capital Stock in Nova Scotia as a Percentage of Canada, 1984-2001



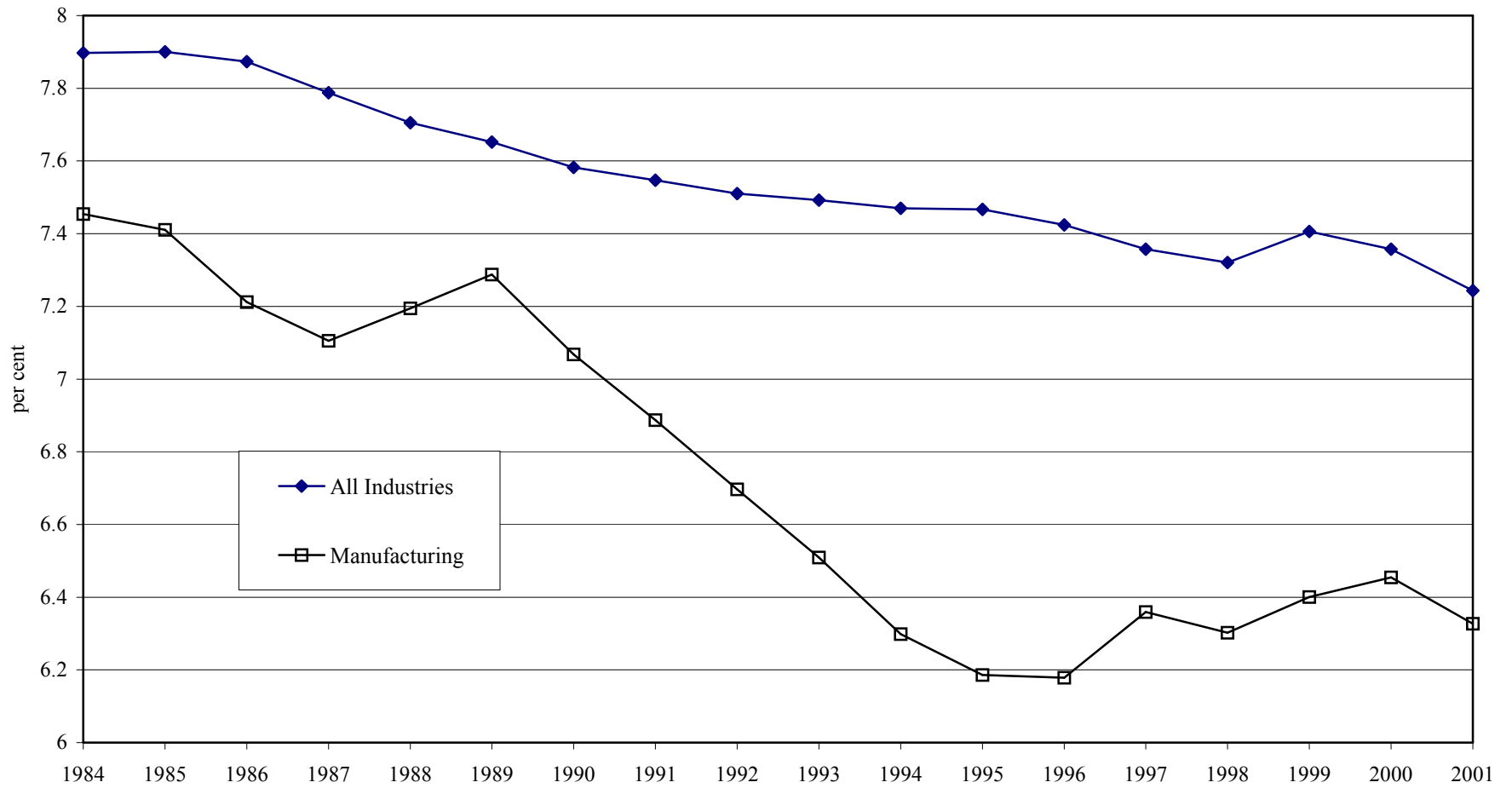
Source: Unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Chart 44: Manufacturing and All Industries Capital Stock in New Brunswick as a Percentage of Canada, 1984-2001



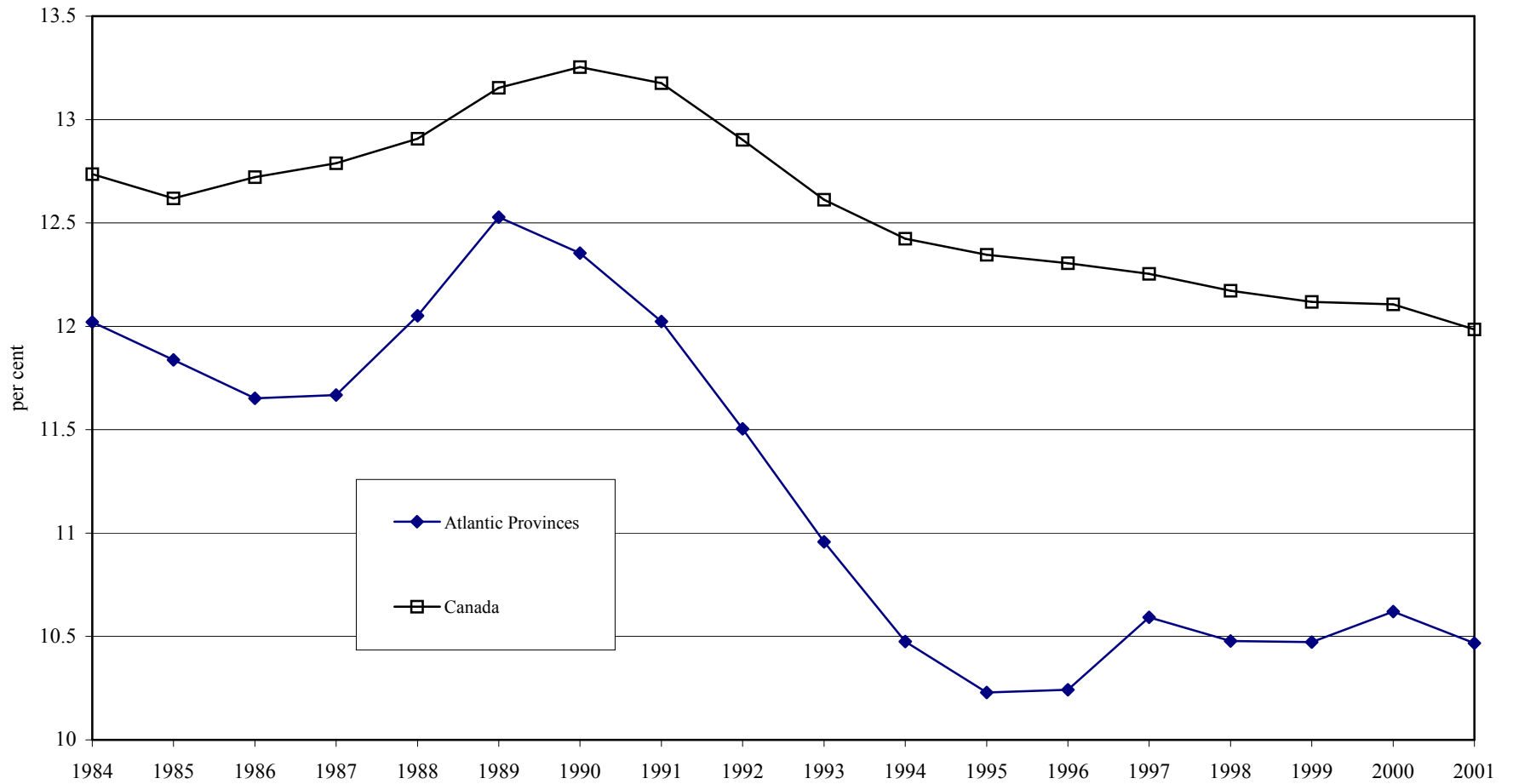
Source: Unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Chart 45: Manufacturing and All Industries Capital Stock in New Brunswick as a Percentage of Canada, 1984-2001



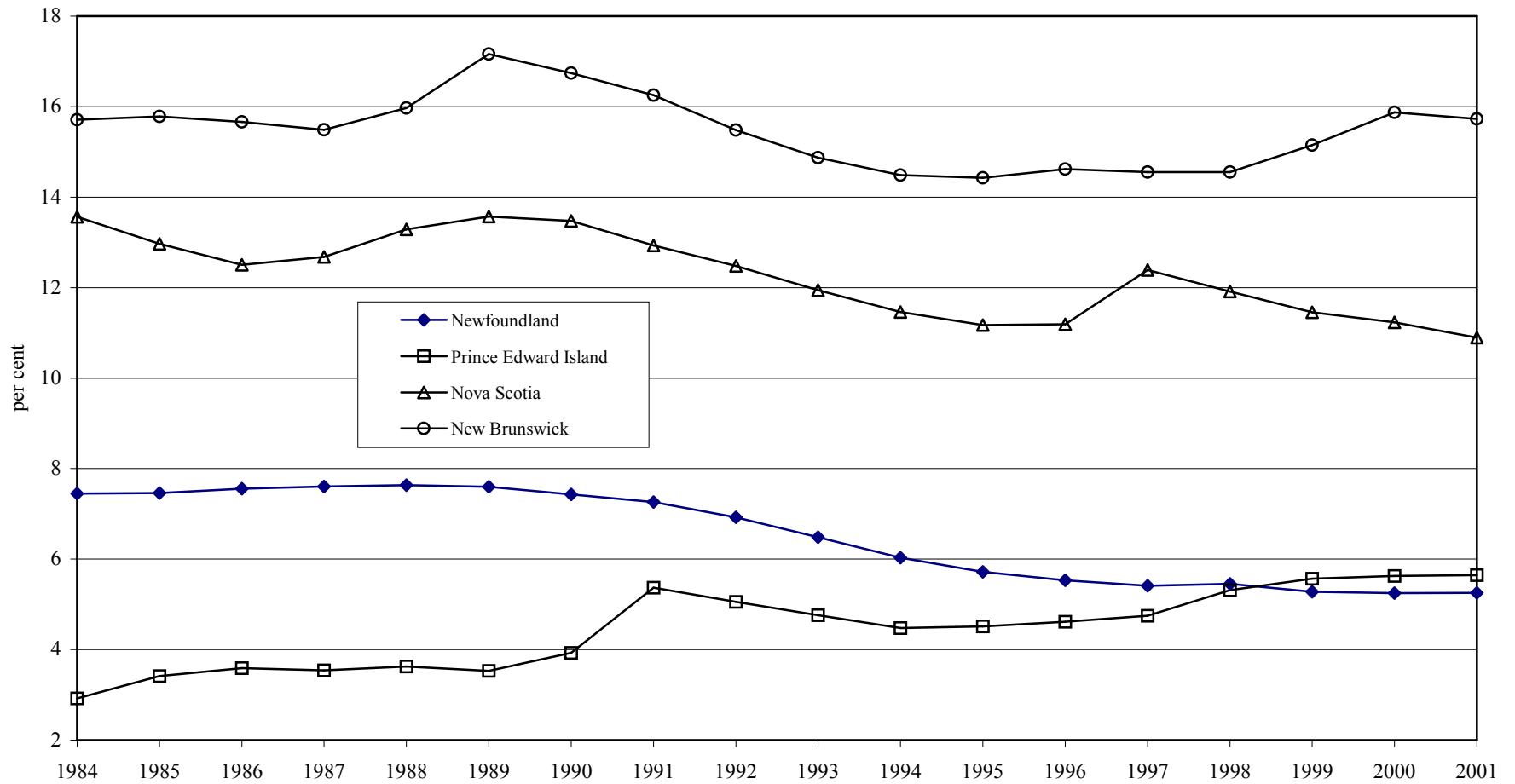
Source: Unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Chart 46: Manufacturing Capital Stock as a Percentage of All Industries Capital Stock in Canada and Atlantic provinces, 1984-2001



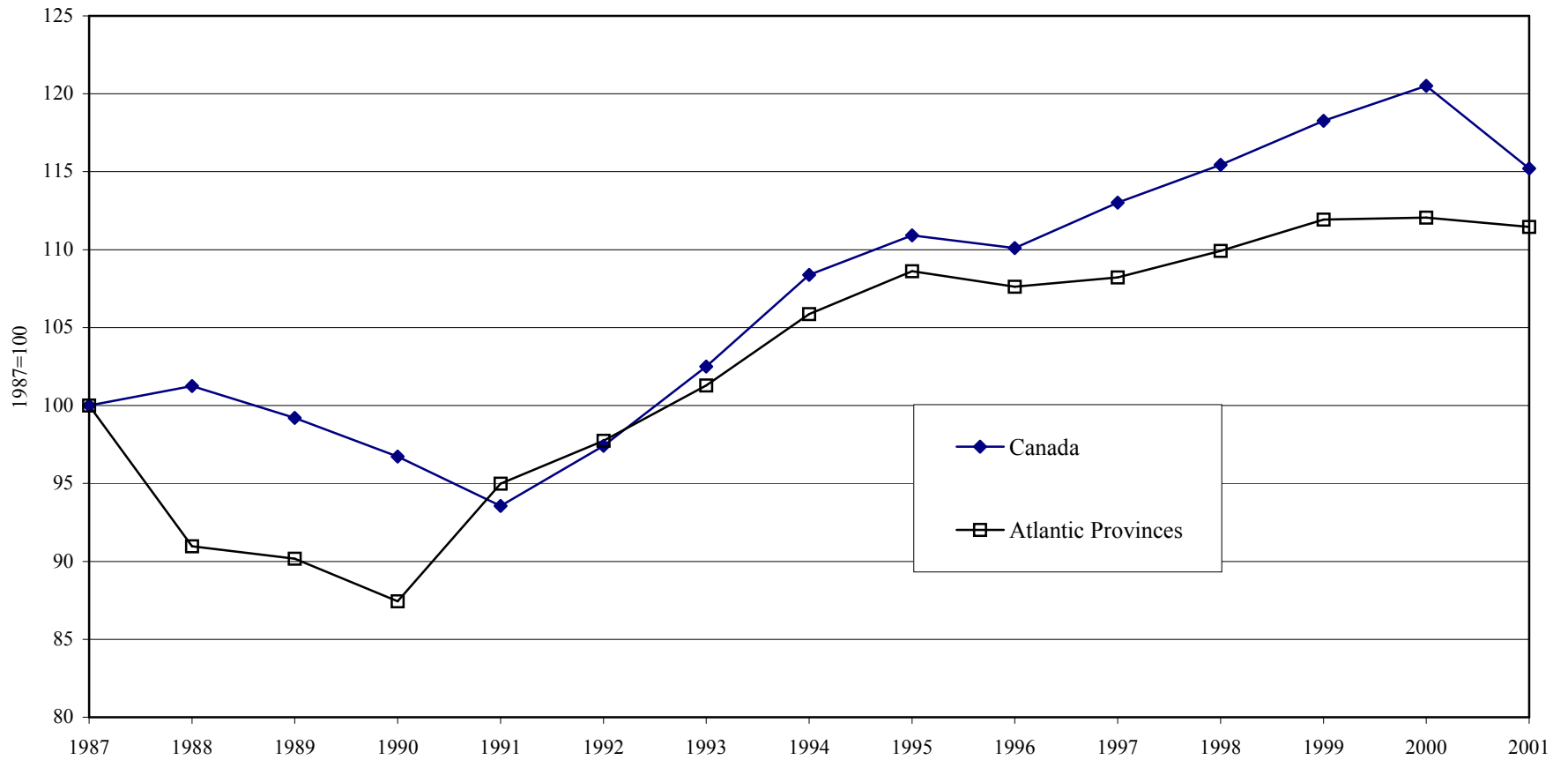
Source: Unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Chart 47: Manufacturing Capital Stock as a Percentage of All Industries Capital Stock in Canada and Atlantic provinces, 1984-2001



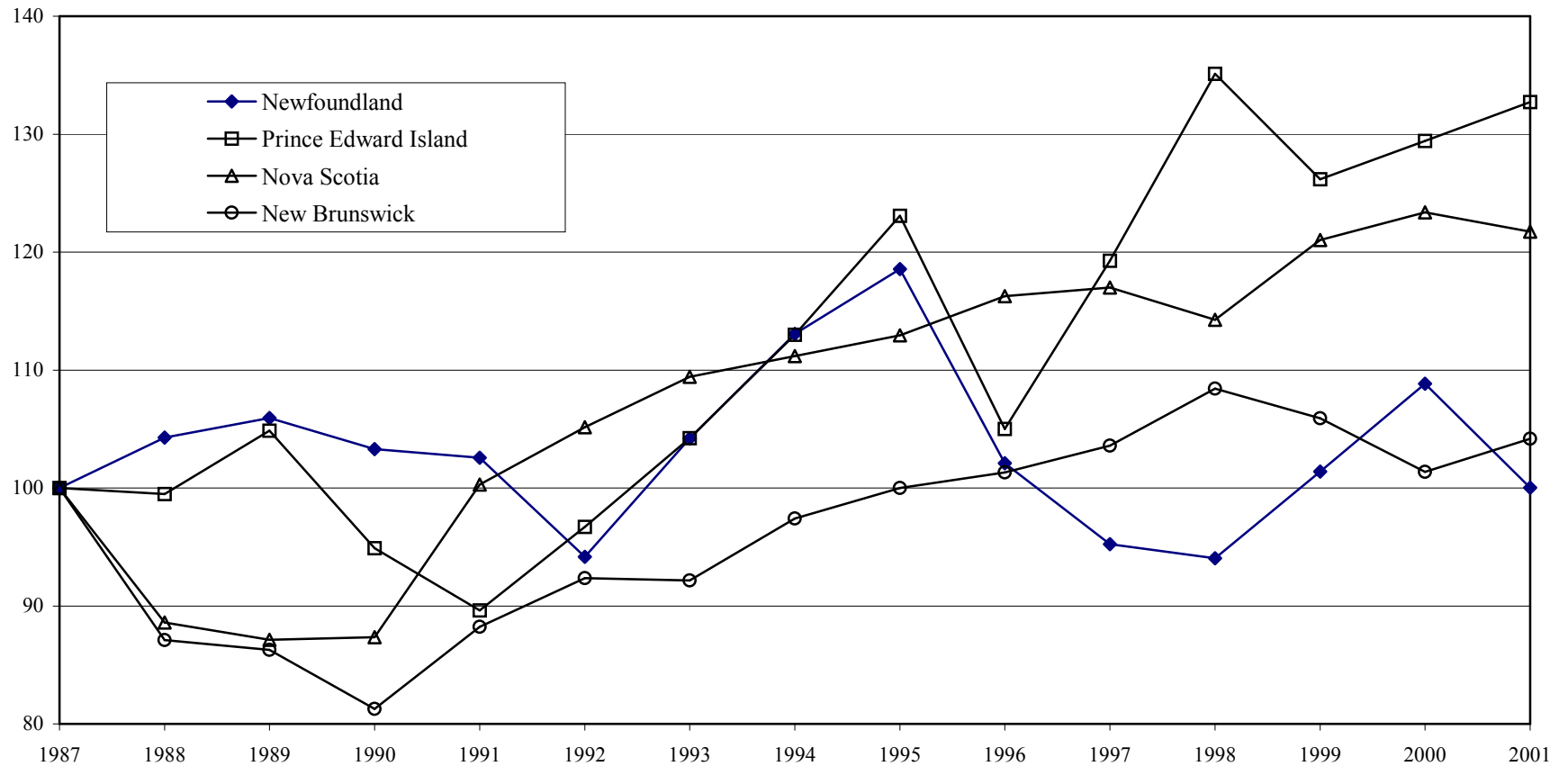
Source: Unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Chart 48: Trends in Total Factor Productivity in Manufacturing in Canada and Atlantic Provinces, 1987-2001



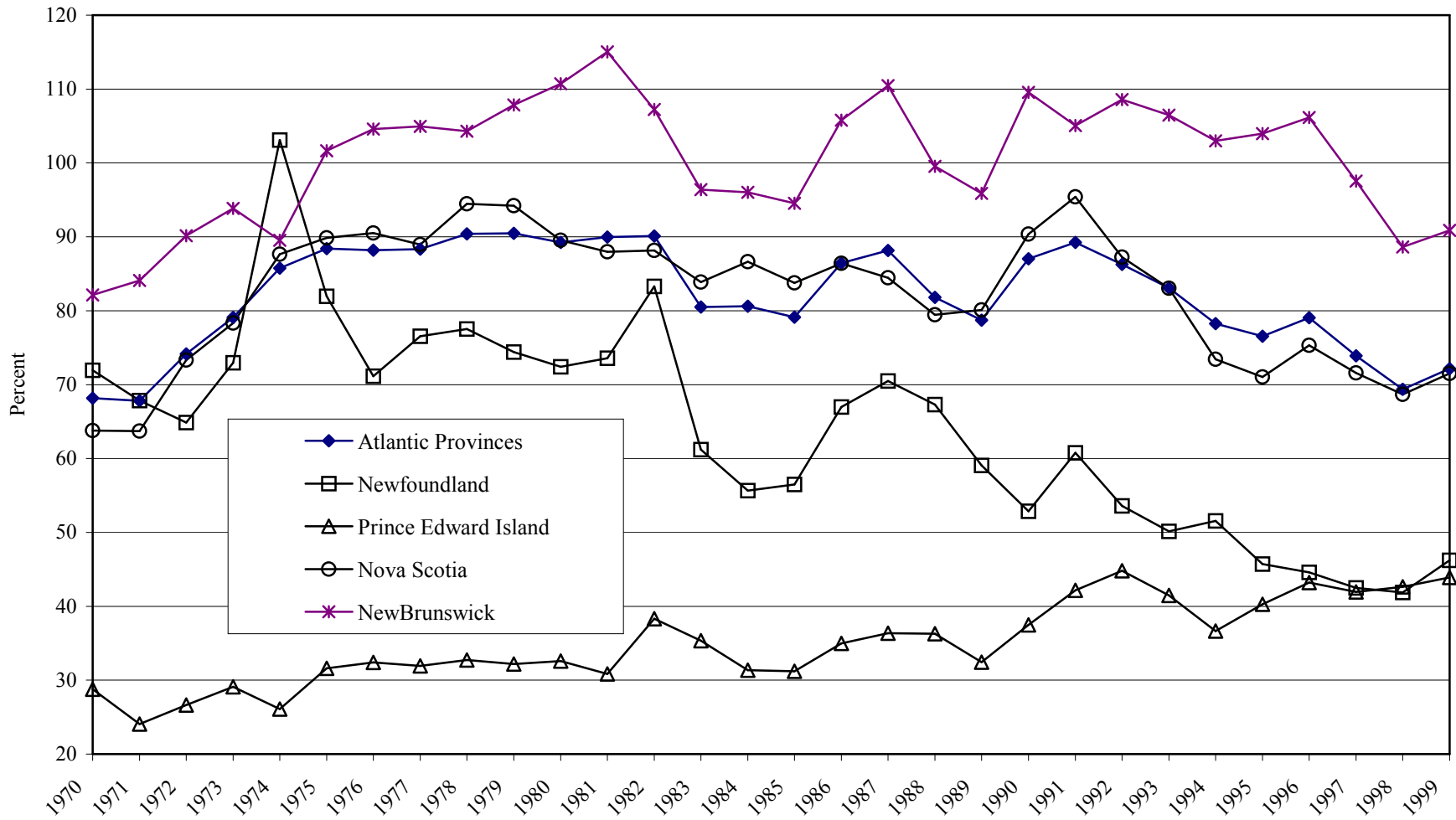
Source: Unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis, unpublished Total Hours data provided by Statistics Canada Division of Labour Statistics, and unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Chart 49: Trends in Total Factor Productivity in Manufacturing in Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, 1987-2001



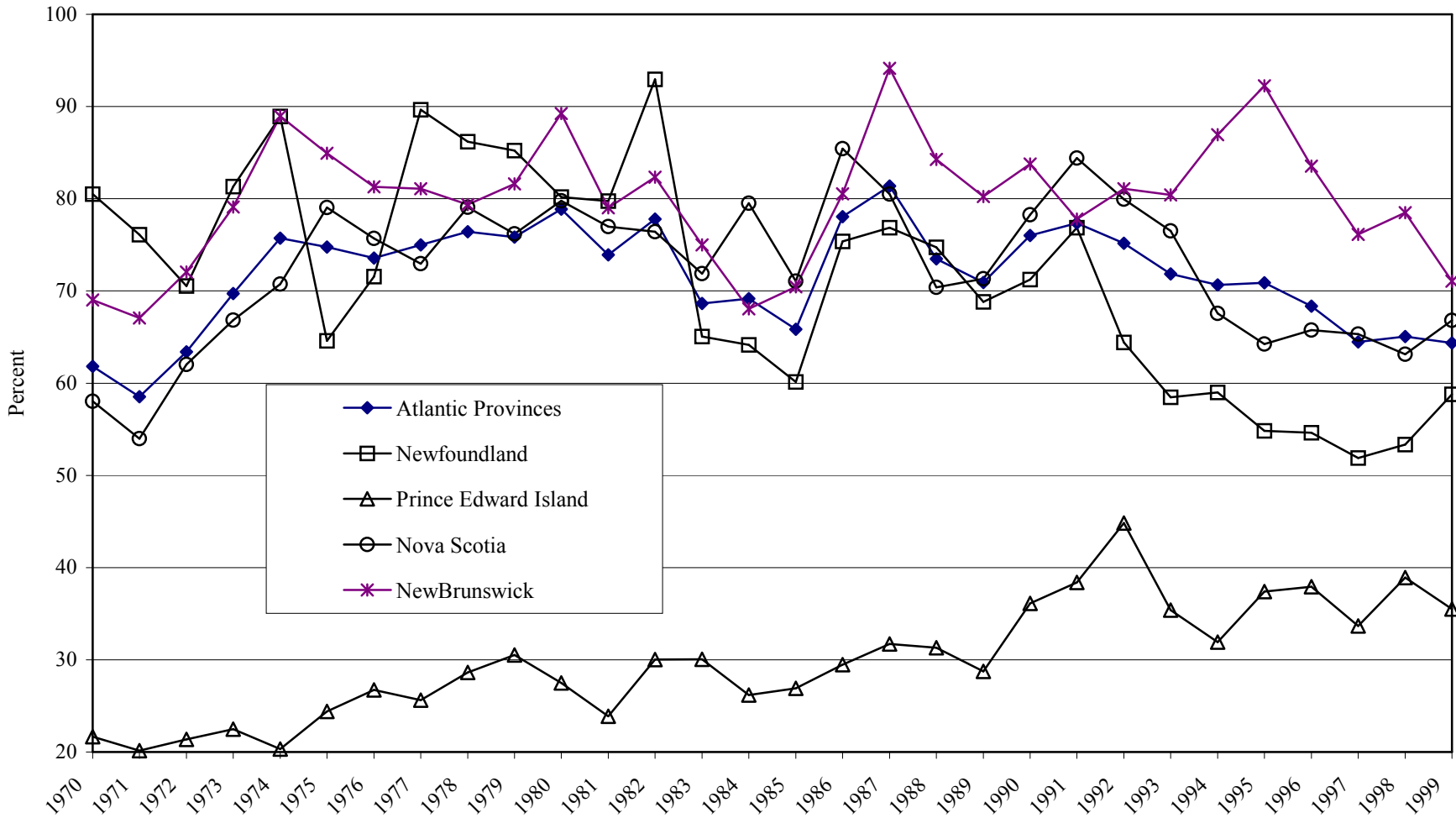
Source: Unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis, unpublished Total Hours data provided by Statistics Canada Division of Labour Statistics, and unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Chart 50: Value of Shipments per Manufacturing Establishment in Atlantic Canada as a Proportion of Canada, 1970-1999



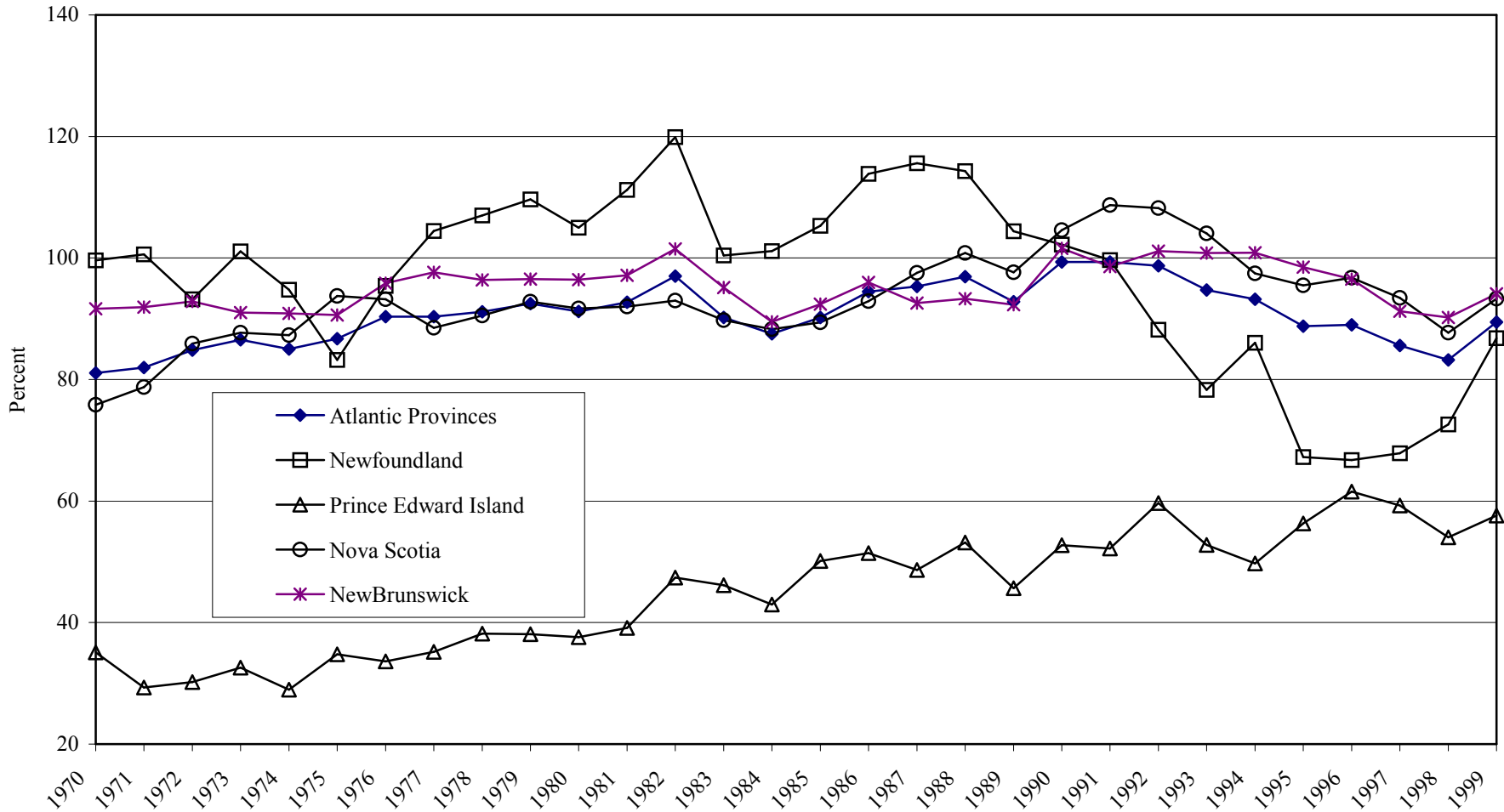
Source: Statistics Canada, Manufacturing Industries in Canada: National and Provincial Areas, 1999 Cat. 31-203-XPB., June 2002

Chart 51: Total Activity Value Added per Manufacturing Establishment in Atlantic Canada as a Proportion of Canada, 1970-1999



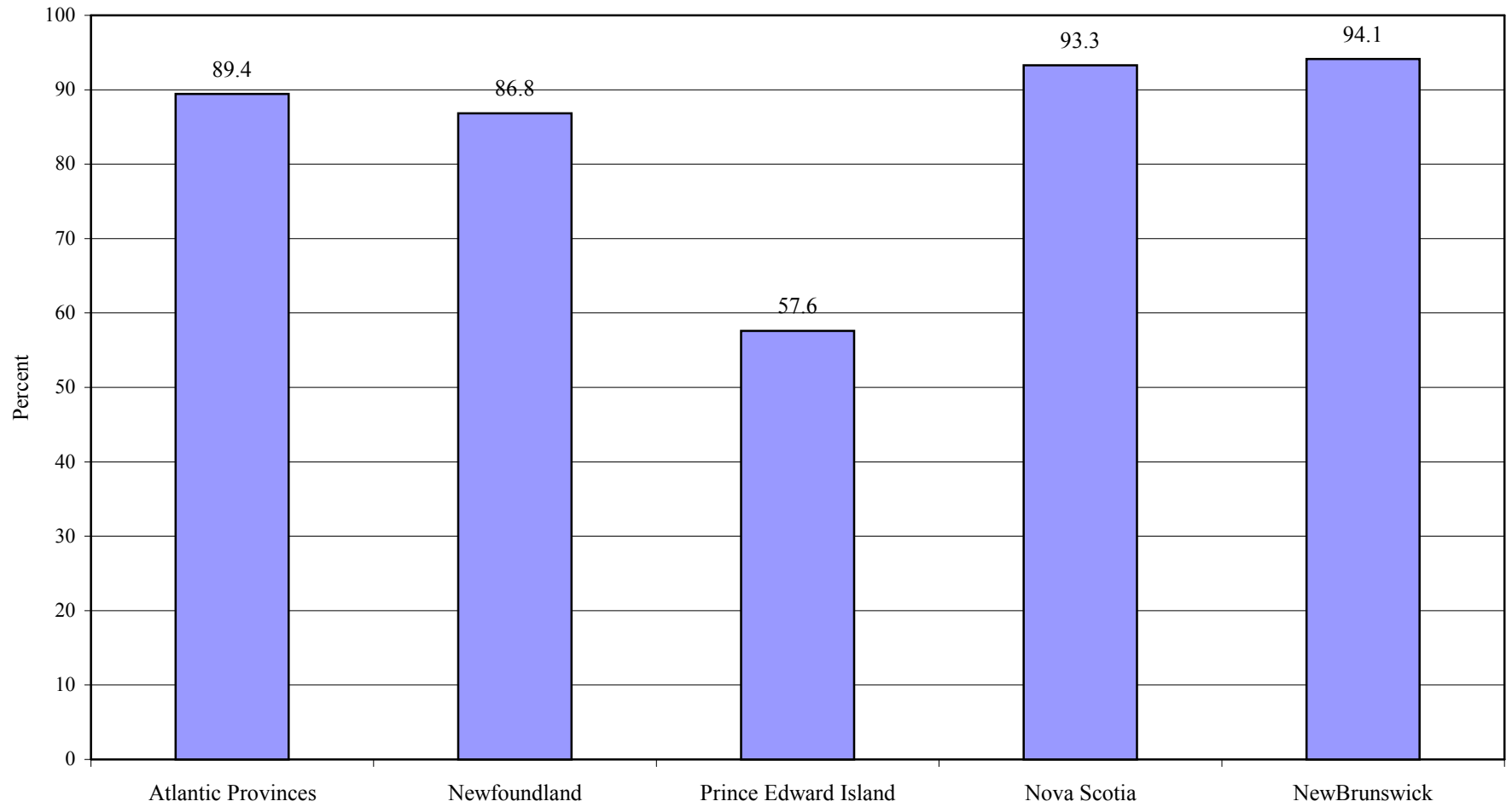
Source: Statistics Canada, Manufacturing Industries in Canada: National and Provincial Areas, 1999 Cat. 31-203-XPB., June 2002

Chart 52: Total Employees per Manufacturing Establishment in Atlantic Canada as a Proportion of Canada, 1970-1999



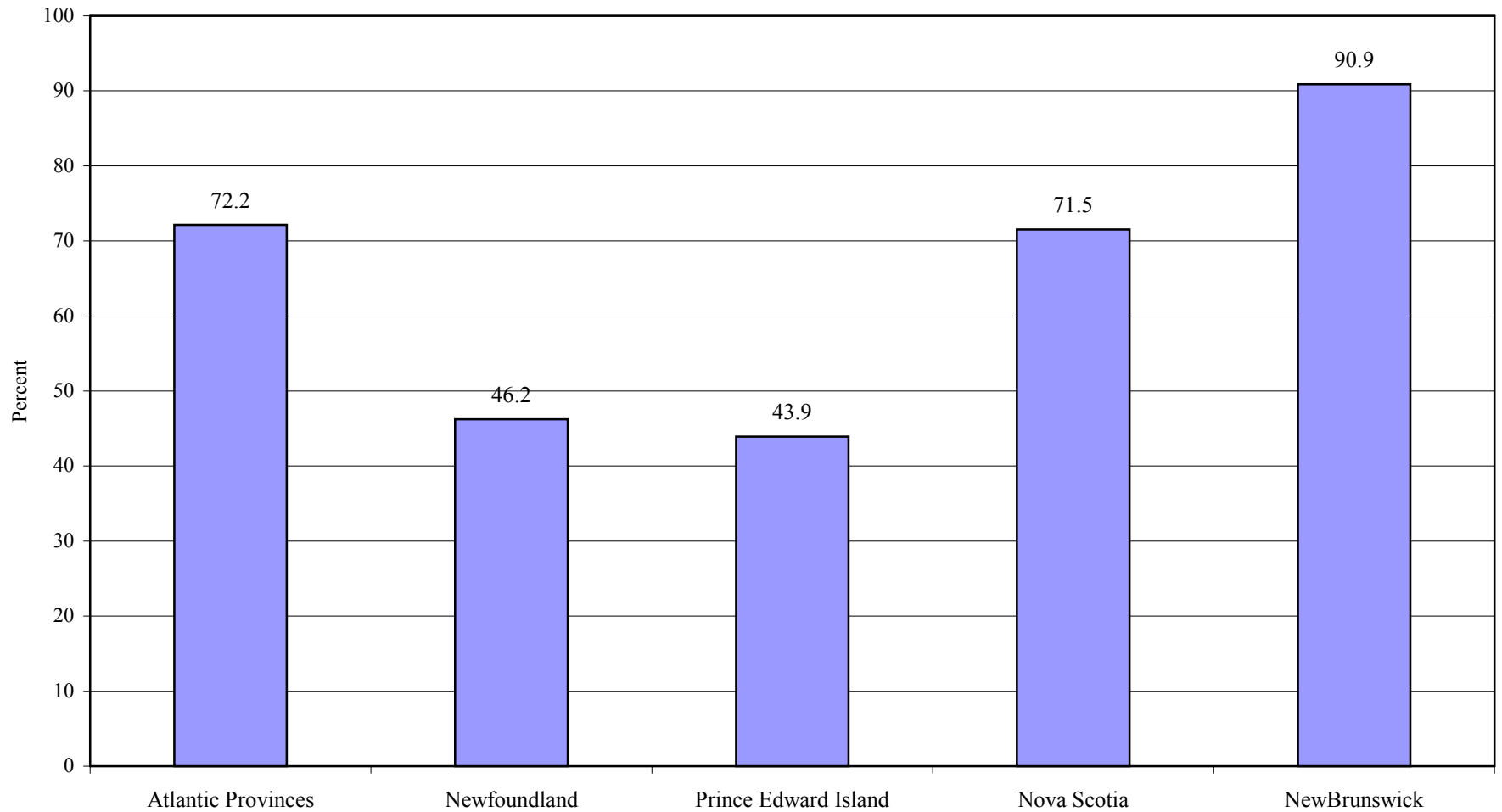
Source: Statistics Canada, Manufacturing Industries in Canada: National and Provincial Areas, 1999 Cat. 31-203-XPB., June 2002

Chart 53: Total Employees per Manufacturing Establishment in Atlantic Provinces as a Proportion of Canada, 1999



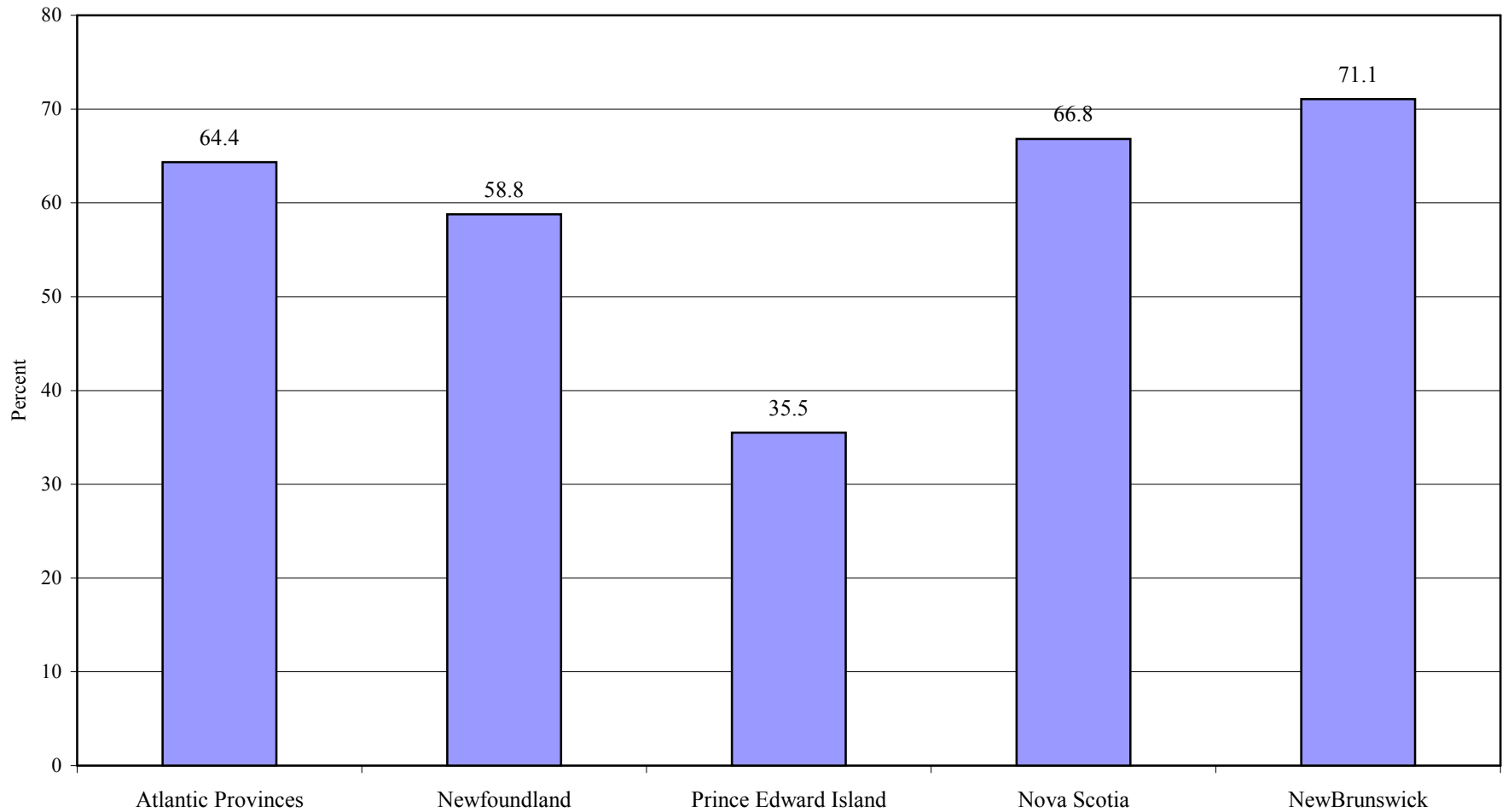
Source: Statistics Canada, Manufacturing Industries in Canada: National and Provincial Areas, 1999 Cat. 31-203-XPB., June 2002

Chart 54: Value of Shipments of Goods per Manufacturing Establishment in Atlantic Provinces as a Proportion of Canada, 1999

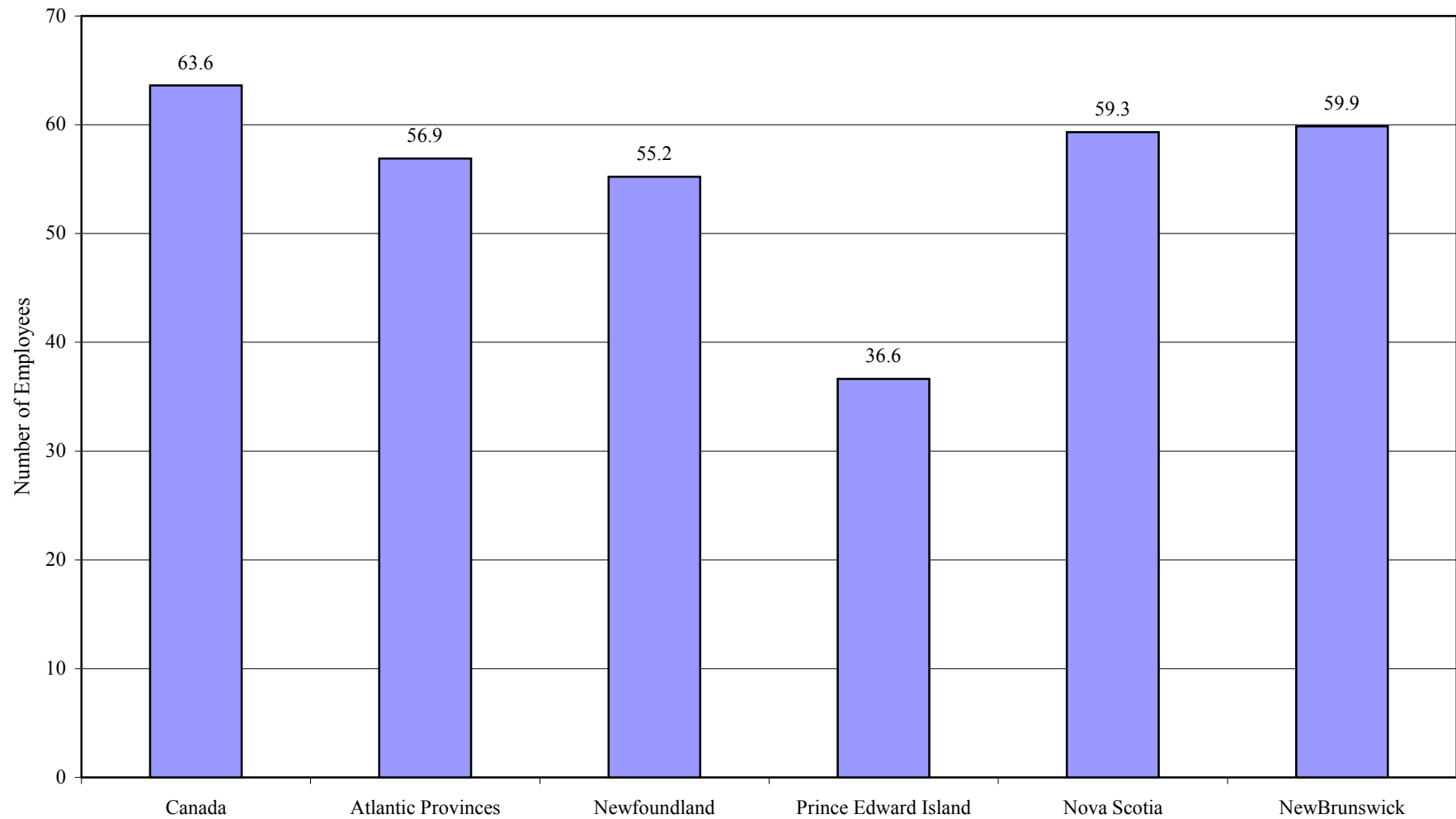


Source: Statistics Canada, Manufacturing Industries in Canada: National and Provincial Areas, 1999 Cat. 31-203-XPB., June 2002

Chart 55: Total Activity Value Added per Manufacturing Establishment in Atlantic Provinces as a Proportion of Canada, 1999

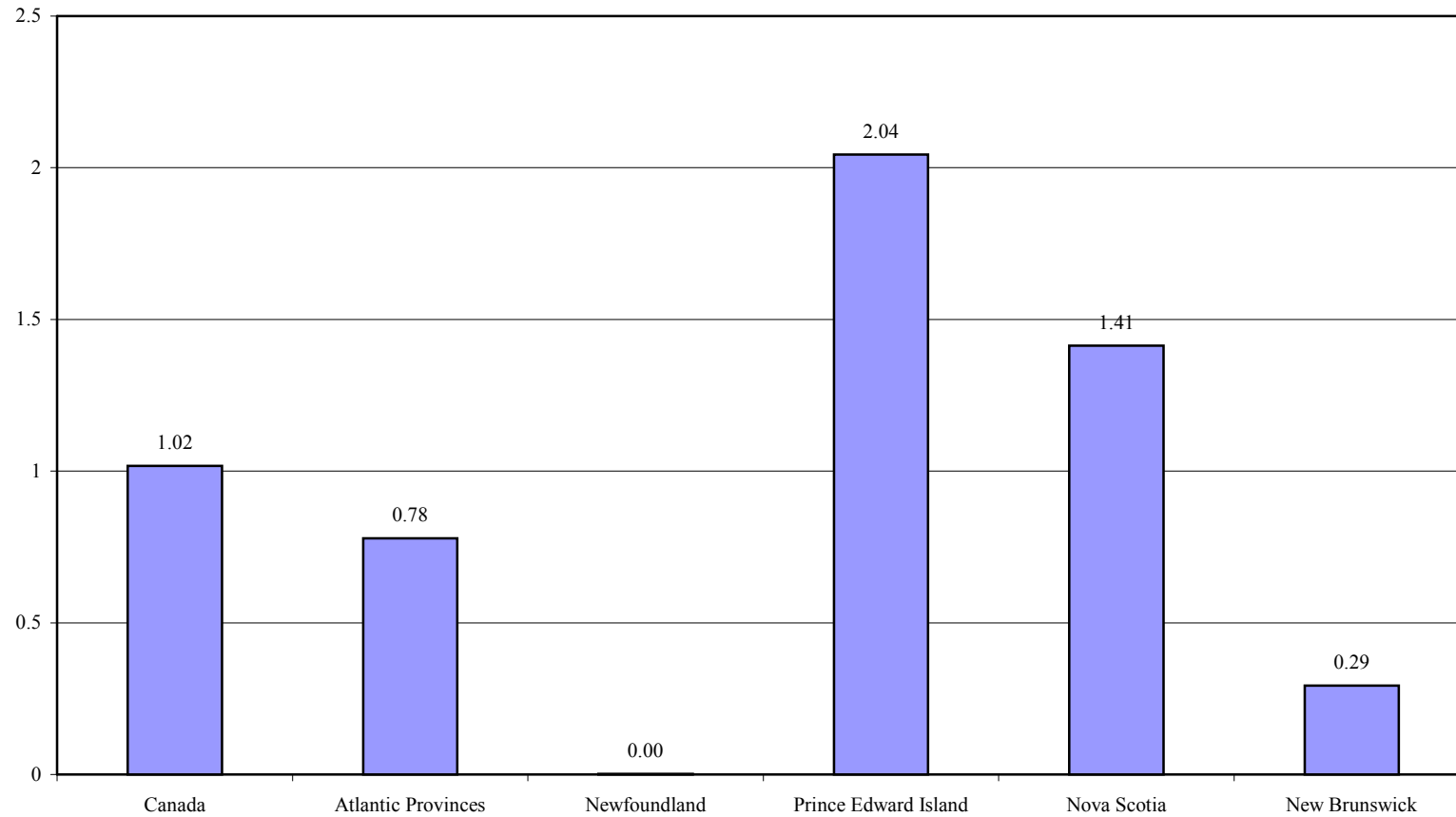


Source: Statistics Canada, Manufacturing Industries in Canada: National and Provincial Areas, 1999 Cat. 31-203-XPB., June 2002

Chart 56: Total Employees per Manufacturing Establishment in Canada and Atlantic Provinces, 1999

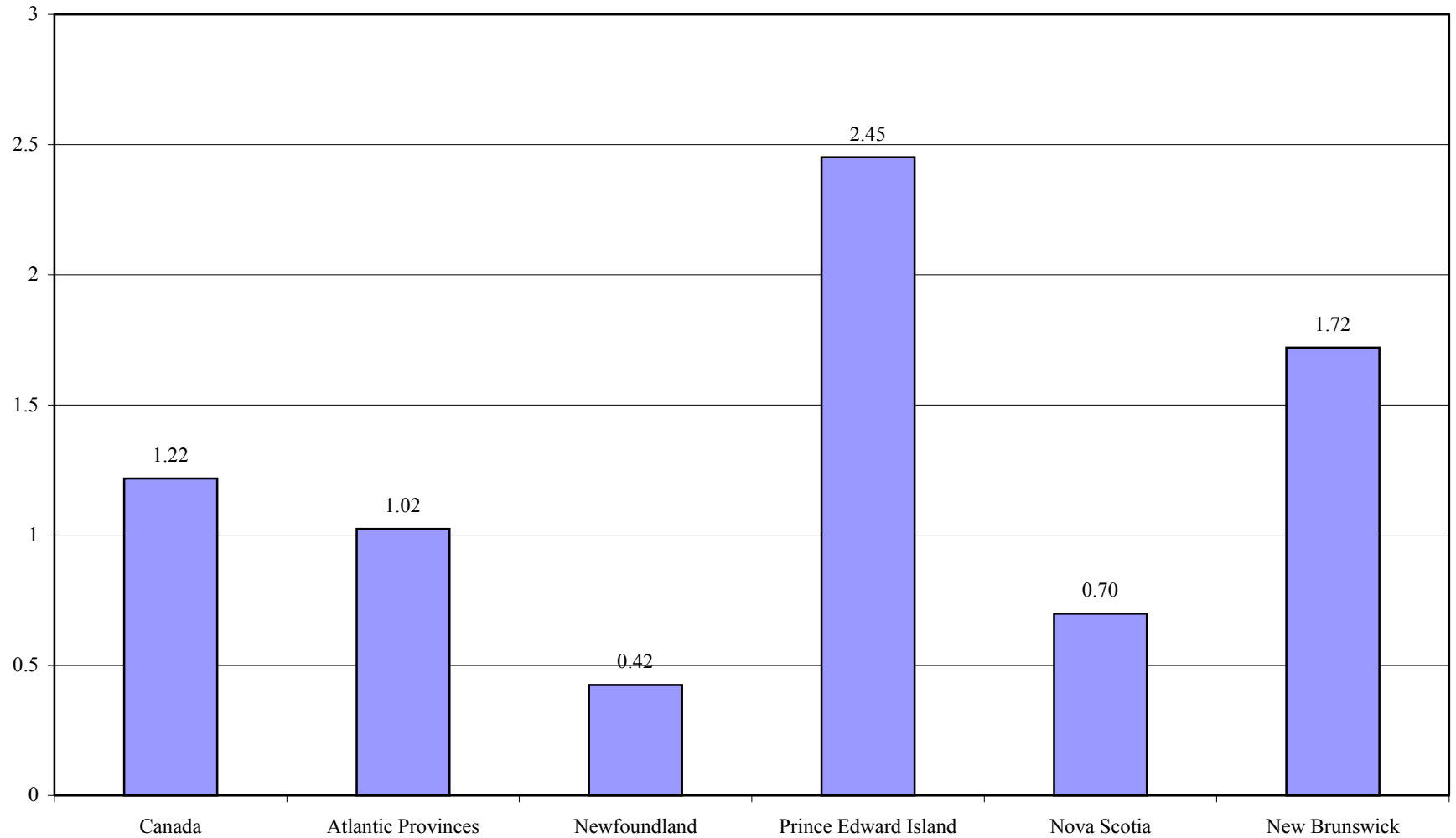
Source: Statistics Canada, Manufacturing Industries in Canada: National and Provincial Areas, 1999 Cat. 31-203-XPB., June 2002

Chart 57: Manufacturing Total Factor Productivity Growth in Canada and the Atlantic Provinces, 1987-2001



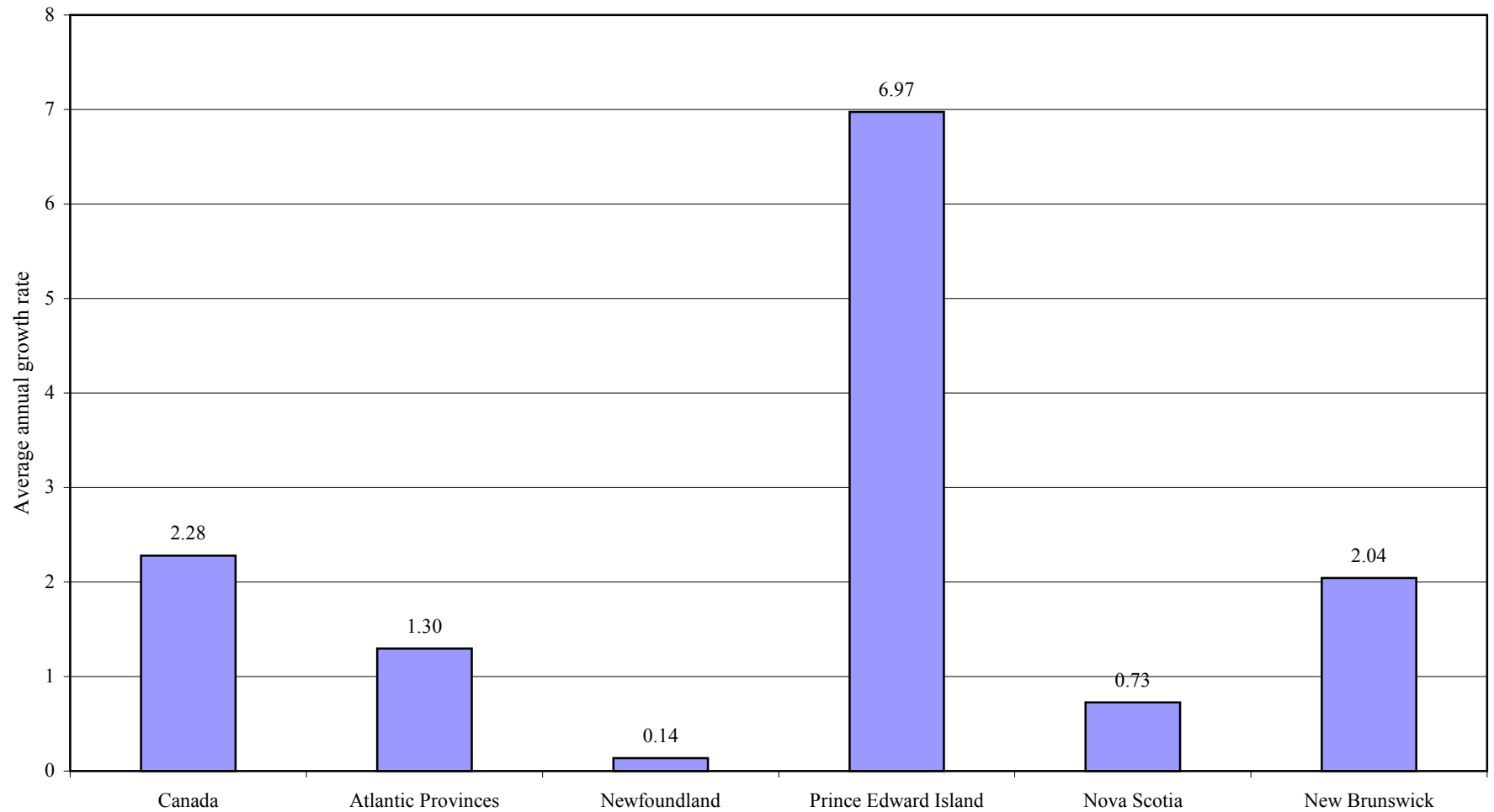
Source: Unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis, unpublished Total Hours data provided by Statistics Canada Division of Labour Statistics, and unpublished Capital Stock data provided by Statistics Canada Division of Fixed Assets.

Chart 58: Manufacturing Capital Stock per Hour Worked Ratio Growth in Canada and the Atlantic Provinces, 1987-2001

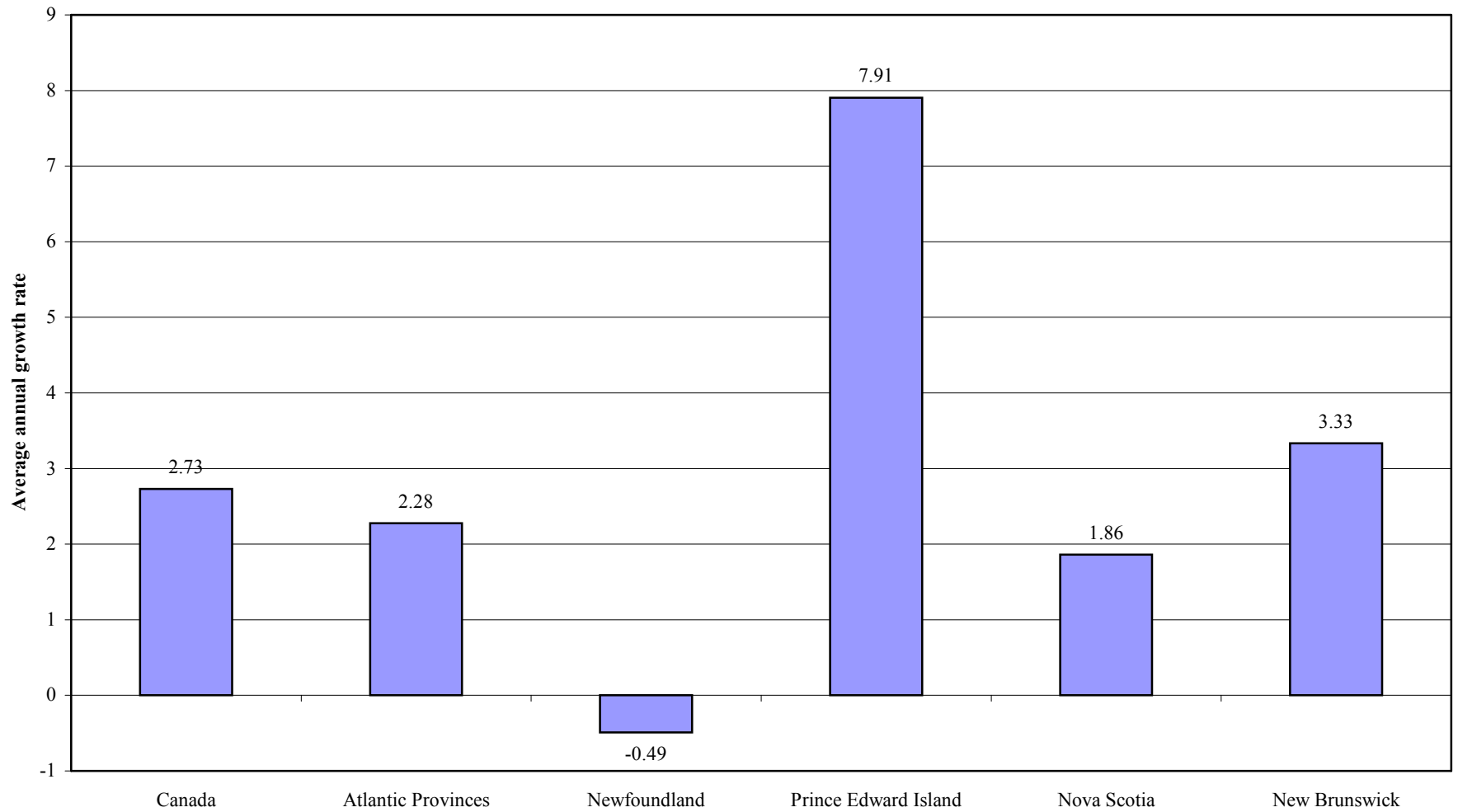


Source: Unpublished Hours data provided by Statistics Canada Division of Labour Statistics and unpublished capital stock data provided by Statistics Canada Division of Fixed Assets

Chart 59: Manufacturing End-Year Net Capital Stock Growth in Canada and the Atlantic Provinces, 1984-2001

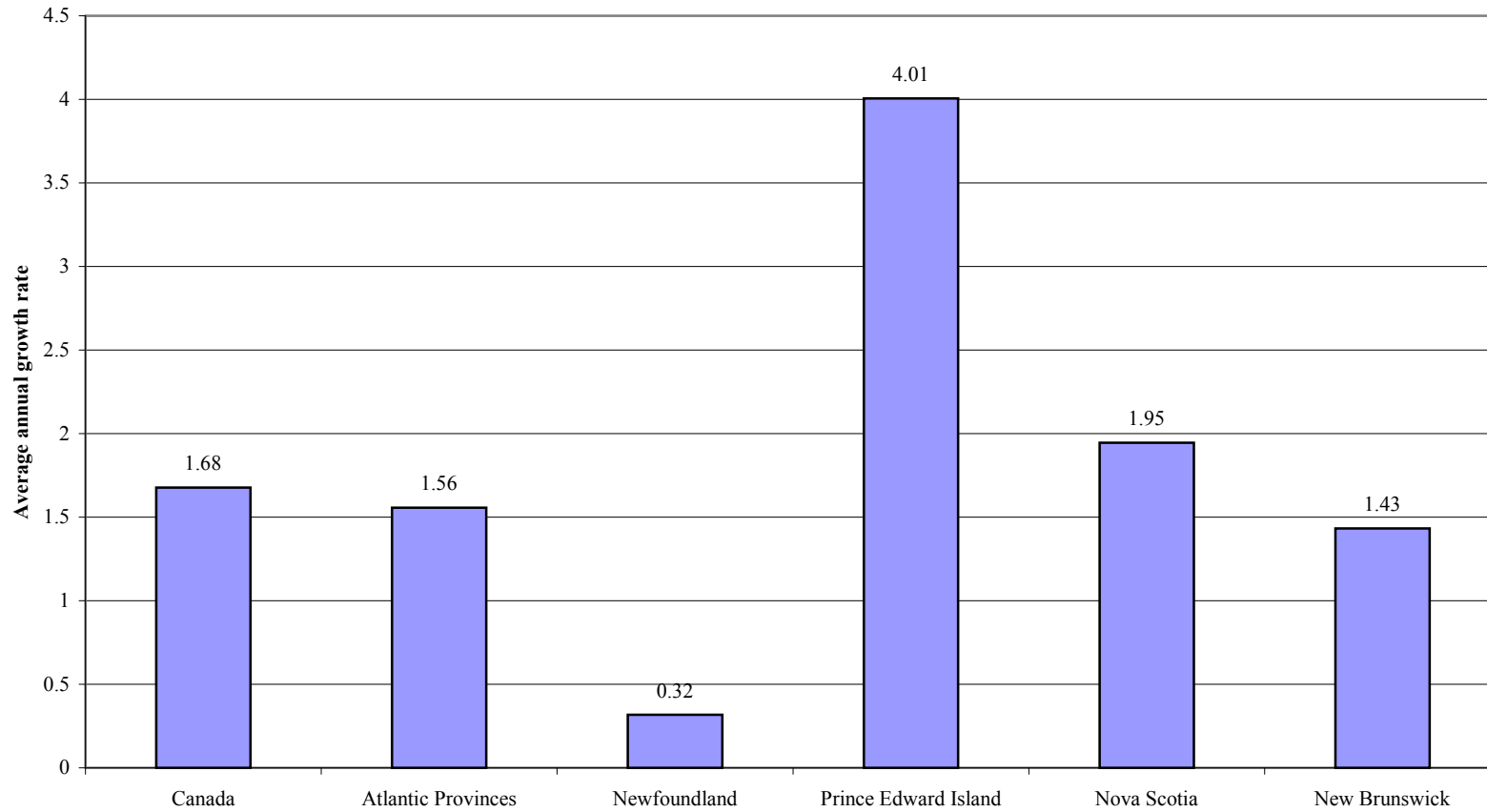


Source: Unpublished End-Year Net Capital Stock data provided by Statistics Canada Division of Fixed Assets.

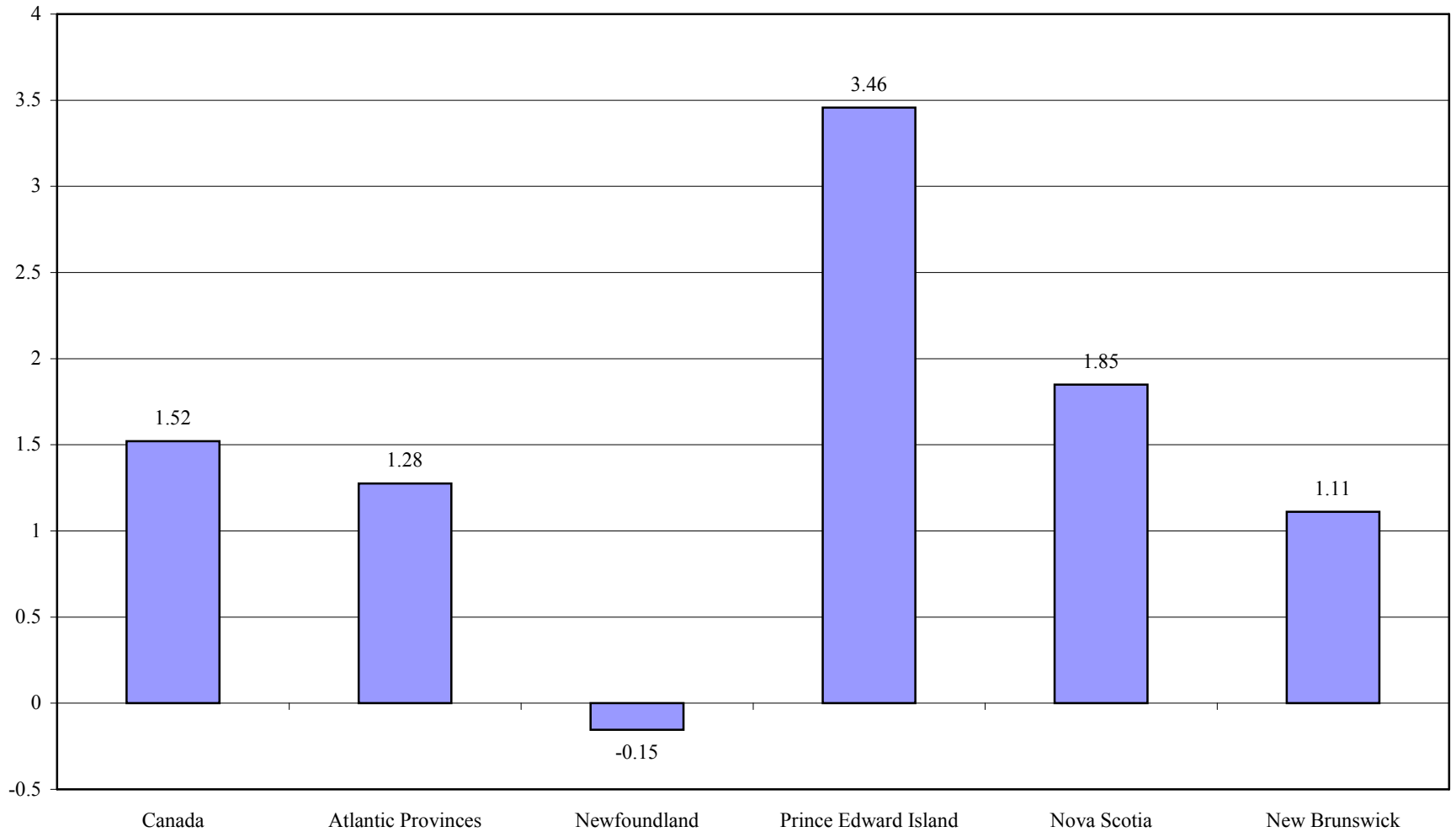
Chart 60: Manufacturing Real GDP Growth in Canada and the Atlantic Provinces, 1984-2002

Source: Unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis

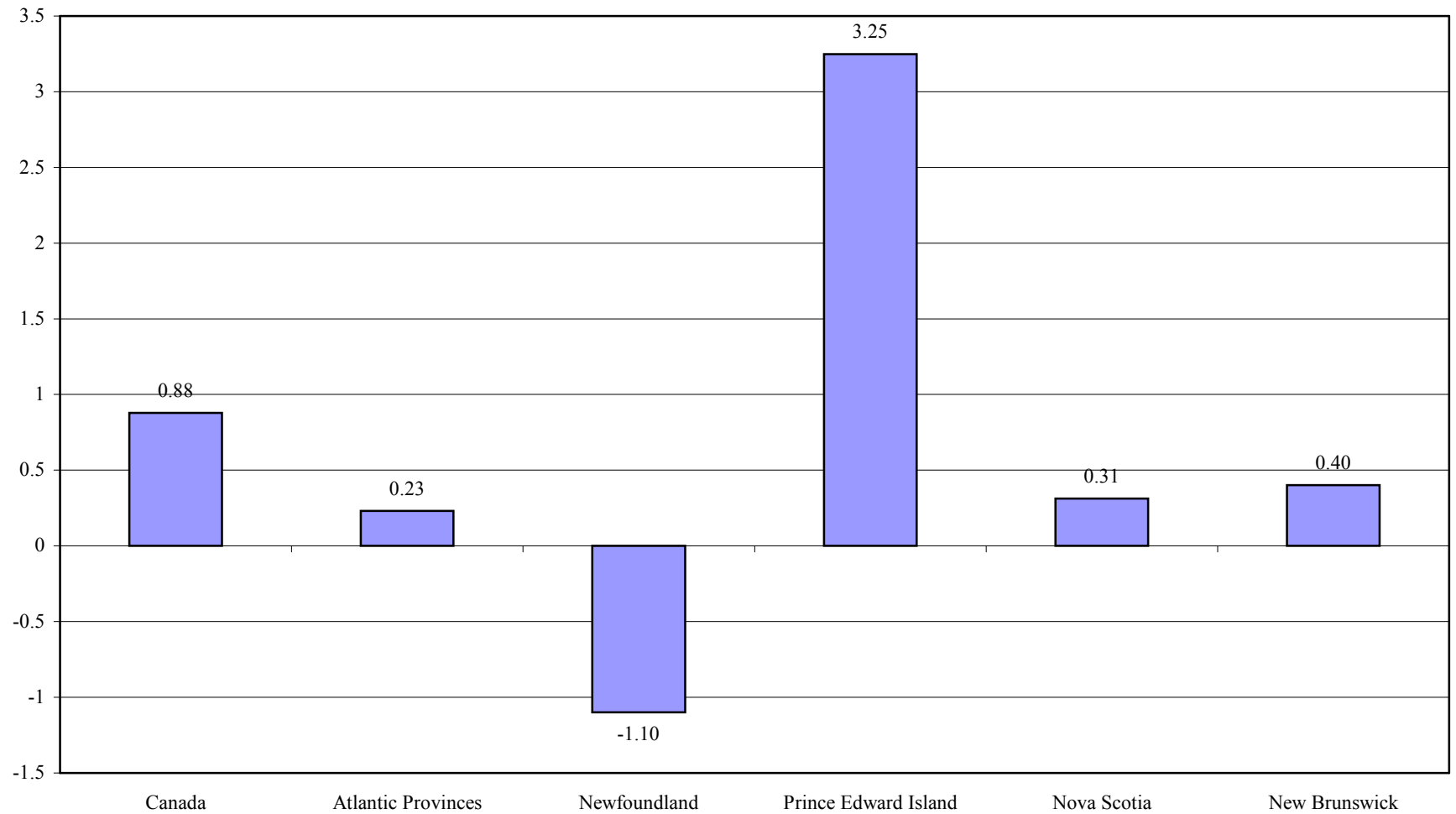
Chart 61: Manufacturing Real GDP per Worker Growth in Canada and the Atlantic Provinces, 1987-2002



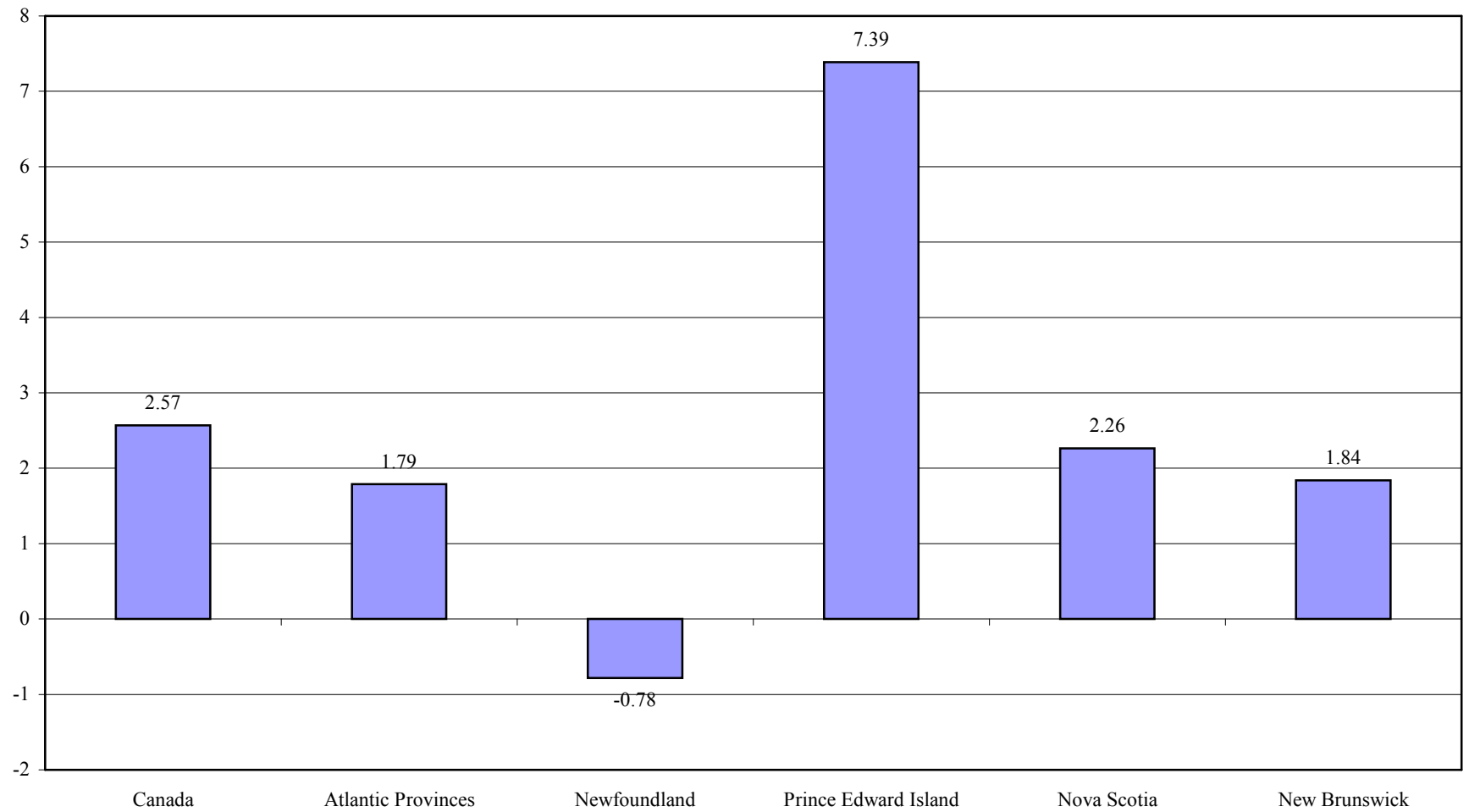
Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Chart 62: Manufacturing Real GDP per Hour Growth in Canada and the Atlantic Provinces, 1987-2002

Source: Unpublished Total Hours data provided by Statistics Canada Division of Labour Statistics, and unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis.

Chart 63: Manufacturing Employment Growth in Canada and the Atlantic Provinces, 1987-2002

Source: Unpublished Employment data provided by Statistics Canada Division of Labour Statistics.

Chart 64: Manufacturing Real GDP Growth in Canada and the Atlantic Provinces, 1987-2002

Source: Unpublished Real GDP data provided by Statistics Canada Division of Industry Measure and Analysis

List of Appendix Tables

(The Appendix Tables are available with this report at www.csls.ca under Research Reports.)

Selected Principal Statistics in Manufacturing

Appendix Table 1 Selected Principal Statistics of Manufacturing Industries, Canada, 1970-1999

Appendix Table 1A Ratios Calculated from Selected Principal Statistics of Manufacturing Industries, Canada, 1970-1999

Appendix Table 2 Selected Principal Statistics of Manufacturing Industries, Newfoundland, 1970-1999

Appendix Table 2A Ratios Calculated from Selected Principal Statistics of Manufacturing Industries, Newfoundland, 1970-1999

Appendix Table 2B Proportion of National Average Calculated from Selected Principal Statistics of Manufacturing Industries, Newfoundland, 1970-1999

Appendix Table 3. Selected Principal Statistics of Manufacturing Industries, PEI, 1970-1999

Appendix Table 3A. Ratios Calculated from Selected Principal Statistics of Manufacturing Industries, PEI, 1970-1999

Appendix Table 3B Proportion of National Average Calculated from Selected Principal Statistics of Manufacturing Industries, Prince Edward Island, 1970-1999

Appendix Table 4. Selected Principal Statistics of Manufacturing Industries, Nova Scotia, 1970-1999

Appendix Table 4A. Some Derivations from Selected Principal Statistics of Manufacturing Industries, Nova Scotia, 1970-1999

Appendix Table 4B Proportion of National Average Calculated from Selected Principal Statistics of Manufacturing Industries, Nova Scotia, 1970-1999

Appendix Table 5. Selected Principal Statistics of Manufacturing Industries, New Brunswick, 1970-1999

Appendix Table 5A. Ratios Calculated from Selected Principal Statistics of Manufacturing Industries, New Brunswick, 1970-1999

Appendix Table 5B Proportion of National Average Calculated from Selected Principal Statistics of Manufacturing Industries, New Brunswick, 1970-1999

Appendix Table 6. Selected Principal Statistics of Manufacturing Industries, Atlantic Provinces, 1970-1999

Appendix Table 6A. Ratios Calculated from Selected Principal Statistics of Manufacturing Industries, Atlantic Provinces, 1970-1999

Appendix Table 6B Proportion of National Average Calculated from Selected Principal Statistics of Manufacturing Industries, Atlantic Provinces, 1970-1999

Decomposition of GDP per Capita into Productivity and Labour Market Components

Appendix Table 7: Real GDP (in millions of constant 1997 dollars) in Atlantic Provinces and Canada, 1984-2001

Appendix Table 8: Total population in Atlantic Provinces and Canada, 1984-2001

Appendix Table 9 Working Age Population (in thousands of persons) in Atlantic Provinces and Canada, 1984-2001

Appendix Table 10: Total Employment (in thousands of workers) in Atlantic Provinces and Canada, 1984-2001

Appendix Table 11: Real GDP per Capita (in 1997 constant dollars) in Atlantic Provinces and Canada, 1984-2001

Appendix Table 12: Real GDP per Worker (in 1997 constant dollars), in Atlantic Provinces and Canada, 1984-2001

Appendix Table 13: Employment to population Ratio (in per cent), in Atlantic Provinces and Canada, 1984-2001

Appendix Table 14: Working Age Population to Total Population Ratio (in per cent), in Atlantic Provinces and Canada, 1984-2001

Appendix Table 15: Employment to Working Age Population Ratio (in per cent), in Atlantic Provinces and Canada, 1984-2001

Real GDP (NAICS)

Appendix Table 16: Real GDP (in millions of 1997 constant dollars), in Canada, 1984-2001

Appendix Table 17: Real GDP (in millions of 1997 constant dollars), in Atlantic Provinces, 1984-2001

Appendix Table 18: Real GDP (in millions of 1997 constant dollars), in Newfoundland, 1984-2001

Appendix Table 19: Real GDP (in millions of 1997 constant dollars), in Prince Edward Island, 1984-2001

Appendix Table 20: Real GDP (in millions of 1997 constant dollars), in Nova Scotia, 1984-2001

Appendix Table 21: Real GDP (in millions of 1997 constant dollars), in New Brunswick, 1984-2001

Appendix Table 17A: Real GDP in Atlantic Provinces, as a Percentage of Canada, 1984-2001

Appendix Table 18A: Real GDP in Newfoundland, as a Percentage of Canada, 1984-2001

Appendix Table 19A: Real GDP in Prince Edward Island, as a Percentage of Canada, 1984-2001

Appendix Table 20A: Real GDP in Nova Scotia, as a Percentage of Canada, 1984-2001

Appendix Table 21A: Real GDP in New Brunswick, as a Percentage of Canada, 1984-2001

Real GDP (SIC)

Appendix Table 16A Shares of GDP by two-Digit SIC Manufacturing Industries for Canada, Atlantic Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick, 1984-98

Hours

Appendix Table 22: Total Hours Worked (in thousands of Hours) per Week in Canada, 1987-2001

Appendix Table 23: Total Hours Worked (in thousands of Hours) per Week in Atlantic Provinces, 1987-2001

Appendix Table 24: Total Hours Worked (in thousands of Hours) per Week in Newfoundland, 1987-2001

Appendix Table 25: Total Hours Worked (in thousands of Hours) per Week in Prince Edward Island, 1987-2001

Appendix Table 26: Total Hours Worked (in thousands of Hours) per Week in Nova Scotia, 1987-2001

Appendix Table 27: Total Hours Worked (in thousands of Hours) per Week in New Brunswick, 1987-2001

Appendix Table 23A: Total Hours Worked per Week in Atlantic Provinces, as a Percentage of Canada, 1987-2001

Appendix Table 24A: Total Hours Worked per Week in Newfoundland, as a Percentage of Canada, 1987-2001

Appendix Table 25A: Total Hours Worked per Week in Prince Edward Island, as a Percentage of Canada, 1987-2001

Appendix Table 26A: Total Hours Worked per Week in Nova Scotia, as a Percentage of Canada, 1987-2001

Appendix Table 27A: Total Hours Worked per Week in New Brunswick, as a Percentage of Canada, 1987-2001

Employment (NAICS)

Appendix Table 28: Employment (in thousands of workers) in Canada, 1987-2001

Appendix Table 29: Employment (in thousands of workers) in Atlantic Provinces, 1987-2001

Appendix Table 30: Employment (in thousands of workers) in Newfoundland, 1987-2001

Appendix Table 31: Employment (in thousands of workers) in Prince Edward Island, 1987-2001

Appendix Table 32: Employment (in thousands of workers) in Nova Scotia, 1987-2001

Appendix Table 33: Employment (in thousands of workers) in New Brunswick, 1987-2001

Appendix Table 29A: Employment in Atlantic Provinces, as a Percentage of Canada, 1987-2001

Appendix Table 30A: Employment in Newfoundland, as a Percentage of Canada, 1987-2001

Appendix Table 31A: Employment in Prince Edward Island, as a Percentage of Canada, 1987-2001

Appendix Table 32A: Employment in Nova Scotia, as a Percentage of Canada, 1987-2001

Appendix Table 33A: Employment in New Brunswick, as a Percentage of Canada, 1987-2001

Employment (SIC)

Appendix Table 28A Employment Shares by two-Digit SIC Manufacturing Industries for Canada, Atlantic Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick, 1984-98

Real GDP per Hour (NAICS)

Appendix Table 34: Real GDP per Hour Worked (in constant 1997 dollars) in Canada, 1987-2001

Appendix Table 35: Real GDP per Hour Worked (in constant 1997 dollars) in Atlantic Provinces, 1987-2001

Appendix Table 36: Real GDP per Hour Worked (in constant 1997 dollars) in Newfoundland, 1987-2001

Appendix Table 37: Real GDP per Hour Worked (in constant 1997 dollars) in Prince Edward Island, 1987-2001

Appendix Table 38: Real GDP per Hour Worked (in constant 1997 dollars) in Nova Scotia, 1987-2001

Appendix Table 39: Real GDP per Hour Worked (in constant 1997 dollars) in New Brunswick, 1987-2001

Appendix Table 35A: Real GDP per Hour Worked in Atlantic Provinces, as a Percentage of Canada, 1987-2001

Appendix Table 36A: Real GDP per Hour Worked in Newfoundland, as a Percentage of Canada, 1987-2001

Appendix Table 37A: Real GDP per Hour Worked in Prince Edward Island, as a Percentage of Canada, 1987-2001

Appendix Table 38A: Real GDP per Hour Worked in Nova Scotia, as a Percentage of Canada, 1987-2001

Appendix Table 39A: Real GDP per Hour Worked in New Brunswick, as a Percentage of Canada, 1987-2001

Appendix Table 34B: Real GDP per Hour Worked (in constant 1997 dollars) in NAICS 2-Digit Industrial Sectors, in Canada and the Atlantic Provinces 2001

Appendix Table 34C: Real GDP per Hour Worked (in constant 1997 dollars) in NAICS 2-Digit Industrial Sectors, in Canada and the Atlantic Provinces 1987

Real GDP per Hour (SIC)

Appendix Table 34A: Value Added per Working Hour by Industry for Atlantic Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick as a Proportion of the National Average, 1984-98

Real GDP per Worker (NAICS)

Appendix Table 40: Real GDP per Worker (in constant 1997 dollars) in Canada, 1987-2001

Appendix Table 41: Real GDP per Worker (in constant 1997 dollars) in Atlantic Provinces, 1987-2001

Appendix Table 42: Real GDP per Worker (in constant 1997 dollars) in Newfoundland, 1987-2001

Appendix Table 43: Real GDP per Worker (in constant 1997 dollars) in Prince Edward Island, 1987-2001

Appendix Table 44: Real GDP per Worker (in constant 1997 dollars) in Nova Scotia, 1987-2001

Appendix Table 45: Real GDP per Worker (in constant 1997 dollars) in New Brunswick, 1987-2001

Appendix Table 41A: Real GDP per Worker in Atlantic Provinces, as a Percentage of Canada, 1987-2001

Appendix Table 42A: Real GDP per Worker in Newfoundland, as a Percentage of Canada, 1987-2001

Appendix Table 43A: Real GDP per Worker in Prince Edward Island, as a Percentage of Canada, 1987-2001

Appendix Table 44A: Real GDP per Worker in Nova Scotia, as a Percentage of Canada, 1987-2001

Appendix Table 45A: Real GDP per Worker in New Brunswick, as a Percentage of Canada, 1987-2001

Appendix Table 40B: Real GDP per Worker (in constant 1997 dollars) in NAICS 2-Digit Industrial Sectors, in Canada and the Atlantic Provinces 2001

Appendix Table 40C: Real GDP per Worker (in constant 1997 dollars) in NAICS 2-Digit Industrial Sectors, in Canada and the Atlantic Provinces 1987

Appendix Table 40 D: Changes in Labour productivity (in constant 1997 dollars) in NAICS 2-Digit Industrial Sectors, in the Atlantic Provinces 1987

Real GDP per Worker (SIC)

Appendix Table 40A: Value Added per Worker Employed by Industry for Atlantic Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick as a Proportion of the National Average, 1984-98

End-Year Net Capital Stocks

Appendix Table 46 Capital Stock (in thousands of 1997 dollars) for the Total Economy and Manufacturing in Newfoundland, 1984-2001

Appendix Table 47 Capital Stock (in thousands of 1997 dollars) for the Total Economy and Manufacturing in Prince Edward Island, 1984-2001

Appendix Table 48 Capital Stock (in thousands of 1997 dollars) for the Total Economy and Manufacturing in Nova Scotia, 1984-2001

Appendix Table 49 Capital Stock (in thousands of 1997 dollars) for the Total Economy and Manufacturing in New Brunswick, 1984-2001

Appendix Table 50 Capital Stock (in thousands of 1997 dollars) for the Total Economy and Manufacturing in Atlantic Canada, 1984-2001

Appendix Table 51 Capital Stock (in thousands of 1997 dollars) for the Total Economy and Manufacturing in Canada, 1961-2001

Capital Stock per Worker

Appendix Table 52 Capital Stock (1997 constant dollars) per person Employed for the Total Economy and Manufacturing for Canada Atlantic Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick, 1987-2001.

Appendix Table 52A Capital Stock (1997 constant dollars) per person Employed for the Total Economy and Manufacturing as a Proportion of the National Average for Canada, Atlantic Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick, 1987-2001

Real Value Added per 1,000\$ of Capital Stock

Appendix Table 53: Real GDP (in constant 1997 dollars) per 1,000\$ of End-Year Net Capital Stock (in constant 1997 dollars) in Atlantic Provinces and Canada, 1984-2001

Appendix Table 53A: Real GDP per Unit of End Year Net Capital Stock in Atlantic Provinces as a Percentage of Canada, 1984-2001

Total Factor Productivity

Appendix Table 54: Indexes of Total Factor Productivity (1987=100) in All Industries and Manufacturing in Canada and the Atlantic provinces, 1987-2001

Establishments by Employment Size

Appendix Table 55 Distribution of establishments in manufacturing by number of employees for Canada, Atlantic Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick, 1999

Appendix Table 56 Distribution of establishments in manufacturing by employment size range and by industry, Canada, Atlantic Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick, 1999

Appendix Table 57 Relative distribution of establishments in manufacturing by employment size range and by industry, Canada, Atlantic Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick, 1999

Appendix Table 58 Relative distribution of establishments in manufacturing by number of employees, Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick, 1999

Educational Attainment

Appendix Table 59 Labour Force Educationnal Attainment in Newfoundland, 1976-2001

Appendix Table 59A Labour Force Educationnal Attainment as a Proportion of Total, Newfoundland, 1976-2001

Appendix Table 60 Labour Force Educationnal Attainment in Prince Edward Island, 1976-2001

Appendix Table 60A Labour Force Educationnal Attainment as a Proportion of Total, Prince Edward Island, 1976-2001

Appendix Table 61 Labour Force Educationnal Attainment in Nova Scotia, 1976-2001

Appendix Table 61A Labour Force Educationnal Attainment as a Proportion of Total, Nova Scotia, 1976-2001

Appendix Table 62 Labour Force Educationnal Attainment in New Brunswick, 1976-2001

Appendix Table 62A Labour Force Educationnal Attainment as a Proportion of Total, New Brunswick, 1976-2001

Appendix Table 63 Labour Force Educationnal Attainment in Atlantic Provinces, 1976-2001

Appendix Table 63A Labour Force Educationnal Attainment as a Proportion of Total, Atlantic Provinces, 1976-2001

Appendix Table 64 Labour Force Educationnal Attainment in Canada, 1976-2001

Appendix Table 64A Labour Force Educationnal Attainment as a Proportion of Total, Canada, 1976-2001

Capital and R&D Expenditure

Appendix Table 65 Annual Capital Expenditure in Manufacturing Industries in Canada, Atlantic Canada, Newfoundland, PEI, Nova Scotia, and New Brunswick, 1991-2001, in millions of current dollars

Appendix Table 66 General Domestic Expenditure on R&D, millions of current dollars, 1979-2001, natural sciences and engineering, all funders

Appendix Table 66A General Domestic Expenditure on R&D Relative to the National Level, %, 1979-2001, natural sciences and engineering, all funders

Variables Used in Regression Analysis

Appendix table 67: Variables Used in Regression Analysis, Labour Productivity

Appendix table 68: Variables Used in Regression Analysis, Average Years of Schooling for Employed Persons in manufacturing

Appendix table 69: Variables Used in Regression Analysis, Capital Stock per Hour Worked

Appendix table 70: Variables Used in Regression Analysis, Nominal share of R&D investment in GDP, % (natural sciences and engineering, all funders, performed by the business enterprise sector)

Appendix table 71: Variables Used in Regression Analysis, Total employees per establishment in manufacturing

Appendix table 72: Variables Used in Regression Analysis, Proportion of the manufacturing labour force unemployed, %