

April 2011



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**An Analysis of Prince Edward Island's Productivity,
1997-2007: Falling Multifactor Productivity
Dampens Labour Productivity Growth**

CSLS Research Report 2011-03b

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April 2011

An Analysis of Prince Edward Island's Productivity, 1997-2007: Falling Multifactor Productivity Dampens Labour Productivity Growth

Executive Summary

The report, based on the [CSLS Provincial Productivity Database](#), provides an overview of Prince Edward Island's productivity performance over the 1997-2007 period. The key findings are the following:

- Prince Edward Island experienced weak labour productivity growth in the market sector from 1997 to 2007, with an average annual growth rate of 1.6 per cent, slightly below the national average of 1.7 per cent. In terms of labour productivity growth, Prince Edward Island's performance ranked 8th among the provinces.
- Despite low labour productivity growth overall, three of the 15 two-digit NAICS industries enjoyed the highest growth rates in Canada when compared to equivalent industries in other provinces: other services (4.6 per cent per year), accommodation and food services (2.6 per cent per year), and professional, scientific and technical services (2.4 per cent per year).
- Labour productivity growth in the province was driven mainly by capital intensity growth, which accounted for 88.2 per cent of the increase experienced over the 1997-2007 period. Labour quality growth accounted for 22.0 per cent of labour productivity growth, while multifactor productivity growth actually hindered growth, being responsible for a reduction of 11.3 per cent of labour productivity growth.
- Prince Edward Island's labour productivity level in 2007 was \$22.11 (1997 dollars) per hour, which represents 61.3 per cent of the Canadian level (which, in turn, implies a labour productivity gap of 38.7 percentage points), down from 62.1 per cent in 1997. The province had by far the lowest labour productivity level among all the ten provinces in 2007, significantly below the second worst province, Nova Scotia, which had a labour productivity level equal to 75.1 per cent of the Canadian level.
- Prince Edward Island had labour productivity gaps relative to Canada in 14 of the 15 two-digit NAICS industries (the only exception was information and cultural industries). In most cases, the below average multifactor productivity level was the main culprit.
- Capital productivity in Prince Edward Island's market sector declined at a rate of 1.9 per cent per year during the 1997-2007 period. Although declining capital productivity was by no means unique to Prince Edward Island, the province still had a very poor performance when compared to the national average of -0.6 per cent per year. The province's capital productivity growth in the market sector ranked 9th in Canada.
- Prince Edward Island's multifactor productivity in the market sector declined at an average rate of 0.2 per cent per year during the 1997-2007 period, while in Canada it grew at an average rate of 0.4 per cent per year. The province ranked 9th in Canada.

An Analysis of Prince Edward Island's Productivity, 1997-2007: Falling Multifactor Productivity Dampens Labour Productivity Growth

Productivity is the key factor that determines living standards in the long run. If the amount of output each worker produces does not increase, real wages and incomes cannot rise (Sharpe, 2010a). Since 2000, Canada's labour productivity growth has been abysmal, both from an historical and an international perspective (Sharpe and Thomson, 2010b).¹ Improving this poor performance must be a key objective of Canada's economic agenda. To develop policies with this goal in mind, it is important to understand the nature of labour productivity at both the national and provincial levels, including the sources of growth at the market sector and industry levels.

This report analyzes Prince Edward Island's productivity performance over the 1997-2007 period. It is based on the CSLS Provincial Productivity Database. Level and growth rate estimates of labour, capital and multifactor productivity are discussed, with an emphasis on Prince Edward Island's market sector. Two-digit NAICS industry level estimates are also presented.²

This report is divided into ten sections. The first section provides a brief overview of basic concepts related to productivity, along with the methodology and the data sources used. Section two discusses Prince Edward Island's industry composition by nominal GDP and total hours worked. Sections three through nine detail Prince Edward Island's productivity performance, focusing on the following topics: labour productivity, capital productivity, multifactor productivity, capital intensity, labour quality, sources of labour productivity growth in the market sector, and sources of labour productivity gap by industry. Section ten concludes. An appendix provides details on the growth accounting framework used in the report.

I. Basic Concepts, Methodology and Data Sources

In this section, we first define the main concepts used in this report, as well as explain important topics related to productivity analysis – such as the difference between partial and total productivity measures, and the distinction between productivity growth rates and levels. This is followed by a brief discussion on methodology and data sources. Although the basics of the growth accounting framework used in the report are presented in this section, its details are only discussed in the Appendix.

¹ From 1981 to 2000, labour productivity in Canada's business sector grew at an average annual rate of 1.6 per cent. In the 2000-2009 period, labour productivity growth dropped sharply to a mere 0.7 per cent per year in Canada. This slowdown in labour productivity growth in Canada was not experienced in the United States, which grew at an average annual rate of 2.5 per cent during the same period (up from 2.0 per cent during the 1981-2000 period).

² This report builds on and extends earlier CSLS work on provincial productivity. The CSLS Provincial Productivity Database is available at http://www.csls.ca/data/mfp_new.asp. Previous CSLS articles on this topic include Sharpe and Arsenault (2009), Sharpe (2010) and Sharpe and Thomson (2010a, 2010b).

Basic Concepts

Productivity is, broadly speaking, a measure of how much output is produced per unit of input used. The output and input measures used will affect, however, the productivity estimates. In this sub-section, we define the input, output and productivity measures used throughout this paper:

- The **labour services input** is defined as total *quality adjusted* hours worked in a particular sector or in the market sector as a whole. It is the weighted sum of hours worked across different categories of workers, with the weights being equal to relative labour compensation shares.
- **Labour quality** (also known as **labour composition**) is defined residually as the difference between growth in labour services and growth in hours worked (*unadjusted* by quality). In Canada, the variables used to differentiate labour quality are education (four education levels), experience (proxied by seven age groups) and class of workers (paid employees versus self-employed workers). Overall, there are 56 different categories of workers.³
- The **capital services input** represents the flow of services provided by the capital stock. The difference between capital stock and capital services stems from the fact that not all forms of capital assets provide services at the same rate. Short-lived assets, such as a car or a computer, must provide all of their services in just a few years before they completely depreciate. Office buildings provide their services over decades. As a consequence, over a single year, a dollar's worth of a car provides relatively more capital services than a dollar's worth of a building. Thus, capital services growth is driven by: 1) increases in the level of **capital stock**; and 2) shifts in the **capital composition** caused by more investment in assets that provide relatively more services per dollar of capital stock (i.e. short lived assets).
- **Capital intensity** is defined as capital services per hour worked.
- **Gross domestic product (GDP)** measures the value of all *final* goods and services produced in a defined geographic region during a certain time period, typically a year or a quarter.
- **Labour productivity** is defined as real GDP per hour worked.
- **Capital productivity** is real GDP per unit of capital services.
- **Multifactor Productivity (MFP)⁴** growth is measured as the difference between real output growth and combined input growth. In other words, MFP reflects output growth that is not accounted for by input growth. The inputs that are taken into account to construct a combined input aggregate vary whether we are calculating MFP using a gross output basis or a value

³ For more information on how Statistics Canada calculates labour quality, see Gu *et al* (2002).

⁴ Also known as total factor productivity (TFP).

added basis. The gross output basis takes into consideration labour, capital, and intermediate inputs, while the value added basis takes into account only capital and labour (because intermediate consumption is already subtracted from value added). Thus, MFP captures the residual effects of several elements of the production process, such as improvements in technology and organizations, capacity utilization, increasing returns to scale, mismeasurement, etc. In this report, MFP growth is calculated on a value added basis.

When discussing productivity, there are two important dimensions to consider. The first is whether productivity is measured using a partial productivity approach or a multifactor productivity approach. The second is whether the focus is on growth rates, levels, or both.

There is a fundamental distinction between partial and multifactor productivity (MFP). Partial productivity measures refer to the relationship between output and a single input, such as labour or capital. Multifactor productivity, on the other hand, attempts to measure how efficiently all factors of production are used in the production process. This report provides estimates for two partial productivity measures – labour productivity (the most commonly used measure of productivity) and capital productivity –, as well as multifactor productivity.

Productivity can be expressed either in growth rates or in levels. The economics literature largely focuses on productivity growth rates, which reflect increases in *real* output per hour or per unit of capital. In this report we are also interested in making level comparisons between provinces. Ideally, productivity level comparisons are done in current dollars (i.e. using *nominal* GDP), as these estimates capture changes in relative prices. However, at the time the CSLS Provincial Productivity Database was constructed, nominal GDP figures at the industry level were available only up to 2005. As a consequence, the productivity levels were calculated using real GDP. One advantage of using real GDP instead of nominal GDP for the level comparisons is that the growth rates and changes in levels are consistent with each other. Regardless of whether nominal or real GDP figures are used for productivity level comparisons, it is important to note that these comparisons should be used with caution, due not only to differences in industry composition between provinces, but also due to the lack of industry purchasing power parities (PPPs) estimates at the provincial level.

As mentioned above, this report makes provincial comparisons of both productivity levels and growth rates. These comparisons are done both at the **market sector level** and at the **two-digit NAICS industry level**.⁵ The North American Industry Classification System (NAICS) breaks down the economy into 20 sectors:

⁵ The words *industry* and *sector* are used interchangeably in this report.

Exhibit A: The North American Industry Classification System (NAICS) at the Two-Digit Level

Sector Number	Description
11	Agriculture, Forestry, Fishing and Hunting
21	Mining, and Oil and Gas Extraction
22	Utilities
23	Construction
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
48-49	Transportation and Warehousing
51	Information and Cultural Industries
52	Finance and Insurance
53	Real Estate, Rental and Leasing
54	Professional, Scientific, and Technical Services
55	Management of Companies and Enterprises
56	Administrative and Support, Waste Management and Remediation Services
61	Education Services
62	Health Care and Social Assistance
71	Arts, Entertainment, and Recreation
72	Accommodation and Food Services
81	Other Services (except Public Administration)
92	Public Administration

The market sector is comprised by 17 of the 20 sectors, all of which have been highlighted in Exhibit A. The only three sectors that are not included in the market sector are: education services, health care and social assistance, and public administration. For practical purposes, we have grouped the finance and insurance, real estate, rental and leasing, and management of companies and enterprises sectors into only one sector, which will be referred to as the finance, insurance, real estate, rental and leasing (FIRE) sector. Since this change is only a slight departure from the standard NAICS breakdown, we will still refer to these 15 sectors as NAICS sectors.

The provincial comparisons are done by ranking the productivity growth rates and levels of different provinces from 1 (highest) to 10 (lowest). Each province has two market sector ranks: an **equally-weighted rank** and an **industry composition weighted rank**. The industry composition weighted market sector rank, which will be referred throughout this report simply as the market sector rank, takes into account the province's market sector output, labour input and capital input, which are basically a sum of the outputs and inputs of the 15 two-digit NAICS industries in the province. Thus, it gives more weight to the sectors that comprise a more significant part of the province's economy. The equally-weighted market sector rank, as the name implies, attributes equal weights to all industries. Comparing the two ranks allows for important characteristics of the province's productivity performance to be identified. For instance, a province with a high market sector rank and a low equally-weighted market sector rank in labour productivity growth will most likely have strong labour productivity growth in its largest industries, but low productivity growth in most of the fifteen two-digit NAICS industries.

Lastly, we also perform **growth accounting** exercises in order to measure how different factors contributed to labour productivity growth. Contributions to labour productivity growth were broken

down into three factors: 1) capital intensity⁶; 2) labour quality; and 3) multifactor productivity.⁷ Formally, this decomposition is a consequence of the growth accounting framework adopted in this report. However, it is also quite intuitive:

- Workers that have access to more capital (i.e. higher capital intensity) tend to have, *ceteris paribus*, higher labour productivity. Imagine, for example, two teams with two workers each. In the first team, one worker has a shovel and the other has a snow blower. In the second team, both workers have snow blowers. The second team uses capital more intensively than the first, and thus is able to clear much more snow in the same period of time.
- Improvements in labour quality tend to increase the amount of output a worker can produce in a given time period. Thus, an experienced coal miner will normally be able to extract more coal than a novice miner during a given timeframe.
- Technological progress can substantially increase output per worker. A logger with a chainsaw, for instance, is much more productive than one with an axe. This is an example of productivity growth driven by MFP. It should be noted, however, that technological progress is only one of the several possible factors to drive MFP growth.

Methodology and Data Sources

Statistics Canada has detailed the methodologies and data sources used in the preparation of its estimates of multifactor productivity (MFP) at the national level in Baldwin *et al.* (2007). The provincial estimates used in this report have been prepared by Statistics Canada for the Centre for the Study of Living Standards (CSLS) and largely follow the methodologies used for the national estimates. There are, however, certain differences between the national and provincial estimates which are discussed in detail in Sharpe and Arsenault (2009). CSLS supplemented Statistics Canada data by calculating multifactor productivity level estimates for the provinces relative to the Canadian average.⁸

The growth accounting framework used in this report is the same as the one used in Sharpe and Thomson (2010a). It assumes a Cobb-Douglas production function such that:

$$Y = AK^\alpha L^{1-\alpha}$$

where Y is real output, K stands for capital services, L for labour input (quality adjusted hours), A for multifactor productivity and α is the share of output that takes the form of capital compensation. For more information, refer to the Appendix.

⁶ Note, once again, that capital intensity has been defined here as capital services per hour worked, *not* capital stock per hour worked.

⁷ To understand the reasons behind this decomposition, refer to the Appendix.

⁸ For more details, see Appendix.

II. Industry Composition by Nominal GDP and Total Hours Worked

In order to understand Prince Edward Island's overall productivity performance, it is essential to understand how each of the 15 two-digit NAICS industries contributed to the province's market sector in terms of nominal GDP and actual hours worked. Table 1 details these contribution shares for 1997 and 2007. In Prince Edward Island, the industries that had the highest GDP shares in 2007 were manufacturing (16.2 per cent of the province's nominal GDP in the market sector), FIRE (finance, insurance, real estate, rental and leasing) (12.4 per cent), and retail trade (11.7 per cent). In terms of total hours worked, the three industries that had the highest contributions in 2007 were manufacturing (15.8 per cent of total hours worked), retail trade (15.3 per cent), and agriculture, forestry, fishing and hunting (11.2 per cent).

It is interesting to note that Prince Edward Island's shares (both in terms of GDP and total hours worked) in mining, and oil and gas extraction, and utilities were notably below the national shares. This undoubtedly had an impact in the province's labour productivity level, since these two sectors are usually associated with high GDP per hour worked.⁹ The GDP share of mining, and oil and gas in Prince Edward Island, in particular, approached zero, and was the lowest among all the provinces in both 1997 and 2007. In this sense, the province is the exact opposite of Newfoundland and Labrador, in which mining, and oil and gas extraction accounted for almost 60 per cent of nominal GDP in 2007.

Table 1: Industry Share of Nominal GDP and Total Hours Worked in Prince Edward Island

	1997		2007		GDP Canada	Hours Worked Prince Edward Island	GDP Canada	Hours Worked Prince Edward Island
	GDP Canada	Hours Worked Prince Edward Island	GDP Canada	Hours Worked Prince Edward Island				
Market Sector								
Agriculture, Forestry, Fishing and Hunting	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mining, and Oil and Gas Extraction	3.2	13.4	5.4	17.1	2.1	10.9	3.4	11.2
Utilities	5.5	0.2	1.7	0.2	11.1	0.0	2.0	0.1
Construction	4.2	1.9	0.9	0.4	3.0	1.2	0.8	0.3
Manufacturing	7.0	8.4	7.9	11.5	9.0	11.0	10.1	10.2
Wholesale Trade	23.2	13.1	18.3	9.9	16.8	16.2	14.8	15.8
Retail Trade	7.1	6.3	7.4	4.5	7.1	5.1	6.9	5.0
Transportation and Warehousing	6.9	10.5	13.1	15.7	7.4	11.7	12.9	15.3
Information and Cultural Industries	6.2	6.2	6.3	5.9	5.6	4.8	6.6	5.5
FIRE*	4.3	4.9	2.5	1.6	4.3	5.0	2.7	1.5
Professional, Scientific and Technical Services	15.0	15.9	7.5	4.8	14.6	12.4	7.8	4.7
ASWMR**	4.9	3.0	6.3	3.3	6.2	3.8	7.9	3.6
Arts, Entertainment and Recreation	2.5	1.3	4.0	1.8	3.3	3.3	5.7	5.4
Accommodation and Food Services	0.9	0.8	1.5	1.0	0.9	1.3	1.9	2.3
Other Services (Except Public Administration)	3.2	5.4	7.8	10.2	2.8	5.1	7.0	9.5
	5.7	8.6	9.4	12.1	5.8	8.3	9.5	9.4

Source: Shares calculated by the CSLS, based on Statistics Canada data (Cansim Table 383-0011).

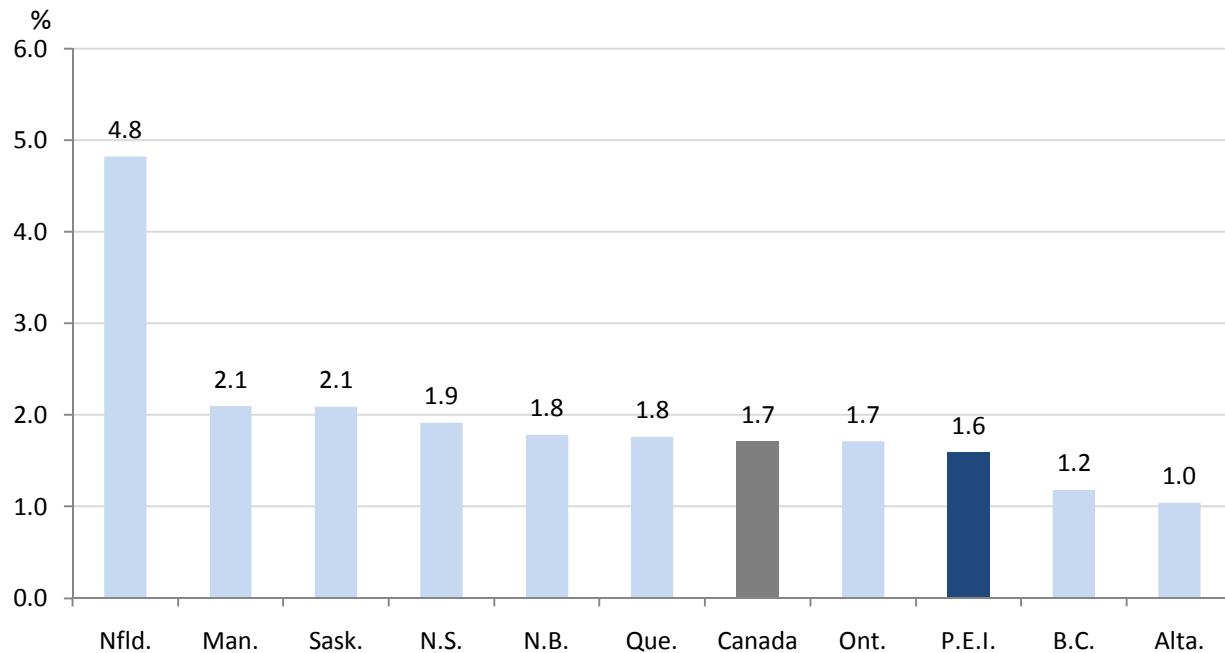
*Finance, insurance, real estate, rental and leasing **Administrative and support, waste management and remediation services

⁹ In 2007, while labour productivity in Canada's market sector was \$36.06 (1997 dollars) per hour worked, the labour productivity levels in the Canadian mining, and oil and gas extraction industry, and utilities industry were \$78.69 (1997 dollars) per hour worked, and \$134.61 (1997 dollars) per hour worked, respectively.

III. Labour Productivity

Labour productivity, defined as real GDP per hour worked,¹⁰ grew at an average rate of 1.6 per cent per year in Prince Edward Island's market sector during the 1997-2007 period. This is marginally below the national average of 1.7 per cent per year. Prince Edward Island ranks 8th among the provinces in terms of labour productivity growth, only above British Columbia and Alberta (Chart 1).

**Chart 1: Labour Productivity Growth in Canada and the Provinces, Market Sector, 1997-2007
(Average Annual Growth Rates)**



Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

During the 1997-2007 period, the industry that experienced the highest labour productivity growth rate in Prince Edward Island was the information and cultural industry (4.8 per cent per year), followed by other services (4.6 per cent), and retail trade (3.8 per cent) (Table 2). The industry that had the lowest labour productivity growth rate was mining, and oil and gas extraction (-8.8 per cent per year), followed by utilities (-4.7 per cent), and arts, entertainment and recreation (-4.2 per cent).

In terms of labour productivity growth, Prince Edward Island ranked 7th or below in nine of the 15 two-digit NAICS industries. This widespread low labour productivity growth across several industries explains why the province had both the third worst market sector rank (only above British Columbia and Alberta) and the third worst equally-weighted market sector rank (only above British Columbia and Newfoundland). In particular, mining, and oil and gas extraction, utilities, wholesale trade, and transportation and warehousing had the lowest labour productivity growth rates in Canada when compared to equivalent industries in other provinces. Notable exceptions were other services (4.6 per

¹⁰ Note that the total hours worked figures used to calculate labour productivity are unadjusted for labour quality.

cent per year), accommodation and food services (2.6 per cent per year), and professional, scientific and technical services (2.4 per cent per year), all of which ranked 1st in Canada.

Prince Edward Island's labour productivity level in 2007 was \$22.11 (1997 dollars) per hour, which represents 61.3 per cent of the Canadian level, down from 62.1 per cent in 1997. The province ranked 10th in terms of labour productivity level in Canada in 2007, significantly below the second worst province, Nova Scotia, which had a labour productivity level equal to 75.1 per cent of the Canadian level.

In 2007, only one of the 15 two-digit NAICS industries in Prince Edward Island had labour productivity levels above Canada's – namely, information and cultural industries (137.9 per cent of the Canadian average). The industries that had the lowest levels in the province were mining, and oil and gas extraction (10.7 per cent of the Canadian level), wholesale trade (43.7 per cent), and utilities (48.0 per cent).

At the industry level, Prince Edward Island's information and cultural industries ranked 1st in terms of relative labour productivity level in 2007. However, seven of the province's industries ranked 10th in Canada. These industries were mining, and oil and gas extraction, wholesale trade, utilities, transportation and warehousing, arts, entertainment and recreation, construction, and agriculture, forestry, fishing and hunting.

Table 2: Labour Productivity Levels and Growth Rates in Prince Edward Island, 1997-2007

	Compound Annual Growth Rate, 1997-2007	Provincial Ranking	Province's Labour Productivity Level Relative to Canada's, 1997	Province's Labour Productivity Level Relative to Canada's, 2007	Labour Productivity Level, 2007	Provincial Ranking, 2007
	(per cent)		(Canada=100)	(Canada=100)	(1997 Dollars)	
Market Sector	1.6	8	62.1	61.3	22.1	10
Agriculture, Forestry, Fishing and Hunting	3.0	8	82.2	73.1	19.9	10
Mining, and Oil and Gas Extraction	-8.8	10	21.4	10.7	8.4	10
Utilities	-4.7	10	70.8	48.0	64.6	10
Construction	2.8	3	51.9	57.5	18.3	10
Manufacturing	0.2	8	65.0	53.1	25.4	9
Wholesale Trade	-3.5	10	90.0	43.7	18.3	10
Retail Trade	3.8	4	79.3	82.9	18.3	7
Transportation and Warehousing	-1.2	10	68.0	56.3	17.9	10
Information and Cultural Industries	4.8	3	116.0	137.9	94.6	1
FIRE*	1.4	7	100.9	99.8	70.2	3
Professional, Scientific and Technical Services	2.4	1	71.4	79.3	21.4	7
ASWMR**	-2.2	8	73.3	56.7	11.2	10
Arts, Entertainment and Recreation	-4.2	7	83.2	61.2	9.9	9
Accommodation and Food Services	2.6	1	81.4	94.5	13.0	5
Other Services (Except Public Administration)	4.6	1	65.9	83.8	13.6	7
Absolute Equally Weighted Average Rank		6.1				7.9
Equally Weighted Market Sector Rank		8				10

Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

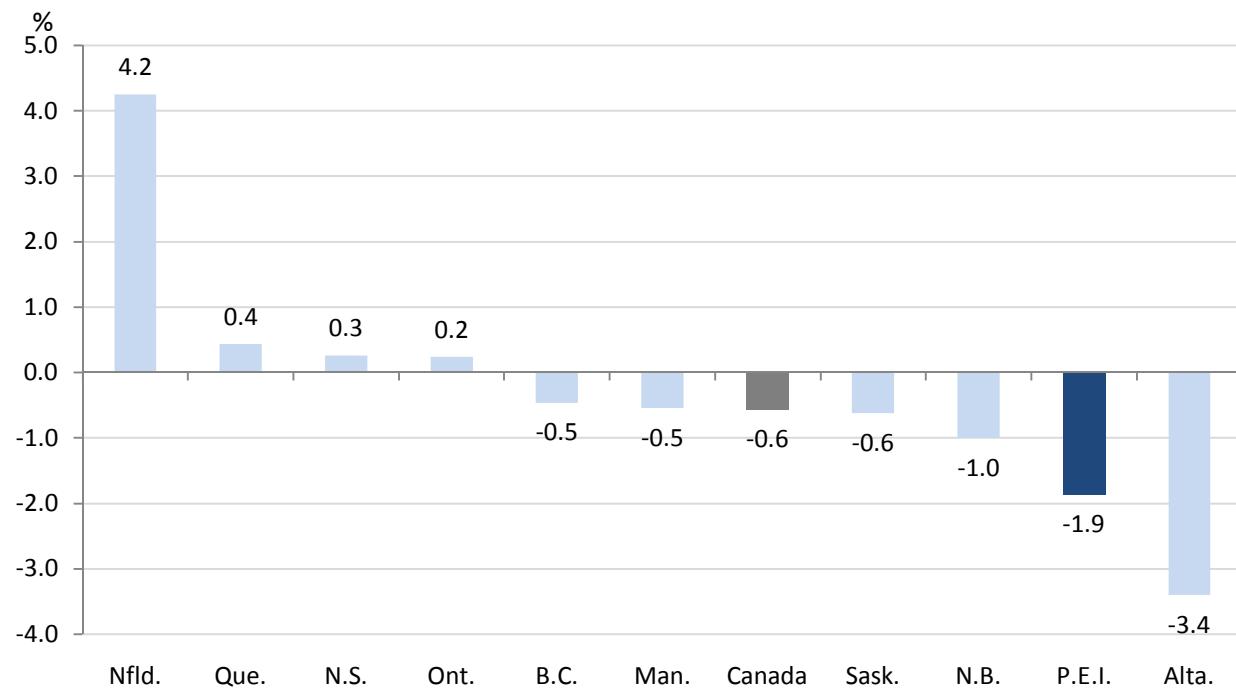
*Finance, insurance, real estate, rental and leasing **Administrative and support, waste management and remediation services

IV. Capital Productivity

Capital productivity, defined as real GDP per unit of capital services, fell at a rate of -1.9 per cent per year in Prince Edward Island's market sector during the 1997-2007 period. Declining capital productivity was by no means unique to Prince Edward Island, having happened in six of the ten provinces. Canada's capital productivity declined 0.6 per cent per year over the period. Prince Edward Island ranked 9th in Canada in terms of capital productivity (Chart 2).

In Prince Edward Island, 11 of the 15 two-digit NAICS industries had negative capital productivity growth rates during the period. The industries that had the worst performances were mining, and oil and gas extraction (-25.7 per cent per year), utilities (-11.6 per cent), and professional, scientific and technical services (-10.6 per cent) (Table 3). The four industries that had positive growth rates were arts, entertainment and recreation (5.7 per cent per year), information and cultural industries (4.5 per cent), manufacturing (1.6 per cent), and accommodation and food services (0.4 per cent).

**Chart 2: Capital Productivity Growth Rates in Canada and the Provinces, Market Sector, 1997-2007
(Average Annual Growth Rates)**



Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

In terms of capital productivity growth, Prince Edward Island ranked 7th or below in 10 of the 15 two-digit NAICS industries. Again, this widespread low capital productivity growth across several industries explains why the province had both the second worst market sector rank (only above Alberta) and the worst equally-weighted market sector rank. The following Prince Edward industries had the worst growth rates in Canada when compared to equivalent industries in other provinces: mining, and oil and gas extraction, utilities, FIRE, construction, and agriculture, forestry, fishing and hunting. In contrast,

arts, entertainment and recreation, and information and cultural industries had the highest growth rates in Canada.

Prince Edward Island's capital productivity level in the market sector in 2007 was 96.2 per cent of the Canadian level, down from 109.7 per cent in 1997. Only six of the 15 two-digit NAICS industries in the province had capital productivity levels above the Canadian average. The industries with highest relative capital productivity levels in the province were arts, entertainment and recreation (221.3 per cent of the Canadian level), transportation and warehousing (180.5 per cent), and information and cultural industries (122.8 per cent). The industries with lowest relative capital productivity levels in the province were mining, and oil and gas extraction (14.8 per cent of the Canadian level), utilities (30.7 per cent), and professional, scientific and technical services (60.3 per cent).

Prince Edward Island's market sector ranked 8th in terms of capital productivity level in Canada in 2007 (its equally-weighted market sector rank was only marginally better, 6th place). Compared to the other provinces, Prince Edward Island had the lowest relative capital productivity levels in Canada in four industries: mining, and oil and gas extraction, utilities, FIRE, and retail trade. Conversely, the province had the highest capital productivity levels in Canada in three industries: arts, entertainment and recreation, information and cultural industries, and transportation and warehousing.

Table 3: Capital Productivity Levels and Growth Rates in Prince Edward Island, 1997-2007

	Compound Annual Growth Rate, 1997-2007	Provincial Ranking	Province's Capital Productivity Level Relative to Canada's, 1997	Province's Capital Productivity Level Relative to Canada's, 2007	Capital Productivity Level, 2007	Provincial Ranking, 2007
	(per cent)		(Canada=100)	(Canada=100)	(1997 Dollars)	
Market Sector	-1.9	9	109.7	96.2	2.21	8
Agriculture, Forestry, Fishing and Hunting	-1.6	10	117.0	81.6	1.71	9
Mining, and Oil and Gas Extraction	-25.7	10	160.8	14.8	0.11	10
Utilities	-11.6	10	105.2	30.7	0.40	10
Construction	-4.4	10	200.7	111.1	7.59	4
Manufacturing	1.6	5	117.0	116.6	3.18	3
Wholesale Trade	-1.2	8	103.5	93.2	2.96	5
Retail Trade	-2.4	9	96.6	83.8	3.84	10
Transportation and Warehousing	-2.7	7	195.0	180.5	4.35	1
Information and Cultural Industries	4.5	1	83.4	122.8	2.37	1
FIRE*	-4.5	10	87.6	60.5	0.99	10
Professional, Scientific and Technical Services	-10.6	9	92.1	60.3	1.47	9
ASWMR**	-1.6	5	85.0	95.9	2.95	5
Arts, Entertainment and Recreation	5.7	1	80.3	221.3	4.56	1
Accommodation and Food Services	0.4	2	86.8	94.1	4.05	3
Other Services (Except Public Administration)	-2.6	7	130.5	108.9	5.80	3
Absolute Equally-Weighted Average Rank		6.9				5.6
Equally-Weighted Market Sector Rank		10				6

Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

*Finance, insurance, real estate, rental and leasing **Administrative and support, waste management and remediation services

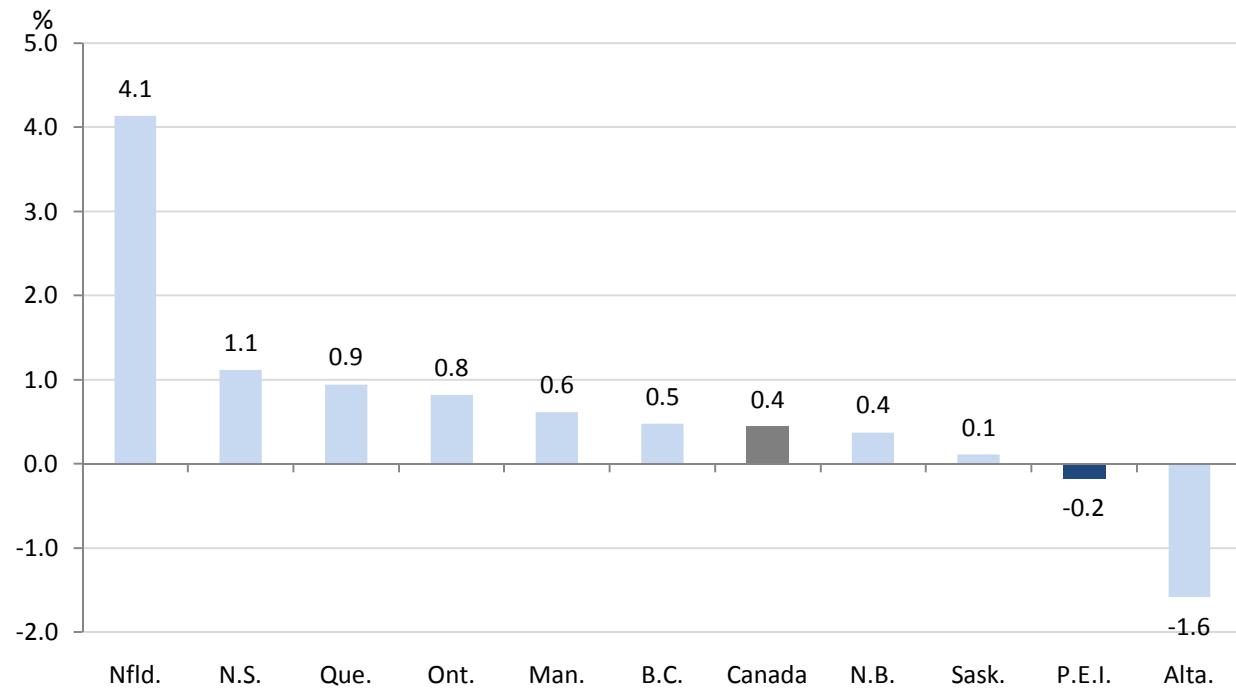
V. Multifactor Productivity

Prince Edward Island's multifactor productivity in the market sector grew at an average rate of -0.2 per cent per year during the 1997-2007 period, below the national average of 0.4 per cent per year. The province ranked 9th in Canada (Chart 3).

The industry that experienced the highest multifactor productivity growth rate in Prince Edward Island was information and cultural industries (4.7 per cent per year), followed by other services (3.6 per cent), and retail trade (2.1 per cent) (Table 4). The industries that had the lowest multifactor productivity growth rates were mining, and oil and gas extraction (-20.5 per cent per year), utilities (-9.9 per cent), and wholesale trade (-2.4 per cent).

In terms of multifactor productivity growth, Prince Edward Island ranked 7th place or lower in eight of the 15 two-digit NAICS. The following five industries experienced the worst growth rates among all provinces: mining, and oil and gas extraction, utilities, wholesale trade, FIRE, and agriculture, forestry, fishing and hunting. Conversely, information and cultural industries, accommodation and food services, and professional, scientific and technical services had ranked 1st in Canada in terms of multifactor productivity growth.

**Chart 3: Multifactor Productivity Growth in Canada and the Provinces, Market Sector, 1997-2007
(Average Annual Growth Rates)**



Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

The province's multifactor productivity level was 74.1 per cent of the Canadian level in 2007, up from 78.8 per cent in 1997. Only one of the 15 two-digit NAICS industries in Prince Edward Island had multifactor productivity levels above those of Canada – namely, information and cultural industries (130.9 per cent of the Canadian level). The industries with lowest relative multifactor productivity in the province were mining, and oil and gas extraction (13.3 per cent of the Canadian level), utilities (35.1 per cent), and wholesale trade (59.6 per cent).

In terms of multifactor productivity levels, Prince Edward Island ranked 10th in Canada according to both its market sector rank and its equally-weighted market sector rank. Overall, the province had low levels of multifactor productivity, ranking 7th or below in 11 of the 15 two-digit NAICS industries. In particular, Prince Edward Island had the lowest multifactor productivity levels among all the provinces in the following five industries: mining, and oil and gas extraction, utilities, wholesale trade, construction, and administrative and support, waste management and remediation services.

Table 4: Multifactor Productivity Levels and Growth Rates in Prince Edward Island, 1997-2007

	Compound Annual Growth Rate, 1997- 2007	Provincial Ranking	Province's Multifactor Productivity Level Relative to Canada's, 1997	Province's Multifactor Productivity Level Relative to Canada's, 2007	Provincial Ranking, 2007
	(per cent)		(Canada=100)	(Canada=100)	
Market Sector	-0.2	9	78.8	74.1	10
Agriculture, Forestry, Fishing and Hunting	0.5	10	97.7	79.9	9
Mining, and Oil and Gas Extraction	-20.5	10	81.0	13.3	10
Utilities	-9.9	10	97.0	35.1	10
Construction	1.7	3	63.7	64.2	10
Manufacturing	0.9	7	81.5	74.6	8
Wholesale Trade	-2.4	10	94.8	59.6	10
Retail Trade	2.1	5	83.8	83.6	9
Transportation and Warehousing	-1.9	9	96.3	83.5	7
Information and Cultural Industries	4.7	1	95.8	130.9	1
FIRE*	-2.1	10	94.5	76.5	9
Professional, Scientific and Technical Services	-0.5	1	76.5	78.1	7
ASWMR**	-2.0	9	73.8	62.7	10
Arts, Entertainment and Recreation	-1.7	4	84.5	87.4	4
Accommodation and Food Services	1.6	1	83.1	91.9	6
Other Services (Except Public Administration)	3.6	2	76.6	97.0	5
Absolute Equally-Weighted Average Rank		6.1			7.7
Equally-Weighted Market Sector Rank		8			10

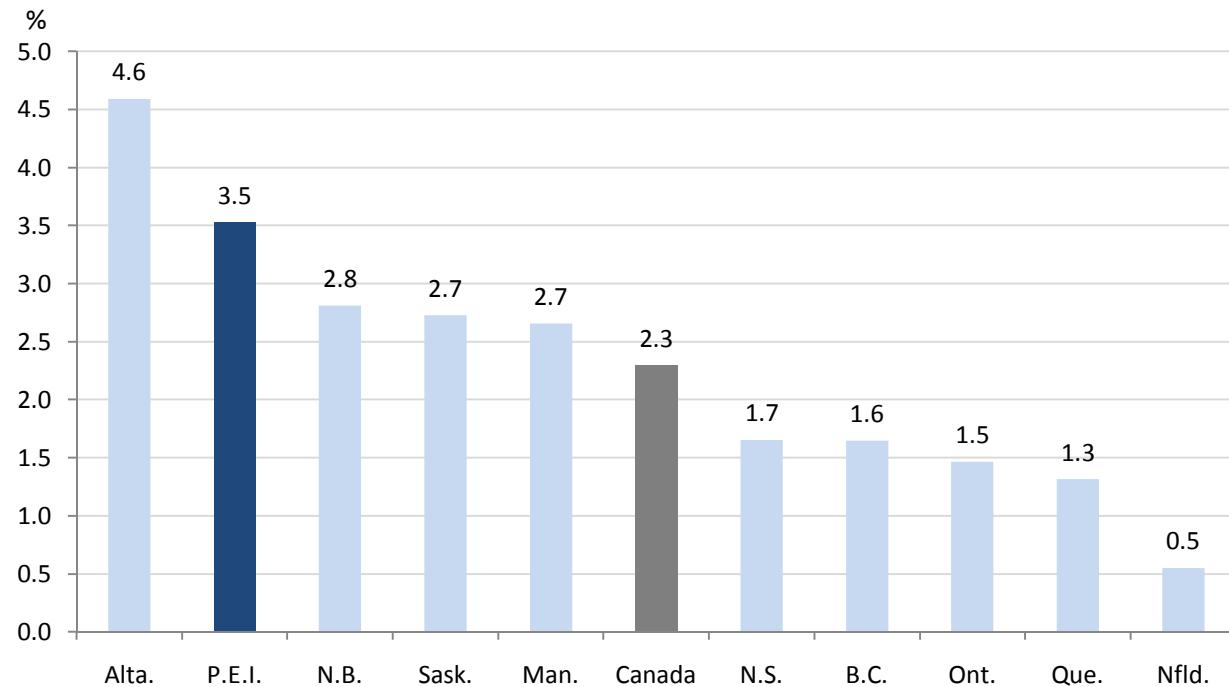
Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

*Finance, insurance, real estate, rental and leasing **Administrative and support, waste management and remediation services

VI. Capital Intensity

Capital intensity, defined as capital services per hour worked (unadjusted for labour quality), grew at an average rate of 3.5 per cent per year in Prince Edward Island's market sector during the 1997-2007 period. This was significantly above the national average of 2.3 per cent per year. The province ranked 2nd among the ten provinces in terms of capital intensity (Chart 4).

**Chart 4: Capital Intensity Growth in Canada and the Provinces, Market Sector, 1997-2007
(Average Annual Growth Rates)**



Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

During the 1997-2007 period, the industries that experienced the highest capital intensity growth rates in Prince Edward Island were mining, and oil and gas (22.8 per cent per year), professional, scientific and technical services (14.5 per cent), and utilities (7.8 per cent) (Table 5). Conversely, the industries that had the lowest growth rates were arts, entertainment and recreation (-9.4 per cent per year), wholesale trade (-2.3 per cent), and manufacturing (-1.4 per cent).

The province ranked 3rd or higher in eight of the 15 two-digit NAICS industries in terms of capital intensity growth. The following five industries, in particular, had the highest capital intensity growth rates in Canada when compared to equivalent industries in the other provinces: mining, and oil and gas extraction, professional, scientific and technical services, utilities, construction, and FIRE. On the other hand, arts, entertainment and recreation and wholesale trade had the lowest capital intensity growth rates in among all the provinces.

Table 5: Capital Intensity Levels and Growth Rates in Prince Edward Island, 1997-2007

	Compound Annual Growth Rate, 1997-2007	Provincial Ranking	Province's Capital Intensity Level Relative to Canada's, 1997	Province's Capital Intensity Level Relative to Canada's, 2007	Capital Intensity Level, 2007	Provincial Ranking, 2007
			(per cent)	(Canada=100)	(Canada=100)	(1997 Dollars)
Market Sector	3.5	2	56.5	63.7	10.0	9
Agriculture, Forestry, Fishing and Hunting	4.7	3	70.0	89.6	11.6	6
Mining, and Oil and Gas Extraction	22.8	1	13.3	72.5	73.8	4
Utilities	7.8	1	67.1	156.3	163.1	3
Construction	7.5	1	26.0	51.7	2.4	10
Manufacturing	-1.4	8	55.7	45.5	8.0	9
Wholesale Trade	-2.3	10	87.1	46.9	6.2	10
Retail Trade	6.3	2	82.7	98.9	4.8	3
Transportation and Warehousing	1.5	8	35.0	31.2	4.1	10
Information and Cultural Industries	0.3	9	141.1	113.9	40.6	5
FIRE*	6.2	1	115.1	165.1	70.7	1
Professional, Scientific and Technical Services	14.5	1	77.5	131.5	14.5	2
ASWMR**	-0.6	7	85.8	59.2	3.8	6
Arts, Entertainment and Recreation	-9.4	10	103.8	27.6	2.2	10
Accommodation and Food Services	2.1	7	94.4	100.5	3.2	5
Other Services (Except Public Administration)	7.4	2	50.5	76.9	2.3	9
Absolute Equally-Weighted Average Rank		4.7			6.2	
Equally-Weighted Market Sector Rank		3				7

Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

*Finance, insurance, real estate, rental and leasing **Administrative and support, waste management and remediation services

Prince Edward Island's capital intensity level was 63.7 per cent of the Canadian level in 2007, up from 56.5 per cent in 1997. The province's relative capital intensity level ranked 9th in Canada according to its market sector rank (it ranked marginally better, 7th, according to its equally-weighted market sector rank).

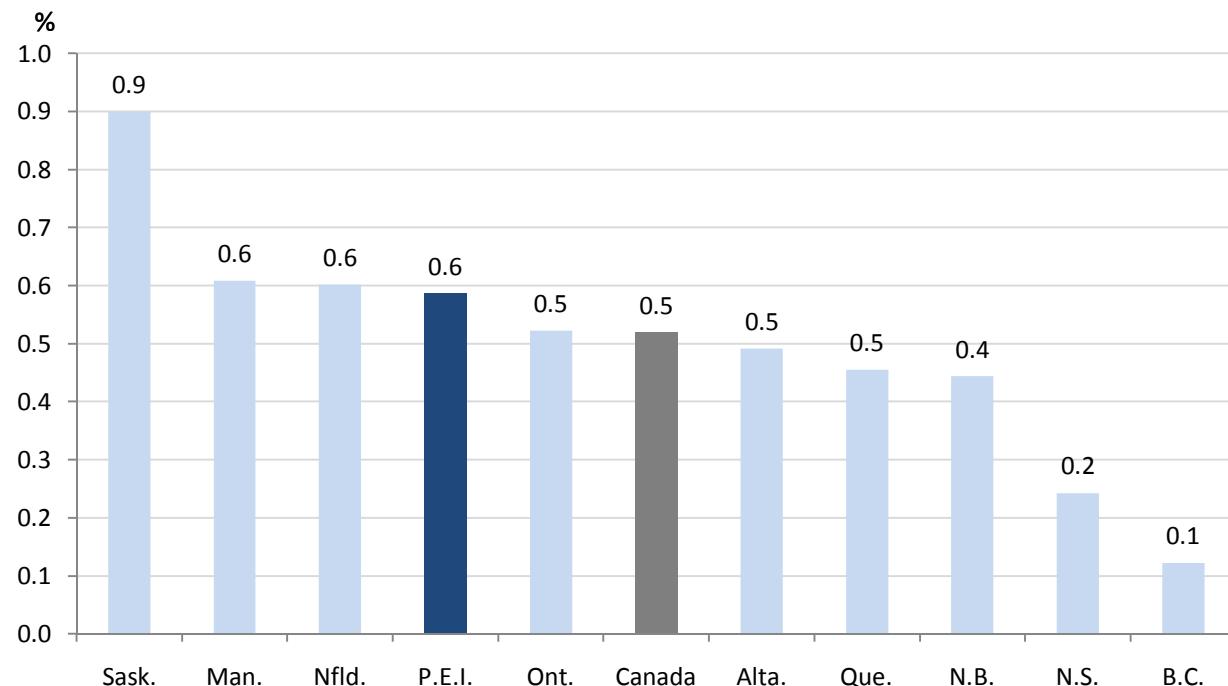
In 2007, only five of the 15 two-digit NAICS industries had capital intensity levels above the Canadian levels. Industries with high relative levels in the province included: FIRE (165.1 per cent of the Canadian level), utilities (156.3 per cent), and professional, scientific and technical services (131.5 per cent). The industries that had the lowest capital intensity levels in Prince Edward Island were arts, entertainment and recreation (27.6 per cent of the Canadian level), transportation and warehousing (31.2 per cent), and manufacturing (45.5 per cent).

At the industry level, the province ranked 9th or lower in six of the 15 two-digit NAICS industries in terms of capital intensity levels. In particular, Prince Edward Island had the lowest capital intensity levels among all the provinces in the following four industries: arts, entertainment and recreation, transportation and warehousing, retail trade, and construction. On the other hand, the Prince Edward Island's FIRE industry had the highest capital intensity level in Canada.

VII. Labour Quality

Prince Edward Island experienced slightly above average labour quality growth in its market sector during the 1997-2007 period. The province grew at an average rate of 0.6 per cent per year, while the national average was 0.5 per cent per year. The province ranked 4th in Canada in terms of labour quality growth (Chart 5).

**Chart 5: Labour Quality Growth in Canada and the Provinces, Market Sector, 1997-2007
(Average Annual Growth Rates)**



Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

During the period in question, the industries that experienced the highest labour quality growth rates in Prince Edward Island were arts, entertainment and recreation (1.2 per cent per year), transportation and warehousing (0.8 per cent), and accommodation and food services (0.6 per cent) (Table 6). The industries that had the lowest labour quality growth rates were utilities (-0.8 per cent per year), other services (-0.7 per cent), mining, and oil and gas extraction, and information and cultural industries (both of which grew at an average rate of -0.3 per cent).

As mentioned previously, Prince Edward Island's market sector ranked 4th in Canada in terms of labour quality growth. However, the province's equally-weighted market sector rank was considerably lower, 9th (only above British Columbia). This divergence between the two ranks indicates that most of the province's industries had low labour quality growth. In particular, the following industries had the lowest labour quality growth rates in Canada when compared to equivalent industries in other provinces: utilities, other services, and information and cultural industries.

Table 6: Labour Quality Levels and Growth Rates in Prince Edward Island, 1997-2007¹¹

	Compound Annual Growth Rate, 1997-2007	Provincial Ranking
	(per cent)	
Market Sector		
Agriculture, Forestry, Fishing and Hunting	0.6	4
Mining, and Oil and Gas Extraction	0.3	7
Utilities	-0.3	7
Construction	-0.8	10
Manufacturing	0.4	1
Wholesale Trade	0.3	6
Retail Trade	-0.2	9
Transportation and Warehousing	0.0	5
Information and Cultural Industries	0.8	2
FIRE*	-0.3	10
Professional, Scientific and Technical Services	-0.2	9
ASWMR**	0.1	9
Arts, Entertainment and Recreation	0.3	4
Accommodation and Food Services	1.2	3
Other Services (Except Public Administration)	0.6	1
Absolute Equally-Weighted Average Rank	-0.7	10
Equally-Weighted Market Sector Rank		6.2
		9

Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

*Finance, insurance, real estate, rental and leasing **Administrative and support, waste management and remediation services

¹¹ Labour quality levels are not shown here because they are assumed to be the same (and equal to 100.0) across all provinces and in Canada in the base year, 1997 (Sharpe and Thomson, 2010a). They differ after 1997, incorporating the different labour quality growth rates experienced by the provinces and Canada. For example, labour quality in Prince Edward Island's market sector grew at an average annual rate of 0.6 per cent over the 1997-2007 period, while Canada's labour quality grew at an average annual rate of 0.5 per cent. As a consequence, Prince Edward Island's labour quality level was 100.7 per cent of the Canadian level in 2007.

VIII. Sources of Labour Productivity Growth in the Market Sector

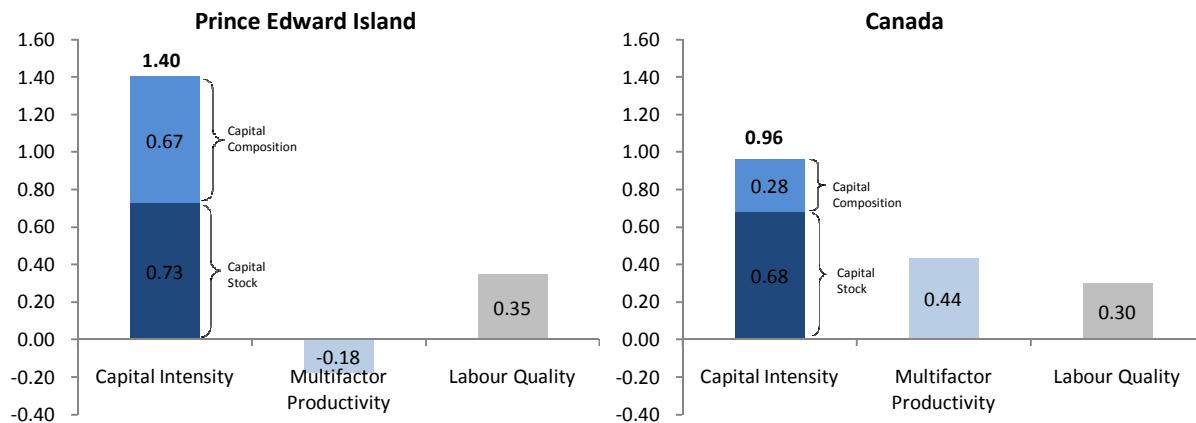
Prince Edward Island's labour productivity grew at an average rate of 1.6 per cent per year during the 1997-2007 period, slightly below the national average of 1.7 per cent per year. Charts 6 and 7 show both the percentage point and per cent contributions to labour productivity growth by the sources of growth for Prince Edward Island and Canada over the period.

Prince Edward Island's labour productivity growth was driven mainly by capital intensity growth, which accounted for 1.40 percentage points of the overall labour productivity growth (or, alternatively, 88.2 per cent of total growth). The contribution of capital intensity to labour productivity growth can be broken down into two components: capital composition growth, which was responsible for 0.67 percentage points (42.4 per cent), and capital stock growth, which accounted for 0.73 per cent (45.8 per cent). Labour quality growth was responsible for 0.35 percentage points (6.5 per cent) of the labour productivity growth experienced in the province. Finally, multifactor productivity growth actually had a negative contribution to labour productivity growth. It accounted for a decrease of 0.18 percentage points (-11.3 per cent) of labour productivity growth.¹²

Comparing the two charts, it can be seen that capital intensity played a greater part in Prince Edward Island's labour productivity growth than in Canada's (88.2 per cent vs. 56.1 per cent). Furthermore, multifactor productivity growth actually hindered the province's growth, while it was an important labour productivity growth driver in Canada (-11.3 per cent vs. 25.5 per cent). Finally, labour quality growth had a slightly lower importance driving labour productivity growth in Prince Edward Island than it had in Canada (22.0 per cent vs. 17.5 per cent).

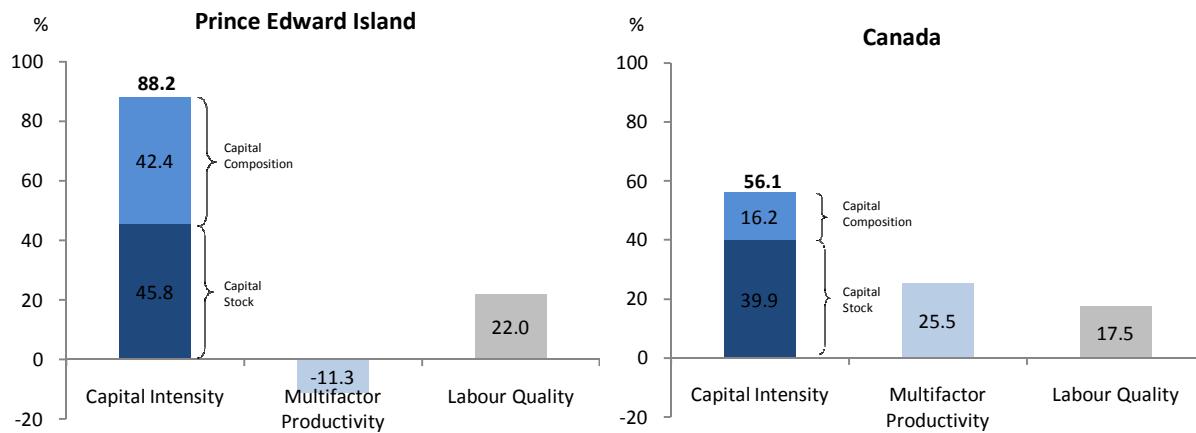
¹² During the 1997-2007 period, the only other province where multifactor productivity growth was negative was Alberta.

Chart 6: Percentage Point Contribution to Labour Productivity Growth by the Source of Labour Productivity Growth in the Market Sector in Prince Edward Island and in Canada, 1997 to 2007



Source: CSLS Provincial Productivity Database, Appendix Table 17, http://www.cls.ca/data/mfp_new.asp.

Chart 7: Per Cent Contribution to Labour Productivity Growth by the Source of Labour Productivity Growth in the Market Sector in Prince Edward Island and in Canada, 1997 to 2007



Source: CSLS Provincial Productivity Database, Appendix Table 17, http://www.cls.ca/data/mfp_new.asp.

Note: Numbers may not sum to 100 due to rounding.

Table 7 details the contributions in absolute and per cent terms of capital intensity, MFP, and labour quality growth to labour productivity growth in Prince Edward Island over the 1997-2007 period at the two-digit NAICS industry level.

Table 7: Contributions to Labour Productivity Growth at the Industry Level by Source in Prince Edward Island, 1997-2007

	Labour Productivity	Capital Intensity			MFP	Labour Quality
		Total	Capital Composition	Capital Stock		
		Percentage Point Contributions to Labour Productivity Growth				
Market Sector	1.6	1.4	0.7	0.7	-0.2	0.3
Agriculture, Forestry, Fishing and Hunting	3.0	2.4	0.5	1.9	0.5	0.1
Mining, and Oil and Gas Extraction	-8.8	14.3			-20.5	0.3
Utilities	-4.7	6.1			-9.9	-0.2
Construction	2.8	0.7	0.1	0.7	1.7	0.3
Manufacturing	0.2	-0.9	-0.1	-0.8	0.9	0.1
Wholesale Trade	-3.5	-1.0	-0.1	-0.9	-2.4	-0.1
Retail Trade	3.8	1.7	0.2	1.5		0.0
Transportation and Warehousing	-1.2	0.1	0.7	-0.6	-1.9	0.5
Information and Cultural Industries	4.8	0.2			4.7	0.0
FIRE*	1.4	3.6	1.4	2.2	-2.1	-0.1
Professional, Scientific and Technical Services	2.4	2.8	0.1	2.7	-0.5	0.1
ASWMR**	-2.2	-0.4			-2.0	0.3
Arts, Entertainment and Recreation	-4.2	-3.4	-51.7	47.9	-1.7	0.8
Accommodation and Food Services	2.6	0.6	0.1	0.5	1.6	0.4
Other Services (Except Public Administration)	4.6	1.5	1.1	0.5	3.6	-0.6
Per Cent Contributions to Labour Productivity Growth						
Market Sector	100.0	89.2	42.4	45.8	-11.3	22.0
Agriculture, Forestry, Fishing and Hunting	100.0	79.2	15.9	63.0	15.6	4.7
Mining, and Oil and Gas Extraction	100.0	-163.3			233.2	-3.6
Utilities	100.0	-130.9			213.1	5.0
Construction	100.0	26.9	2.9	23.8	60.5	11.9
Manufacturing	100.0	-467.3	-42.2	-423.3	498.4	73.2
Wholesale Trade	100.0	28.7	3.5	25.1	69.5	2.5
Retail Trade	100.0	44.3	4.3	39.8		0.4
Transportation and Warehousing	100.0	-8.4	-57.2	46.2	151.1	-43.7
Information and Cultural Industries	100.0	3.2			97.3	-0.7
FIRE*	100.0	256.0	97.6	154.6	-144.9	-5.8
Professional, Scientific and Technical Services	100.0	116.0	2.3	113.4	-19.6	4.0
ASWMR**	100.0	18.7			93.3	-11.9
Arts, Entertainment and Recreation	100.0	80.3	1221.7	-1130.8	39.6	-19.6
Accommodation and Food Services	100.0	22.9	4.9	17.8	61.8	14.7
Other Services (Except Public Administration)	100.0	33.4	23.2	9.9	78.1	-12.1

Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

Note: Per cent contributions may not sum to 100 due to rounding.

*Finance, insurance, real estate, rental and leasing **Administrative and support, waste management and remediation services

IX. Sources of Labour Productivity Level Gap by Industry

Prince Edward Island's labour productivity level was only 61.3 per cent of the Canadian level in 2007, which implies a labour productivity gap of 38.7 percentage points. Table 8 makes it clear that the gap was caused by below average capital intensity and multifactor productivity levels in the province's market sector. The capital intensity level was responsible for 15.3 percentage points of the gap, while the multifactor productivity level was responsible for 23.7 percentage points of the gap. The province's labour quality level contributed to a small 0.3 percentage point reduction of the gap.¹³

Prince Edward Island had a labour productivity gap in 14 of the 15 two-digit NAICS industries. In most cases, the below average multifactor productivity level was the main culprit, with significant contributions to the gap that were sometimes compounded by below average capital intensity levels. The only industry that had a positive labour productivity differential was information and cultural industries, which had a capital intensity level well above the Canadian average.

Table 8: Sources of the Labour Productivity Gap Relative to Canada for Prince Edward Island at the Two-Digit Industry Level, 2007

	Labour Productivity Relative Level	Labour Productivity Gap	Percentage Point Contributions to Labour Productivity Gap			Percent Contributions to Labour Productivity Gap			Labour Quality
			Capital Intensity	Multifactor Productivity	Labour Quality	Labour Productivity	Capital Intensity	Multifactor Productivity	
Market Sector	61.3	-38.7	-15.3	-23.7	0.3	100.0	39.5	61.3	-0.8
Agriculture, Forestry, Fishing and Hunting	73.1	-26.9	-5.0	-19.3	-2.6	100.0	18.5	71.8	9.7
Mining, and Oil and Gas Extraction	10.7	-89.3	-8.3	-80.5	-0.5	100.0	9.2	90.2	0.5
Utilities	48.0	-52.0	23.9	-74.3	-1.6	100.0	-46.0	142.9	3.1
Construction	57.5	-42.5	-10.0	-34.1	1.6	100.0	23.5	80.1	-3.7
Manufacturing	53.1	-46.9	-24.6	-21.7	-0.6	100.0	52.4	46.3	1.3
Wholesale Trade	43.7	-56.3	-18.9	-35.2	-2.2	100.0	33.6	62.5	3.9
Retail Trade	82.9	-17.1	-0.3	-16.3	-0.5	100.0	1.7	95.5	2.8
Transportation and Warehousing	56.3	-43.7	-31.7	-13.7	1.7	100.0	72.5	31.3	-3.8
Information and Cultural Industries	137.9	37.9	9.7	31.8	-3.6	100.0	25.6	83.8	-9.4
FIRE*	99.8	-0.2	29.0	-26.8	-2.4	100.0	-15,481.2	14,299.9	1,281.3
Professional, Scientific and Technical Services	79.3	-20.7	5.1	-22.1	-3.7	100.0	-24.5	106.8	17.7
ASWMR**	56.7	-43.3	-9.4	-35.6	1.7	100.0	21.8	82.2	-3.9
Arts, Entertainment and Recreation	61.2	-38.8	-34.4	-10.6	6.2	100.0	88.5	27.4	-15.9
Accommodation and Food Services	94.5	-5.5	0.1	-8.2	2.6	100.0	-2.6	150.7	-48.1
Other Services (Except Public Administration)	83.8	-16.2	-5.5	-2.7	-8.0	100.0	33.9	16.9	49.2

Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

*Finance, insurance, real estate, rental and leasing **Administrative and support, waste management and remediation services

¹³ Again, it is important to bear in mind that labour quality levels were assumed to be equal to 100.0 in all provinces and in Canada for the base year of 1997. They differ after 1997, incorporating the different labour quality growth rates experienced by the provinces and Canada.

X. Conclusion

During the 1997-2007 period, Prince Edward Island experienced declines in both capital productivity (-1.9 per cent per year) and multifactor productivity (-0.2 per cent), coupled with a labour productivity growth rate slightly below the national average (1.6 per cent vs. 1.7 per cent). Despite low labour productivity growth overall, three of the 15 two-digit NAICS industries enjoyed the highest growth rates in Canada when compared to equivalent industries in other provinces: other services (4.6 per cent per year), accommodation and food services (2.6 per cent), and professional, scientific and technical services (2.4 per cent). Information and cultural industries also performed well in terms of labour productivity (3rd highest growth rate in Canada, highest level in 2007).

Prince Edward Island's labour, capital, and multifactor productivity levels in 2007 were all below the national levels. In particular, the province's labour productivity level was only 61.3 per cent of the Canadian level, with the labour productivity gap between Prince Edward Island's market sector and Canada's reaching 38.7 per cent. The gap was caused mainly by the province's below average multifactor productivity level, responsible for 61.3 per cent of the gap, although the below average capital intensity level also played an important role, accounting for 39.5 per cent of the gap.

Table 9 provides a summary of both levels (in 1997 and 2007) and growth rates (for the 1997-2007 period) for the productivity measures discussed in this report, along with rankings that show how Prince Edward Island fared in comparison to the other provinces. Two observations are immediately clear from this table. First, both growth rates and levels in Prince Edward Island were, in general, below the national averages, and close to the bottom of their respective distributions. Second, this poor performance was not confined to the market sector rank, but is followed closely by the equally-weighted market sector rank, which indicates that low growth rates and levels were widespread throughout all the province's industries.

Table 9: Summary of Prince Edward Island's Productivity Performance in the Market Sector

	Market Sector Growth, 1997 to 2007			Per Cent of the Canadian Level		Level Rankings, 2007	
	Compound Annual Growth Rate	Market Sector Rank	Equally-Weighted Market Sector Rank	1997	2007	Market Sector Rank	Equally-Weighted Market Sector Rank
Labour Productivity	1.6	8	8	62.1	61.3	10	10
Capital Productivity	-1.9	9	10	109.7	96.2	8	6
Multifactor Productivity	-0.2	9	8	78.8	74.1	10	10
Capital Intensity	3.5	2	3	56.5	63.7	9	7
Labour Quality	0.6	4	9	n.a.	n.a.	n.a.	n.a.

Source: CSLS Provincial Productivity Database, Appendix Tables, http://www.cls.ca/data/mfp_new.asp.

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Appendix – A Growth Accounting Framework

The growth accounting framework used in this report assumes a Cobb-Douglas production function such that

$$Y = AK^\alpha L^{1-\alpha} \quad (1)$$

where Y is real output, K stands for capital services, L for labour input (quality adjusted hours), A for multifactor productivity and α is the share of output that takes the form of capital compensation. The labour input L can be decomposed into hours (H) and labour quality (QL):

$$L = H * QL \quad (2)$$

Capital services can be decomposed into capital stock (SK) and capital composition (QK):

$$K = SK * QK \quad (3)$$

Capital intensity (KI) is defined as:

$$KI = \frac{K}{H} \quad (4)$$

Using (1), (2), and (4), the components of labour productivity *growth* can be decomposed as follows:

$$\Delta LP = \Delta Y - \Delta H = [\Delta QL * (1 - \alpha)] + [\Delta KI * \alpha] + \Delta A \quad (5)$$

where LP stands for labour productivity and Δ is the percentage change. This equation was used in section eight.

The province's MFP levels relative to the Canadian levels ($Relative\ MFP_{p,i}$) were calculated using the equation below:

$$\ln(Relative\ MFP_{p,i}) = \ln\left(\frac{A_{p,i}}{A_{c,i}}\right) = \ln\left(\frac{Y_{p,i}}{Y_{c,i}}\right) - k_{p,c} * \ln\left(\frac{K_{p,i}}{K_{c,i}}\right) - (1 - k_{p,c}) * \ln\left(\frac{L_{p,i}}{L_{c,i}}\right) \quad (6)$$

where $k_{p,c}$ is the average share of capital input between Canada and the province, and the subscripts c , p and i stand for Canada, province and industry, respectively.

Finally, the contributions to the relative labour productivity levels between the province and Canada ($Relative\ LP_{p,i}$) can be found using the following formula:

$$\ln(Relative\ LP_{p,i}) = \ln\left(\frac{A_{p,i}}{A_{c,i}}\right) + k_{p,c} * \ln\left(\frac{KI_{p,i}}{KI_{c,i}}\right) + (1 - k_{p,c}) * \ln\left(\frac{QL_{p,i}}{QL_{c,i}}\right) \quad (7)$$

This equation was used in section nine. For a detailed discussion about the growth accounting framework used here, refer to Sharpe and Thomson (2010a).