December 2009

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CENTRE FOR THE STUDY OF LIVING STANDARDS

THE PRODUCTIVITY PERFORMANCE OF ATLANTIC CANADA

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CSLS Research Report 2009-14
December 2009

Prepared by the Centre for the Study of Living Standards as part of a contribution agreement funded by the Atlantic Canada Opportunities Agency

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Executive Summary

This study seeks to answer three questions. First, what has been the productivity performance of Atlantic Canada in both absolute terms and compared to the Canadian average and other OECD countries over the period 1981-2007? Second, what have been the trends in the drivers of the region's productivity performance? And finally, what public policy changes, if any, should be adopted to close the productivity gap between Atlantic Canada and the rest of the country?

In 1981 Atlantic Canada had a level of labour productivity (nominal GDP per hour worked) that was only 78 per cent of the Canadian average. In 2007 the region was in much better shape, with labour productivity at 94 per cent of the Canadian average. This closing of the gap with the rest of the country reflected stronger labour productivity growth in Atlantic Canada than in the rest of country. However, this significant improvement in the region's aggregate performance concealed two rather different stories.

First, thanks to the expansion of the high productivity mining and oil and gas extraction sector, Newfoundland and Labrador saw labour productivity grow very rapidly, especially between 2000 and 2007 when it grew 3.7 per cent per year, compared with 1.0 per cent per year in the country as a whole (growth rates are expressed in real terms). From 13 per cent below the national productivity level in 1981, Newfoundland and Labrador attained a productivity level that was 49 per cent above it in 2007 (level comparisons are made in nominal terms).

The story on the mainland has been rather different. The three Maritime provinces did not see the robust labour productivity growth of Newfoundland and Labrador. As a result, they only slightly narrowed the gap with the rest of Canada from 25 per cent below the Canadian average in 1981 to 20 per cent below in 2007. The failure of the Maritimes to substantially close the productivity gap is the second major story that this report explores.

In recent years there has been some good news. Relative to Canada, the period from the peak of the business cycle in 2000 to the peak in 2007 saw stronger labour productivity growth in every Atlantic province except Nova Scotia, which saw only slightly slower labour productivity growth than Canada as a whole. Indeed every Atlantic province saw labour productivity growth in this period that outpaced that of Ontario and Alberta. As a result, Atlantic Canada has recently made progress in closing the labour productivity gap, but in the Maritimes these gains have not overcome declines in relative productivity levels experienced in the 1990s.

Differences in the industrial structure and resource base of the economies of Canada's provinces explain completely why Newfoundland and Labrador has done so well, and partly why the Maritimes have not. The report analyzes labour productivity levels in 2004 and simulates the impact of applying Canada's industrial structure of hours worked to the Atlantic provinces. In the Maritimes lower shares of hours worked in high-productivity finance, insurance, real estate rental and leasing, and mining and oil and gas extraction, as well as the relatively high shares of hours worked in low productivity agriculture, forestry, fishing and hunting, healthcare and social assistance, and retail explain about one-fifth of the gap in labour productivity with the rest of Canada.

While differences in industrial structure offer a partial explanation of the persistent labour productivity gap with Canada, what other factors can explain the on-going gap in labour productivity and the improvement in productivity growth from the 1990s to the 2000-2007 period? The report reviews in detail the drivers of productivity in Atlantic Canada for which data were available and which were deemed by the authors to be the most relevant. These drivers are machinery and equipment investment, human capital, innovation, scale economies and agglomeration, public infrastructure, and competitive intensity. The key findings of this review are as follows:

- Atlantic Canada has a significant gap with the rest of Canada in terms of machinery and equipment available per hour worked, particularly information and communications technologies. This gap exists within industries and cannot be entirely explained by the differing industrial structure of Atlantic Canada.

- Based on a review of a number of indicators, workers in Atlantic Canada embody less human capital than workers in other parts of the country.

- The available information suggests that firms in Atlantic Canada are less focused on developing new products and services than firms in the rest of the country. This weakness is evidenced by very low levels of business sector research and development spending as a share of GDP.

- A considerably smaller share of workers in Atlantic Canada is employed in very large establishments than in Canada as a whole. This suggests that scale economies that support innovation and machinery and equipment investment may not be as strong in the Atlantic provinces as in the rest of Canada.

- Atlantic Canada is significantly less urbanized than the rest of Canada. Less urbanization likely means that university degree holders and the firms that employ them are less likely to locate in Atlantic Canada than in other regions of the country.

- Atlantic Canada does not appear to suffer from a shortfall in the amount of public infrastructure. Indeed, there is some evidence that resources that could be better deployed elsewhere are locked up in public infrastructure that is not needed. At the same time, there is also some evidence that infrastructure outside of Atlantic Canada, which links the region to the North American economy, is in need of improvement.

- Atlantic Canada has far more hours worked in public administration as a share of total hours worked than in Canada as a whole. This is particularly the case at the provincial level, which suggests that there may be scope for efficiencies in the provision of government services.

Building on these findings, we recommend policy changes in a number of areas to accelerate productivity growth in Atlantic Canada, and to close the gap with Canada as a whole. Governments in Atlantic Canada, including the Government of Canada where applicable, should

- **Reduce distortions across asset classes and sectors.** Tax systems in the Atlantic provinces tend to favour forestry, manufacturing, and utilities at the expense of communications, wholesale and retail trade, and other service industries, including through the Atlantic Investment Tax Credit. The federal and provincial governments should frequently review the desirability and cost-effectiveness of favouring some sectors over others, since governments are seldom able to pick winners. The objective should be a tax system which treats all asset classes equally to avoid giving businesses incentives to invest based on tax, rather than economic/business, considerations.

- **Eliminate capital taxes, including on financial institutions.** Financial services firms in all of the Atlantic provinces face high capital taxes in comparison to other provinces. The finance, insurance, real estate rental and leasing sector account for an important part of the productivity gap with Canada.

- **Prince Edward Island should harmonize its retail sales tax with the federal Goods and Service Tax (GST).** PEI maintains a non-harmonized retail sales tax (Revenue Tax or PST) that significantly increases the cost to business of investing in new machinery and equipment. PEI should harmonize its PST with the federal GST as soon as possible. The economic downturn presents an opportunity to harmonize, since firms have to pay PST on inputs even if the firm is not profitable, and there is little fear of inflation when the tax base for the PST is broadened to mirror the GST. Ontario and British Columbia took this approach in the spring and summer of 2009.

- **Continue to reduce corporate income tax rates.** Lower corporate income taxes will spur investment and create a comparative advantage for the Atlantic region. At the same time, governments should also refrain from further widening the gap between small and large business corporate income tax rates, since this distortion does not improve productivity.

- **Reduce restrictions on competition in utilities, transportation, and telecommunications.** The Atlantic provinces and Canada as a whole can learn from successful reform initiatives in other jurisdictions to improve competition in these sectors, which have experienced weak productivity growth since 2000.

- **Continue to reduce interprovincial barriers to trade, investment and labour mobility.** While the details of any initiatives will reflect regional priorities, the

Atlantic provinces should be inspired by the efforts of the Governments of British Columbia and Alberta in the Trade, Investment, and Labour Mobility Agreement.

- **Ensure that borders remain open to trade and investment and further reduce barriers where they exist.** Atlantic Canada is a small economy in a small country, but its strategic location between Europe and North America offers an opportunity to gain huge new markets for exports, including tourism. Larger markets mean more opportunities to take advantage of scale economies and attract new sources of investment. Recent initiatives of the US Government aimed at increasing security on the Canadian border have a potential to impair flows of trade, people, and investment.

- **Improve cooperation to create efficiencies in government service delivery.** In the Atlantic provinces the share of hours worked in provincial public administration, not including health and education, was 65 per cent higher than the national average in 2007. It seems likely that there is significant scope to improve efficiency and thereby reduce taxes through economies of scale in service delivery.

Atlantic Canada has historically been Canada's poorest region. While the gap in GDP per capita has narrowed over the past few decades, it remains sizeable, except in Newfoundland and Labrador, which has seen outstanding economic and productivity growth as a result of the development of off-shore oil and gas reserves. In principle, there is no reason why the Maritimes should be the poorest region in Canada. The Maritimes benefit from a stable democracy, the rule of law, sound macroeconomic policies, an educated population and rich natural resources. However, to date, these strong fundamentals have not been fully harnessed to make Atlantic Canada a world leader.

The Productivity Performance of Atlantic Canada

1. Introduction

This study[1] seeks to answer three questions. First, what has been the productivity performance of Atlantic Canada in both absolute terms and compared to the Canadian average and other OECD countries? Second, what have been the trends in the drivers of the region's productivity performance? And finally, what public policy changes, if any, should be adopted to continue closing the gap between Atlantic Canada and the rest of the country?

Atlantic Canada is the easternmost region of Canada. It includes four provinces: Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick. The latter three are collectively referred to as the Maritimes or the Maritime provinces. This distinction is particularly important, because in recent years the productivity growth of Newfoundland and Labrador has greatly exceeded that of the Maritimes. The Atlantic region is paradoxically both at the centre the North Atlantic economy, located directly in-between the United States and Europe, but also isolated as a result of a small population, much as Ireland was until the 1990s. There is no question that geography has played and will continue to play a defining role in Atlantic Canada's economy.

In recent history, Atlantic Canada has been Canada's poorest region. While the gap in GDP per capita has narrowed over the past few decades, it remains sizeable, except in Newfoundland and Labrador, which has seen outstanding economic and productivity growth as a result of the development of off-shore oil and gas reserves. In principle, there is no reason why Atlantic Canada should be the poorest region in Canada. The Atlantic provinces benefit from a stable democracy, the rule of law, sound macroeconomic policies, an educated population, rich natural resources, and a moderate climate. However, to date, these strong fundamentals have not been fully harnessed to make Atlantic Canada a world leader.

This report is divided into seven parts. After this introduction, the second part discusses some important conceptual, definitional, and data issues related to the analysis of productivity in Atlantic Canada. The third part discusses the economic performance of Atlantic Canada and identifies productivity as the key long-run determinant of living standards. The fourth part analyzes Atlantic Canada's productivity performance by province and by industrial sector in order to identify the sources of the gap with Canada. The fifth part of the report considers in detail the key drivers of productivity and the

[1] The authors would like to acknowledge the contributions of Jean-François Arsenault, Sean Rogers, and Christopher Ross. The views expressed in this report are solely those of the authors, and do not necessarily reflect those of the funding partners.

In addition to this document, a comprehensive database on economic performance, labour productivity, and its associated drivers has been prepared for this project. Most tables and charts contained in this report refer to appendix tables in the database.

evidence available to support possible explanations for the gap. Key drivers examined are machinery and equipment, human capital, innovation, agglomeration and scale economies, public infrastructure, and competitive intensity. The sixth part of the report sets out policy options for improving Atlantic Canada's productivity performance. The seventh and concluding part provides policy recommendations and some areas for further research.

2. Conceptual, Definitional, and Data Issues Related to Productivity

This part of the report[2] lays the foundation for the analysis of productivity performance that follows. We begin by examining why productivity is important, and then we discuss conceptual issues associated with productivity. The third section of this part of the report reviews the key drivers of productivity, and the fourth section discusses issues related to the data on which this report is based.

2.1. Why is Productivity Important?

Productivity is the relationship between the output of goods and services and the inputs of resources, human and non-human, used in the production process, with the relationship usually expressed in ratio form. Both outputs and inputs are measured in physical volumes and thus are unaffected by price changes. Multiplying quantities of the various outputs and inputs by the price each has commanded in a base year yields the comparable or constant price values that can be added up to provide measures of aggregate output and input.[3] The ratios may relate to the national economy, to an industrial sector, to a firm, or even to a plant. Output growth that exceeds growth in measured inputs, that is to say an increase in the ratio of output to inputs, is what analysts mean when they say that productivity is increasing.

Productivity growth is the most important source of long-term economic growth. From 1946 to 2000, real GDP per hour growth—labour productivity—accounted for 65 per cent of real GDP growth in the business sector in Canada, with growth in total hours worked—an input which itself was growing rapidly—the remaining 35 per cent.

Over the long term, increasing productivity is the only sustainable way to raise the standard of living of Canadians, defined as GDP per capita. Real, adjusted for inflation, per capita GDP growth can come from increases in the employment-to-total population ratio, reflecting increased labour force participation, lower unemployment, a larger share of population of working age, or from improved terms of trade. But these sources of income growth are unsustainable in the long run as they have upper bounds (except possibly for the terms of trade). Productivity growth, on the other hand, is not constrained by the size of the population, and its growth is at least in principle sustainable through technological advance. Thus, productivity growth is the key determinant of long-run trends in both absolute and relative living standards.

The magnitude of the productivity growth estimates economists debate, almost always below three per cent for the aggregate economy, may seem small or even trivial to non-economists. But small differences matter. The implications for society of moving from a one to three per cent trend productivity growth rate are huge. With productivity growth of just one per cent per year, it would take 70 years for real GDP per worker to

[2] This section draws on Sharpe (2002a) and CSLS (2005c).
[3] It should be noted that with the adoption by Statistics Canada of chain-Fisher indexes, the components of real GDP by province or industry no longer add up exactly to total economy or national real GDP.

double. In contrast, with productivity growth of three per cent per year it would take only 24 years for real GDP per worker to double. Even moving from a one to two per cent trend productivity growth world, cuts in half (to 36 years) the time needed to double living standards.

There is of course much more to life than productivity and the real GDP growth it generates, as even economists realize. The economic well-being and quality of life of the population, much broader concepts than GDP per capita, are determined by many factors, of which productivity is only one.[4] A focus on productivity does not mean that economists consider these other determinants of well-being and quality of life unimportant. Economists study productivity because it is crucial for real GDP growth and important for improving economic well-being and quality of life, or at least its material aspects. They also believe that a better understanding of productivity trends and determinants can lead to the development of public policies and private sector actions that can improve productivity performance.

2.2. Conceptual Issues Related to Productivity

This section reviews a number of productivity concepts needed for an understanding of productivity: partial versus multifactor productivity, hours worked versus workers as a measure of labour input, productivity levels versus growth rates, the cyclical behaviour of productivity, and the distinction between market and non-market output.

2.2.1. Partial versus Multifactor Productivity

A fundamental distinction is made between partial and total productivity measures. The former relate output to only one input, more often labour and capital, even though it is recognized that other inputs contribute to output. Intermediate goods or raw materials also regularly figure in some compilation of inputs. Labour productivity is the best known partial productivity measure. Multifactor or multi-factor productivity relates output to a combination of inputs, such as capital and labour. These measures represent the growth in output not accounted for by input growth.

The most readily available and widely used measure of productivity is labour productivity, the ratio of output to some measure of labour input (employment or hours). This term sometimes creates confusion, as it may seem to imply that the level of labour productivity or the rate of growth of labour productivity is attributable solely to the effects of labour. In fact, labour productivity reflects the influence of all factors that affect productivity, including capital accumulation, technical change, and the organization of production. While the intensity of labour effort is obviously a factor that does affect labour productivity, it is generally significantly less important than the amount of capital a worker has to work with or the level of production technology.

The concept of total or multifactor productivity (MFP) has been developed to measure the contribution of all factors of production to productivity growth. The rates of

[4] For more on the relationship between economic well-being and productivity see Sharpe (2002).

growth of all inputs are weighted to give one growth rate for the combined inputs. Multifactor productivity growth is defined as the growth rate of output minus the growth rate of the combined inputs (just as labour productivity growth equals output growth minus labour input growth). As the growth rate of the capital stock is generally greater than that of employment (and hence the capital/labour ratio is rising), the growth rate of multifactor productivity (using labour and capital as inputs) is generally less than the growth rate of labour productivity. This situation arises from the fact that the growth rate of the combined inputs of capital and labour exceeds that of labour alone.

A key issue in MFP measurement is the weighting of these inputs. Under competitive conditions, the current dollar income share of the factor of production—labour income for hours worked and interest, gross capital income (profits, and depreciation) for the capital stock—is normally considered the relative contribution of the factor to output and consequently used to weight the factor to produce an index of total input, or the growth rate of the index. When markets are not competitive, as in the case of monopolies, the weighting issue is much more complex.

The meaning of multifactor productivity is also controversial. Some economists interpret it as a measure of overall technical change, others as a measure of disembodied technological change, that is technical change that is not embodied in new machinery and equipment, and still others argue that MFP is in no way a measure of technological change.

It is incorrect to say that multifactor productivity is a superior or preferred measure of productivity compared to labour productivity, as the two concepts serve different purposes. For those interested in how efficiently *all* factors of production are used in the production process, multifactor productivity is the relevant productivity measure, since it takes account of the productivity of factors of production other than labour, such as capital, intermediate goods, and energy. For those interested in the potential of the economy to raise the standard of living, labour productivity is the relevant productivity measure. It tells us how much output or income is produced by each worker, and when combined with the total number of workers, how much total income there is to be distributed among the population.

2.2.2. Output Per Worker Versus Output Per Hour

Labour input can be measured either in terms of the average annual number of workers or in terms of the total number of hours worked in a year. This second measure is the more appropriate concept of labour productivity, since it represents a more precise measure of labour input than persons employed. It is always important to specify which concept of labour productivity is being used. The growth rates of output per worker and output per hour may differ when there is a change in the hours worked over time. Indeed, historically, the large fall in average working time has meant that output per hour has grown significantly faster than output per worker.[5]

[5] Equally, international productivity comparisons may differ greatly when annual hours worked vary across countries. The greater annual hours put in by American workers compared to those in many European countries means that productivity measures based on output per worker portray US productivity levels in a much more favourable light than

2.2.3. Productivity Levels versus Growth Rates

An important distinction is that between productivity levels and growth rates. The level of productivity refers to the output per unit of input at a given point in time. For example, in 2007 the level or value of output per hour in the total economy in Canada was $44.24, expressed in constant (chained) 2002 prices. The growth rate of productivity represents the percentage change in GDP per hour levels, expressed in constant prices, between two points in time. An example would be the 8.3 per cent increase in labour productivity between 2000 and 2007, from a level of GDP per hour of $40.87 to a level of $44.24. One often hears the complaint that Canada's productivity is poor. This could be referring to a situation of a low aggregate productivity level or a low productivity growth rate, or both. It is important that commentators specify whether they are referring to levels or growth rates as the implications of the two situations can differ significantly.[6]

2.2.4. Cyclical Behaviour of Productivity

The short- to medium-term movement of productivity is determined by two influences—an underlying productivity trend and a cyclical component. Over the long term, the cyclical component is offsetting, with cyclical upturns cancelling out cyclical downturns so that actual productivity growth tends to converge on trend growth. Actual productivity growth between cyclical output peaks provides an approximation of trend productivity, although average capacity utilization over the cycle and differences in capacity utilization at the peaks may also influence the trend.

The short-term behaviour of labour productivity is explained by lags in the adjustment of labour input to changes in output. If labour input adjusted simultaneously to changes in output, productivity growth would always be at trend. Lags in the adjustment of labour input, both employment and total hours worked, are due to a number of factors, including firms' unfulfilled expectations concerning demand conditions; the existence of overhead labour, which is relatively invariant to output levels; and a tendency for firms to hoard skilled labour in downturns in order not to lose their investment.

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measures based on the more relevant output per hour. For example, on an output per person employed basis, in 2001 Norway's GDP per person employed was 81.5 per cent of that in the United States, but on an output per hour basis it was 110.6 per cent, a 29.1 percentage point difference. The Netherlands also had a very large difference between the two productivity measures – 28.4 points from 73.4 per cent of the US level for output per person employed to 101.8 per cent for ouput per hour worked.

[6] International comparison of productivity levels requires that levels expressed in a domestic currency be converted into a common currency. This conversion can be done with either market exchange rates or exchange rates based on purchasing power parities (PPPs), that is, the exchange rate that equalizes the price of a basket of goods and services between two countries. For accurate productivity level comparisons, it is imperative that PPPs be used, although the development of reliable PPPs is a complex task, particularly at the industry level. The construction of PPPs requires comparisons of prices across countries. Internationally consistent surveys on the prices of goods and services in expenditure categories have been carried out by the OECD on a regular basis, so estimates of PPPs for GDP and consumer expenditure are available. However, there are no surveys of product prices as estimates of PPPs for industry output are much harder to compile. The existence of a range of PPPs produced by different agencies and researchers means that there is a range for relative international productivity level estimates. Statistics Canada does not publish provincial PPPs.

For the reasons outlined above, the rate of change in GDP per worker tends to move in a procyclical pattern, declining below trend in downturns and rising above trend in recoveries. The rate of change in output per hour shows a slightly more dampened procyclical movement, as it is easier to adjust average weekly hours through short-time or overtime than it is to adjust employment levels. Multifactor productivity, which includes the capital stock as well as labour as an input, exhibits even greater procyclical variation in movement than output per worker because of the fixity of the capital input.

Two implications arise from this cyclical behaviour of productivity. First, one should not extrapolate long-term productivity trends from short-term developments. When in 2008 the Canadian economy entered a period of weak growth due to falling aggregate demand, slower productivity growth was expected for cyclical reasons. This did not mean that long-term productivity growth had necessarily deteriorated, as any productivity shortfall could be recovered later in the business cycle. Second, to minimize the impact of cyclical influences on productivity, growth rates should be calculated at comparable points of the business cycle, preferably on a peak-to-peak basis.[7]

2.2.5. Market vs. Non-Market Output

A key requirement for the development of productivity estimates is that output be measured independently of inputs.[8] If output is measured by the quantity of inputs, productivity growth will by definition be zero. In sectors where output is not marketed, it is not possible to deflate the nominal value of output to produce real output and hence productivity estimates. This means that there are no reliable estimates of productivity growth for these sectors—primarily public administration and the publicly funded components of the education and health sectors. It is therefore best to exclude these sectors from aggregate productivity measures.

For this reason, the business sector is the most appropriate category for analysing productivity trends at the aggregate level and the sector for which official productivity statistics are produced. The wide availability of data for total employment and real GDP does mean that productivity growth estimates for the total economy are often referred to, although, because of the lack of measured productivity growth in the non-marketed sectors, these growth estimates have a downward bias. The reader should keep this in mind while working through this report. However, since the focus of the discussion in on comparisons of the level of productivity, issues of bias in productivity growth rates is of secondary importance.

It is in theory possible to develop productivity growth estimates for the non-business sector by measuring, in physical units, the output of the sector. Possible physical indicators include the number of graduates of the education system, the number of procedures performed in hospitals and the number of cheques processed by a government office. But such indicators may represent only part of the output of the sector and, more importantly, may exhibit significant quality changes over time. The development of

[7] Cyclical output peak years in Canada that are used in this report are 1981, 1989, 2000, and 2007. As a result, cyclically neutral periods are 1981-1989, 1989-2000, and 2000-2007.
[8] This section is drawn from Sharpe (2002b).

reliable productivity growth estimates for the non-marketed sector is still in its early stages.

2.3. Drivers of Productivity Growth

2.3.1. Theoretical Analysis

Economic theory advances in stages. First, a simple framework based on highly restrictive and often unrealistic assumptions is developed. Then over time, these assumptions are gradually eliminated as the model attempts to incorporate more elements of reality. The development of the theory of economic and productivity growth from the 1950s to the 2000s has conformed to this pattern.

The modern study of economic growth and long-run productivity growth dates from the 1950s when Robert Solow, Moses Abramovitz, and Dale Jorgenson identified the basic inputs of a growing economy as labour, capital, and technology. Solow (1957) in a famous article found that technological change, not labour and capital, was responsible for most economic growth. However, he did not measure the contribution of technological change to economic growth directly, but rather as a residual after the contribution of labour and capital had been calculated. Solow characterized this residual as "a measure of our ignorance." In the Solow model, technological change was exogenous or "manna from heaven." This treatment of technology was not meant to be taken literally but rather as an abstraction to simplify and facilitate the model's focus on long-term growth.

Solow's theoretical framework for the analysis of economic growth served as the basis for the development by Edward Denison (1962) of a growth accounting framework that attributed economic growth to a large number of sources, including increases in the education of the labour force, the contribution of capital, the shift of resources from low-productivity endeavours into the mainstream of the modern economy, gains from knowledge, and economies of scale.

The limitations of the neoclassical or Solow growth model and growth accounting methodology as an explanation of the growth process, in particular the model's inability to account for the post-1973 productivity slowdown, has in recent years led to the development of more sophisticated models of economic growth by such economists as Paul Romer. A key feature of many of these models is the emphasis on knowledge as the driving force behind productivity growth. Romer (1990) pointed out

> 'the neoclassical assumptions of diminishing returns to increasing investment and perfect competition placed the accumulation of new technologies at the centre of the growth process and simultaneously denied the possibility that economic analysis could have anything to say about this process'

In other words, while early versions of growth theory convincingly demonstrated the importance of studying technology, the aggregate macroeconomic models used offered little room for the analysis of the sources of invention or innovation, new and improved

products or processes, or organizational or structural change (Landau, Taylor and Wright, 1996).

In recent years, the basic neoclassical model has been enriched and expanded upon in at least five broad areas (Landau, Taylor and Wright, 1996). These developments reflect the elimination of many of the model's restrictive and unrealistic assumptions.

- Neoclassical growth theory assumed that all firms behaved in the same manner in their quest to maximize profits. It is now widely recognized that while the profit motive is still important, behaviour can differ greatly among firms. Economists interested in economic growth are now exploring such questions as how firms learn from experience, how good management differs from bad management, how firms differ in gathering and transmitting information internally, and how firms compete in international markets.

- The neoclassical model also assumed perfect competition. This is a particularly unrealistic assumption for a growth model because in a world characterized by perfect competition firms have no incentive to undertake research and development since they can sell at the market price all they can produce. Such a model also assumes away the important real-world issue of the appropriability of the gains from technical progress. Many models of economic growth now assume monopolistic competition and give explicit treatment to patents as a mechanism for influencing the appropriability of the gains from technical progress.

- The neoclassical model assumes that the secrets of technical progress are available to all. This implies that productivity levels in all countries will converge on that of the technological leader as these countries avail themselves of this knowledge. But this ignores the obvious point that the social capability to gain advantage of advanced technologies varies greatly among nations and explains why productivity levels have not converged. Putnam (2001) has developed the concept of "social capital" as a factor of production to explain international differences in growth rates and productivity levels.

- In the neoclassical model, all industries are assumed equally important. But some economists now argue that certain industries may be more important than others to long-run productivity growth because they yield a greater rate of social return through externalities (eg. the information technology sector) or may exhibit increasing returns to scale.

- An implication of the early growth theory was that the long-term steady-state rate of growth was determined by the rate of technical progress and population growth and was independent of the rate of saving and investment. Recent research suggests that the higher rates of accumulation and investment can increase productivity growth; that there is no steady-state rate of growth; and that there is interdependence between the inputs in the growth process. For example, Boskin and Lau (1992) found that the higher the capital stock, the more technology can increase productivity because most technology is embodied in capital goods.

2.3.1. Empirical Analysis

Building on the recent theoretical developments reviewed above, a large literature has developed aimed at deriving their implications for public policy. At the international level, the McKinsey Global Institute (MGI) - a think tank based in Washington, D.C. founded in 1990 by McKinsey & Company with the objective of analyzing international productivity levels from both economic and management perspectives - has studied most of the world's major economies. In each case, MGI used microeconomic analysis on a sector-by-sector level to study the effects that industry decisions ultimately had on national productivity.

Time and again, the McKinsey Global Institute's studies have returned to the same story in trying to explain productivity gaps between countries: a lack of competitive intensity. To the extent that certain European and Japanese sectors seem to consistently trail the United States in productivity, these sectors are nearly always characterized by a small number of domestic firms who engage in little price or service competition because of regulatory protection in the form of product market restrictions and trade barriers. MGI finds that such restrictions lead to managerial complacency, a consequent lack of innovation in production processes, and ultimately to a productivity performance below that of the technological leader. Potential factors related to competition that have been identified by MGI as directly affecting productivity are the following.

- **Concentration:** A high market share held by a small number of firms is not necessarily inconsistent with intense competition. Concentration can improve productivity through achieving economies of scale, and it can also boost productivity if it allows a small number of large firms to compete intensely with each other. Examples of highly concentrated yet highly competitive industries include the Dutch banking industry and the Swedish automobile industry.

- **Trade Protection:** Tariffs and quotas reduce productivity through shielding industries from international competition and so making the adoption of global best practices unnecessary. The automobile industry in Germany, France and the United Kingdom, the food processing industry in Japan, and many Swedish service industries are all examples highlighted by MGI of industries whose productivity performance has been hindered by trade protection.

- **Deregulation:** MGI highlights the airline, telecommunications and banking industries as cases in which deregulation has boosted productivity, and in which countries that have chosen to delay or forgo deregulation have consequently suffered lower productivity levels than the early deregulators.

Other competition-related factors can affect productivity in a more indirect fashion.

- **Minimum Wages:** Higher wages typically have the effect of reducing the number of low-skill jobs, as the benefit of these low-skill services is outweighed by the

higher cost of providing them. While this has the effect of raising conventionally-measured average labour productivity, MGI argues that overall "service productivity" is negatively affected because the range of services that is offered shrinks.

- **Work Rules:** MGI recognizes that some labour market inflexibilities can be beneficial. However, collective agreement terms that are not adjustable to market realities can negatively affect productivity by preventing productivity-enhancing reorganizations of work.

- **Zoning Laws:** Some European countries have zoning regulations that have a negative impact on productivity by making it difficult for firms to purchase parcels of land of a required size, and through creating an artificial scarcity of land and thereby making land overly expensive. This affects productivity because high rents hinder the ability of smaller firms to innovate, and because larger firms have difficulties achieving optimal scale.

Perhaps even more important than the market conditions under which a firm operates is the way its managers choose to react to those conditions. Competitiveness is the main driver of managerial innovation, but that managerial innovation (or lack thereof) is what affects productivity, first at the firm level, then the industry level, and ultimately at the national level. MGI makes the following observations related to managerial innovation.

- **Best Practice:** Managers need to be aware of best practices in a given industry, and be prepared to implement them. MGI states that sufficient exposure to competition will ensure that this is the case.

- **Human Capital:** MGI finds little evidence that labour skills at the production level differ greatly across countries. However, the qualifications of managers can have a significant impact on productivity, through entrepreneurship and the training of production workers.

- **Marketing:** MGI finds that the U.S. telecommunications sector's productivity performance has been positively affected through marketing, since the resulting greater demand for telecommunication services means that there is greater output for a given investment in fixed capital.

- **Information Technology:** Although few would dispute that investment in information technology can have a significant impact on productivity growth, MGI concludes that realizing its full benefit requires an appropriate application. In addition to the effect of IT use on productivity growth, the presence and strong productivity performance of industries producing IT goods also positively affect overall manufacturing productivity growth.

- **Capital Intensity:** MGI finds that improvements in capital intensity are a necessary but not sufficient condition for improvements in productivity. This is

because increasing the amount of capital per worker does not necessarily mean that the capital is being used efficiently. Improvements in capital productivity are often dependent on other managerial and competitive factors.

The final category of productivity determinants identified by MGI is demand factors. If a competitive market forces a firm to innovate in order to create better goods and services at lower prices (and costs), then there should be an increase in demand for those improved products, which should more than justify the initial costs of innovation and increase firm profits. There are other demand factors besides this general desire for improved goods that can affect a firm's decisions and thus productivity. Briefly, income levels, cyclical demand factors, and general consumer preferences can all affect the format, output level, and ultimately productivity of a firm.[9]

In Canada, recent contributions to the literature aimed at deriving implications for public policy include Harris (2002) and Sharpe (1998). Based on a review of the cross-country growth literature, Harris (2002) identifies three proximate drivers of productivity growth: investment in machinery and equipment, human capital development, and openness to trade and investment. In addition, he notes that once one moves from the proximate determinants to the indirect linkages of productivity growth, a large number of factors may influence productivity growth. His compendium of potential indirect productivity determinants includes innovation (both product and process), diffusion of technology (national and international), spatial agglomeration (eg. Silicon Valley), external economies of scale at the industry level, government consumption (negative), management practices, public infrastructure (positive), income inequality (negative), high taxes (negative), small firms (negative), labour market flexibility (positive), exchange rate stability (positive), and low inflation (positive).

In turn, Sharpe (1998) identifies the following determinants of productivity growth: the rate of technical progress; investment in physical capital; the quality of the workforce; industrial structure and intersectoral shifts; and the microeconomic policy environment.

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[9] The McKinsey Global Institute has not produced a report on Canadian productivity. However, the findings from the McKinsey productivity studies on industry productivity differentials between the United States and a number of major developed and developing countries may have relevance for the explanation of industry productivity differentials between the United States and Canada. In some respects, the Canadian economy is a bit of a hybrid between the U.S. free-market system and the more sheltered, socially-conscious systems of countries like France or Sweden. Canada is more globally-exposed than most EU countries, yet it also retains a certain level of trade protection and restricts entry to some domestic sectors. It also has a more developed welfare state than the United States in terms of more government control of social programs such as health care and pensions. Differences between Canada and the United States in these areas can be examined in the context of the productivity drivers identified by the MGI studies in an attempt to shed light on the factors behind Canada-U.S. labour productivity gaps at the industry level.

In terms of competitive factors, Canadian service-sector firms may be less exposed to U.S. retail trade industry in this regard, spurring other firms to innovate through competitive pressure. Apparently Wal-Mart has not yet had this effect in Canada.

Given the similarities between Canada and the United States, which are much greater than between the United States and Europe, Japan, Brazil, and India, the findings of the MGI studies cannot be indiscriminately applied to Canada-U.S. productivity differences at the industry level. Further work is needed to dig more deeply into the Canada-U.S. industry productivity gaps, although the MGI studies do put forward a number of useful working hypotheses for such analysis.

In the context of Atlantic Canada, the limitations of available data and the relevance of each of the factors noted above suggest that we focus on a subset of the drivers:

- investment in machinery and equipment;
- human capital development;
- innovation and technology diffusion;
- spatial agglomeration and economies of scale;
- public infrastructure; and
- competitive intensity.

It is important to note that there is still considerable uncertainty about the drivers of productivity. The relative and absolute contributions that different determinants make to productivity growth may vary over time and across space. Many factors are interrelated and can act in a synergistic manner.

2.4. Data Sources

This report relies heavily on Statistics Canada estimates and selected other sources to analyze the productivity performance of Atlantic Canada.

Statistics Canada does not publish estimates of productivity (either labour or multifactor) by province. However, it does publish estimates of GDP and hours worked by province, so labour productivity estimates can be constructed. There is only one GDP series to use. It is drawn from the Provincial Economic Accounts and is available from 1981 to 2007 in current prices, chained 2002 dollars, and 2002 constant prices on an expenditure basis, e.g. expenditures on personal consumption, business investment, etc. Provincial GDP is also available for the same period on an income-basis, e.g. wages, salaries, and supplementary labour income, corporation profits before taxes, etc, but only in current dollars.

For comparisons over time the real (constant or chained) series from expenditure GDP are used in this report. For comparisons across jurisdictions, the income GDP current dollar estimates are used. These are the same as the current dollar expenditure GDP estimates.

Estimates of GDP by industry and province are available from Statistics Canada from the Income and Expenditure Accounts at basic prices in current dollars and chained 2002 dollars for the period 1984 to 2007. These estimates are available for 115 different aggregations within the NAICS framework to the 4-digit, and occasionally 5-digit, level. Estimates are also available at a far greater level of detail (NAICS 6-digit; 477 different aggregations) for the period from 1997 to 2005, but only at basic prices in current dollars.

Statistics Canada publishes three different series of hours worked. Estimates are published under the Survey of Employment, Payrolls, and Hours (SEPH), the Labour Force Survey (LFS), Canadian Productivity Accounts (CPA). SEPH surveys employers

on the numbers and characteristics of employees. It provides estimates of average weekly hours worked by province, by enterprise size of employment, and by 2-digit NAICS sector for the period 2000 to 2007. The LFS provides estimates of hours worked by province, by 2-digit NAICS sector for the period from 1987 to 2008.

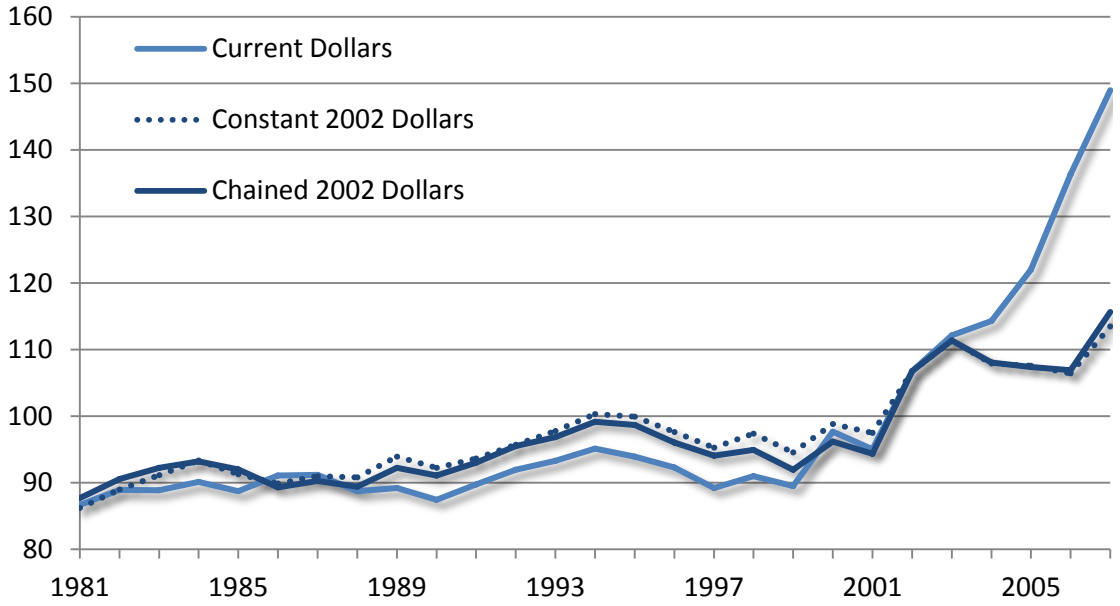
The hours worked series from the Canadian Productivity Accounts is the most appropriate series for use in studying productivity, because it is the only series that is consistent with GDP from the income and expenditure accounts both conceptually and with respect to coverage. The CPA series is prepared with data from LFS, SEPH, and the Census of Population and administrative data. The approach of Statistics Canada to produce the CPA hours worked series is two-pronged. On the one hand, they estimate average hours worked per job by province, industry, and class of worker. On the other hand, they estimate the number of jobs on the same basis. The number of hours worked is obtained by multiplying these two components (Maynard, 2005). Generally speaking, the approach at Statistics Canada is to rely on the LFS for estimates of total jobs in the economy and trends over time, while SEPH and other administrative data are used to allocate workers to detailed industries, because Statistics Canada feels that employers are more accurate in describing their industry than workers who provide the LFS data.

For this report we endeavour to strike a balance between providing appropriate productivity estimates by province and industry, and providing a long-term time series, since it can be more meaningful to analyze productivity growth over longer periods. In practice the approach we have taken is to use the CPA series on hours worked from 1997 to 2007 and extend it back to 1981 using growth rates from the corresponding LFS series. We view this approach as appropriate at the provincial level, but not at the industry level, since Statistics Canada does not view unadjusted LFS as appropriate measure of hours worked by industry. As a result, we only present estimates of labour productivity by industrial sector from 1997 to 2007.[10]

By way of example of the importance of data issues, let us consider labour productivity (GDP per hour worked) in Newfoundland and Labrador relative to Canada. Depending on which GDP series is used (nominal, real chained-dollar, real constant-dollar), we can tell rather different stories (Chart 1). The story in this province has been the impact of the skyrocketing price of oil on nominal GDP, while real GDP, whether in chained or constant dollars, takes into account only changes in the volume of oil produced, and not the price of oil. After 2003, labour productivity in Newfoundland and Labrador actually declined, but the value of production per hour worked in nominal terms rose dramatically. In this paper, we compare provinces at a given point in time based on labour productivity using nominal GDP, however, it is important to keep in mind that prices and volumes may follow very different paths.

[10] In March 2009, Statistics Canada prepared for the Centre for the Study of Living Standards (CSLS) estimates of labour, capital, and multifactor productivity by province and industry (2-digit) for the 1997-2007 period. These estimates will be posted on the CSLS website and are the best available. While these estimates were received after this report was completed, they are consistent with the findings presented in this report.

Chart 1: Alternative Measures of Relative Labour Productivity, Newfoundland and Labrador Relative to Canada = 100, 1981-2007



Source: Appendix Table 73b. CSLS calculations based on Statistics Canada estimates.

Other important data issues are discussed where relevant both in the body of this report and in the footnotes that accompany the tables, charts, figures, and appendix tables. At all times the reader should bear in mind that estimates are subject to error. In order to respect the limitations of the available data on productivity in Atlantic Canada, we have avoided conclusions that are overly strong when we lack confidence in the underlying estimates.

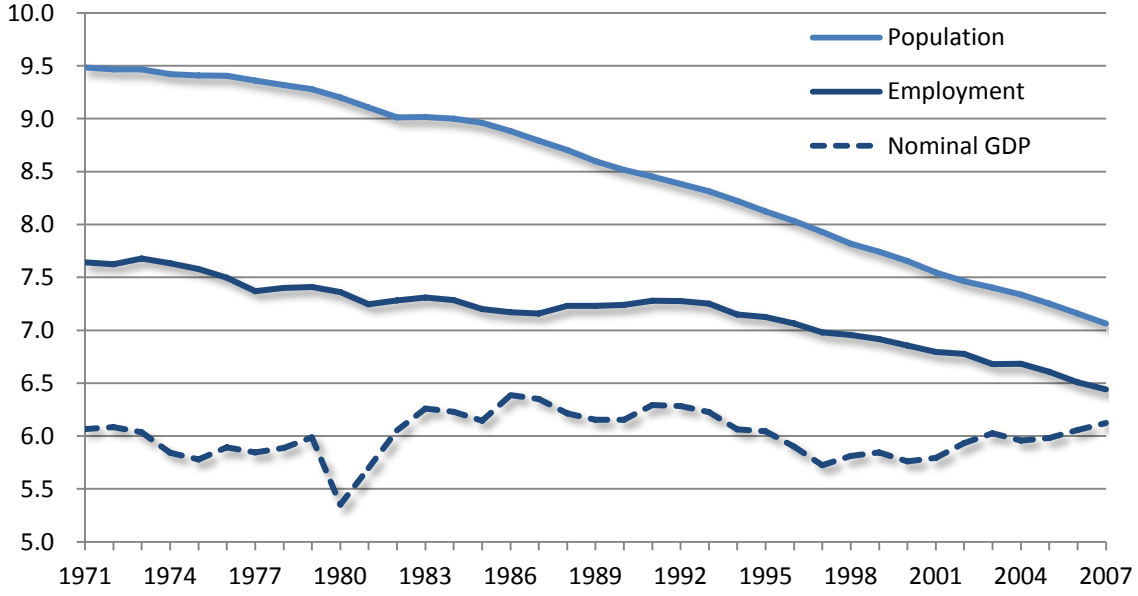
3. Living Standards in Atlantic Canada

The objective of this part of the report is to provide a comprehensive overview of the living standards in Atlantic Canada. The most commonly used measure of living standards is GDP per capita. The first part of this section compares GDP, employment and population in Canada and Atlantic Canada. The second section explores trends in GDP per capita in Atlantic Canada. The third section explores the drivers of GDP per capita, including labour productivity (measured as GDP per hour worked), average hours worked per week, and the share of the population that is employed. The fourth section explores personal income in Atlantic Canada, an alternative measure of living standards to GDP per capita. This part of the report concludes with some summary observations about Atlantic Canada's economic performance including the central role of productivity.

3.1. Relative GDP, Employment, and Population in Atlantic Canada

The broadest measure of a region's economic performance within a country is its relative weight in national population and economic activity, measured by GDP. Chart 2 shows trends in Atlantic Canada's share of population, employment, and GDP in Canada from 1971 to 2007. The key point is that Atlantic Canada has experienced a notable decline in relative population and employment while maintaining its share of nominal output.

Chart 2: Population, Employment, and GDP in Atlantic Canada, as a Share of Canada, 1971-2007



Source: Author's calculations based on Statistics Canada estimates. Appendx Tables 1a, 2d, and 5.

Whereas in 1971 Atlantic Canada had 9.5 per cent (2.08 million people) of Canada's population (21.9 million), it had only 7.5 per cent of Canada's employed people and only 6.0 per cent of Canada's economic activity, as measured by nominal GDP. By 2007, the relative population of Atlantic Canada had declined to 7.0 per cent (2.3 million

people) of the Canadian total (32.9 million), but this population was supported by 6.5 per cent of Canada's employed people and 6.0 per cent of Canada's economic activity. This remarkable convergence over the past 36 years (and before) has meant a higher standard of living for Atlantic Canadians, and it should be borne in mind as we examine the recent economic and productivity performance of Atlantic Canada in this report.

3.2. Trends in GDP per Capita in Atlantic Canada

This section examines trends in GDP per capita in Atlantic Canada in relation to the rest of Canada and to US regions and states. It then turns to an analysis of the sources of growth of GDP per capita.

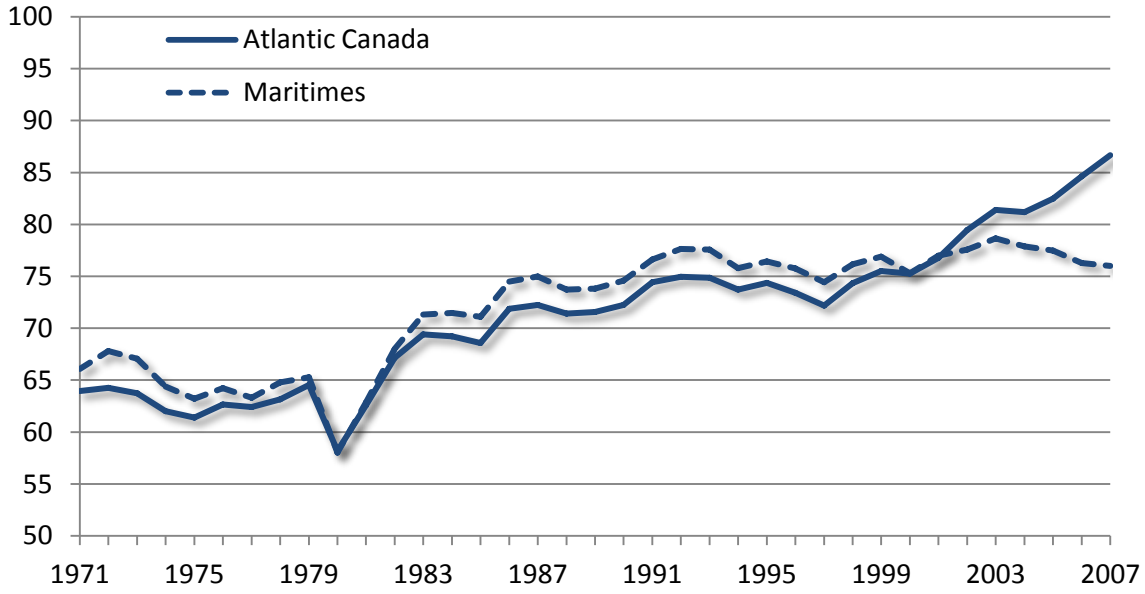
Gross domestic product per capita is by far the most common measure of living standards; it represents how much production is available for consumption and investment per person. If population grows faster than production, GDP per capita falls. If the population shrinks and production is maintained, then GDP per capita will increase.[11] In economics, the well-known convergence hypothesis holds that with access to the same production technology, regions with lower levels of GDP per capita will grow faster than regions with high levels of GDP per capita. This hypothesis seems to fit the data for Atlantic Canada as GDP per capita in the region has converged with the rest of Canada.

In 1971, the Atlantic provinces had 64 per cent of the level of GDP per capita of Canada as whole (Chart 3). Newfoundland and Labrador and Prince Edward Island had GDP per capita of only slightly more than one-half of the Canadian average (58 per cent and 54 per cent respectively). New Brunswick and Nova Scotia had somewhat higher GDP per capita at 62 per cent and 65 per cent of the Canadian average respectively.

As convergence theory predicts, since 1981, real GDP per capita in Atlantic Canada has grown faster than in Canada as whole. Measured in chained 2002 dollars, real GDP per capita in Atlantic Canada grew at an average annual rate of 2.45 per cent from 1981 to 2007, whereas in Canada as a whole, the growth rate was only 1.67 per cent. Of particular note is the surge in real GDP capita that has taken place in Newfoundland and Labrador in recent years. While real GDP per capita expanded at 2.74 per cent per year from 1981 to 1989 and at 2.51 per cent per year from 1989 to 2000, from 2000 to 2007 real GDP per capita grew at a very brisk 5.61 per cent per year, reflecting the boom in oil and gas extraction.

[11] GDP per capita says nothing about the distribution of income or the riskiness of individual income streams. As such it performs less well as measure of the broader concept of economic well-being than it does a measure of the narrower concept of living standards, see for example Osberg and Sharpe (2002 and 2008).

Chart 3: Nominal GDP per Capita as a Share of Canada, Atlantic Canada, Canada = 100, 1971-2007



Source: Appendix Table 6a. CSLS calculations based on Statistics Canada estimates.

Table 1: Growth Rates of Real GDP per Capita, Per Cent, 1981-2007

	1981-2007	1981-1989	1989-2000	2000-2007
Canada	1.67	1.85	1.58	1.60
Newfoundland and Labrador	3.41	2.74	2.51	5.61
Prince Edward Island	2.19	2.31	2.23	2.00
Nova Scotia	1.94	2.53	1.55	1.87
New Brunswick	2.40	2.93	1.90	2.60
Quebec	1.46	1.41	1.60	1.31
Ontario	1.49	2.16	1.28	1.05
Manitoba	1.49	1.22	1.58	1.65
Saskatchewan	1.97	0.77	2.81	2.05
Alberta	1.55	0.96	2.04	1.47
British Columbia	0.95	0.57	0.44	2.18
Atlantic Canada	2.45	2.70	1.92	2.98
Maritimes	2.15	2.68	1.74	2.18

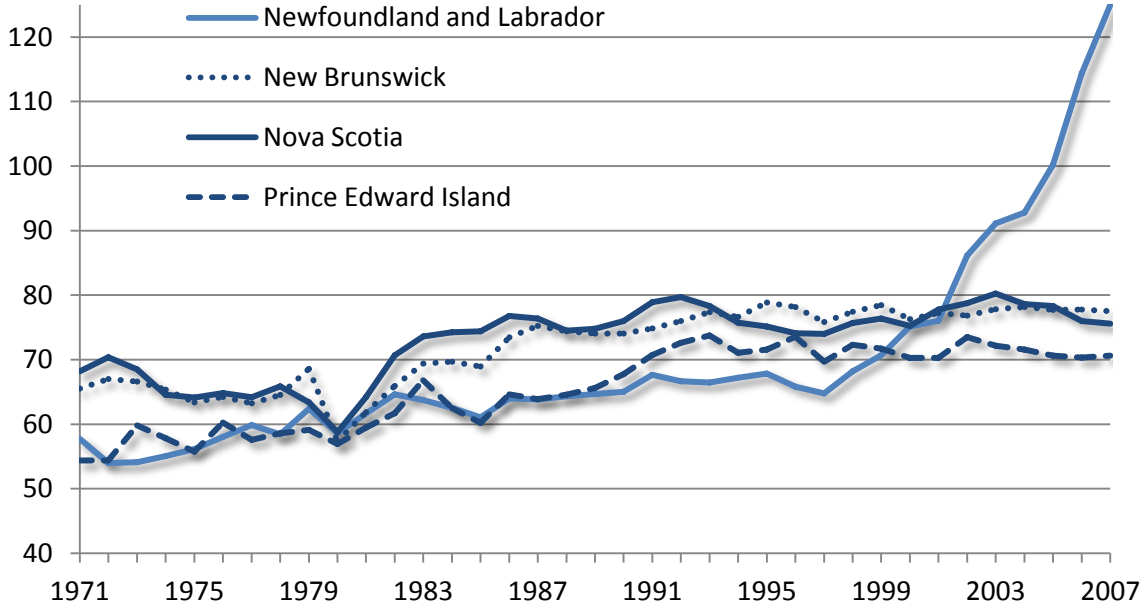
Source: Appendix Table 6b.

Note: GDP per capita at market prices chained 2002 dollars. Average annual growth rates in per cent.

By 2007, Atlantic Canada remained below the Canadian average GDP per capita, but the gap was much smaller than in 1971 or 1981 (Chart 4). Newfoundland and Labrador's exceptional growth moved that province above the Canadian average GDP per capita from 2005 to 2006; by 2007 residents of Newfoundland and Labrador were producing on average 25 per cent more value added than the average Canadian. New Brunswick and Nova Scotia attained GDP per capita of 76 per cent and 78 per cent of the

Canadian level in 2007 respectively, while Prince Edward Island reached just over 70 per cent of the Canadian average. At the same time, the Maritimes have made little progress in closing the gap with Canada since the late 1980s, because most of the relative gains occurred in the 1970s and early 1980s.

Chart 4: Nominal GDP per Capita as a Share of Canada, Atlantic Provinces, Canada = 100, 1971-2007



Source: Appendix Table 6a. CSLS calculations based on Statistics Canada estimates.

3.3. Sources of Atlantic Canada's Growth in GDP per Capita

This section explores the sources of the growth of real GDP per capita in Atlantic Canada: labour productivity, average hours worked, the share of the labour force employed (employment rate), the share of the working-age population (15-64) participating in the labour force, and the share of the total population of working age.[12] In comparison to Canada as a whole, all of the drivers of real GDP per capita moved more strongly in a favourable direction in Atlantic Canada, accounting for the faster growth in real GDP per capita observed in the previous section.

[12] The relationship between these concepts expressed algebraically is

$$\frac{Y}{N_{Total}} = \frac{Y}{H} \times \frac{H}{E} \times \frac{E}{LF} \times \frac{LF}{N_{Working\ Age}} \times \frac{N_{Working\ Age}}{N_{Total}}$$

Where Y is real GDP, N_{Total} is the total population, H is hours worked, E is the employment, L is the labour force, and $N_{Working\ Age}$ is the working age (15-64) population. Expressed in rates of change in percentage terms, this expression becomes

$$\Delta\frac{Y}{N_{Total}} = \Delta\frac{Y}{H} + \Delta\frac{H}{E} + \Delta\frac{E}{L} + \Delta\frac{L}{N_{Working\ Age}} + \Delta\frac{N_{Working\ Age}}{N_{Total}}$$

Over the period from 1981 to 2007, the growth of real GDP per capita in Atlantic Canada was primarily driven by labour productivity growth (62.0 per cent), but increasing labour force participation[13] (24.9 per cent), and an increasing share of the total population that was of working age (12.7 per cent) were also important factors (Table 2). Labour force participation increased from 64.5 per cent in 1981 to 75.6 per cent in 2007, reflecting an increase in the number of people working or actively searching for work. This increase was much greater than in Canada as a whole, which saw labour force participation increase from 73.6 per cent to 80.0 per cent. In Atlantic Canada, the share of the population of working age rose very significantly from 63.4 per cent to 68.6 per cent, reflecting the aging of the baby boom generation. In contrast, in Canada as a whole, the share of the population of working age increased from 67.1 per cent to 68.1 per cent. Falling average hours worked per week had a slight negative impact on the growth of real GDP per capita, while falling unemployment had a small positive impact. Overall, the growth of real GDP per capita in Atlantic Canada resulted from not only strong productivity growth, but also from a greater proportion of the population working.

This pattern was generally repeated across all four Atlantic provinces, but there were some notable variations. As noted above, Newfoundland and Labrador experienced particularly strong labour productivity growth between 1981 and 2007; for this reason, the province saw a relatively large share—69.4 per cent compared with 62.0 per cent in Atlantic Canada as a whole—of its gains in real GDP per capita come from labour productivity growth. In Prince Edward Island, increases in labour force participation were a particularly important source of gains in real GDP per capita (28.7 per cent), while declines in average weekly hours worked, from 35.7 hours to 34.5 hours, made a more significant negative contribution than in other provinces. The experience of New Brunswick was notable because relatively poor labour productivity growth resulted in the smallest contribution of labour productivity to real GDP per capita growth, just 53.9 per cent, while average weekly hours worked actually increased, and a reduction in unemployment was relatively important.

[13] Labour force = employed + unemployed.

Table 2: Decomposition of GDP per Capita Growth, Canada and Atlantic Canada, 1981-2007

	Real GDP per Capita	Real Labour Productivity: Real GDP per Hour Worked	Average Weekly Hours per Employed Person	Employment Rate: Employment as a Share of the Labour Force	Labour Force Participation Rate: Labour Force as a Share of the Working-Age Population (15-64)	Working-Age Population (15-64) as a Share of the Total Population
	A	B	C	D	E	F
	(Chained 2002 Dollars)		(Hours)	(Per Cent)		
1981						
Canada	26,081	31.9	1.8	92.4	73.6	67.0
Atlantic Canada	17,501	26.6	1.8	88.6	64.5	63.4
Newfoundland and Labrador	16,278	28.0	1.8	86.5	59.7	62.6
Prince Edward Island	17,094	24.2	1.9	88.7	69.4	61.9
Nova Scotia	18,687	26.5	1.8	90.0	67.0	63.7
New Brunswick	17,131	26.1	1.8	88.4	64.6	63.8
2007						
Canada	40,079	44.4	1.8	94.0	80.0	68.1
Atlantic Canada	32,811	39.3	1.8	90.8	75.6	68.7
Newfoundland and Labrador[1]	38,890	51.4	1.9	86.4	70.2	70.6
Prince Edward Island	30,040	34.1	1.8	89.7	81.7	68.5
Nova Scotia	30,771	36.5	1.8	92.0	76.8	67.7
New Brunswick	31,755	36.5	1.8	92.5	76.7	68.6
Average Annual Rate of Change 1981-2007, Per Cent						
Canada	1.67	1.28	-0.07	0.07	0.32	0.07
Atlantic Canada	2.45	1.52	-0.06	0.09	0.61	0.31
Newfoundland and Labrador	3.41	2.36	0.12	0.00	0.63	0.46
Prince Edward Island	2.19	1.32	-0.20	0.04	0.63	0.39
Nova Scotia	1.94	1.24	-0.16	0.08	0.53	0.23
New Brunswick	2.40	1.29	-0.02	0.17	0.66	0.28
Relative Contribution to the Growth of GDP per Capita, Per Cent						
Canada	100.0	76.8	-4.2	3.9	19.2	3.9
Atlantic Canada	100.0	62.0	-2.6	3.8	24.9	12.7
Newfoundland and Labrador	100.0	69.4	3.4	-0.1	18.4	13.6
Prince Edward Island	100.0	60.2	-9.1	1.9	28.7	17.7
Nova Scotia	100.0	64.0	-8.1	4.2	27.3	12.1
New Brunswick	100.0	53.9	-0.9	7.1	27.5	11.6

Source and Notes:

A: Real GDP per capita, chained 2002 dollars, population estimates from Statistics Canada

B: Real GDP per hours worked, chained 2002 dollars, hours from Statistics Canada Labour Force Survey

C-F: Employment, labour force, and working age population (15-64) data from Statistics Canada Labour Force Survey

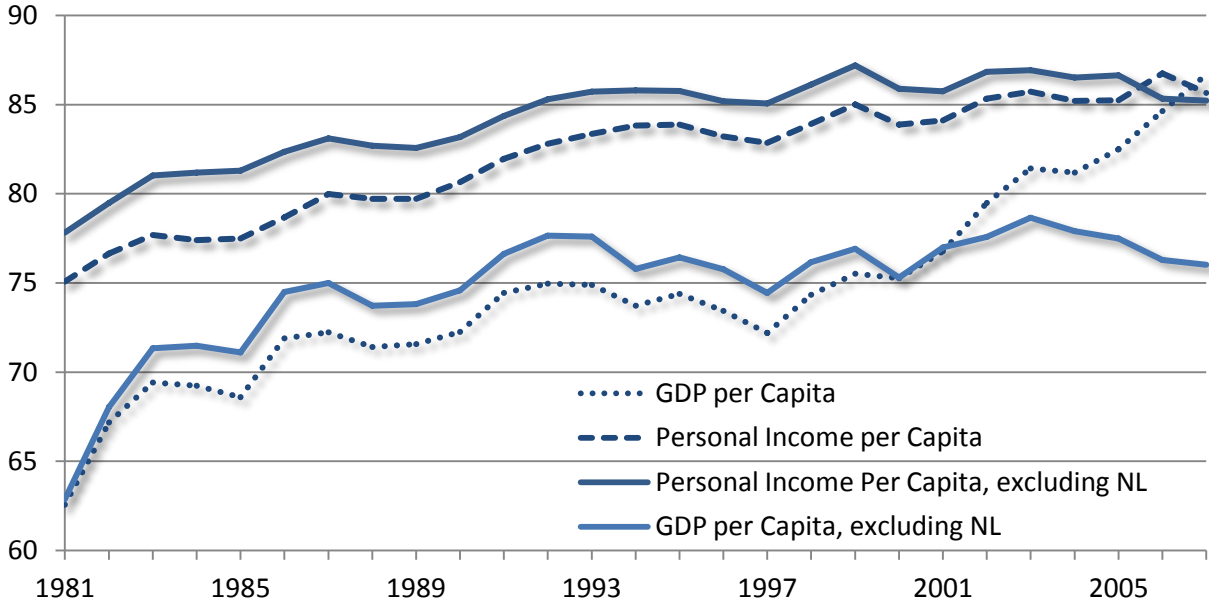
1. Newfoundland and Labrador appears here to a lower level of GDP per capita than Canada in 2007. As we have seen above, this is not the case when GDP per capita is estimated in current dollars. The difference between GDP per capita in current and chained dollars reflect changing relative prices, especially the price of oil. The comparison of GDP per capita levels at a point in time should be done in current dollars.

3.4. Personal Income per Capita in Atlantic Canada

GDP per capita offers only one perspective on living standards. An alternative point of view is personal income per capita. Personal income differs from GDP in that it excludes non-personal income (eg. corporate retained earnings, capital cost allowances) and includes transfer payments to individuals, which are not recorded in GDP.

Compared to GDP per capita, Atlantic Canada's performance appears better when viewed in terms of personal income (Chart 5). Whereas the level GDP per capita in Maritimes has been around 75 per cent of the Canadian level since the late 1980s, personal income per capita has been around 85 per cent.

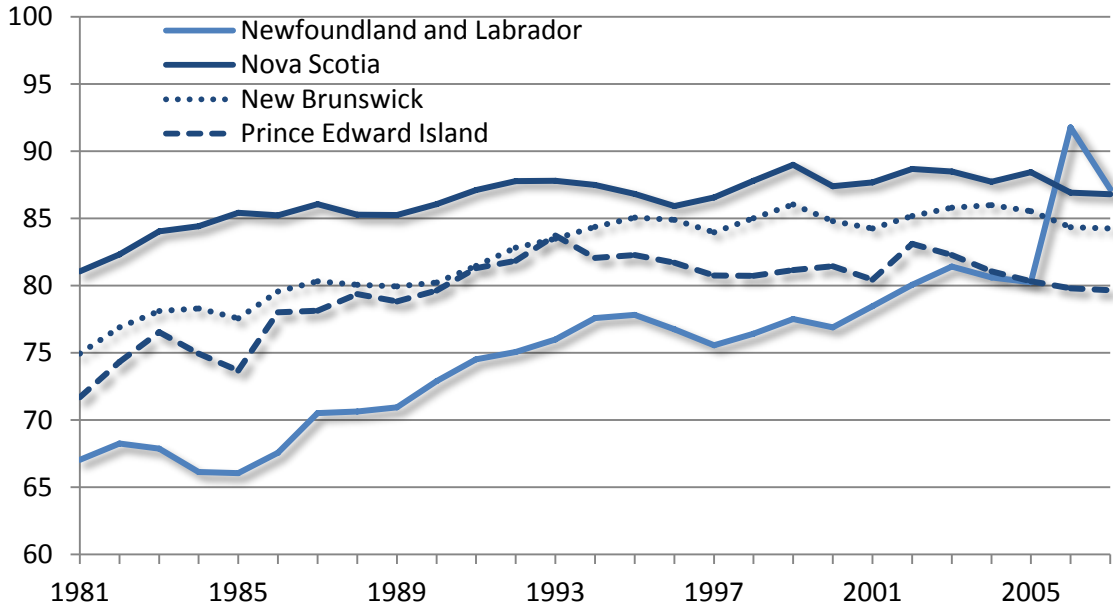
Chart 5: Comparison of Relative Nominal GDP and Personal Income per Capita, Canada and Atlantic Canada, Canada = 100, 1981-2007



Source: Appendix Tables 6a and 7d. CSLS calculations based on Statistics Canada estimates.

In 2007, all Atlantic provinces had levels of personal income per capita roughly between 80 and 90 per cent of the Canadian level (Chart 6). Since 1981, the gap with Canada has narrowed, most significantly in Newfoundland and Labrador. The gap between the Atlantic provinces has also narrowed somewhat, with Prince Edward Island, New Brunswick, and especially Newfoundland and Labrador catching up with Nova Scotia.

Chart 6: Relative Personal Income per Capita, Atlantic Provinces, Canada = 100, 1981-2007



Source: Appendix Table 7d. CSLS calculations based on Statistics Canada estimates.

The gap between personal income in Canada and the Atlantic provinces is a result of lower labour income (wages, salaries, and supplementary labour income), lower unincorporated business income, and lower investment income (Table 3). Higher government transfer payments only slightly offset these gaps. The largest gap is in Prince Edward Island, where personal income per capita is 20.3 per cent lower than in Canada. This gap is almost entirely explained by lower labour income. Relative to the other Atlantic provinces, Newfoundland and Labrador was notable for having particularly high labour income, low investment income, and high transfers from government. The very high transfers ($6,204 per capita) in Newfoundland and Labrador relative to the rest of Atlantic Canada ($5,329) and Canada as a whole ($4,634) are interesting in light of the relatively high GDP per capita of Newfoundland and Labrador, and may be a result of some resource revenues flowing to individuals through government rather than through firms.

It is important to understand from the point of view of living standards that these comparisons have been made in current dollars. That is, not adjusting for differences in purchasing power across provinces. To the extent that prices are lower in Atlantic Canada, the real value of personal income will be higher because more goods and services can be purchased for the same dollar. Estimates of the relative retail prices of selected consumer goods and services in selected cities are available from Statistics Canada (Chart 7). The CPI includes property taxes and sales taxes (including the federal Goods and Services Tax, the Harmonized Sales Tax, and provincial sales taxes).

Table 3: Decomposition of the Personal Income Gap with Canada, 2007

	Personal Income	Labour Income	Farm Income	Unincorp-orated Business Income	Investment Income	Current Transfers		
						From Government	From Corporations	From Non-Residents
Personal Income, 2007, Current Dollars								
Canada	35,586	23,942	3	2,744	4,101	4,634	80	81
Newfoundland and Labrador	31,029	20,035	-8	2,051	2,587	6,204	79	81
Prince Edward Island	28,353	16,776	-123	2,599	3,229	5,713	80	80
Nova Scotia	30,893	19,013	-16	2,395	4,183	5,158	80	80
New Brunswick	29,988	19,125	-13	2,027	3,216	5,472	80	80
Atlantic Canada	30,482	19,139	-20	2,215	3,469	5,519	80	80
Maritimes	30,329	18,889	-23	2,260	3,714	5,329	80	80
Contribution to Gap, Percentage Points								
Newfoundland and Labrador	-12.8	-11.0	0.0	-1.9	-4.3	4.4	0.0	0.0
Prince Edward Island	-20.3	-20.1	-0.4	-0.4	-2.5	3.0	0.0	0.0
Nova Scotia	-13.2	-13.9	-0.1	-1.0	0.2	1.5	0.0	0.0
New Brunswick	-15.7	-13.5	0.0	-2.0	-2.5	2.4	0.0	0.0
Atlantic Canada	-14.3	-13.5	-0.1	-1.5	-1.8	2.5	0.0	0.0
Maritimes	-14.8	-14.2	-0.1	-1.4	-1.1	2.0	0.0	0.0

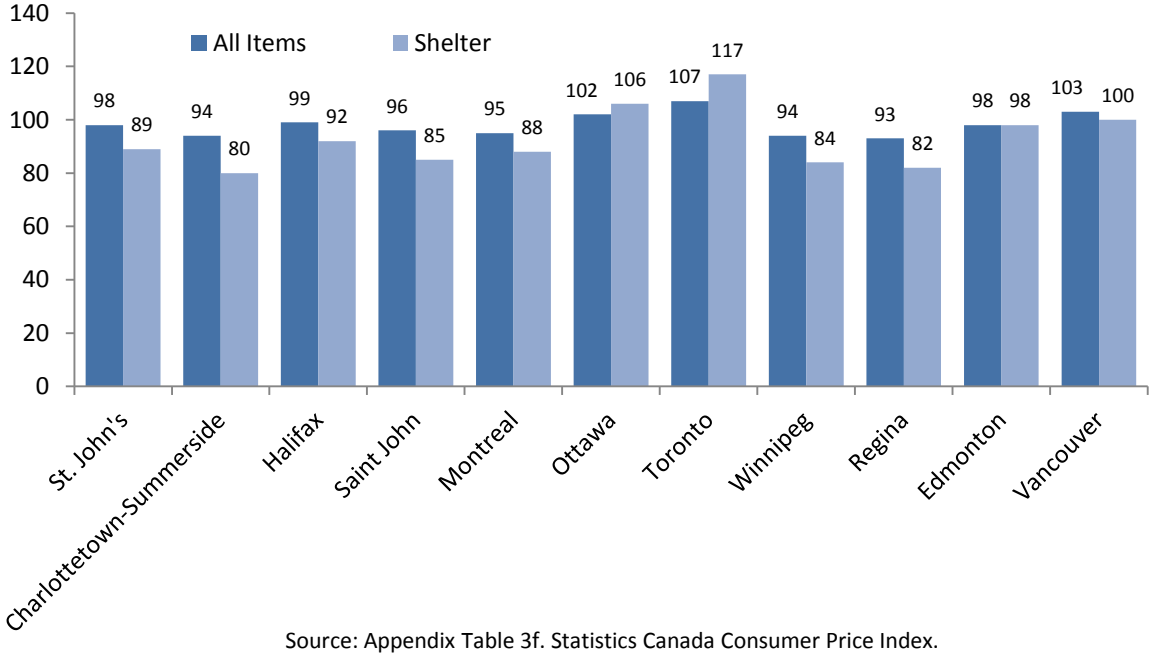
Source: Calculated by the author from Statistics Canada data. Appendix Tables 1 and 8-8f.
Notes:
1. Labour income is wages, salaries and supplementary labour income (national basis).
2. Farm income is accrued net income of farm operators from farm production.
3. Unincorporated business income is net income of non-farm unincorporated business, including rent.
4. Investment income is interest, dividends and miscellaneous investment income.

Lower consumer prices in Atlantic Canada are primarily driven by lower costs for shelter; other consumer prices tend to be very similar to the combined city average. For instance, the cost of shelter in Saint John was 15 per cent lower than the combined city average and 27 per cent lower than in Toronto. However, shelter costs in the cities of Atlantic Canada are comparable to such costs in Montreal, Winnipeg, and Regina. The overall cost of living is only slightly lower than in Ottawa, Toronto, or Vancouver, and is roughly equal to Edmonton. That said, there are methodological concerns about these price comparisons, so caution should be used when using them.[14]

[14] In regard to the intercity price indexes Statistics Canada notes that

> The diverse nature of shelter means that accurate matches between cities are often difficult to make. To account for some of these difficulties, a rental equivalence approach is used to construct the Inter-city price indexes for owned accommodation. Such an approach uses market rents as an approximation to the cost of the shelter services consumed by homeowners. This approach may not be suitable for the needs of all users. For instance, since the rental equivalence approach does not represent an out-of-pocket expenditure, the indexes should not be used for measuring differences in the purchasing power of homeowners across cities (CANSIM Footnote, See Appendix Table 3f).

Chart 7: Intercity Retail Price Index for Selected Consumer Goods and Services, Combined City Average = 100, 2007



Source: Appendix Table 3f. Statistics Canada Consumer Price Index.

Overall, the picture that emerges from this snapshot of personal income in Atlantic Canada is that lower labour income, which is primarily driven by labour productivity in the long-run (Sharpe, et al, 2008a), has resulted in lower personal income. Lower labour income has been slightly offset by higher government transfers. As we will see in the next part of the report, lower productivity is the chief driver of Atlantic Canada's low standard of living, relative to Canada. If Atlantic Canadians want to improve their standard of living, productivity improvement is key.

3.5 Summary of Key Findings: The Economic Performance of Atlantic Canada

A number of key findings emerge from this examination of the economic performance of Atlantic Canada.

- GDP per capita in the Maritimes is lower than in Canada as a whole, but has improved relative to Canada since 1971, from 64 per cent of the Canadian average to 87 per cent in 2007.
- However, all of the improvement since 1990 has taken place in Newfoundland and Labrador, which experienced exceptional growth in GDP per capita starting in 1997. The Maritimes saw little gains in GDP per capita relative to Canada from 1990 to 2007.
- Since 1981, labour productivity growth, but also increasing labour force participation and employment rates, has been the main driver of real GDP per capita in Atlantic Canada. In the future, labour productivity growth will likely be an even more important source of improvement in living standards, since

there are practical limits on the increase in employment and participation rates.

- In terms of personal income per capita, instead of GDP per capita, Atlantic Canada does better relative to Canada as a whole. However, the gap in personal income reflects lower labour income, which in the long run is driven by lower labour productivity.

All of the evidence points to the importance of labour productivity as the source of future improvements in living standards in Atlantic Canada. Why the Maritimes have failed to close ground with the rest of Canada and what to do about it is the focus of the rest of this report.

4. Productivity Performance in Atlantic Canada

This part of the report explores the labour productivity performance of Atlantic Canada, in comparison to Canada as a whole and in comparison to other advanced countries including the United States. It is important to recall throughout that, with the exception of Newfoundland and Labrador, the level of GDP per capita is lower in Atlantic Canada than in the rest of Canada.

4.1. Atlantic Canada's Productivity Performance in the Canadian Context

As was the case with GDP per capita, labour productivity levels in Atlantic Canada are lower than in Canada as a whole; in recent years Newfoundland and Labrador is a striking exception (Chart 8).[15] In the late 1980s, relative levels of labour productivity in Newfoundland and Labrador, Nova Scotia, and New Brunswick were all around 90 per cent of the Canadian average; Prince Edward Island was much further behind with a relative labour productivity level of around 70 per cent. Since that time, the relative labour productivity of Newfoundland and Labrador improved dramatically, surpassing the Canadian average in 2001-02 and reaching a level 49 per cent above it in 2007.[16] Since the late 1980s, relative labour productivity levels in the Maritime provinces have stagnated.

In the previous section we saw that labour productivity in Atlantic Canada grew faster (1.52 per cent per year) than in Canada as a whole (1.28 per cent per year) over the period from 1981 to 2007 (Chart 9). There are a number of points to note about Atlantic Canada's performance. Labour productivity in Atlantic Canada grew faster in the 1980s than in Canada as a whole, but these gains were lost by 1990. From that point labour productivity in Atlantic Canada grew faster than in Canada as a whole, but this strength was the result of the exceptional growth rate of labour productivity in Newfoundland and Labrador. Labour productivity growth in the other provinces of Atlantic Canada did not keep pace with the country as whole.

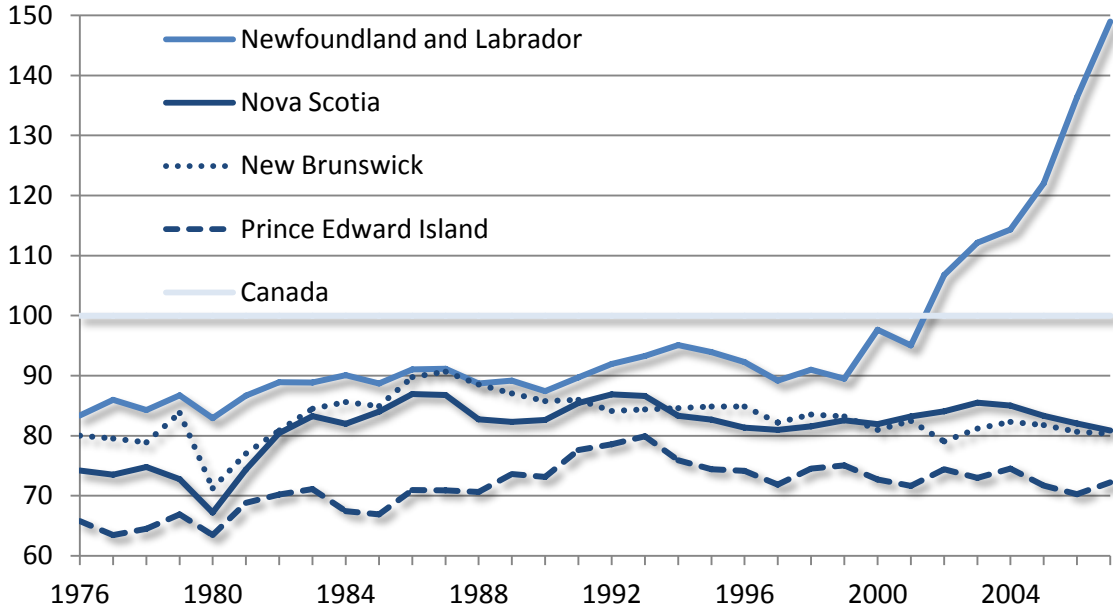
Table 4 shows the relative labour productivity performance of the Atlantic provinces. The Maritime provinces—Prince Edward Island, Nova Scotia, and New Brunswick—all had roughly the same annual growth rate, 1.24 per cent to 1.32 per cent, and these rates were relatively stable over the period. Newfoundland and Labrador saw labour productivity growth accelerate dramatically after 2000. From 1981 to 1989 labour productivity in Newfoundland and Labrador grew by 1.51 per cent per year, from 1989 to 2000 by 2.12 per cent per year, but from 2000 to 2007 growth was a very strong 3.73 per

[15] The rapid rise and then rapid fall in oil prices in 2008 will significantly affect nominal GDP in Newfoundland and Labrador. As a result, comparisons of relative levels of labour productivity in nominal terms will be affected.

[16] It is very important to bear in mind that when we compare Canada and Newfoundland and Labrador in level of productivity, we are using current dollars. Current dollar relative productivity levels reflect both volume and price changes. Price changes are not reflected in the productivity growth rates that we present in chained 2002 dollars. For this reason relative levels in current dollars will be somewhat different from relative level in chained dollars. This difference is most significant in Newfoundland and Labrador owing to significant increases in energy prices in recent years.

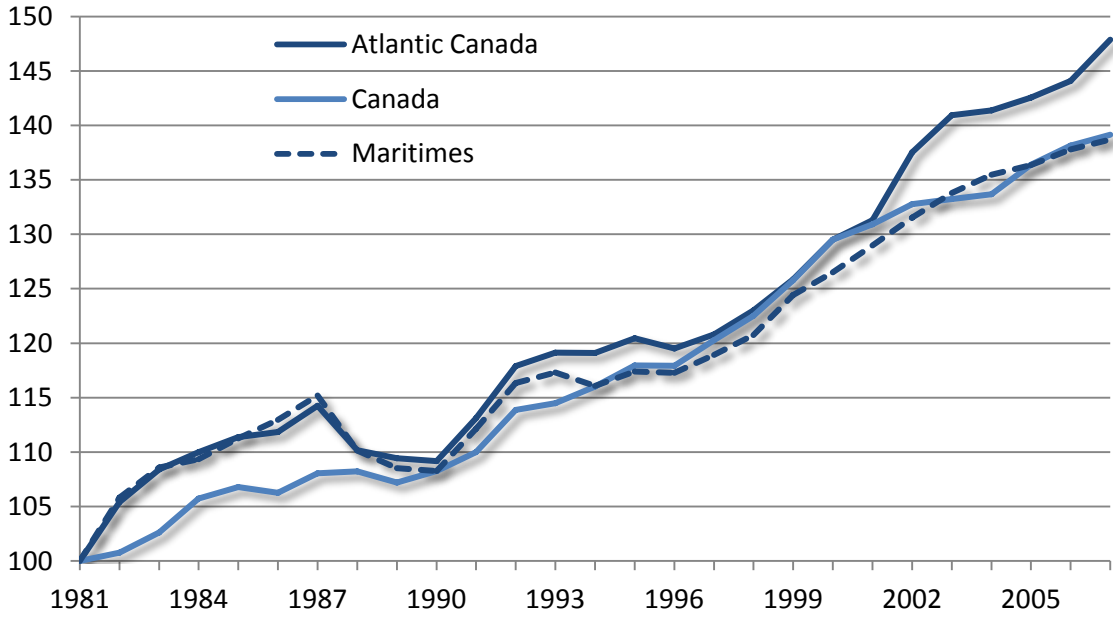
cent per year, reflecting the very large increase in output from the offshore oil and gas industry.

Chart 8: Relative Labour Productivity Levels, GDP per Hour Worked, Canada and the Atlantic Provinces, Canada = 100, 1981-2007



Source: Appendix Table 11b, calculated by CSLS from Statistics Canada National Accounts current dollar GDP estimates at market prices and Labour Force Survey estimates of hours worked.

Chart 9: Labour Productivity in Atlantic Canada, Index 1981 = 100, 1981-2007



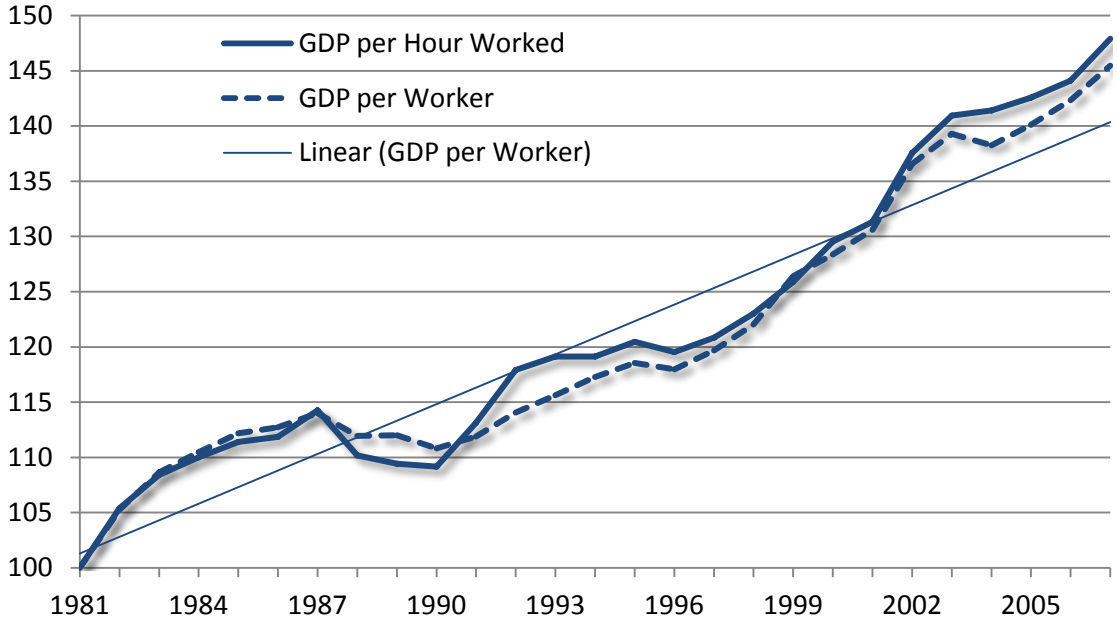
Source: Appendix Table 11c calculated by CSLS from Statistics Canada National Accounts Chained 2002 GDP estimates and Labour Force Survey estimates of hours worked.

Table 4: Summary of Atlantic Canada's Productivity Performance in the Canadian Context, Real GDP per Hour Worked, Chained 2002 Dollars, 1981-2007

	1981-2007	1981-1989	1989-2007	1989-2000	2000-2007
Canada	1.28	0.87	1.46	1.73	1.03
Newfoundland and Labrador	**2.36**	**1.51**	**2.74**	**2.12**	**3.73**
Prince Edward Island	**1.32**	**0.93**	**1.49**	**1.64**	**1.27**
Nova Scotia	**1.24**	**0.90**	**1.39**	**1.61**	**1.05**
New Brunswick	**1.29**	**1.21**	**1.33**	**1.12**	**1.67**
Quebec	1.03	0.34	1.34	1.54	1.02
Ontario	1.32	1.02	1.45	1.82	0.87
Manitoba	1.20	0.65	1.45	1.57	1.25
Saskatchewan	1.61	0.44	2.14	2.64	1.35
Alberta	1.26	1.16	1.31	1.78	0.58
British Columbia	0.44	-0.42	0.83	0.83	0.83
Atlantic Canada	**1.52**	**1.13**	**1.69**	**1.54**	**1.91**
Maritimes	**1.27**	**1.03**	**1.37**	**1.40**	**1.32**

Source: Appendix Table 11c.

Chart 10: Labour Productivity in Atlantic Canada, Under Alternative Measures of Labour Input, Index 1981 = 100, 1981-2007



Source: Appendix Tables 11c and 11d, calculated by CSLS from Statistics Canada National Accounts Chained 2002 GDP estimates and Labour Force Survey estimates of employment and hours worked.

It is worth noting that the findings about productivity growth in Atlantic Canada are not overly sensitive to whether productivity is measured on the basis of GDP per hour worked or GDP per worker over the 1981-2007 period (Chart 10). For instance, measured in GDP per hour worked labour productivity in Atlantic Canada advanced at the average annual rate of 1.52 per cent and GDP per worker grew by 1.45 per cent. This insensitivity to the definition of labour input reflects the secular stability of average hours worked per worker in Atlantic Canada over the 1981-2007 period. This relationship was somewhat less stable over shorter periods, reflecting cyclical factors like the tendency of employers to cut hours rather than employees during a downturn or to increase overtime rather than hire new staff during a boom.[17]

Overall, Atlantic Canada has not performed overly well in terms of labour productivity growth. Newfoundland and Labrador, which saw labour productivity grow, is an exception. If Atlantic Canadians, especially those in the Maritimes, want their standard of living—GDP per capita—to reach the standard of living enjoyed by the average Canadian, labour productivity growth in the Maritimes will have to accelerate relative to Canadian average labour productivity growth (see Appendix B for a discussion of the future of living standards in Atlantic Canada). Over the past 25 years labour productivity growth in Atlantic Canada has stubbornly remained at the same rate as Canada, making elusive the goal of closing the gap.

4.2. Canada's Productivity Performance in International Context

With increasing global trade, financial, and information flows, economic developments outside of Canada are increasingly relevant to Canadians. The financial crisis and economic downturn in 2008 and 2009 has served as a painful reminder of this reality. The performance of Atlantic Canada should not be assessed only in the Canadian context, but in comparison with comparable countries and regions around the world. This section situates Canada's and Atlantic Canada's productivity performance in the international context in terms of both productivity levels and growth rates.

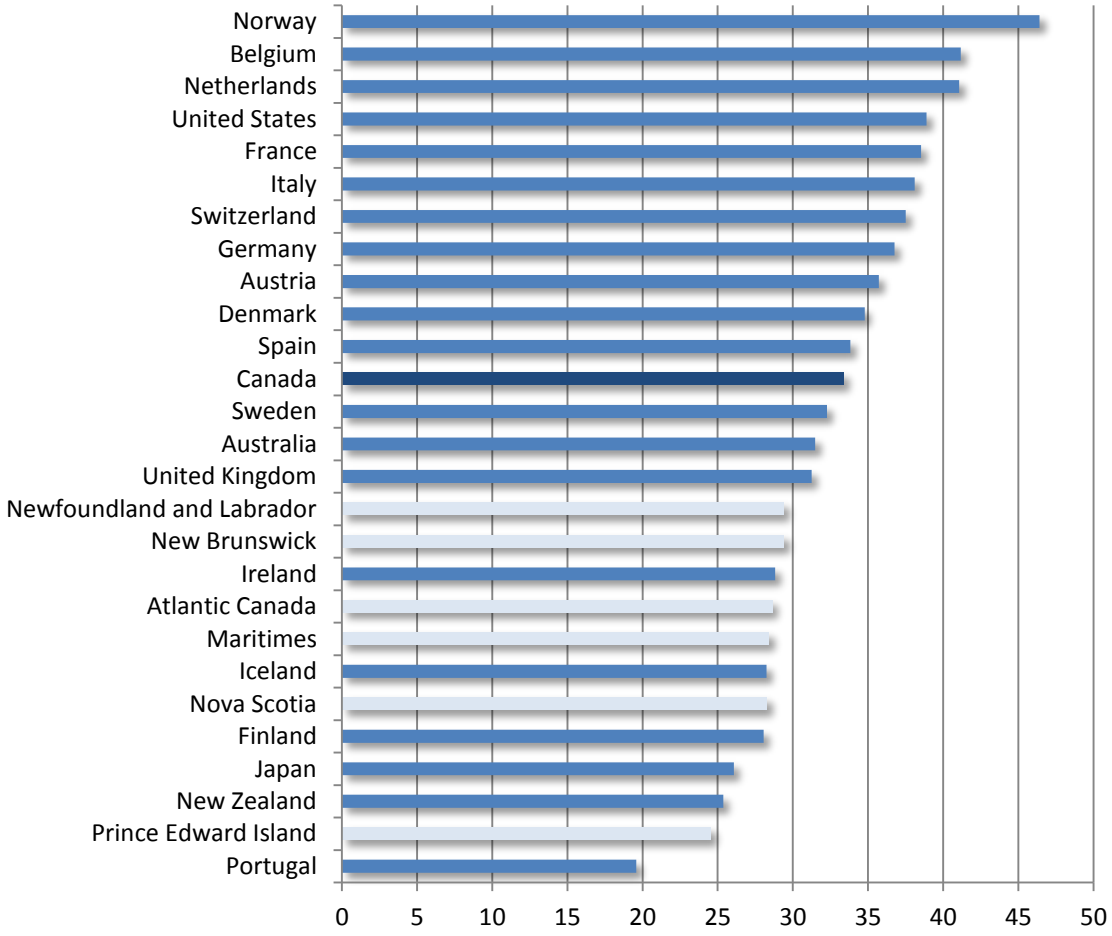
In discussion of international productivity performance, the issue of the comparability of data always arises. According to the OECD (Schreyer, 2001), differences in definitions of statistical categories and measurement techniques across countries do not result in significant differences in productivity levels and growth estimates, at least at the aggregate or total economy level. Thus, little of the variation in productivity growth rates among countries can be attributed to differences in measurement techniques. Of course, there are a large number of measurement differences, many of them offsetting.

Chart 11 and Chart 12 present estimates in US dollars of levels of total economy output per hour, based on purchasing power parities, for selected high-income countries for 1989 and 2007 respectively. These estimates are drawn from the US Conference

[17] For further discussion of new estimates of labour productivity growth in the Atlantic provinces, including a growth accounting decomposition involving multifactor productivity, labour composition and capital services, see Appendix D.

Board. Because the Conference Board does not produce estimates of labour productivity at purchasing power parity for Atlantic Canada, we have used the levels of labour productivity relative to Canada presented in Chart 8 to estimate levels of productivity for Atlantic Canada. It should be noted that these relative levels assume purchasing power parity levels in Atlantic Canada equivalent to those of the country as a whole, so the estimates are not entirely exact. As a result, Chart 11 and Chart 12should be interpreted with care.

Chart 11: Labour Productivity Levels, GDP per Hour Worked, Selected High-Income Countries and Atlantic Provinces, US Dollars at 2005 Purchasing Power Parity, 1989

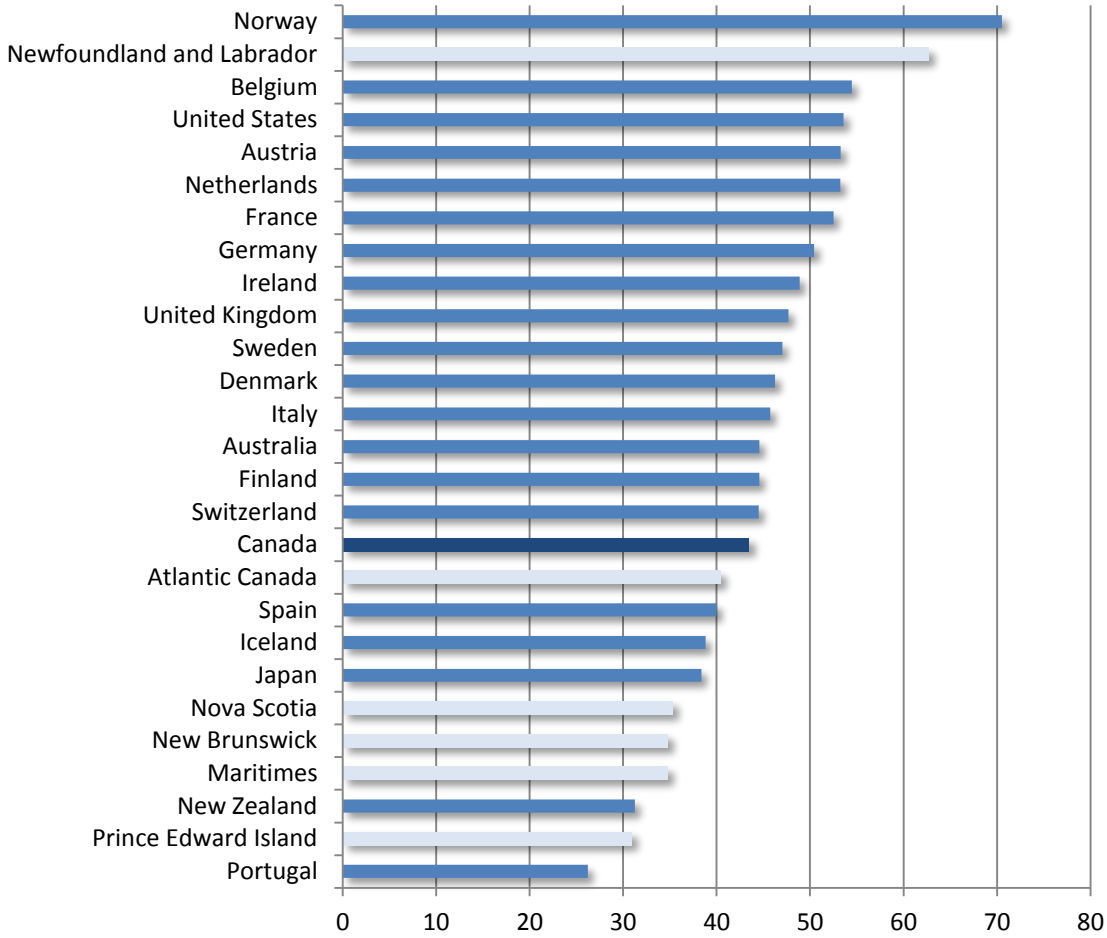


Source: Appendix Table 11j. CSLS calculations based on the Conference Board, Total Economy Database, January 2009, http://www.conference-board.org/economics. EKS purchasing power parities from the OECD.
Note: Atlantic provinces calculated using labour productivity levels in 1989 relative to Canada. Appendix Table 11f.

In 1989, Norway had by far the highest level of labour productivity, more than 50 per cent higher than Atlantic Canada. In 1989, the Atlantic provinces were all clustered together with levels of labour productivity similar to those of New Zealand, Japan,

Finland, Iceland, Ireland, and the United Kingdom. Over next 18 years some things would change, but much would remain the same.

Chart 12: Labour Productivity Levels, GDP per Hour Worked, Selected High-Income Countries and Atlantic Provinces, US Dollars at 2005 Purchasing Power Parity, 2007



Source: Appendix Table 11j. CSLS calculations based on the Conference Board, Total Economy Database, January 2009, http://www.conference-board.org/economics. EKS purchasing power parities from the OECD.
Note: Atlantic provinces calculated using labour productivity levels in 2007 relative to Canada. Appendix Table 11f.

By 2007, Norway had more than twice the level of labour productivity of the Maritimes. In 2007, Newfoundland and Labrador appeared to have labour productivity in excess of Belgium and the United States. The Maritime provinces were all clustered together with levels of labour productivity similar to those of Portugal, New Zealand, Iceland, and Spain. Since Canada is estimated to have labour productivity below most of the largest high-income countries and the Maritime provinces have levels of labour productivity below that of Canada, this international comparison reinforces the view that Atlantic Canada's productivity level is low.

Overall, it seems that the Maritimes have low levels of labour productivity when seen in the international context, and that they have failed to close this gap over the past two decades because they have experienced relatively slow labour productivity growth rates. Newfoundland and Labrador had a very different experience. It saw rapid labour productivity growth from 1989 to 2007, which resulted in a very high level of labour productivity in 2007. It is interesting to note that the Maritimes have not been able to replicate the performance of Ireland, which, in the absence of energy reserves similar to those of Newfoundland and Labrador, has been able to move from a relatively low level of labour productivity in 1989 to a relatively high level of labour productivity in 2007.

4.3. Decomposition of the Labour Productivity Level Gap between Canada and Atlantic Canada

Productivity at the aggregate provincial, regional, or national level is the result of not only what happens within a sector of the economy, say agriculture or manufacturing, but also the relative importance of these sectors in the economy. In terms of productivity levels, it is easy to see that an economy with a majority of its workforce in (lower productivity) agriculture will have a lower average level of productivity than an economy with the majority of its workforce in (higher productivity) manufacturing. By virtue of this industrial structure effect, two economies could have different levels of productivity even if they had exactly the same level of productivity in every sector.

Productivity growth rates can also be affected by industrial structure. Productivity growth can result not only from growth within sectors, but also from the reallocation of workers from low productivity sectors to high productivity sectors. This can take two forms. First, whenever there is growth in the share of hours worked in an industry with above average labour productivity, it has a positive impact on aggregate labour productivity growth. Second, a growing share of hours worked in a sector where labour productivity growth is above average will as well have a positive impact on aggregate labour productivity growth.[18]

The goal of this section is to quantify the impact of industrial structure on labour productivity in Atlantic Canada compared to Canada, both in terms of levels and growth.

4.3.1. The Industrial Structure of Atlantic Canada

Differences in industrial structure offer a potential explanation for the gap in labour productivity level between Atlantic Canada and Canada as a whole. This section will assess to what extent differences in industrial structure, defined as the distribution of hours worked across industrial sectors, affects the aggregate labour productivity level difference between the Atlantic provinces and Canada as a whole.

[18] Below the sector level this effect is replicated at each level of aggregation. Within sectors, sub-sectors (e.g. wood product manufacturing and chemical manufacturing) have different levels and growth rates of productivity. Within sub-sectors, different industry groups (e.g. within wood product manufacturing includes sawmills and wood preservation and veneer, plywood and engineered wood product manufacturing, among others) have different levels and growth rates of productivity, and so on down to the level of the individual establishment. Unfortunately, at present the limitations of the available data do not permit significant analysis at the provincial level below the sector level.

The industrial structure of Atlantic Canada is significantly different than that of the country as a whole (Table 5). In Prince Edward Island agriculture, forestry, fishing and hunting was three times more important than in Canada and twice as important as in the Maritimes as a whole. Mining, oil and gas extraction was twice as important in Newfoundland and Labrador as in Canada, but significantly less important in the Maritimes. Manufacturing was less important across Atlantic Canada, but especially in Newfoundland and Labrador and Nova Scotia. Retail trade was significantly more important in Canada than in New Brunswick and Nova Scotia, but it was especially important in Newfoundland and Labrador. Transportation and warehousing was a notably larger sector in New Brunswick, probably reflecting the province's geographic location as the land link between Atlantic Canada and the rest of North America. Finance, insurance, real estate rental and leasing and professional, scientific and technical services were notably less important in Atlantic Canada than in Canada as a whole, although, to some extent, Nova Scotia was an exception, likely reflecting the role of Halifax as a regional service hub. Finally, public administration was significantly more important in Atlantic Canada than in Canada as a whole, a point we will return to below.

Table 5: Industrial Structure, Share of Hours Worked by Sector, Per Cent, 2004

	Canada	Newfound-land and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Atlantic Canada	Maritimes
Agriculture, Forestry, Fishing, and Hunting	3.1	2.6	9.9	3.9	4.6	4.2	4.6
Mining and Oil and Gas Extraction	1.3	2.5	0.0	0.7	0.9	1.1	0.7
Utilities	0.8	1.3	0.5	0.7	1.0	0.9	0.8
Construction	7.0	7.3	7.5	7.6	6.7	7.3	7.3
Manufacturing	13.8	9.7	13.1	9.6	12.4	10.8	11.1
Wholesale Trade	6.1	4.1	3.5	5.1	4.5	4.6	4.8
Retail Trade	10.7	15.4	10.5	12.8	12.4	13.0	12.5
Transportation and Warehousing	5.6	6.0	3.6	5.4	7.3	6.0	6.0
Information and Cultural Industries	2.6	2.1	1.3	2.1	1.8	2.0	1.9
Finance, Insurance, and Real Estate	6.6	3.7	3.9	5.0	4.2	4.4	4.6
Professional, Scientific, and Technical Services	6.0	3.9	2.9	4.6	3.3	3.9	3.9
Administrative, Waste, and Remediation	4.4	2.4	3.0	4.1	5.2	4.0	4.4
Education Services	5.4	6.7	5.8	6.1	4.8	5.8	5.5
Health Care and Social Assistance	8.3	10.9	9.9	10.1	10.0	10.2	10.0
Arts, Entertainment, and Recreation	2.0	1.0	1.7	1.7	1.4	1.5	1.6
Accommodation and Food Services	6.2	6.6	7.8	6.3	6.3	6.5	6.4
Other Services	5.5	6.2	5.6	5.8	6.1	6.0	5.9
Public Administration	4.9	7.6	9.4	8.4	7.1	7.8	7.9

Source: Appendix Table 19h. Author's calculations based on Canadian Productivity Accounts estimates.

The second aspect of industrial structure is differences in labour productivity within sectors, but across provinces. At the aggregate level, labour productivity in Atlantic Canada was 86.2 per cent of the Canadian level in 2004; in the Maritimes it was lower at 79.5 per cent (Table 6). Newfoundland and Labrador had labour productivity above the national average in a number of sectors, but especially in agriculture, forestry, fishing and hunting and in mining and oil and gas extraction. These differences within

sectors across provinces probably reflects differences in industrial structure within these sectors, e.g. fishing is probably far more important in Newfoundland and Labrador than in Canada as a whole, and it therefore affects the estimates of labour productivity in the aggregate agriculture, forestry, fishing and hunting sector. Similarly, the extremely high productivity of offshore oil, relative to oil sands, probably explains much of Newfoundland and Labrador's higher productivity in this sector.

Table 6: Sector Relative Labour Productivity Levels in Atlantic Canada, Current Dollars of GDP per Hour Worked, 2004

	Canada	Newfound-land and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Atlantic Canada	Maritimes
	$	Relative to Canada = 100					
All Industries	*39.2*	113.2	71.2	81.2	79.1	86.2	79.5
Agriculture, Forestry, Fishing, and Hunting	*30.2*	150.5	85.9	84.5	92.4	95.7	88.0
Mining and Oil and Gas Extraction	*223.6*	271.8	10.7	99.6	26.4	158.7	63.6
Utilities	*139.9*	86.1	53.4	82.5	89.1	85.0	84.6
Construction	*34.0*	81.3	61.4	79.5	85.3	80.5	80.3
Manufacturing	*48.2*	50.9	56.1	88.7	86.2	78.6	84.6
Wholesale Trade	*36.6*	91.2	72.1	81.9	104.2	90.4	90.2
Retail Trade	*21.9*	70.9	92.6	83.9	79.6	80.0	82.7
Transportation and Warehousing	*34.1*	64.5	62.4	71.7	70.6	69.5	70.7
Information and Cultural Industries	*58.1*	109.1	128.8	97.6	98.3	101.6	99.5
Finance, Insurance, and Real Estate	*73.3*	90.2	89.0	93.1	94.2	92.7	93.3
Professional, Scientific, and Technical Services	*32.2*	86.0	74.7	75.4	86.6	80.6	79.3
Administrative, Waste, and Remediation	*23.0*	84.5	74.5	84.4	69.2	77.5	76.5
Education Services	*36.8*	107.0	99.3	90.4	106.1	99.1	96.8
Health Care and Social Assistance	*32.9*	101.7	91.5	89.0	78.3	88.4	84.8
Arts, Entertainment, and Recreation	*21.1*	76.2	88.2	70.6	74.7	73.9	73.6
Accommodation and Food Services	*15.5*	83.2	89.2	88.8	80.5	85.0	85.5
Other Services	*19.3*	77.4	76.9	76.9	75.4	76.5	76.3
Public Administration	*48.3*	94.8	87.5	88.9	93.4	91.2	90.4

Source: Appendix Table 19i. Author's calculations based on Canadian Productivity Accounts estimates.

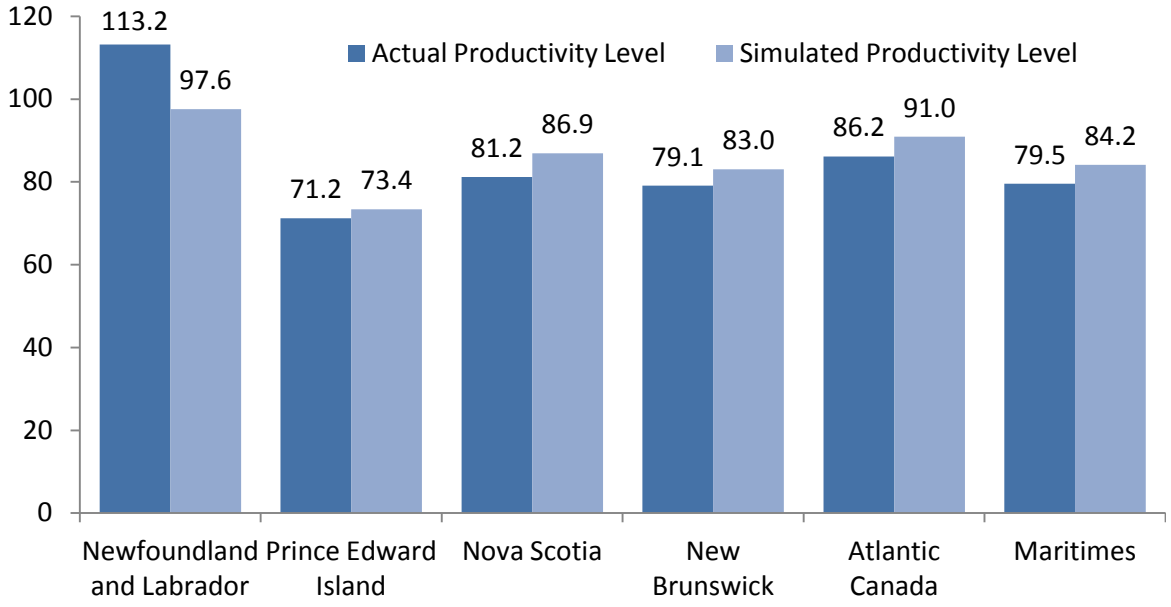
4.3.2. The Impact of Industrial Structure on Labour Productivity Level Differences

In this section we run a simulation to assess the impact of industrial structure on the gap in labour productivity levels between Canada and the Atlantic provinces in current dollar terms. The simulation uses Statistics Canada estimates of current dollar GDP and hours worked for 2004, the latest year for which current dollar GDP estimates were available. We simulate the effect on aggregate labour productivity levels in the Atlantic provinces by applying the distribution of hours worked by sector that prevailed in Canada in 2004, while retaining the levels of labour productivity that prevailed in each individual sector in Atlantic Canada (or individual provinces) in 2004.

The effect of the simulation is to significantly reduce the gap in aggregate productivity levels between the Atlantic Canada and Canada as a whole (Chart 13 and

Chart 14), suggesting that the industrial structure of Atlantic Canada is adversely affecting its level of labour productivity relative to Canada as a whole. It is important to distinguish that differences in industrial structure have opposite effects in Newfoundland and Labrador and the Maritimes. In Newfoundland and Labrador, industrial structure has a strong positive effect on the relative labour productivity level. This effect results entirely from the higher share of hours worked in the mining and oil and gas sector and the very high level of productivity in this sector in Newfoundland and Labrador relative to its level in Canada. In our simulation, if Newfoundland and Labrador had Canada's industrial structure, labour productivity would actually be below the Canadian average. In reality, labour productivity was 13.2 per cent higher in 2004.

Chart 13:Simulated Labour Productivity Level Assuming Canada's Employment Structure in Atlantic Provinces, Current Dollars per Hour Worked, Canada = 100, 2004



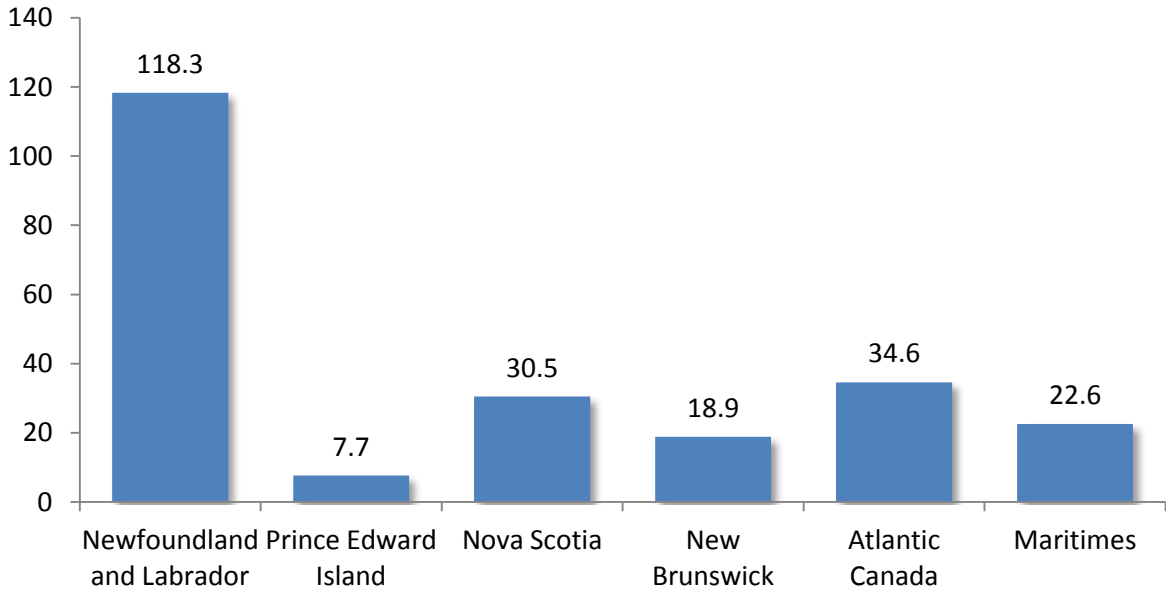
Source: CSLS calculations on Statistics Canada estimates of GDP and hours worked. Appendix Table 19g.
Note: Labour productivity levels are GDP in current dollars divided by hours worked.

In the Maritimes, the effect of industrial structure on the relative level of labour productivity is negative. While in 2004, the Maritimes had a level of aggregate labour productivity that was 79.5 per cent the level of Canada, after applying Canada's industrial structure, the Maritime's level of aggregate productivity would have been 84.2 per cent. Industrial structure thus explains 22.6 per cent of the gap in aggregate labour productivity levels between Canada as a whole and the Maritimes.

In the Maritimes most of the difference in labour productivity levels caused by industrial structure can be explained by sectors that have both a higher than average level of labour productivity relative to the all industries average for Canada, and a smaller share of hours worked than in Canada (Chart 15). The four sectors that fall into the category are mining and oil and gas; finance, insurance, real estate rental and leasing (FIRE); the information and cultural industries; and manufacturing. On the other hand, a number of sectors contribute to the labour productivity gap because they have a relatively low level of

labour productivity compared to the average for all industries in Canada, and they have a higher share of hours worked in the Maritimes than in the rest of Canada. The sectors that contribute most significantly to the gap in this category are retail trade; agriculture, forestry, fishing and hunting; healthcare and social assistance; and other services.

Chart 14: Percentage of Gap in Labour Productivity Levels Explained by Differences in Industrial Structure, Atlantic Provinces, Per Cent, 2004



Source: CSLS calculations on Statistics Canada estimates of GDP and hours worked. Appendix Table 19g.
Note: Labour productivity levels are GDP in current dollars divided by hours worked.

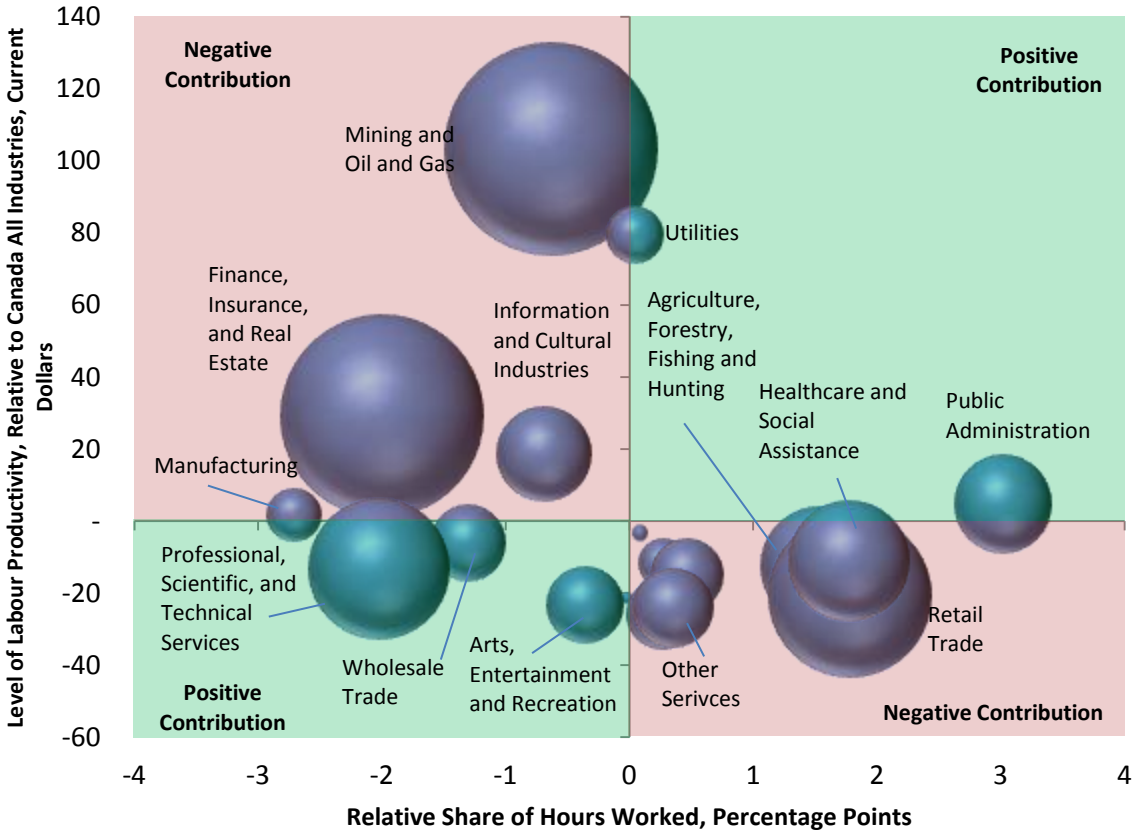
Some sectors of the economy actually contributed to closing the labour productivity gap with Canada, but their contribution was more than offset by the sectors that contributed to the gap, mentioned above. In this positive category were professional, scientific, and technical services; wholesale trade; and arts, entertainment and recreation. In all cases, these sectors had below average levels of labour productivity, but also had smaller shares of hours worked in the Maritimes than in the rest of Canada. Only public administration and utilities had higher levels of labour productivity than the Canadian all industries average and had higher shares of hours worked in the Maritimes than in the rest of Canada. They therefore helped to close the gap.

Prince Edward Island had a significantly lower level of labour productivity than Canada as a whole. Only 7.7 per cent of this difference was explained by differences in industrial structure (Chart 16). The negative effect of the industrial structure of Prince Edward Island on labour productivity levels was explained primarily by the higher share of hours worked in the relatively low productivity agriculture, forestry, hunting and fishing sector. The small shares of hours worked in the relatively high productivity finance, insurance and real estate, and information and cultural sectors also contributed to the gap.

Just over 30 per cent of the labour productivity level gap between Canada and Nova Scotia is explained by differences in industrial structure. Nova Scotia's lower-than-

average level of labour productivity in 2004 was largely explained by relatively small shares of hours worked allocated to the high productivity mining and oil and gas extraction and the finance, insurance and real estate sector. Larger shares of hours in lower productivity sectors like retail trade and healthcare and social assistance also played a role.

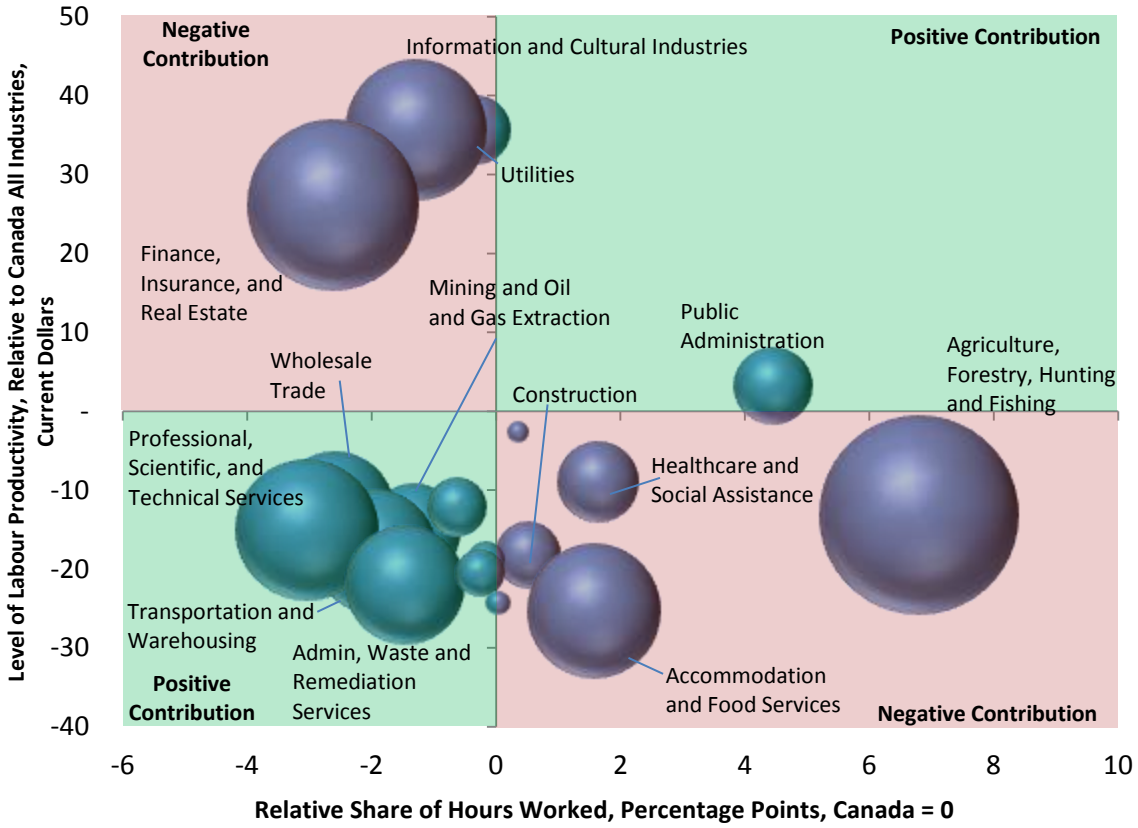
Chart 15: Contribution of Sectors to Relative Labour Productivity Level, The Maritimes, 2004



Source: Appendix Table 19f2. CSLS calculations on Statistics Canada estimates of GDP and hours worked.
Note: Size of bubble indicates the contribution. The horizontal axis indicates the percentage difference between the province and Canada as a whole in terms of share of hours worked. The vertical axis indicates the difference in current dollars between the productivity level of the sector in the province or region and the all industries productivity level for Canada.

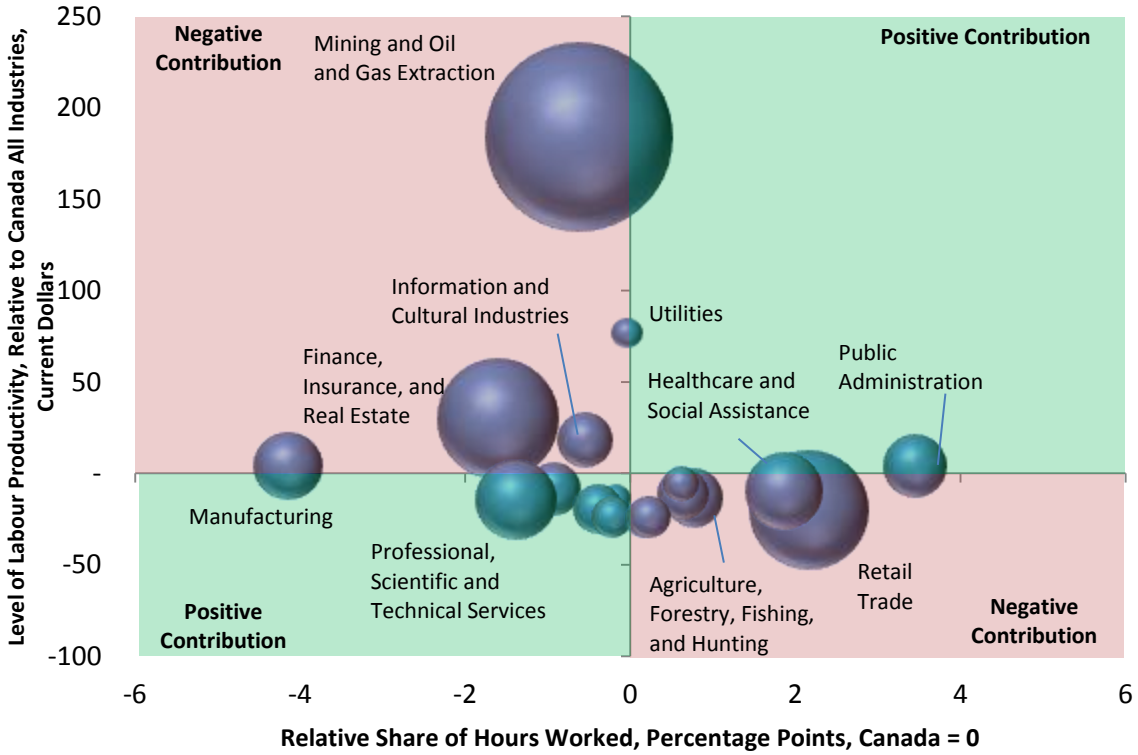
Almost 20 per cent of the labour productivity gap between Canada and New Brunswick can be explained by differences in industrial structure. A smaller share of hours devoted to finance, insurance and real estate was a key explanation for the gap, as were larger shares of hours in retail trade; healthcare and social assistance; and transportation and warehousing (Chart 18). Higher than average shares of hours worked in high-productivity utilities and public administration, as well as a relatively low share of hours worked in low-productivity professional scientific and technical services all contributed to narrowing the gap.

Chart 16: Contribution of Sectors to Relative Labour Productivity Level, Prince Edward Island, 2004



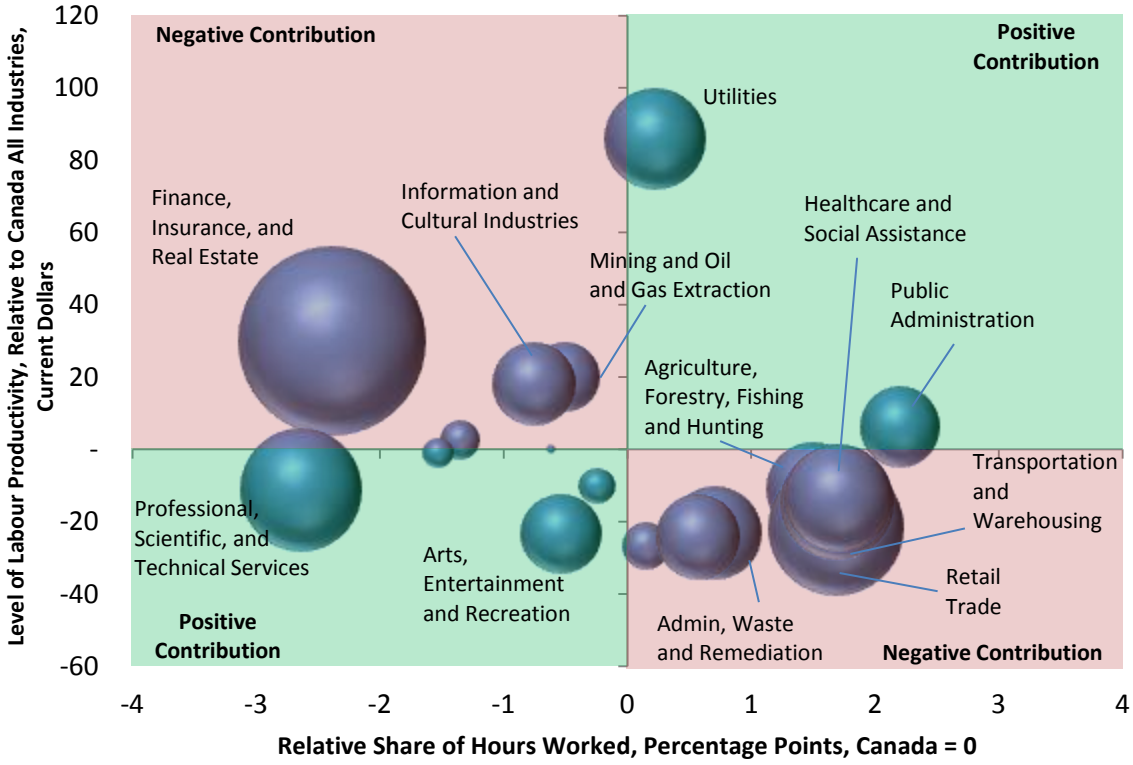
Source: Appendix Table 19b2. CSLS calculations on Statistics Canada estimates of GDP and hours worked.
Note: See Chart 15 for an explanation of how to interpret each axis and the size of the bubbles.

Chart 17: Contribution of Sectors to Relative Labour Productivity Level, Nova Scotia, 2004



Source: Appendix Table 19c2. CSLS calculations on Statistics Canada estimates of GDP and hours worked.
Note: See Chart 15 for an explanation of how to interpret each axis and the size of the bubbles.

Chart 18: Contribution of Sectors to Relative Labour Productivity Level, New Brunswick, 2004



Source: Appendix Table 19d2. CSLS calculations on Statistics Canada estimates of GDP and hours worked.
Note: See Chart 15 for an explanation of how to interpret each axis and the size of the bubbles.

What conclusions can we draw from this examination of the impact of industrial structure on labour productivity levels in Atlantic Canada?

- Industrial structure is an important explanation for differences in labour productivity levels between Canada and Atlantic Canada, but its importance varies from province to province. On average industrial structure explains just over one-third of the difference in labour productivity levels between Atlantic Canada and Canada as a whole.

- Most of the gap between Canada and Atlantic Canada related to industrial structure can be explained by the smaller shares of hours worked in high-productivity mining and oil and gas extraction (almost half) and finance, insurance, real estate rental and leasing (FIRE) (one-third); and the larger share of hours worked in low-productivity retail trade.

- All of Newfoundland and Labrador's relatively high level of labour productivity can be explained by its orientation toward the mining and oil and gas sector, which is highly productive.

- Industrial structure is not a substantial explanation for why Prince Edward Island's level of labour productivity is almost 30 per cent below that of Canada as a whole.

- Industrial structure explains about 30 per cent of the labour productivity gap with Canada in Nova Scotia. The below average share of hours worked in the high-productivity mining and oil and gas and FIRE sectors, and the relatively large amount of hours worked in retail, which is relatively low productivity, are the principal explanations for the gap resulting from industrial structure.

- Industrial structure in New Brunswick explained about 20 per cent of the gap in labour productivity with Canada. Below average shares of hours worked in high-productivity FIRE and low-productivity professional, scientific and technical services were important factors. Relatively high shares of hours worked in low-productivity healthcare and social assistance; transportation and warehousing; and retail trade also widened the gap.

4.3.2. The Impact of Within-Sector Labour Productivity Level Differences on the Aggregate Labour Productivity Level Gap

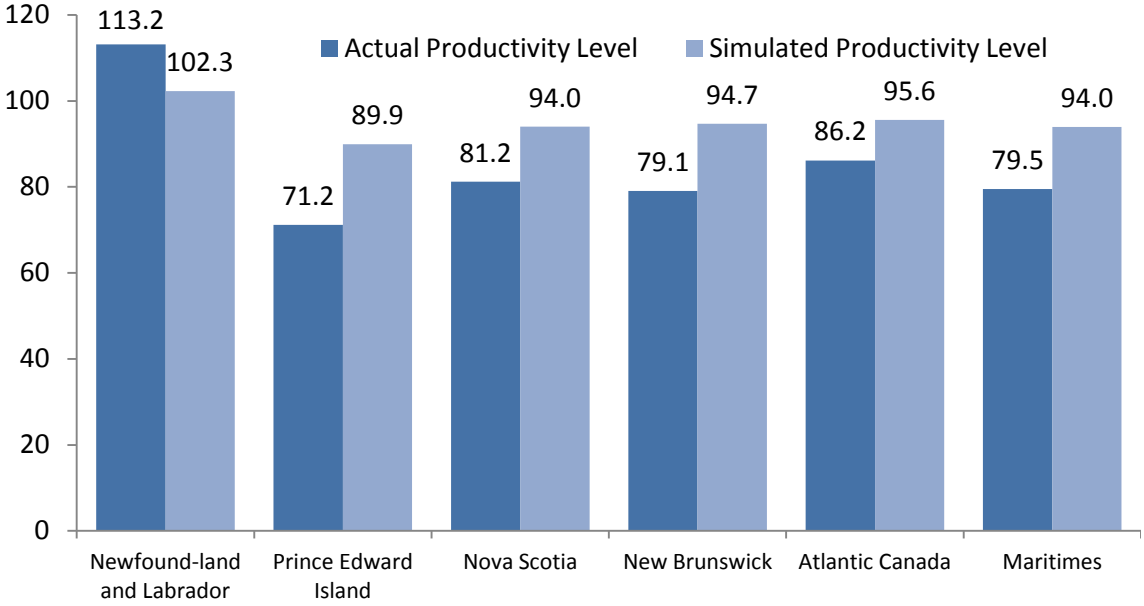
While industrial structure can explain some of the gap in labour productivity levels between Canada and the Atlantic provinces, a more important explanation is that the same sectors in Atlantic Canada, with a few notable exceptions, are less productive than in the rest of Canada. One caveat is that these within-sector gaps may be the result of differences in industrial structure within sectors. For example, the manufacturing sector in Atlantic Canada may be quite different in terms of the relative importance of the constituent sub-sector (eg. wood product manufacturing, food manufacturing). Due to a lack of detail in the available data on productivity by sector, we are unable to quantify these effects.

In order to isolate the effect of within-sector differences in labour productivity on each province's level of aggregate labour productivity, we ran a simulation in which each sector in each province was assumed to have the average level of labour productivity in that sector in Canada. These labour productivity levels were multiplied by the actual hours worked in each sector in each province to generate GDP levels. These were summed to produce a simulated level of aggregate GDP, which was then divided by actual total hours worked in the province to produce a simulated level of aggregate labour productivity. This simulation was undertaken in current dollars for the year 2004, the latest year for which data were available at the time this report was prepared.

As with the industrial structure simulation, our within-sector level effect simulation has the effect of reducing labour productivity in Newfoundland and Labrador and raising it in every other province (Chart 19). Within-sector level differences are a much more important explanation for the aggregate labour productivity level gap between Canada and the Atlantic provinces than difference in industrial structure (Chart 20). Lower levels of labour productivity within sectors explained between 65.1 per cent

(PEI) and 82.5 per cent (Newfoundland and Labrador) of the difference in labour productivity between Canada and the Atlantic provinces (Table 7).[19]

Chart 19: Simulated Labour Productivity Level Assuming Canada's Level of Labour Productivity by Sector in Atlantic Provinces, Current Dollars per Hour Worked, Canada = 100, 2004



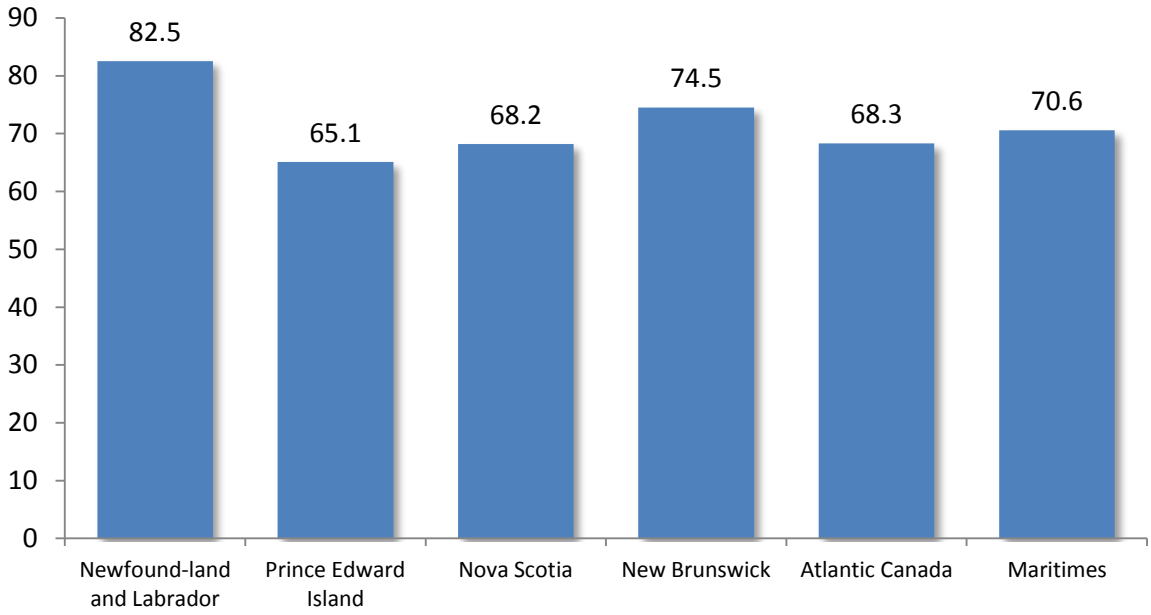
Source: CSLS calculations on Statistics Canada estimates of GDP and hours worked. Appendix Table 19h.
Note: Labour productivity levels are GDP in current dollars divided by hours worked.

In Newfoundland and Labrador, where labour productivity was actually 13.2 per cent higher than in Canada, this difference was entirely explained by the higher level of labour productivity in mining and oil and gas extraction. A higher level of labour productivity in agriculture, forestry, fishing and hunting also contributed to the positive gap. On the other hand, if it had not been for the mining and oil and gas extraction sector Newfoundland and Labrador would not have fared so well. Labour productivity levels in most sectors were well below the national average. Labour productivity was particularly low in manufacturing (49 per cent below the Canadian level) and retail trade (29 per cent below).

In Prince Edward Island, only the information and cultural industries had a higher level of labour productivity than in Canada as a whole. Every other sector of the economy saw lower levels of labour productivity. Sectors making particularly large contributions to the labour productivity gap with Canada were manufacturing (37.8 per cent of the gap) and construction (13.4 per cent of the gap).

[19] Since industrial structure explained 118 per cent of the gap between Newfoundland and Labrador and Canada and within-sector productivity differences explained 82.5 per cent of the gap, it appears that the gap is over-explained by these two simulations when considered together. For mathematical reasons, there is an interaction term that affects Newfoundland and Labrador in particular, but the other provinces as well. This interaction effect reflects the combined impact of within-sector and industrial structure differences. The interaction effect is particularly strong (and negative) in Newfoundland and Labrador largely because of the very high level of productivity in oil and gas extraction relative to Canada.

Chart 20: Percentage of Gap in Aggregate Labour Productivity Levels Explained by Differences in Labour Productivity Within Sectors, Atlantic Provinces, Per Cent, 2004



Source: CSLS calculations on Statistics Canada estimates of GDP and hours worked. Appendix Table 19h.
Note: Labour productivity levels are GDP in current dollars divided by hours worked.

In Nova Scotia no sector of the economy had a higher level of labour productivity than Canada as a whole. Major contributing sectors to the gap were construction (10.6 per cent), manufacturing (10.4 per cent), transportation and warehousing (10.3 per cent), retail trade (9.0 per cent), public administration (8.9 per cent), healthcare and social assistance (7.3 per cent), and professional scientific and technical services (7.2 per cent).

In New Brunswick only wholesale trade and educational services saw higher labour productivity levels than in Canada. The major contributions to the gap were mining and oil and gas extraction (22.9 per cent) manufacturing (13.4 per cent), healthcare and transportation and warehousing (11.9 per cent), healthcare and social assistance (11.6 per cent), and retail trade (9.0 per cent).

For the Maritimes as a whole, the explanation for low levels of labour productivity is widespread across sectors. Owing to a combination of size (share of hours worked) and the magnitude of the labour productivity gap, a number of sectors are especially worrisome.

- Every Atlantic province, especially Newfoundland and Labrador and Prince Edward Island, had low manufacturing labour productivity.
- New Brunswick had low labour productivity in mining and oil and gas extraction.
- All provinces had relatively low labour productivity in construction.
- All provinces had low labour productivity in transportation and warehousing.
- Every province except PEI had low labour productivity in retail trade.

Table 7: Impact of Within-Sector Differences on Labour Productivity, Atlantic Provinces, 2004

	Canada	Newfound-land and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Atlantic Canada	Maritimes
Actual	39.23	44.40	27.93	31.86	31.02	33.81	31.21
Gap with Canada							
Current Dollars per Hour	-	5.17	(11.31)	(7.37)	(8.21)	(5.42)	(8.03)
Percentage	-	13.2	(28.8)	(18.8)	(20.9)	(13.8)	(20.5)
Canada = 100	100.0	113.2	71.2	81.2	79.1	86.2	79.5
Simulated	39.23	40.13	35.29	36.89	37.14	37.51	36.87
Gap with Canada							
Current Dollars per Hour	-	0.90	(3.94)	(2.34)	(2.09)	(1.72)	(2.36)
Percentage	-	2.3	(10.1)	(6.0)	(5.3)	(4.4)	(6.0)
Canada = 100	100.0	102.3	89.9	94.0	94.7	95.6	94.0
Change in Gap with Canada							
Current Dollars per Hour	-	4.26	(7.36)	(5.03)	(6.12)	(3.71)	(5.66)
Percentage	-	10.9	(18.77)	(12.82)	(15.60)	(9.45)	(14.44)
Per Cent of Gap with Canada Explained	-	82.5	65.1	68.2	74.5	68.3	70.6
Actual Relative Level of Labour Productivity							
All Industries		13.2	(28.8)	(18.8)	(20.9)	(13.8)	(20.5)
Agriculture, Forestry, Fishing, and Hunting		50.5	(14.1)	(15.5)	(7.6)	(4.3)	(12.0)
Mining and Oil and Gas Extraction		171.8	(89.3)	(0.4)	(73.6)	58.7	(36.4)
Utilities		(13.9)	(46.6)	(17.5)	(10.9)	(15.0)	(15.4)
Construction		(18.7)	(38.6)	(20.5)	(14.7)	(19.5)	(19.7)
Manufacturing		(49.1)	(43.9)	(11.3)	(13.8)	(21.4)	(15.4)
Wholesale Trade		(8.8)	(27.9)	(18.1)	4.2	(9.6)	(9.8)
Retail Trade		(29.1)	(7.4)	(16.1)	(20.4)	(20.0)	(17.3)
Transportation and Warehousing		(35.5)	(37.6)	(28.3)	(29.4)	(30.5)	(29.3)
Information and Cultural Industries		9.1	28.8	(2.4)	(1.7)	1.6	(0.5)
Finance, Insurance, and Real Estate		(9.8)	(11.0)	(6.9)	(5.8)	(7.3)	(6.7)
Professional, Scientific, and Technical Services		(14.0)	(25.3)	(24.6)	(13.4)	(19.4)	(20.7)
Administrative, Waste, and Remediation		(15.5)	(25.5)	(15.6)	(30.8)	(22.5)	(23.5)
Education Services		7.0	(0.7)	(9.6)	6.1	(0.9)	(3.2)
Health Care and Social Assistance		1.7	(8.5)	(11.0)	(21.7)	(11.6)	(15.2)
Arts, Entertainment, and Recreation		(23.8)	(11.8)	(29.4)	(25.3)	(26.1)	(26.4)
Accommodation and Food Services		(16.8)	(10.8)	(11.2)	(19.5)	(15.0)	(14.5)
Other Services		(22.6)	(23.1)	(23.1)	(24.6)	(23.5)	(23.7)
Public Administration		(5.2)	(12.5)	(11.1)	(6.6)	(8.8)	(9.6)
Contribution to Gap, Per Cent							
All Industries		100.0	100.0	100.0	100.0	100.0	100.0
Agriculture, Forestry, Fishing, and Hunting		9.4	5.7	3.6	1.7	1.5	3.0
Mining and Oil and Gas Extraction		224.3	1.1	0.1	22.9	(38.1)	10.5
Utilities		(5.9)	4.3	3.6	2.5	5.3	3.2
Construction		(10.8)	13.4	10.6	5.5	13.0	8.6
Manufacturing		(53.9)	37.8	10.4	13.4	30.0	14.5
Wholesale Trade		(3.1)	4.8	6.8	(1.1)	4.4	3.0
Retail Trade		(22.9)	2.3	9.0	9.0	15.4	8.3
Transportation and Warehousing		(17.0)	6.3	10.3	11.9	16.9	10.6
Information and Cultural Industries		2.7	(3.0)	0.6	0.3	(0.5)	0.1
Finance, Insurance, and Real Estate		(6.3)	4.3	5.0	2.9	6.3	4.0
Professional, Scientific, and Technical Services		(4.1)	3.2	7.2	2.3	6.6	4.6
Administrative, Waste, and Remediation		(2.0)	2.4	2.9	6.0	5.6	4.2
Education Services		4.0	0.2	4.3	(1.8)	0.5	1.1
Health Care and Social Assistance		1.5	3.8	7.3	11.6	10.5	8.9
Arts, Entertainment, and Recreation		(1.2)	0.6	2.1	1.2	2.2	1.6
Accommodation and Food Services		(4.0)	1.8	2.2	3.1	4.0	2.6
Other Services		(6.4)	3.4	5.1	4.8	7.3	4.8
Public Administration		(4.5)	7.7	8.9	3.7	8.9	6.5

Sources:
CSLS calculations based on Statistics Canada estimates presented in Appendix Table 19h.
Estimates of hours worked are drawn from Statistics Canada's Productivity Accounts. Estimates of GDP are drawn from unpublished National Accounts data. The estimates for all industries and finance, real estate, rental and leasing do not include the imputed rent of owner occupied housing, since estimates of the hours worked in this industry are not available.

4.3.3. The Impact of the Reallocation of Labour across Sectors on Labour Productivity Growth in Atlantic Canada

Aggregate labour productivity growth is determined by both productivity growth within a sector and the reallocation of the share of hours worked between sectors. This section of the report analyzes absolute and relative importance of these effects in Canada and the Atlantic provinces for the 2000-2007 period.[20]

We call the effect on aggregate labour productivity growth of labour productivity growth within a sector the within-sector effect. This effect captures the change in labour productivity within a sector, for instance, when new technology allows a worker to produce twice as many barrels of oil.

The reallocation effect has two aspects, a level effect and a growth effect. The reallocation level effect indicates whether changes in the share of hours worked have favoured sectors with above- or below-average labour productivity levels. The reallocation growth effect[21] measures whether an economy is subject to a phenomenon akin to Baumol's cost disease, i.e. the tendency of labour to move towards sectors with relatively small absolute increases in labour productivity. A negative reallocation growth effect at the aggregate level means that labour is moving to sectors with relatively smaller absolute labour productivity increases.[22]

Table 8 provides estimates of the total contributions to aggregate labour productivity growth from these effects in both absolute and relative terms for the period 2000-2007. While data are available to allow a comparison over the period 1997-2007, the 2000-2007 is used because it reduces the impact of business cycle variation on this analysis, since both 2000 and 2007 were cyclical peak years. Appendix Tables 18-18d provide estimates of the sectoral contributions to aggregate labour productivity growth from the different effects. The focus of the discussion in this section will be on Table 8.

Based on the estimates used for this analysis, which are somewhat different than the labour productivity growth estimates used earlier, for Canada as a whole, the average annual rate of labour productivity growth in the 2000-2007 period was 0.90 per cent per year. Of this growth rate, 0.83 percentage points or 91.9 per cent was due to the within-sector effect, that is, productivity growth within the 18 sectors; 0.09 percentage points or 9.5 per cent was due to the reallocation level effect, and -0.14 percentage points or -15.6 per cent was due to the reallocation growth effect. The total reallocation effect is the sum

[20] For a more technical discussion of the analytical framework used in this section, see Appendix A.
[21] The reallocation growth effect is the sum of the product of the absolute change in the share of hours worked and the absolute change in the labour productivity level (in constant dollars) for each of the sectors.
[22] There are some limitations to this analysis. First, the analysis assumes that differences in technological, institutional, and market structures across sectors lead to differences in average levels of labour productivity, even if marginal products are the same. It also assumes that when a sector loses or gains labour, the changes in output per hour are equal to the sector's average output per hour worked. Second, these results are sensitive to the level of disaggregation. For instance, we use 18 sectors. If within a sector, resources shift from one subsector to another, and these subsectors have different levels of labour productivity, then the measured impact of the reallocation effect on aggregate labour productivity growth would be different.

of the reallocation level and growth effects and was -0.05 percentage points or -6.1 per cent.

Table 8: Decomposition of Aggregate Labour Productivity Growth by Province into Within-Sector and Reallocation Effects, 2000-2007

	Average Annual Growth Rate	Contribution to Labour Productivity Growth							
		Within-Sector Effect[1]		Reallocation Level Effect[2]		Reallocation Growth Effect[3]		Total Reallocation Effect	
	Per Cent	Percentage Points	Per Cent	Percentage Points	Per Cent	Percentage Points	Per Cent	Percentage Points	Per Cent
Canada	0.90	0.83	91.9	0.09	9.5	- 0.14	- 15.6	- 0.05	- 6.1
Newfoundland and Labrador	3.65	2.39	65.3	0.58	16.0	0.37	10.1	0.95	26.0
Prince Edward Island	1.42	1.52	107.5	0.15	10.5	- 0.52	- 36.9	- 0.37	- 26.4
Nova Scotia	1.34	1.14	85.0	0.14	10.5	- 0.16	- 12.1	- 0.02	- 1.6
New Brunswick	1.59	1.53	95.8	0.03	2.0	- 0.19	- 11.7	- 0.15	- 9.7

Source: Appendix Tables 18-18d. CSLS calculations based on Statistics Canada estimates from the National Accounts.

Notes:

1. The contribution of labour productivity growth within the sector to aggregate labour productivity growth.

2. The contribution of changes in the share of hours worked between sectors to aggregate labour productivity growth.

3. The reallocation growth effect is the sum of the product of the absolute change in the share of hours worked and the absolute change in the labour productivity level for each of the sectors. It measures whether an economy is subject to Baumol's cost disease, i.e. the tendency of factors of production to move into sectors with relatively small absolute increases in productivity.

Figures may not sum exactly due to the non-additivity of chained-dollar GDP across sectors.

Across the Atlantic provinces the within-sector effect was of variable importance. In absolute terms, it was most important in Newfoundland and Labrador, where it contributed 2.39 percentage points of the 3.65 per cent average annual growth rate of labour productivity. This significant contribution reflects strong productivity gains within sectors in Newfoundland and Labrador. Prince Edward Island and New Brunswick saw roughly identical absolute within-sector effects of 1.5 percentage points; in both cases this accounted for all of the labour productivity growth in those provinces. In Nova Scotia, the absolute within-sector effect on aggregate labour productivity was smaller, closer to one percentage point, but it also explained almost all labour productivity growth in the provinces, given Nova Scotia's slower rate of labour productivity in 2000-2007 relative to the other Atlantic provinces.

Reallocation effects were small in Nova Scotia and New Brunswick but offered a much more important explanation for labour productivity growth in Newfoundland and Labrador and Prince Edward Island. In Newfoundland and Labrador, the total reallocation effect accounted for roughly one-quarter of the labour productivity growth experience from 2000 to 2007 (Appendix Table 18a). Reallocation level and reallocation growth rate effects were both strongly positive, suggesting that labour was being drawn into high-productivity-level and high-productivity-growth sectors. As might be expected this was almost entirely a story of mining and oil and gas extraction. A sector that had a

high level of labour productivity to begin with, and which saw both significant labour productivity growth (8.02 per cent per year on average) and saw its share of total hours worked in the province grow from 2.8 per cent to 3.7 per cent.

In PEI the story was rather different (Appendix Table 18b). A positive reallocation level effect was offset by a larger negative reallocation growth effect. This means that workers in PEI were being drawn into sectors that had higher than average levels of labour productivity, but also sectors that had slower-than-average labour productivity growth. It appears that much of the positive reallocation level effect resulted from shifts of labour out of the low-productivity other services and agriculture, forestry, fishing and hunting sectors to higher productivity jobs in utilities and manufacturing. At the same time, falling labour productivity in agriculture, forestry, fishing and hunting, construction, wholesale trade, and administrative, support, waste management, and remediation services coupled with labour shifts into some of these sectors resulted in a large negative reallocation growth effect.

In sum, even within sectors, Atlantic Canada had more rapid labour productivity growth than Canada as a whole over the 2000-2007 period. This growth was especially rapid in Newfoundland and Labrador. In Nova Scotia and New Brunswick, there is no evidence to suggest that the reallocation of labour across sectors had a major impact on labour productivity growth. In contrast, the significant inflow of labour to the mining and oil and gas extraction sector boosted labour productivity growth in Newfoundland and Labarador, while in PEI inter-sectoral reallocation slowed down labour productivity growth.

5. Drivers of Productivity in Atlantic Canada

The previous part of this report established that the Maritime provinces have low levels of labour productivity, and that since the early 1990s these provinces have seen the labour productivity gap with Canada widen. Newfoundland and Labrador has had the opposite experience. It saw labour productivity grow from a level similar to that of the other Atlantic provinces to a level that was similar to the highest productivity countries in the world. We have also seen that industrial structure explains some of the difference in productivity levels and growth rates between Atlantic Canada and Canada as a whole, but that other factors must also be at play.

Building on the discussion of key drivers of productivity growth in the first part of the report and the discussion of Atlantic Canada's productivity performance in the previous part, this part of the report explores a number of explanations for the current state of productivity in Atlantic Canada. It examines six key drivers of productivity identified in the first part of the report: machinery and equipment, human capital, innovation, scale economies and agglomeration, public infrastructure and competitive intensity. As noted above, there are very large numbers of other factors that can drive productivity growth and these factors are also discussed where appropriate in the context of these six drivers.

5.1. Machinery and Equipment

This section of the report examines the state of machinery and equipment in Atlantic Canada. The quantity and quality of machinery and equipment is an important determinant of productivity. Generally speaking, if workers have more and better tools to work with, they will be able to produce more per hour of effort, i.e. they will have higher productivity. The most important measure of machinery and equipment, from the standpoint of productivity analysis, is the amount of capital available per hour of work, the capital-labour ratio.

5.1.1. The Importance of Machinery and Equipment for Productivity

A string of cross-country empirical studies have found machinery and equipment (M&E) investment to have a particularly strong positive relationship with economic growth and productivity growth.[23] The classic work from this literature is that of De Long and Summers (1991), who use cross-country regression analysis to relate M&E and structures investment to per-worker GDP growth. They find that a three percentage-point increase in M&E investment as a share of GDP is associated with an increase of 1.0 percentage points in the annual rate of per-worker GDP growth. This is a significant effect; it amounts to 29 per cent faster per-worker GDP growth over their 25-year sample period. By contrast, De Long and Summers find no statistically significant relationship between per-worker GDP growth and investment in structures. For this reason, apart from

[23] This sub-section draws on Sharpe and Arsenault (2008).

our discussion of public infrastructure, which can be found later, we do not consider structures in this report.[24]

Within the subcategory of M&E, the distinction between information and communications technology (ICT) and non-ICT investment also appears to be important. Fuss and Waverman (2005) developed an econometric model to relate the Canada-US gap in labour productivity to various types of investment. They found that when both the effect of ICT intensity and ICT spillovers are taken into account, differences in the stock of ICT accounts for 56 per cent of the Canada-US productivity gap in 2000 and 60 per cent of the gap in 2003. In comparison, increases in non-ICT capital (structures and other M&E) per worker (non-ICT capital deepening) accounts for just about 5 per cent of the productivity gap. Digging further, they found that slightly less than half of the ICT contribution to the gap is attributable not to simple capital deepening but to investment spillover effects; information and telecommunications technologies become increasingly important as they spread throughout the economy. Thus, they attributed much of the persistent Canada-US gap in labour productivity to different levels of investment in ICT.

The results of Fuss and Waverman (2005) emphasized the importance of the network effects of ICT investment. The internet would be useless if only one computer were connected to it; its transformative economic power is realized only when a large part of the economy has access to it. This idea of ICT as a so-called "general purpose technology" has advocates (Helpman and Trajtenberg 1998) and detractors (Gordon 2003), but it is broadly consistent with the empirical regularities we have already discussed. ICT has fundamentally altered production and organization processes in at least some sectors. For instance, the US retail market has been revolutionized by the Wal-Mart model of just-in-time inventory management, which would be impossible without the power to collect and transfer large amounts of sales data quickly and cheaply.[25] If ICT investment stimulates the development of new complementary technologies (Basu et al, 2003), then ICT investment may also have spillover effects that make non-ICT investment more effective in promoting productivity growth (Pakko, 2002; Gort et al, 1999).

Abdi (2008) finds empirical support for such spillover effects within the Canadian manufacturing sector. He notes that the elasticity of output with respect to M&E capital is generally found to be greater than the factor share of output of M&E, which implies that the level of M&E investment is below the socially efficient level (in line with the

[24] Most subsequent studies corroborated the De Long and Summers result for M&E investment. De Long and Summers (1992) use updated data and statistical techniques to test their previous results and find them to be robust. Sala-i-Martin (1997) finds a positive relationship between M&E investment and economic growth, similar in magnitude to the relationship identified by De Long and Summers; a one percentage-point increase in the M&E investment share of GDP is associated with a 0.2 percentage-point increase in per worker GDP growth. This M&E investment effect is about four times the size of the effect of structures investment. Lee (1995) finds a positive cross-country relationship between productivity and the ratio of imported equipment to total investment; since M&E is more easily tradable than structural capital, this measure is likely to reflect the share of M&E in total investment. Jalilian and Odedokun (2000) further subdivide capital investment into five categories (business, machinery, transport, residential, and "other") and find that investment in machinery remains statistically significant in most of their cross-country regression specifications.

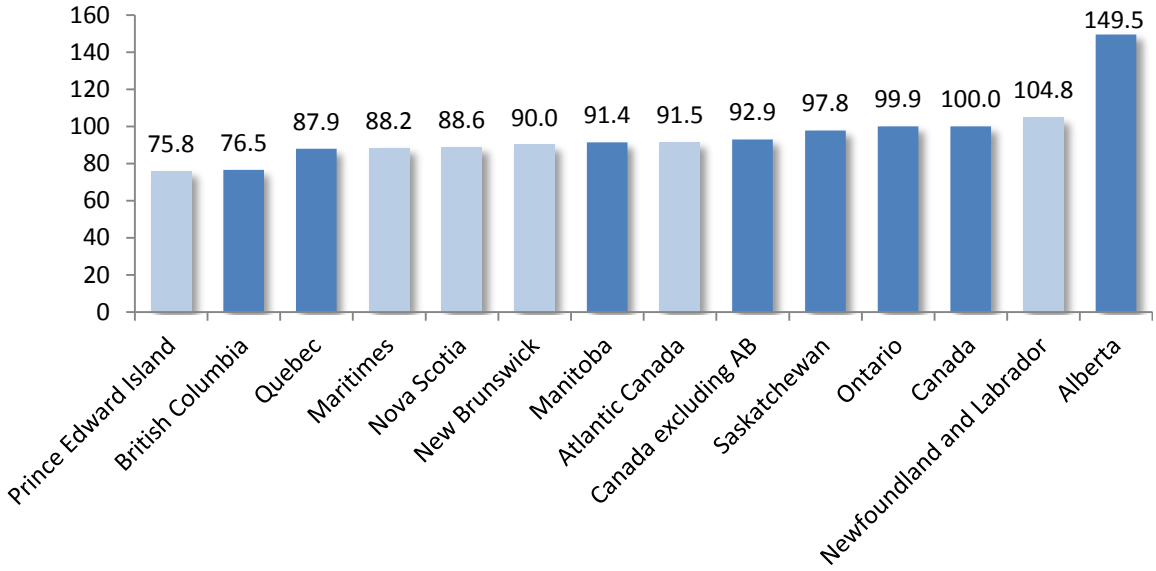
[25] Harvard economist Kenneth Rogoff (2006) suggests that Wal-Mart (and a small number of other big-box retailers) may account for as much as 50 per cent of the US productivity growth advantage over Europe in the past decade, and that general ICT-related advances in wholesaling supply chains may account for a further 25 per cent of the gap.

predictions of the New Growth Theory of Romer (1986 and 1987), Lucas (1988) and others). This evidence is consistent with the idea that ICT investment has important network effects on economy-wide productivity; one firm's investments in ICT may provide external benefits to the rest of the economy, and since firms cannot capture external benefits, the level of ICT investment will be suboptimal.

5.1.2. Machinery and Equipment Intensity

Machinery and equipment capital intensity, defined as the current dollar total economy stock of machinery and equipment capital per hour worked (LFS hours worked), was generally lower in Atlantic Canada than in the rest of the country (Chart 21). In current dollars, for an hour of work the average worker in Atlantic Canada had 8.5 per cent less machinery and equipment than the Canadian average. In contrast, workers in Ontario had the average amount of machinery and equipment, whereas those in Alberta had almost 50 per cent more than the average.

Chart 21: Machinery and Equipment Capital Intensity, Canada by Province, Canada = 100, 2007



Source: Appendix Table 21a. Author's calculations based on Statistics Canada unpublished capital stock estimates and Labour Force Survey hours estimates.
Note: Note: Capital intensity is nominal year-end net capital stock per hour worked, geometric depreciation.

Newfoundland and Labrador had a notably higher level of machinery and equipment capital intensity than the rest of the region (4.8 per cent above the national average); the extent to which this advantage relates to industrial structure, and especially the presence of the oil and gas extraction industries, will be explored later. Prince Edward Island had the lowest machinery and equipment capital intensity in Canada (24.2 per cent below the national average), while New Brunswick and Nova Scotia had similar levels of machinery and equipment capital intensity (respectively 10.0 per cent and 11.4 per cent

below the national average). Overall, machinery equipment capital intensity in Atlantic Canada is significantly lower than in the rest of the country.[26]

Table 9: Trends in Machinery and Equipment Intensity, Real Stock per Hour Worked, Canada and Atlantic Canada, 1981-2007

	Canada	Newfound-land and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Atlantic Canada	Maritimes
Average Annual Growth Rate, Per Cent							
1981-2007	1.19	1.15	2.45	1.24	-0.49	0.62	0.48
1981-1989	0.09	0.51	-0.53	1.23	-1.70	-0.14	-0.33
1989-2000	1.22	0.45	2.88	0.39	-1.15	-0.07	-0.20
2000-2007	2.42	3.01	5.27	2.61	1.96	2.61	2.49

Source: Unpublished Statistics Canada estimates.

It is worth noting that the machinery and equipment intensity has improved since 2000, reversing a downward trend in Atlantic Canada from 1981 to 2000 (Table 9). Indeed, machinery and equipment intensity increased faster in Atlantic Canada and the Maritimes than it did in Canada from 2000 to 2007. However, given the ground lost over the previous two decades, many more years of above average growth in machinery and equipment intensity would be required for Atlantic Canada to catch up with the rest of the country.

5.1.3. The Key Dimensions of the Machinery and Equipment Problem in Atlantic Canada

This section analyses the different aspects of Atlantic Canada's M&E problem. It begins with a brief assessment of the composition of M&E in Atlantic Canada by detailed asset type. It then evaluates the impact of the region's industrial structure on its M&E intensity.

5.1.3.1. Asset Types

In general, Atlantic Canada appears to have adequate or even above average investment intensity in the machinery and equipment assets that do not usually embody breakthrough technologies like trucks and automobiles (Table 10). But Atlantic Canada has significantly lower capital per worker in many types assets that generally embody significant new technology than Canada as a whole. For example, in 2007 capital per

[26] The picture does not change significantly when machinery and equipment intensity is assessed in terms of investment instead of capital stock (Appendix Table 22b). If anything, Atlantic Canada performs less well in comparison to the rest of Canada with investment intensity 14.5 per cent below the national average. In terms of rankings, the main difference was the change in the position of Newfoundland and Labrador, which had the second highest level of machinery and equipment capital intensity (4.8 per cent above the national average), but the fourth highest level of machinery and equipment investment intensity (7.2 per cent below the national average). Regardless of measure, workers in Atlantic Canada appear to have less machinery and equipment at their disposal than workers in most other parts of the country.

worker in industrial machinery was about 15 per cent lower in Atlantic Canada than in Canada as a whole, with exception of New Brunswick, where it was 13 per cent higher.

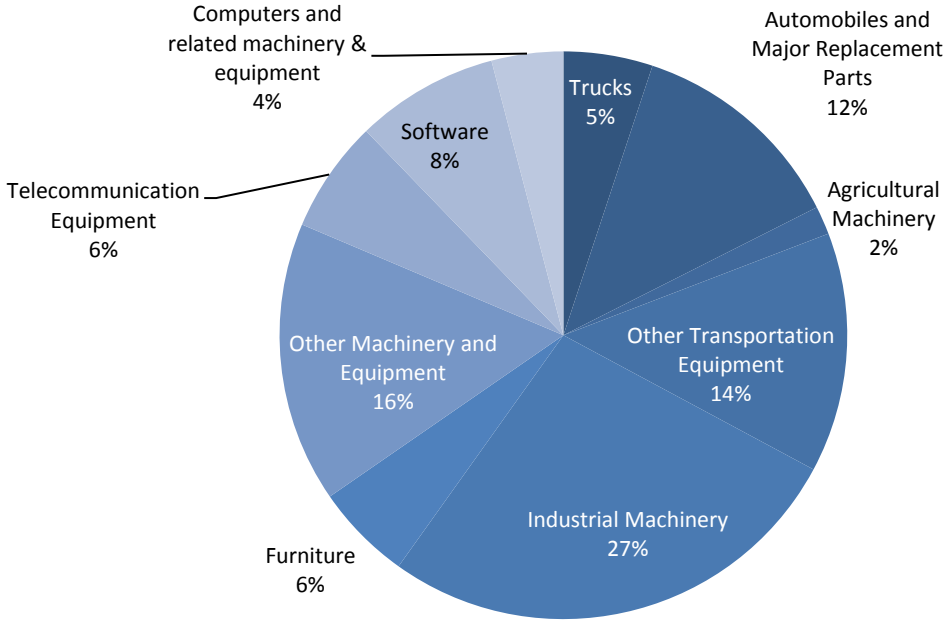
Table 10: Machinery and Equipment Capital Intensity, by Asset Type, As a Share of Canada, Canada = 100, 2007

	Atlantic Canada	Newfound-land and Labrador	Prince Edward Island	Nova Scotia	New Brunswick
Total Machinery & Equipment	91.5	104.8	75.8	88.6	90.0
Trucks	103.6	121.4	97.9	95.1	104.1
Autos and Major Replacement Parts	112.5	75.9	79.3	145.7	101.0
Agricultural Machinery	64.5	30.4	290.7	46.7	63.8
Other Transportation Equipment	146.4	267.2	60.3	161.9	70.4
Industrial Machinery	85.7	70.6	66.0	73.8	113.0
Other Machinery and Equipment	79.2	135.2	65.3	60.5	70.2
Furniture	88.7	91.0	82.2	96.2	79.5
Total Information and Communications Technology (ICT)	79.5	81.6	73.3	77.7	81.5
Software	71.2	69.2	82.2	63.2	79.9
Telecommunication Equipment	107.4	116.7	64.3	108.5	108.5
Computers and Related M&E	67.7	70.6	65.3	74.8	57.8

Source: Appendix Table 30a. Author's calculations based on unpublished Statistics Canada capital stock estimates and Labour Force Survey estimate of hours worked.

Note: Nominal Net Year-End Capital Stock per Hour Worked, Geometric Depreciation, Total Economy.

Chart 22: Composition of Machinery and Equipment in Atlantic Canada, Nominal Year-End Capital Stock, Geometric Depreciation, Total Economy, 2007



Source: Appendix Table 29. Author's calculations based on unpublished Statistics Canada estimates.

The stock of information and communications technology (ICT) was generally lower in Atlantic Canada than in Canada as a whole. While Atlantic Canada did fairly well in terms of telecommunications equipment capital intensity, the amount of computers and software was significantly lower. Given the prime importance of industrial machinery and ICT equipment for productivity, the fact that Atlantic Canada generally has less machinery and equipment that embody large amounts of new technology could help explain its lower level of productivity.

5.1.3.2. Industrial Structure

Differences in stocks of machinery and equipment can be suggestive of differences in industrial structure. Such differences could help explain why Atlantic Canada has low levels of machinery and equipment intensity—when measured as machinery and equipment capital or investment per hour worked—relative to the Canadian average. If industrial structure explains Atlantic Canada's M&E problem, our policy recommendations should focus on specific industries. If, however, Atlantic Canada's industrial structure is not the main culprit for the M&E problem, our analysis should emphasize factors driving M&E investment as a whole. In this section, we assess the extent to which M&E intensity in Atlantic Canada is affected by the region's industrial structure.

This simulation must contend with two data issues. First, estimates of hours worked are available for fewer sectors than estimates of numbers of workers. As a result, this simulation departs from the discussion to this point, because it uses M&E capital per worker. Nonetheless, the result is largely unchanged, since the number of hours worked per worker does not vary significant between the Atlantic provinces and Canada as a whole. The second issue is that estimates are not available for the same sectors in each province. As a result, we do not attempt to aggregate provincial estimates of the impact of industrial structure on machinery and equipment per worker, and therefore do not provide estimate of the impact of industrial structure on machinery and equipment intensity in Atlantic Canada or the Maritimes separately from their constituent provinces.

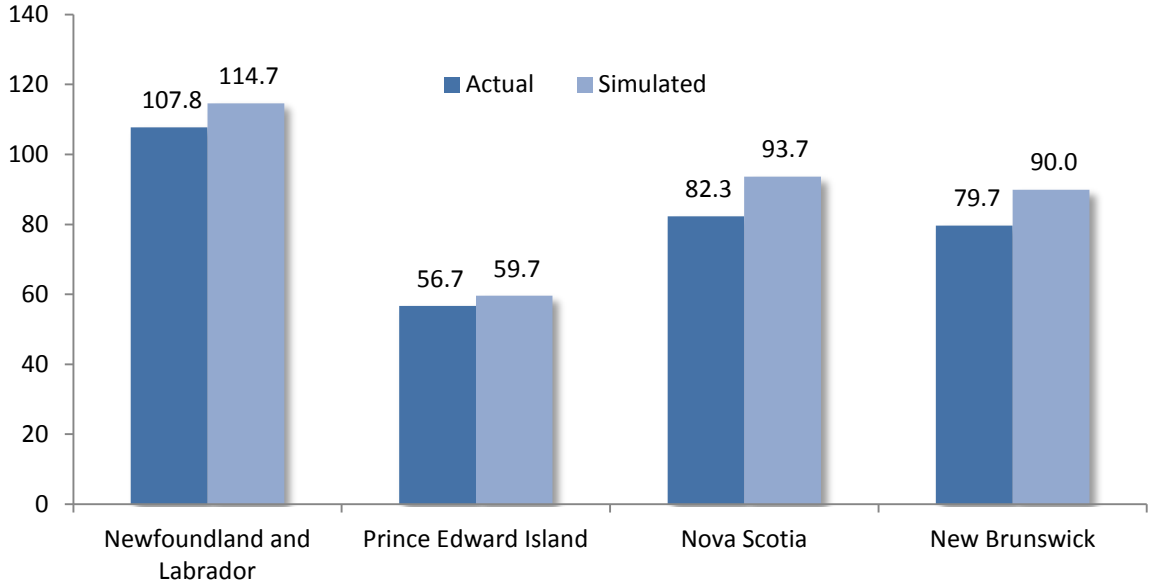
There was considerable variation in the relative level of the stock of M&E per worker among the Atlantic provinces. While variations among data sources complicate this analysis, the finding that industrial structure does not favour M&E appears to be robust for Nova Scotia and New Brunswick in 2007. For Newfoundland and Prince Edward Island, the findings are more ambiguous, but it is probably safe to conclude that differences in industrial structure are having little net effect on M&E intensity (Chart 22).[27]

A number of common effects from differences in industrial structure on the stock M&E are in evidence across the Atlantic provinces. The low share of workers in the M&E-intensive finance, insurance, and real estate, information and cultural, and manufacturing sectors helped to explain the lower aggregate M&E per worker. A higher

[27] That is not to say that industrial structure is not having an effect. For example, Newfoundland and Labrador has an above average share of jobs in mining and oil and gas, a sector with an above-average level of M&E per worker, but this positive effect on productivity is offset by negative effects from other sectors.

share of workers in sectors with low levels of machinery and equipment per worker also helped to explain the low aggregate level of M&E per worker. For example, all of the Atlantic provinces had relatively large shares of the labour force in retail trade, agriculture, forestry, fishing and hunting (except Newfoundland and Labrador), health care and social assistance, and professional, scientific and technical services. While all of these trends affected all of Atlantic Canada, some effects of industrial structure on M&E per worker affected particular provinces.

Chart 23: Simulated Machinery and Equipment Capital Intensity, Relative Level of Machinery and Equipment Capital per Worker, Canada = 100, 2007



Source: Appendix Table 31.
Note: Machinery and equipment capital intensity is nominal year-end net capital stock per worker, geometric depreciation.

Some industries had province-specific effects. Mining and oil and gas extraction, a relatively M&E-intensive sector, helped to boost aggregate M&E per worker in Newfoundland in Labrador because of the relatively large share of the labour force engaged. In contrast, in the Maritimes the relatively low share of workers in this sector depressed aggregate M&E per worker.

Transportation and warehousing exhibited a wide variety of M&E per worker levels across the Atlantic provinces. It is a relatively M&E-intensive sector. At the same time, it employed an above-average share of the labour force in Newfoundland and Labrador and New Brunswick, but below average share in Nova Scotia and Prince Edward Island. As a result, transportation and warehousing made positive contributions to aggregate M&E per worker in Newfoundland and Labrador and New Brunswick, but negative contributions in Prince Edward Island and Nova Scotia.

In summary, industrial structure has had an impact on levels of M&E per worker in Atlantic Canada, although data limitations do not permit the calculation of a meaningful total effect for the Maritimes or Atlantic Canada. Industrial structure would

have the most important effect on the M&E intensity gap in Nova Scotia and New Brunswick where it explains 65 per cent and 51 per cent of the gaps respectively. Key findings are the low share of workers in M&E-intensive services and manufacturing and the relatively high share of labour in low-M&E activities like retail trade; agriculture, forestry, hunting and fishing; health care and social assistance; and professional, scientific and technical services.

5.2. Human Capital in Atlantic Canada

This section takes a broad view of human capital in order to assess to what extent the low level of productivity in Atlantic Canada relative to Canada can be explained by a deficiency in human capital.

Human capital refers to the quality of the workforce in terms of education, training, and experience. Harris (2002) notes that increases in human capital can drive productivity growth in two ways. First, having higher human capital means that workers are more likely to transfer their skills and knowledge to others. Second, higher skills lead to the development of new technology (both in terms of processes and products), and aid in the adoption of new technology.

Human capital has been regarded for some time as a primary driver of productivity or income per capita growth.[28] The famous augmented Solow model developed and tested by Mankiw, Romer and Weil (1992) has been refined and applied by many authors in studies of the growth experiences of several groups of countries. A broad consensus that can be drawn from these studies is that differences in human capital account for a large part of differences in productivity levels and growth between developed and developing countries, while within developed countries, where human capital differences are smaller, they account for a less substantial but still important part of productivity level and growth differences. These same broad conclusions have also been found for the Canadian provinces by Coulombe and Tremblay (2001).[29]

It should be kept in mind that as in many areas of economic policy, there is potentially tension between equity and efficiency in human capital development. For example, the OECD has found that the policies of certain countries which aim to re-integrate low-skilled workers in the labour market, while resulting in a widening of the employment base and increased potential GDP growth, temporarily depressed productivity growth through a negative composition effect on labour quality.

Because human capital is not an easily measureable quantity, the approach here is to look at a variety of different indicators in order to develop a comprehensive picture of

[28] Most growth studies focus on income per person, although some look at income per worker as well. In any case, since income per capita is determined in the long run primarily by income per worker, the results of growth studies apply, in general terms, more or less equally to the two measures.

[29] Using the proportion of the population aged 25 and over with a university degree as their human capital indicator, they found that the convergence behaviour of human capital largely determined the convergence behaviour of per capita income to the Canadian average over the 1951-1996 period. Overall, about 50 per cent of relative per capita income growth over the period was found to be explained by differences across provinces in the human capital indicator.

human capital in Atlantic Canada. The first sub-section describes the various definitions and measures of human capital that are typically discussed in the literature. The second sub-section examines trends in educational attainment in Atlantic Canada. The third sub-section discusses trends in skills acquisition. Finally, while it is one thing to move a large number of students through an education system, the quality of that education is also important. The final part of this section explores indicators of education quality, including comprehension.

5.2.1. Measuring Human Capital

While references to human capital have become ubiquitous, an agreement on its precise definition has never been reached, much less an agreement on the best way to implement its definition within the framework of a measurable indicator. By far the most widely used indicators of human capital are based on the concept of educational attainment.[30]

As a measure of human capital, educational attainment is open to much criticism. The key criticism is that human capital is really about the skills of individuals, rather than simply the amount of education that an individual chooses or is required to obtain. If educational attainment is focused on exclusively as the indicator of human capital, the implicit assumption is that all people start with relatively similar innate abilities and that education is relatively uniform in terms of its productivity in transforming abilities into skills in different people (Hartog, 2001). It is clear that both of these assumptions are false. Students differ greatly in their performance on standardized tests, indicating at least some divergence in innate abilities; and the facts that education can sometimes be a consumption good rather than an investment in future capabilities, and that the quality of education can differ across countries and schools, imply at least some variance in the degree to which higher education actually increases skills.

The result of this type of criticism is that direct measures of competence have begun to be regarded as important, not just for assessing the performance of education systems, but also as measures of actual skills. There has been much recent interest in conducting internationally comparable standardized tests across several countries, and specifically measuring various forms of literacy and proficiency in many subjects.

These direct measures, however, still focus on skills in terms of intelligence. While such skills are regarded as essential in knowledge work, human capital that is essential to less knowledge-intensive industries is also important: dexterity and craftsmanship in certain labour-intensive trades, knowledge of equipment operation and other essential aspects of trades in general, and the experience gained through

[30] Estimates of educational attainment were the used in the first empirical studies of the effect of human capital on growth, such as Barro and Sala-i-Martin (1990, 1991 and 1992), Kyriacou (1991), Mankiw, Romer and Weil (1992), Barro and Lee (1993, 1994 and 1996), and Benhabib and Spiegel (1994). These authors pioneered two types of human capital measures: the proportion of the population at or above a given level of education; and the average years of education of the population. Hall and Jones (1996, 1998 and 1999), who, in a growth accounting framework, use estimates of the return to years of schooling based on Mincer (1974)-type regressions and data on years of schooling to measure human capital, also deserve to be mentioned.

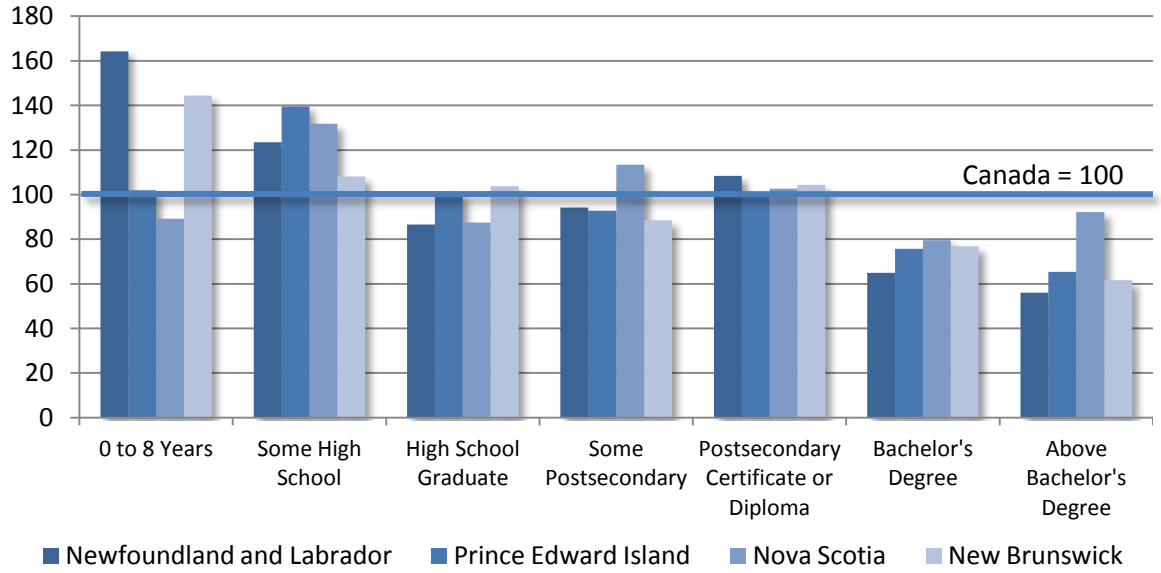
specialization and on-the-job learning over the career cycle. Unfortunately, direct measures of these skills are not typically available; but several variables are available that can partially indicate the acquisition of these skills. These variables include registration in and completion of apprenticeship programs, and participation in on-the-job and professional training programs. As is clear from this discussion, a large set of indicators is necessary in order to capture the many dimensions of human capital. The following sub-sections attempt to construct such a set of indicators for Atlantic Canada and Canada.

5.2.2. Educational Attainment

The most widely used measure of human capital is the proportion of the population with a given level of educational attainment. In Canada estimates of the proportion of provincial population aged 15 years and over by highest educational attainment can be constructed using estimates from Statistics Canada's Labour Force Survey.

Relative to Canada, Atlantic Canada had notably lower levels of educational attainment in 2008 (Chart 24). Newfoundland and Labrador and Nova Scotia had lower proportions of high school graduates, but all Atlantic provinces had proportions of people who had obtained postsecondary certificates or diplomas similar to the Canadian average. The most significant divergence with Canada as a whole was at either extreme in the distribution. At the low end, Atlantic Canada generally had higher shares of the population with low level credentials than in Canada. At the high end, far fewer Atlantic Canadians possessed university degrees than was the case of Canadians in other regions. Overall, these differences in the highest level of educational attainment suggest that the average level of human capital embodied in a resident of Atlantic Canada was less than in the average Canadian.

Chart 24: Population Aged 15 Years and Over by Highest Educational Attainment, Relative to Canada = 100, 2008



Source: Appendix Table 32h. Author's calculations based on Statistics Canada Labour Force Survey estimates.

It could be argued that the most appropriate socio-economic group for measuring educational attainment for the purposes of productivity analysis is somewhere between the population aged 15 and over (labour force) and employed persons aged 25-54. For example, the labour force includes the unemployed, who could become employed in the near future and add their qualifications to the already employed; the 25-54 age group excludes most students, but is also excludes workers over the age of 54 whose educational traits are bound to make some contribution to aggregate productivity. However, the differences between Atlantic Canada and Canada in average years of education are relatively constant across these socio-economic groups, so that the choice has little effect on the analysis of the role of human capital in Atlantic Canada-Canada productivity differences.

Educational attainment can also be gauged by other indicators, such as enrolment, graduation rates and drop-out rates. In 2006 Atlantic Canada actually had 14.4 per cent more university students as a share of the population aged 15 and over relative to Canada as a whole (Table 11). This relative enrolment measure has fluctuated between 114 per cent and 125 per cent of the Canadian level since 1992. In terms of full-time students, Atlantic Canada has 25.9 per cent more than the Canadian average share of the population 15 and over, while it has only 80.8 per cent of the proportion of part-time students. It is difficult to say whether the split between full-time and part-time students should have a positive or negative effect on human capital in Atlantic Canada compared to Canada.

Table 11: Relative University Enrolment, Atlantic Provinces, Share of the Population Aged 15 Years and Over, Canada = 100, 1992-2006

	1992	1996	2000	2006
Atlantic Canada				
Total	115.0	118.4	124.6	114.4
Full-Time	136.9	139.2	141.1	125.9
Part-Time	75.4	72.0	83.4	80.8
Newfoundland and Labrador				
Total	98.2	100.1	106.5	103.1
Full-Time	113.0	119.1	124.5	113.0
Part-Time	71.6	57.8	61.5	74.2
Prince Edward Island				
Total	89.9	72.6	89.2	88.2
Full-Time	104.8	88.7	103.7	99.8
Part-Time	63.2	36.3	53.0	54.3
Nova Scotia				
Total	131.8	140.7	148.8	137.9
Full-Time	159.3	165.4	166.0	151.0
Part-Time	82.4	85.3	106.0	99.5
New Brunswick				
Total	105.5	110.8	112.0	96.3
Full-Time	126.3	128.4	126.7	106.6
Part-Time	68.0	71.4	75.3	65.8

Source: Appendix Table 36b.

This pattern of above average university enrolment has generally held in all Atlantic provinces except PEI and since at least 1992, the first year for which estimates are available. Nova Scotia stands out as having a particularly high share of its population 15 years and over enrolled in university, up to almost 170 per cent of the national average in recent years, reflecting large numbers of out-of-province students. This higher enrolment percentage no doubt explains part of the above average educational attainment of Nova Scotians noted in Chart 24. PEI has particularly weak enrolment rates, especially in part-time university education.

Enrolment rates provide one perspective on human capital, but a more refined perspective is provided by university graduation rates, the share of the population aged 15 and over that graduates each year.[31] While these rates may fluctuate with the age structure of the population, since younger people tend to obtain more university qualifications than older people, they are indicative of broad trends.

Table 12: Relative Graduation Rates, Atlantic Provinces, Share of the Population Aged 15 Years and Over, Canada = 100, 1992-2006

	1992	1996	2000	2006
Atlantic Canada				
Total	100.7	107.5	110.5	120.9
Undergraduate	103.5	112.6	116.0	125.5
Graduate	84.0	80.0	84.6	101.5
Newfoundland and Labrador				
Total	70.5	84.7	93.4	98.3
Undergraduate	74.9	91.1	96.6	101.4
Graduate	45.4	50.8	78.3	85.1
Prince Edward Island				
Total	64.7	65.0	68.4	82.1
Undergraduate	74.5	75.8	80.5	89.9
Graduate	7.9	7.1	11.0	49.1
Nova Scotia				
Total	138.7	136.2	141.3	153.5
Undergraduate	138.7	139.1	146.3	153.2
Graduate	138.6	120.6	117.7	154.9
New Brunswick				
Total	83.6	97.0	92.1	103.2
Undergraduate	87.7	103.0	98.7	114.3
Graduate	60.1	65.0	61.3	55.9

Source: Appendix Table 37b.

Note: Graduation rate is the share of the population aged 15 and over that obtains a degree.

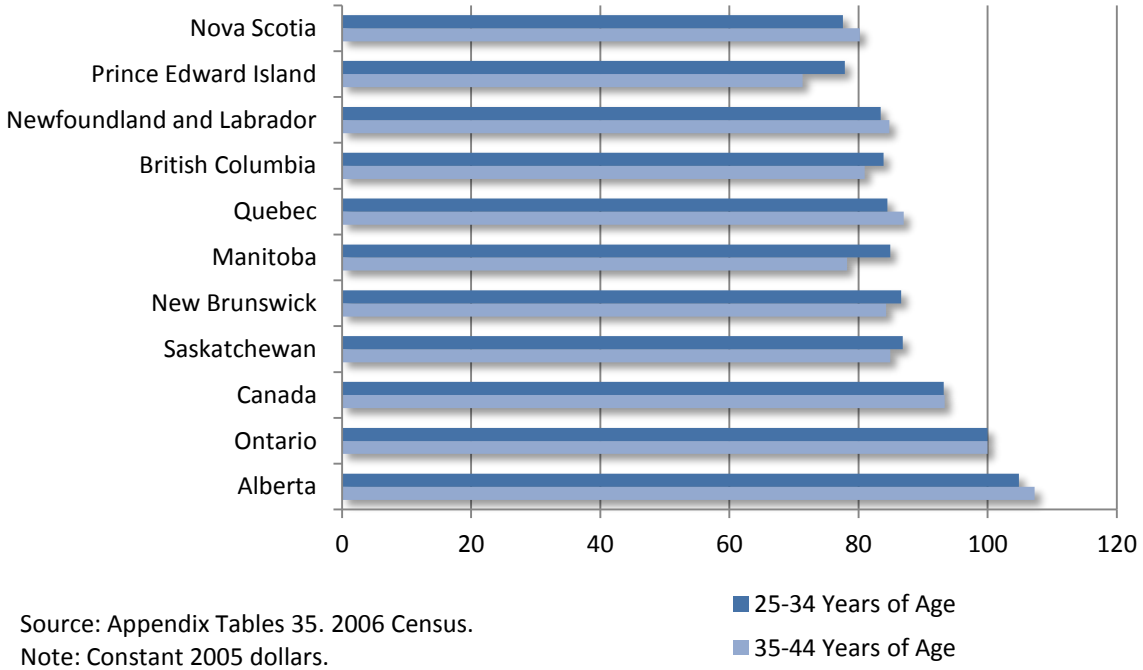
The story told by Table 12 is one of significant increases in graduation rates in Atlantic Canada at both the graduate and undergraduate level, relative to Canada. Even in 1992 Atlantic Canada fared well relative to Canada, although it had somewhat fewer graduations per capita than Canada at the graduate level. By 2006, the latest year for

[31]Estimates of college and trade/vocational graduations that are consistent across provinces are not available.

which estimates are available, Atlantic Canada as a whole surpassed Canada in graduation rates at both the undergraduate (by 25.5 per cent) and graduate (by 1.5 per cent) levels.

This is not to say that all provinces did equally well. As might be expected from the discussion of enrolments and educational attainment above, Nova Scotia was the clear leader with a graduation rate more than 50 per cent higher than Canada as a whole at both the undergraduate and graduate levels. Newfoundland and Labrador and New Brunswick had roughly similar overall graduation rates as Canada, but lagged at the graduate level. New Brunswick had a remarkably low graduation rate at the graduate level, given its higher than average graduation rate for undergraduates. Prince Edward Island was further behind at both levels. On the basis of graduation rates, it does not appear that Atlantic Canada is failing to produce enough university graduates relative to Canada.

Chart 25: Relative Average Employment Income for People Holding a Bachelor's Degree as Highest Educational Attainment, Ontario = 100, 2005

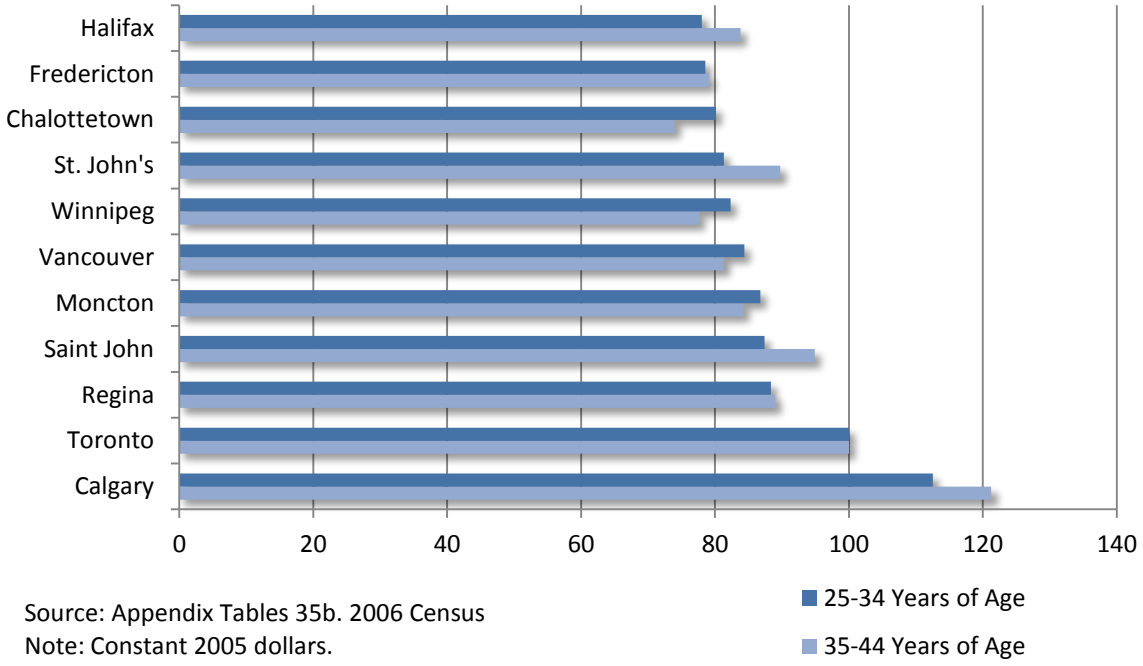


Source: Appendix Tables 35. 2006 Census.
Note: Constant 2005 dollars.

Paradoxically, if anything, there are more students per resident graduating from university programs in Atlantic Canada relative to the rest of the country, but there are fewer residents with postsecondary qualifications. A finding from the 2006 Census offers one explanation for this inconsistency. When young people graduate from university they are often willing and able to move to find work. All else being equal they will tend to move to regions with higher income, adjusted for the cost of living. Chart 25 ranks the provinces in terms of average employment income for those holding bachelor's degrees as their highest level of educational attainment. The averages are presented relative to Ontario, Canada's largest province, and an attractive labour market for skilled workers, owing to its size and level of salaries.

On this basis it is readily apparent that Atlantic Canada faces a serious problem in retaining its university-educated workers. The average employment income for a bachelor's degree holder in the 25-34 age group in Nova Scotia was 78 per cent of the level of his or her peer in Ontario. In 2005 constant dollars, this difference amounted to an annual earnings gap of $9,500. The story was similar in the other Atlantic provinces, although bachelor's degree holders aged 25-34 years in New Brunswick had notably higher employment income than elsewhere in the region. A 25-34 year-old bachelor's graduate earned an average of $36,765 per year in New Brunswick, a gap of $5,700 with his or her peer in Ontario. As bachelor's degree holders continue into mid-career positions (aged 35-44) the gap between employment income in Ontario and Atlantic Canada widens in PEI and New Brunswick, but narrows in Nova Scotia and Newfoundland and Labrador. Nonetheless, a 35-44 year-old bachelor's graduate in Nova Scotia would still earn on average only 80 per cent of what his or her peer would earn in Ontario, a gap of $12,500 per year.

Chart 26: Relative Average Employment Income for People Holding a Bachelor's Degree as Highest Educational Attainment, Toronto = 100, 2005



Source: Appendix Tables 35b. 2006 Census
Note: Constant 2005 dollars.

The story is largely similar if major cities are examined instead of provinces. For bachelor's degree holders in Halifax in the 25-34 age group, average earnings of $34,000 were 22 per cent lower than in Toronto, a difference of $9,500. When compared to Calgary, the difference is a dramatic 31 per cent gap, worth $15,000 per year in 2005. With these earnings differentials it is easy to see why graduates would have an incentive to migrate to the cities of Ontario and Alberta. For bachelor's graduates in the 35-44 age group, relative earnings were generally better in Atlantic Canada than for younger graduates, but still lagged significantly behind Toronto and even more significantly behind Calgary.

As will be discussed in more detail below, both tax rates and consumer prices affect the cost of living, and therefore the real value of employment earnings, so these findings should be viewed in this context. At this point it is sufficient to note that it is unlikely that differences in taxes and consumer prices are sufficient to offset the sizeable gap in average earnings that exists between Ontario (and to an even greater extent Alberta) and Atlantic Canada.

5.2.3. Apprenticeships

University education is neither the only route to skills acquisition nor necessarily the most useful way to acquire skills that will improve human capital and productivity. An alternative route is apprenticeship, a system whereby prospective workers are trained in a practical, work-based environment. This report uses an apprenticeship graduation rate, apprenticeship completions as a share of the population aged 15 and over, to measure the relative number of apprentices being trained by province.

The apprenticeship completion rate in Atlantic Canada has lagged the rest of Canada, more so since the late 1990s (Table 13). In 2006, the latest year for which data were available, Atlantic Canada had an apprenticeship completion rate that was 86.6 per cent of the Canadian level. Newfoundland and Labrador, PEI, and New Brunswick had similar rate of completion, around 80 per cent of the Canadian level. Interestingly, New Brunswick had an apprenticeship completion rate slightly above the Canadian level in 2006. An important caveat in this analysis is the effect that very high apprenticeship completions in Alberta (287.6 per cent of the national average in 2006) are having on the national average.

Table 13: Relative Apprenticeship Completion Rates, Canadian Provinces, As a Share of the Population Aged 15 and Over, Canada = 100, 1991-2006

	1991	1996	2000	2006	Number in 2006
Canada	100.0	100.0	100.0	100.0	20,855
Atlantic Canada	98.6	96.2	84.2	86.6	1,320
Newfoundland and Labrador	87.2	80.5	90.0	77.8	265
Prince Edward Island	49.9	102.6	73.5	83.9	75
Nova Scotia	109.4	73.9	76.2	79.0	480
New Brunswick	102.4	134.3	91.9	102.7	500
Quebec	60.6	38.1	50.9	81.0	4,035
Ontario	98.2	95.8	88.0	68.4	5,575
Manitoba	97.6	66.3	82.6	109.1	775
Saskatchewan	64.2	70.6	131.4	143.0	850
Alberta	218.9	269.6	256.0	287.6	6,050
British Columbia	111.0	127.4	116.7	76.9	2,150

Source: Appendix Table 38c.

5.2.4. Indicators of Comprehension and Proficiency

The skills and educational acquisition variables examined so far are, to a certain extent, input variables. In other words, they are imperfect signals of the outcomes we really want to observe. The human capital of the population cannot be inferred from educational attainment data alone, as some students perform better than other students yet earn the same qualifications in the end. Estimates of actual proficiency have always been sparse, but there have been a few important efforts to uncover this important information.

One such effort is the International Adult Literacy Survey (IALS), which generates scores for proficiency in four areas: document, prose, numeracy, and problem solving. For the latest round of the survey (2003), average scores showed Atlantic Canada, with the exception of Nova Scotia, slightly below the national average, and the western provinces of Saskatchewan, Alberta, and British Columbia somewhat above the national average (Table 14 and Council of Education Ministers of Canada and Statistics Canada (2007)).

Table 14: Average Proficiency Scores, by Literacy Domain, Population Aged 16 and Over, 2003

	Prose Proficiency		Document Proficiency		Numeracy		Problem Solving	
	Average Score	Relative to Canada = 100	Average Score	Relative to Canada = 100	Average Score	Relative to Canada = 100	Average Score	Relative to Canada = 100
Canada	272	100.0	271	100.0	263	100.0	266	100.0
Newfoundland and Labrador	263	96.7	261	96.3	251	95.4	255	95.9
Prince Edward Island	272	100.0	270	99.6	260	98.9	262	98.5
Nova Scotia	276	101.5	274	101.1	262	99.6	267	100.4
New Brunswick	264	97.1	261	96.3	252	95.8	257	96.6
Quebec	266	97.8	263	97.0	259	98.5	262	98.5
Ontario	270	99.3	270	99.6	261	99.2	263	98.9
Manitoba	274	100.7	273	100.7	262	99.6	266	100.0
Saskatchewan	283	104.0	282	104.1	272	103.4	274	103.0
Alberta	283	104.0	283	104.4	274	104.2	274	103.0
British Columbia	281	103.3	282	104.1	272	103.4	274	103.0

Source: Appendix Table 39. International Adult Literacy and Skills Survey, 2003, Statistics Canada.

5.2.5. Key Findings: Human Capital

Atlantic Canada has a human capital problem in the sense that a smaller proportion of the population aged 15 and over or the labour force of the Atlantic provinces has post-secondary education in comparison with Canada as a whole. This lower proportion of the population with higher education stands in contrast to generally above-average enrolment and graduation rates in universities. There is also some evidence to suggest that apprenticeship completions are lower in the Atlantic provinces.

Proficiency in terms of literacy, numeracy, and problem solving is slightly lower in the Atlantic provinces than in Canada.

A key issue is whether the gap in human capital between Atlantic Canada and Canada is a result of supply or demand factors. Supply factors relate to the education system. Demand factors relate to the decision of an individual to acquire human capital; for instance, on average a reasonable person will not acquire human capital unless the expected cost of doing so is outweighed by the expected benefit. In our view, demand factors are probably the most salient explanation for Atlantic Canada's relatively low level of human capital compared to relatively high enrolment and graduation rates. The evidence suggests that the returns to education in Atlantic Canada may be lower than in other parts of Canada, thereby discouraging individuals from upgrading their human capital, or from locating there after they complete their studies.

5.3. Innovation and the Diffusion of Innovation

This section reviews a number of innovation indicators, which may help to explain why the productivity level of Atlantic Canada lags the rest of the country. A well known innovation indicator is research and development (R&D) expenditure, for which Statistics Canada has produced estimates over a relatively long period. But recent surveys that have focused on innovation provide a more complete picture of innovation in Canada. A number of major studies conducted in collaboration with ACOA have been published recently on innovation in the Atlantic provinces.[32]

5.3.1. The Importance of Innovation and the Diffusion of Innovation for Productivity

Bourgeois and LeBlanc (2003) define innovations as "new and significantly improved commodities (product or service innovations), production techniques (process innovations), or ways of organizing firms, of combining workers with machinery (organizational innovations)." The rate of productivity growth is partly determined by the rate of innovation and the rate at which innovations diffuse throughout the economy. Demand factors can also be important. If a competitive market forces a firm to innovate in order to create better goods and services at lower prices (and costs), then there should be an increase in demand for those improved products, which should more than justify the initial costs of innovation and increase firm profits. Having larger markets and better public infrastructure—both factors discussed later—can also provide a powerful incentive to innovate.

The OECD growth project[33] found that research and development (R&D) activities by the business sector had high social returns, and hence contributed to economic growth, but there was no evidence in that analysis of positive effects from

[32] One of those is by Locke and Lynch (2002) entitled *The State of Innovation-An Inter-Provincial Comparison* and a second study by Bourgeois and Leblanc (2002) entitled *Innovation in Atlantic Canada*. Both reports provide data and analysis on a number of indicators of innovation in Atlantic Canada. We build on the work done in those papers and include some of the indicators that are of particular interest for the present report.

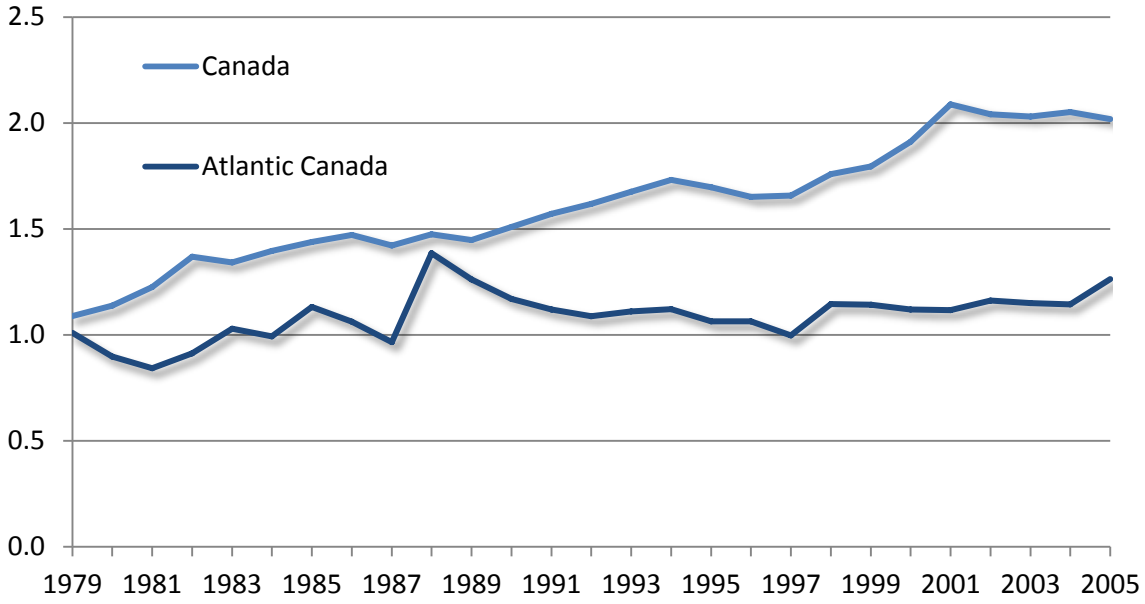
[33] Published in the documents *Sources of Economic Growth* (OECD, 2003) and *Understanding Economic Growth* (OECD, 2004).

government R&D. Moreover, enterprises need not develop knowledge in-house, they can take the best from abroad, either by importing new machinery or by applying new production processes. The McKinsey Global Institute (MGI) found that managers need to be aware of best practices in a given industry, and be prepared to implement them. MGI states that sufficient exposure to competition will ensure that this is the case (Kellison, 2004).

5.3.2. Research and Development

Research and development (R&D) can be an important driver of innovation and thus productivity growth. R&D spending is a key indicator of innovation. R&D expenditure statistics, expressed in current dollars, are available by province for 1979-2005 for both R&D performers (business, government, higher education, private non-profits) and funders (business, government, higher education, private non-profits, foreign). In order to account for the higher levels of R&D spending that occur in larger provinces, we divide nominal R&D spending by nominal GDP to estimate R&D intensity.

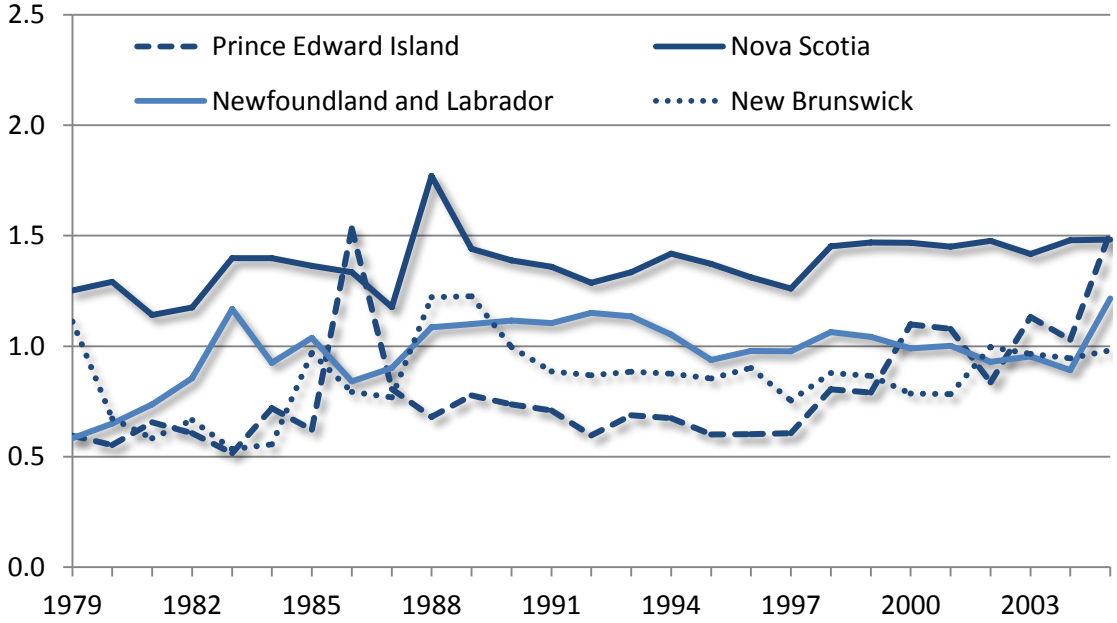
Chart 27: R&D Intensity in Canada and Atlantic Canada (R&D Spending as Share of GDP), Per Cent, 1979-2005



Source: Appendix Table 400. CSLS calculations based on Statistics Canada estimates.

Overall, R&D intensity in Atlantic Canada increased between 1979 and 2005 (Chart 27), from 1.09 in 1979 to 1.17 in 1990 and 1.26 in 2005. Yet, R&D intensity in Canada as a whole increased faster, leading to a widening gap especially since the 1980s. Indeed, R&D intensity in Canada increased from just over 1.0 per cent in 1979 to around 1.5 per cent in 1990 and to just over 2.0 per cent in 2005. While R&D intensity increased in all of the Atlantic provinces, except New Brunswick, from 1979 to 2005, the increase in Prince Edward Island, from 0.6 per cent of GDP in the mid 1990s to over 1.4 per cent in 2005, was particularly notable (Chart 28).

Chart 28: R&D Intensity in the Atlantic Provinces (R&D Spending as Share of GDP), Per Cent, 1979-2005



Source: Appendix Table 18.

The Statistics Canada R&D estimates also allow us to compute R&D intensity by performer, i.e. business, government, and higher education and non-profit. We can thus estimate in which of these areas the gaps in R&D intensity are most acute between the Atlantic provinces and Canada as a whole. Table 15 presents estimates of this gap for 2005, the latest year for which Statistics Canada R&D expenditure estimates were available. It is immediately apparent that most of the gap is explained by lower R&D intensity in the business sector. For instance, while R&D intensity in Canada in 2005 was 2.02 per cent, it was only 1.22 per cent in Newfoundland and Labrador, a gap of 0.80 percentage points. Lower R&D intensity in the business sector explained 0.73 percentage points of this gap.

In the case of Prince Edward Island, very low R&D intensity of 0.19 per cent in the business sector was somewhat offset by higher R&D intensity in the government sector of 0.67 per cent (compared to 0.20 per cent in Canada as a whole) and in the higher education and non-profit sector of 0.65 per cent (compared to 0.70 per cent in Canada as a whole), which led to an overall R&D intensity in PEI of 1.52 per cent. R&D intensity in the higher education and non-profit sector was particularly strong in Nova Scotia (0.95 per cent compared to 0.70 per cent in Canada as whole) and particularly weak in New Brunswick (0.53 per cent). Overall, weak business R&D intensity explained the vast majority of the gap for all the Atlantic provinces (Chart 29).

Unfortunately, estimates of R&D spending by industrial sector at the provincial level are not available for every sector, so it is not possible to determine in a comprehensive way to what extent the industrial structure of the Atlantic provinces affects R&D intensity in the business sector. However, information on total business enterprise research and development intramural expenditures is available for most

industries and provinces. This information shows that the sectors that perform the most R&D are less important, measured in terms of share of hours worked, in Atlantic Canada than in Canada as a whole (Appendix Table 41c). For instance, computer and electronic product manufacturing performed more R&D than any other industry in Canada in 2005, $3.1 billion, or 19 per cent of all R&D spending. In Canada as whole, computer and electronic product manufacturing accounted for 0.63 per cent of all hours worked. In Atlantic Canada (data for PEI unavailable) this industry accounted for a considerably smaller share of hours worked in every province: 0.15 per cent in Newfoundland and Labrador, 0.31 per cent in Nova Scotia, and 0.06 per cent in New Brunswick.

Table 15: The R&D Intensity, Canada and the Atlantic Provinces, By Performer, 2005

	All Performers	Business	Government	Higher Education and Non-Profit
	R&D Intensity, Per Cent			
Canada	2.02	1.12	0.20	0.70
Atlantic Canada	1.26	0.33	0.20	0.73
Newfoundland and Labrador	1.22	0.39	0.15	0.67
Prince Edward Island	1.52	0.19	0.67	0.65
Nova Scotia	1.48	0.30	0.23	0.95
New Brunswick	0.98	0.34	0.12	0.53
	Relative to Canada = 100			
Canada	100.0	100.0	100.0	100.0
Atlantic Canada	62.6	29.5	100.4	104.7
Newfoundland and Labrador	60.3	35.0	76.1	96.2
Prince Edward Island	75.2	17.2	341.2	92.7
Nova Scotia	73.5	26.9	116.4	135.8
New Brunswick	48.7	30.0	61.3	74.9

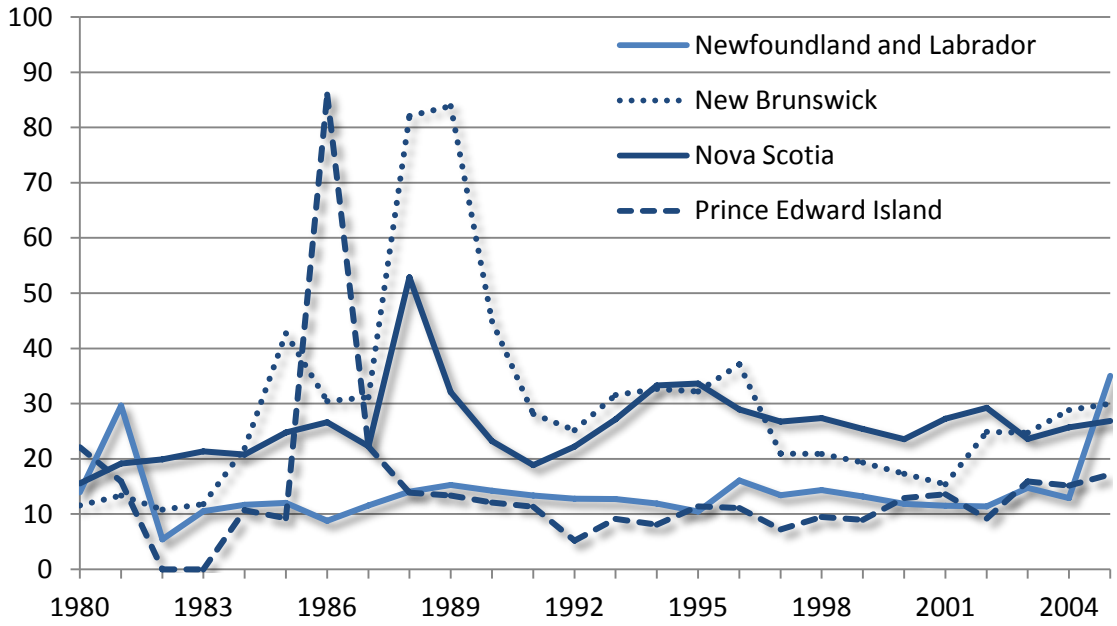
Source: Calculated from Appendix Table 45.

Major R&D-performing industries were less important in Atlantic Canada than in the rest of the country. The top seven R&D-performing industries, which accounted for 51 per cent of Canada's total business expenditure on R&D were almost uniformly less important, as a share of hours worked, in Atlantic Canada than in the rest of the country. As a result, we can conclude that industrial structure accounts for some of the gap between Canada and Atlantic Canada in R&D intensity, but the data do not provide us with sufficient detail to further quantify this conclusion.

R&D intensity estimates are at best an incomplete indicator of innovation. Product and process innovations are not necessarily the result of R&D activities. Enterprises need not develop knowledge in-house, if they can take the best from abroad, either by importing new machinery or by applying new production processes. As noted earlier, the McKinsey Global Institute found that managers need to be aware of best practices in a given industry, and be prepared to implement them. MGI states that sufficient exposure to competition will ensure that this is the case (Kellison, 2004). Alternatively, innovation developed in Atlantic Canada may not have application within

the region, but may lead to productivity improvement elsewhere. Finally, in terms of population and wealth Atlantic Canada is a small part of Canada, which is a small part of the world. It is unlikely that Atlantic Canada will be able to innovate in a large number of areas. The small relative size of Atlantic Canada suggests that the ability to absorb technology and innovation from abroad will always be more important than the ability to generate innovations, and that more focus should be devoted to absorption rather than to internal innovation.[34] Interestingly some research indicates that doing R&D can increase the absorptive capacity of a firm for external R&D (Cohen and Levinthal, 1990).

Chart 29: Business R&D Intensity (R&D Spending as Share of GDP), Atlantic Provinces, Canada = 100, 1980-2005



Source: Appendix Table 41a.

5.3.3. Patents

Patent emission is a result of innovative activity and therefore is an indicator of a region's overall innovative effort, since patents are issued to individuals as well as firms.[35] Far fewer patents are issued for Atlantic Canada than for Canada as a whole. In 2000 based on data reported in Locke and Lynch (2002), only 0.2 per cent of Canadian patents were emitted in Newfoundland and Labrador, 0.2 per cent in PEI, 0.4 per cent in Nova Scotia, and 1.0 per cent in New Brunswick, for a total of 1.8 per cent in Atlantic Canada. Shares of US-emitted patents are of the same order of magnitude (the shares are based on data that excluded patents that have not been attributed to a specific province).

[34] On this point, it is important not to confuse the high-productivity jobs that are associated with innovation (e.g. scientists and researchers) and innovation itself. It is certainly desirable to have an economy that has a greater proportion of workers engaged in highly productive occupations, but innovation is a broader concept as discussed above.

[35] We acknowledge that patents are an imperfect indicator of innovation, because firms have alternative means of protecting intellectual property, such as secrecy, being the first to market, and developing complex designs. To the extent that firms' use of these alternative means changes over time and across regions and sectors, patents may be a misleading indicator of innovation.

In 1999, the last year for which Locke and Lynch (2002) provide data, 0.2 per cent of US patents emitted in Canada were in Newfoundland and Labrador, 0.1 per cent in PEI, 0.9 per cent in Nova Scotia, and 1.1 per cent in New Brunswick, for a total of 2.3 per cent in Atlantic Canada.

To show the relative lack of patent emission in Atlantic Canada bear in mind that Newfoundland and Labrador represented 1.7 per cent of Canadian population in 2000 (and 1.3 per cent of GDP), PEI 0.5 per cent (and 0.3 per cent of GDP), Nova Scotia 3.1 per cent (and 2.3 per cent of GDP), and New Brunswick 2.5 per cent (1.9 per cent of GDP), for a total of 7.7 per cent of the Canadian population in Atlantic Canada (and 5.8 per cent of GDP). Firms in Atlantic Canada are emitting far fewer patents than their weight in Canada might suggest. However, firms in Atlantic Canada can still make use of patented technology by paying fees, which could compensate for the fact they are generating less than their expected share of patented technologies.

5.3.4. Other Innovation Indicators

Like education, innovation is a key determinant of productivity growth. But unlike educational attainment, there is no one indicator of the state of innovation in an economy. This in part reflects the different definitions of innovation (Gault, 2003).

The principal source of information on innovative activity in Canada is the Workplace and Employment Survey (WES) conducted by Statistics Canada. In 2005, based on this survey, Statistics Canada estimated that Atlantic Canada was slightly more innovative than Canada as a whole, measured as the proportion of workplaces with innovation. According to WES estimates, innovation rates in Atlantic Canada have been higher than in Canada as a whole since at least the late 1990s when the survey began.

It is difficult to understand how firms in Atlantic Canada can seemingly be so innovative, yet spend so much less on research and development. One possible explanation is that innovations in Atlantic Canada are of less value or importance than those in the rest of Canada. One indicator of the importance of an innovation is innovation novelty.

The degree of novelty of an innovation has an impact on the competitive advantage of a firm. A firm that produces a Canada-first innovation will be able to enlarge its market share if it markets a new or improved product, or it will be able to undercut its rivals' prices by using a new or improved process. But eventually, firms that do not produce Canada-first innovations might still be able to catch up if they are able to imitate the innovation leader. The degree of novelty of innovation might therefore partly explain the gap in labour productivity if firms in Atlantic Canada are only catching up to firms in the rest of the country in terms of novelty innovation (they might be as innovative in frequency but not in novelty). The productivity gap would be a result of the lag in innovation. But if there is indeed catching up (replication of innovation), the degree of innovation should not impact labour productivity growth differentials and the size of the gap should not be affected.

The 2005 WES provides estimates of innovation novelty. These estimates suggest that there is no difference between Canada and Atlantic Canada in terms of the share of firms that are local-market-first innovators. Unfortunately, estimates of the share of firms that are world-first or Canadian-first innovators are deemed too unreliable to be published by Statistics Canada. There is some evidence to suggest that a lack of financial resources to finance innovation may be relatively more important in Atlantic Canada than in Canada as a whole. As well, it seems that paid on-the-job training is offered in a higher share of workplaces in Atlantic Canada compared to Canada as a whole. Other innovation indicators in the WES also do not suggest major differences in the rate of innovation between Canada and Atlantic Canada.

5.3.5. Key Findings: Innovation in and the Diffusion of Innovation

Overall the picture of innovation in Atlantic Canada is mixed. Innovation indicators from the Workplace and Employee Survey suggest there is little difference between innovation in Atlantic Canada and Canada as whole. By contrast, businesses in Atlantic Canada spend far less on research and development as a share of GDP than their counterparts in the rest of the country.

These paradoxical findings suggest that firms in Atlantic Canada may be adopting innovations from outside the region rather than generating innovations autonomously. This result is hardly surprising given the small relative size of Atlantic Canada in the Canadian, North American and global economies. A key policy question is whether there are barriers to the diffusion of innovation that might stand in the way of firms operating in Atlantic Canada from further adopting productivity-improving technology, a question to which we will return in our discussion of policy options in Part 6.

5.4. Scale Economies and Agglomeration

Agglomeration and scale economies can be important drivers of labour productivity growth and also offer a particularly strong explanation for low labour productivity levels in Atlantic Canada. This section first reviews the available information on scale economies, then turns to agglomeration and urbanization.

5.4.1. Scale Economies

Bigger firms tend to innovate more. In their study of innovation in the Canadian manufacturing sector, Baldwin et al. (2000) find a strong relationship between firm size and innovation. Based on information from Statistics Canada's Labour Force Survey (LFS), we have calculated the share of employees working in establishments of 500 or more employees (very large establishments) as a proxy for firm size (Table 16).[36]

[36] An establishment is "the smallest entity capable of reporting statistics of economic production, typically a factory, a mine, a store or a similar unit" (Statistics Canada, 2008). It would have been preferable to use a measure of the size of enterprises rather than the size of establishments, since even very large firms that might innovate to a great extent, might have large numbers of small establishments and a major centralized research and development operation or corporate headquarters. While data on employment by enterprise size are available in the Survey of Employment, Payrolls, and Hours (SEPH), enterprises may span many provinces, and it is not possible to determine how many employees by enterprise are located in a particular province. For instance, a large share of employment in large

In Atlantic Canada a much smaller share of employees work in very large establishments than in Canada as a whole. For instance, over the period 2005 to 2008 in Canada as a whole, between 13.2 and 13.4 per cent of employees worked in very large establishments. In contrast, in Atlantic Canada over the same period, only between 9.1 and 10.0 per cent of employees worked in such large establishments. While there is significant year-to-year variability in the estimates, a slight upward trend in the share of employees working in very large establishments was also in evidence from 1997 to 2008, providing some evidence that Atlantic Canada might be catching up with Canada as a whole. Table 16: Establishment Size, Share of Employees in Establishments of 500 or more Employees, Canada and the Atlantic Provinces, Per Cent, 1997-2008

	Canada	Atlantic Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick
Per Cent						
1997	12.4	8.1	7.8	6.4	9.1	7.4
1998	12.2	7.5	8.3	5.4	7.7	7.2
1999	11.8	7.7	7.4	6.0	7.7	8.2
2000	12.3	8.9	9.2	7.2	8.0	10.1
2001	12.4	8.9	9.4	6.6	8.6	9.4
2002	12.3	9.9	10.7	6.5	9.9	9.9
2003	12.5	9.6	9.5	7.0	9.7	10.0
2004	12.6	9.9	9.6	7.4	9.8	10.5
2005	13.2	9.7	10.4	7.8	9.8	9.6
2006	13.3	9.2	9.7	7.6	9.2	9.1
2007	13.4	10.0	10.8	8.0	9.4	10.5
2008	13.3	9.1	8.5	8.9	8.4	10.3
Relative to Canada, Canada = 100						
1997	100.0	65.5	63.2	51.7	73.4	59.9
1998	100.0	61.7	68.1	44.1	62.9	59.4
1999	100.0	65.0	62.1	50.3	65.3	68.9
2000	100.0	72.1	74.5	58.3	64.9	82.0
2001	100.0	71.7	75.9	53.1	69.2	75.6
2002	100.0	79.9	86.6	52.7	80.3	80.3
2003	100.0	76.6	76.2	56.2	77.4	79.5
2004	100.0	78.1	75.8	58.7	77.9	83.4
2005	100.0	73.6	78.7	59.2	74.0	72.7
2006	100.0	69.0	72.8	57.3	69.2	68.8
2007	100.0	74.5	80.6	59.9	70.5	78.4
2008	100.0	68.1	63.9	66.5	62.8	77.5

Source: Statistics Canada Labour Force Survey, CANSIM Table 282-0076. Calculated from Appendix Table 53c.

Not only did Atlantic Canada have a far smaller share of hours worked in very large (500+ employees) firms, it also generally had much smaller shares of hours worked

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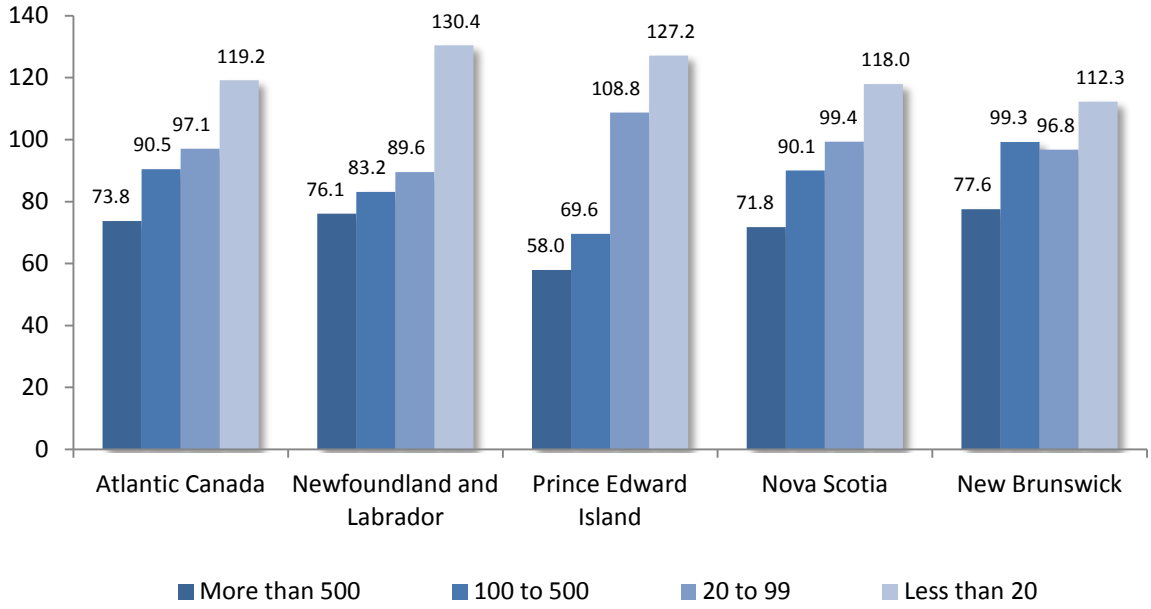
enterprises could mean that a large share of employment takes place in small establishments that are owned by large enterprises headquartered outside of the province. For this reason, to use the SEPH estimates in this analysis could be misleading.

in even large- (100-500 employees) and medium-sized (20-99 employees) establishments (Chart 30). For instance, in Newfoundland and Labrador, relative to Canada, 30 per cent more hours were worked in establishments of less than 20 employees. New Brunswick had the establishment-size structure of hours worked most similar to Canada as a whole, with the shares of hours worked in medium- and large-sized establishments quite similar to the national average.

Chart 30: Average Relative Share of Hours Worked by Establishment Size, Canada and the Atlantic Provinces, Canada = 100, 2000-2007



Source: Appendix Table 53-53c. Author's calculations based on Statistics Canada Labour Force Survey estimates of employment by establishment size.

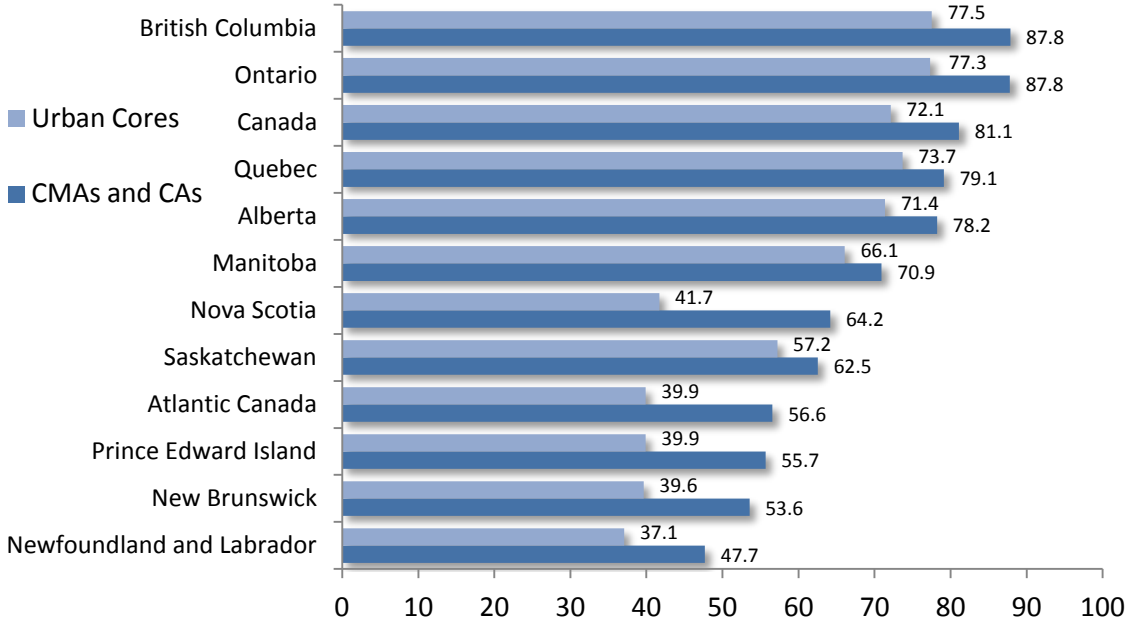
Overall, it is clear that smaller establishments are more prevalent in Atlantic Canada relative to Canada as a whole. This substantial difference in the establishment-size structure of hours worked could help to explain why Atlantic Canada has a lower level of labour productivity than the country as a whole. The economies of scale that come with large establishments and large firms can result in lower costs, leading to higher profits and more funds for investment in new capital equipment and research and development.

5.4.2. Spatial Agglomeration

There is a long-standing school of thought in economics that emphasizes that greater amounts of productive activity concentrated in a particular region or city lead to higher levels of productivity. Harris (2002) notes that there is still debate over the reason why agglomeration and scale economies have a positive impact on productivity growth but leading hypotheses are knowledge spillovers, ease of communication, and the facilitation of learning. It also seems clear that there is a relationship between the size and number of cities and the level of productivity. Since Atlantic Canada is the least urbanized region of Canada, these factors could be particularly relevant.

The share of working-age (15 years of age and over) residents of Atlantic Canada living in urban areas is much smaller than in the rest of Canada (Chart 31). On average over the 2001-2008 period, 81.1 per cent of Canadians lived in a census metropolitan area (CMA) or census agglomeration (CA), a fairly generous definition of urban area.[37] In contrast, in Atlantic Canada only 56.6 per cent of working-age population lived in a CMA or CA over the same time period. Of the Atlantic provinces, Nova Scotia had a notably higher proportion of its population (64.2 per cent) living in CMAs or CAs than the other Atlantic provinces. In Newfoundland and Labrador fewer than half the working-age population (47.7 per cent) lived in a CMA or CA.

Chart 31: Urbanization, Canada by Province, Average Share of Working Age Population by Urban Location, 2001-2008



Source: The author's calculations based on Statistics Canada Labour Force Survey, Appendix Table 54a.
Note: CMA is a Census Metropolitan Area and CA is a Census Agglomeration.

The share of the working-age population living in an urban core is a more restrictive definition of urban population.[38] On this basis the Atlantic provinces appear relatively less urbanized in comparison with the rest of the country, with only 39.9 per cent of the population in Atlantic Canada living in an urban core, compared to 72.1 per cent for Canada as a whole. Interestingly, Nova Scotia, which had 64.2 per cent of its working-age population living in a CMA or CA, had only 41.7 per cent of its population in an urban core. In contrast, Saskatchewan, which had 62.5 per cent of its population

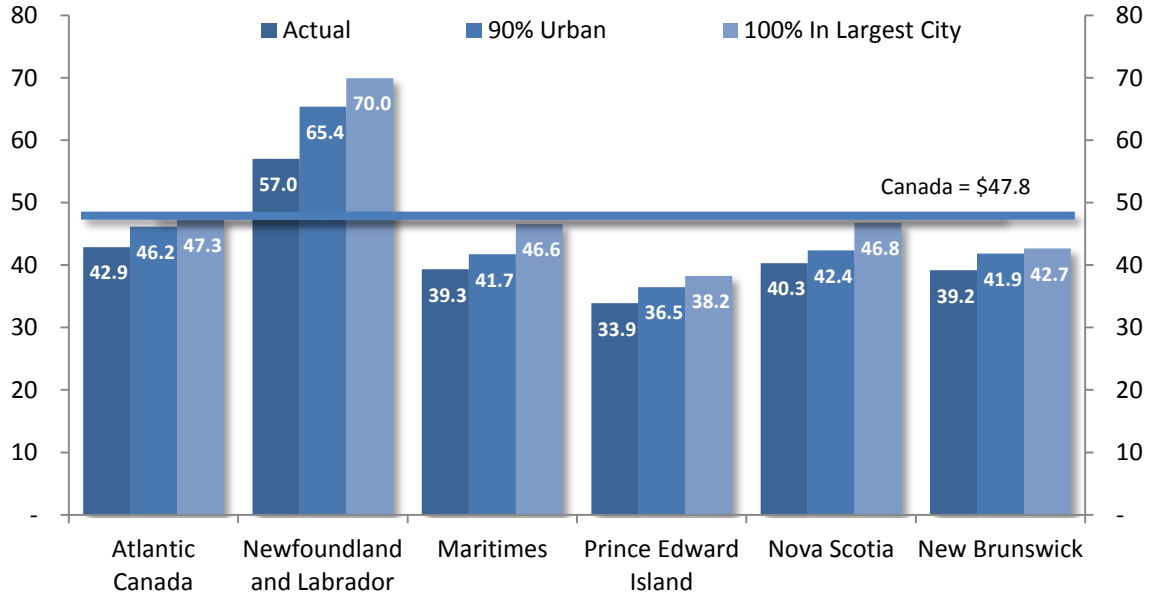
[37] Statistics Canada defines census metropolitan areas and census agglomerations as large urban areas (known as urban cores) together with adjacent urban and rural areas (known as urban and rural fringes) that have a high degree of social and economic integration with the urban cores. A census metropolitan area (CMA) has an urban core population of at least 100,000 and a census agglomeration (CA) has an urban core population between 10,000 and 99,999 based on the previous census.

[38] Statistics Canada defines an urban core as a large urban area within a census metropolitan area or census agglomerations that must have a population of at least 100,000 in the case of a CMA, or between 10,000 and 99,999 in the case of a CA based on the previous census and have a population density of at least 400 per square kilometre.

living in a CMA or CA had 57.2 per cent of its population living in an urban core. Not only is a smaller share of the working age population of Atlantic Canada living in an urban area, urban areas in Atlantic Canada seem to be much less concentrated (lower density) than in the rest of Canada.

But Atlantic Canada has become more urban in recent years.[39] According to estimates of the CMA and CA population aged 15 and over as a share of total population aged 15 and over, every Atlantic province saw its urbanization rate increase from 2001 to 2007. The share of the population aged 15 and over increased from 55.2 per cent to 57.7 per cent. This urbanizing trend is also in evidence in estimates of the share of the population with employment income living in urban areas (CAs and CMAs) based on the 2001 and 2006 Censuses; the share increased slightly from 58.5 per cent to 59.5 per cent for Atlantic Canada as a whole.

Chart 32: Effect of Urbanization on Labour Productivity, Atlantic Provinces, Current Dollars per Hour Worked, 2005



Source: Appendix Table 55f. Author's calculations based on Statistics Canada estimates.

It is difficult to quantify the impact of this low level of urbanization on productivity levels or growth rate in Atlantic Canada. Statistics Canada does not estimate GDP or productivity below the provincial level, so assessing the effect of urbanization on labour productivity is difficult.

The approach taken in this report is to use relative level of employment income as a proxy for relative levels of labour productivity. Over the long run, this assumption is fairly accurate, since employment earnings tend to grow at a similar rate to labour productivity (Sharpe *et. al*, 2008). Using this approach with estimates of employment income from the 2006 Census, which relate to the 2005 reference year, we are able to

[39] For a discussion of some aspects of this trend see Atlantic Provinces Economic Council (2006).

quantify, in crude terms, the effect of urbanization on labour productivity levels in the Atlantic provinces (Chart 32).

It is readily apparent that increased urbanization in Atlantic Canada would likely be associated with a significant improvement in labour productivity. In Atlantic Canada as a whole, increasing the share of the population living in urban areas to 90 per cent, a level similar to that of Ontario, would close 80 per cent of the labour productivity gap between Canada ($47.80 per hour worked) as a whole and Atlantic Canada (from $42.90 per hour worked to $46.20 per hour worked in current dollars). With low levels of urbanization and large gaps between labour productivity in urban and rural areas, Newfoundland and Labrador would see its (already above average) level of labour productivity increase significantly if the population shifted to a level of urbanization similar to Ontario. In the Maritimes, increasing urbanization to the level of Ontario would narrow the labour productivity gap with Canada by almost one-third, from $39.30 per hour worked to $41.70 per hour worked (current dollars).

An alternative analysis, which arguably provides an upper bound estimate of the impact of urbanization on productivity, is to simulate a world in which every resident of an Atlantic province has the same level of productivity as someone living in that province's largest city. For Atlantic Canada and the Maritimes as a whole, the largest city is Halifax. For Newfoundland and Labrador, St. John's is used; for Prince Edward Island, Charlottetown; and for New Brunswick, Moncton. The result of this simulation is that Atlantic Canada, the Maritimes, and Nova Scotia would all enjoy productivity levels similar to Canada as a whole. The effect is more muted in Prince Edward Island and New Brunswick owing to the lower levels of labour productivity in Charlottetown and Moncton relative to Halifax.

Baker and Trefler (2002) found that in 60 jurisdictions in North America in 1997 and 1998, holders of masters, professional or doctoral degrees earned 10 per cent more in urban than in rural areas. In contrast, high school dropouts earned 9 per cent more in rural areas than in urban areas. This research suggests that advanced degree holders—those who embody the high levels of human capital and arguably are likely to make the greatest contributions to innovation—have a financial incentive to locate in urban areas, whereas those who have the lowest level of formal education have an incentive to work in rural areas.

Coulombe (2003) also analyzed the relationship between urbanization and labour productivity, and argued that convergence between provinces will be constrained by the degree of urbanization. He modifies the standard growth model to explain conditional rather than absolute convergence of the Canadian provinces to the Canadian average, and uses the proportion of the population living in urban areas (at least 10,000 inhabitants) in a given province relative to Canada as a whole to proxy the differences in economic structure that would lead to differences in long-term income per capita levels. He concluded that both human capital and per capita income in the provinces have converged to the Canadian average over the past 50 years in relation to relative urbanization rates, and that much of the remaining inter-provincial differences are permanent and constrained by structural differences.

In other words, high human capital is a necessary but not sufficient condition for growth and for higher long-term levels of income per capita or productivity. Necessary and sufficient conditions are human capital combined with some threshold degree of urbanization, or more precisely, the economic structure typically found in provinces with greater rates of urbanization. Coulombe cites Nova Scotia as the most striking evidence of this, as the rich tradition of university education ensures a high level of human capital in that province even after much of the well-educated young population migrates, yet the province as a whole remains relatively poor due to the consequences of its limited degree of urbanization.

From this perspective, policies to increase human capital in Atlantic Canada will be less successful in improving productivity in Atlantic Canada relative to Canada as a whole. A more effective policy direction in terms of relative productivity growth would be to increase the level of urbanization in the Atlantic provinces. Unfortunately, this is a much more elusive policy goal than increasing human capital. While it is a relatively straightforward proposition that educational attainment could be increased by providing more funding to students or that the quality of education could be improved in part by providing more funding to schools, the development of urban areas requires more than simply encouraging people and businesses to locate in a given region. It is debatable whether the agglomeration and network benefits of a well-diversified city could be generated by government policy at all.[40]

One aspect of urban areas may be a candidate for specific policy attention, however, and this is the role of cities as hubs of the knowledge economy. Large urban areas have the economic opportunities to attract the most skilled job candidates, and the most knowledge-intensive firms are thus drawn by the pool of skilled workers to locate in these large centers. The industries that have become synonymous with the knowledge-based economy–those that produce or are intensive users of information and communications technologies and are frequently engaged in product and process innovation, such as high-tech manufacturing, the distributive services, and business service industries–are for the most part concentrated in cities.

There is hence a network of associations between human capital, urbanization, productivity and innovation which might be exploitable in terms of policies to improve productivity in Atlantic Canada relative to Canada as a whole. Human capital and innovation are primary drivers of productivity growth, but as has been discussed, both human capital and productivity growth are constrained by urbanization-dependent economic structure. And while it has not been shown that urbanization is a direct constraint to the innovativeness of an economy, it has certainly been the case so far that

[40] The importance of urbanization for productivity and income per capita differences is also found, in a different type of analysis, by the Institute for Competitiveness and Prosperity (2005) for Canada relative to the United States. This study reports that $3,300 of the $7,200 gap between Canadian and U.S. GDP per capita in 2003 was due to lower urbanization in Canada after controlling for differences in industry clusters, education and physical investment. For a review of the literature on the economic benefits of cities, see Andersson, Burgess and Lane (2004) and the Institute for Competitiveness and Prosperity (2003).

the two are closely related. Further, innovativeness is directly related to human capital, since innovative and knowledge-based firms require highly skilled workers.

The nexus between human capital and innovation is widely recognized, and in fact has been discussed in depth in the context of Atlantic Canada by Beaudin and Breau (2001). These authors see skills acquisition as a critical issue in Atlantic Canada, since, even though the Atlantic provinces score fairly favourably on some measures of human capital, there remains a gap between the amount and type of skills required to support knowledge-based businesses in Atlantic Canada and the present skills of the Atlantic Canadian workforce. However, they do not address the idea that the below-average level of urbanization in Atlantic Canada may limit the usefulness of further skills acquisition. While it may be true that higher human capital is required to find employment in knowledge-intensive positions, it is not clear that enough knowledge-intensive positions will be created in Atlantic Canada in the near future to justify large-scale investment in skills acquisition. Since the aspects of large cities that have so far proven essential to the success of innovative industries do not exist to as large a degree in Atlantic Canada as in other Canadian provinces, further investment in human capital in Atlantic Canada is likely to produce many more job candidates than can be absorbed by knowledge-based businesses in Atlantic Canada.

5.5. Public Infrastructure

Public infrastructure[41] is important for productivity growth. It reduces the costs and risks of doing business and thus fosters investment. For example, gridlocked highways increase the length and variability of time required to move people and goods from place to place. When just-in-time production methods are the global standard, businesses will prefer to invest where the transportation infrastructure is most reliable (see for example, Harchaoui and Tarkhani, 2003). Abundant high-quality infrastructure is an important driver of productivity growth.

The available evidence suggests that there is no deficiency in infrastructure in the Atlantic provinces at the aggregate level (Table 17). The Atlantic provinces all have significantly more public infrastructure per dollar of GDP than the national average. In fact, since 1981 no other province has had as much public infrastructure per dollar of GDP as any one of the Atlantic provinces. The situation is similar with transportation infrastructure density, both public and private. Prince Edward Island and New Brunswick both appear particularly well-equipped with infrastructure, reflecting in part the significant investment in the Confederation Bridge which Statistics Canada allocates equally to these two provinces (Gagnon, et al, 2008).

A high level of public infrastructure density can be interpreted in different ways. In a positive light, it could indicate a particularly strong provincial transportation network and well-developed municipal infrastructure like water, sewer, and port facilities.

[41] Public infrastructure investment is defined as investment in engineering construction in the health care and social assistance, educational services, and government industries, as defined in the North American Industry Classification System (NAICS). It excludes buildings such as hospitals and schools. In fact, almost all government core infrastructure investment is to be found in public administration and consists in large part of roads and bridges.

Alternatively, it could be that differences in geography, climate, industrial structure, and urbanization have naturally led to a different level of infrastructure density. Available data do not allow us to test the hypothesis that industrial structure could be responsible for these findings.[42] A more pessimistic view is that governments have over-invested in infrastructure and that significant capital is locked up in infrastructure assets which are producing little return. In reality, all of these factors are likely having an impact on infrastructure density in Atlantic Canada. There is some evidence to suggest that infrastructure is well under capacity. One study found that the port of Halifax was at 61 per cent capacity in 2005 and would likely have sufficient capacity until 2015, and that rail capacity was abundant and would be adequate until 2016 (CPCS Transcom, 2006). That study was completed well before the downturn in 2008-09. Given the long lead times required to put in place some major types of engineering structures, some excess capacity is desirable, but too much can lock up capital that could better support productivity growth if redeployed in another form.

Table 17: Infrastructure Density in Canadian Provinces, Infrastructure Capital as a Share of Nominal GDP, Period Averages, Canada = 100, 1981-2007

	1981-2007	1981-1989	1989-2000	2001-2007
All Public Infrastructure				
Newfoundland and Labrador and Labrador	188.4	198.5	197.5	152.4
Prince Edward Island	193.8	198.5	197.4	179.7
Nova Scotia	142.3	145.5	144.2	132.5
New Brunswick	187.7	188.9	179.9	201.7
Quebec	108.3	108.4	105.0	113.6
Ontario	78.6	78.7	76.3	82.1
Manitoba	106.0	106.7	108.2	100.1
Saskatchewan	94.4	111.0	80.8	90.6
Alberta	102.9	101.1	113.4	88.7
British Columbia	101.7	96.9	104.5	106.7
Transportation Infrastructure				
Newfoundland and Labrador and Labrador	152.6	158.8	160.5	126.9
Prince Edward Island	172.3	123.3	198.2	223.3
Nova Scotia	117.8	117.2	121.3	112.4
New Brunswick	191.5	180.7	190.8	214.3
Quebec	102.8	103.6	97.6	109.7
Ontario	75.2	75.2	71.9	80.9
Manitoba	123.3	123.8	125.0	120.3
Saskatchewan	121.2	129.9	121.0	106.1
Alberta	97.7	96.9	108.8	81.2
British Columbia	140.8	140.4	146.5	133.1

Note:
1. Year-End Net Stock of Engineering Construction Assets, Current Dollars, Geometric Depreciation
2. Transportation infrastructure estimates include business sector infrastructure, e.g. railroads and pipelines.
Source: CSLS calculations based on unpublished Statistics Canada data.

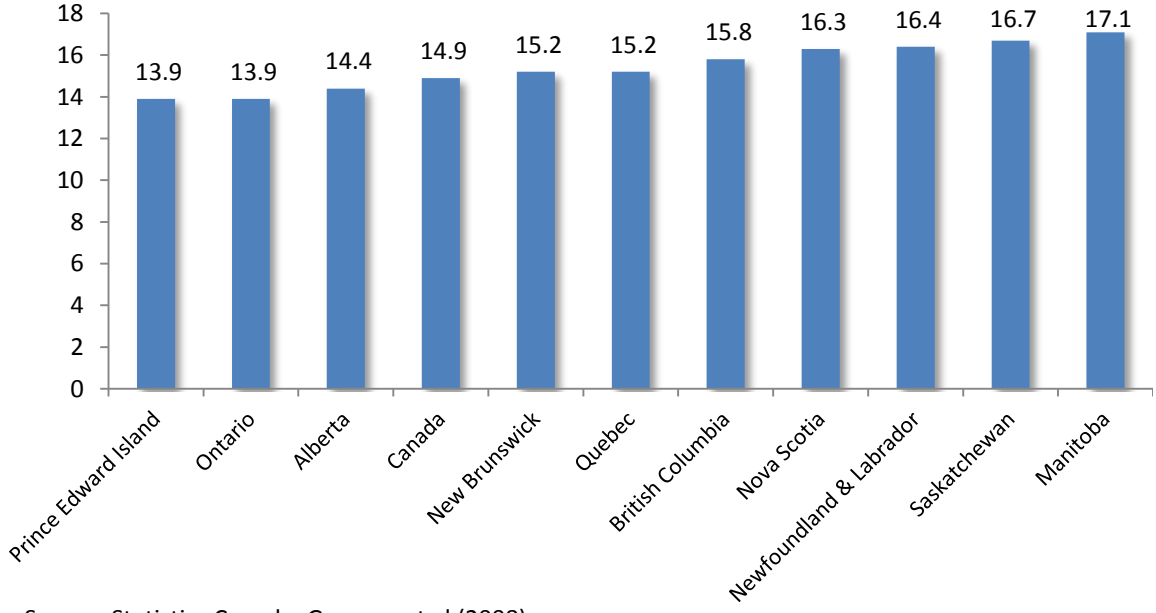
An interesting interpretation of Atlantic Canada's infrastructure situation is that it is not the infrastructure within Atlantic Canada that is the problem, but rather the

[42] Specifically, we do not have detailed asset data by industry and by province.

infrastructure outside of the region that connects it with the United States and the rest of Canada (Cirtwell, 2009). Cirtwell cites some well-known example: the untwined Highway 185 from the New Brunswick border to Rivère-du-Loup; border infrastructure and vehicle weight constraints in Maine; and the structure of the short-line rail industry in the US northeast. This view corroborates the evidence that significant improvements to the transportation infrastructure within Atlantic Canada should not be given priority as a policy issue.

Another perspective on infrastructure adequacy is the age of infrastructure. Gagnon et al (2008) looked at the average age of public infrastructure by province in five asset classes: roads, bridges, water supply systems, wastewater treatment facilities, and sewer systems. They caution that a reduction in the average age of public infrastructure in a province does not necessarily mean that each infrastructure asset is younger or in better condition, or that a greater share of a province's infrastructure meets a specific quality standard. Below we examine roads and bridges, which together account for between 70 and 80 per cent of the gross stock of the five infrastructure assets at historical cost. The gross capital stock is the cumulated total of all investments made on a specific asset. It does not reflect depreciation.

Chart 33: Average Age of Roads and Highways, Canadian Provinces, Years, 2007

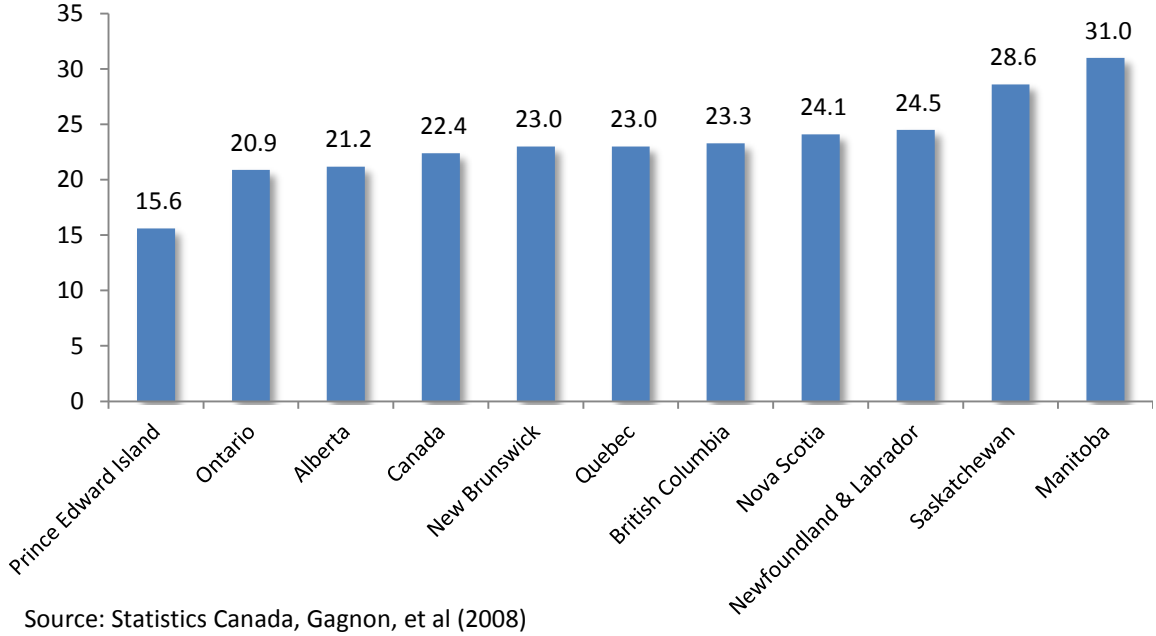


Source: Statistics Canada, Gagnon, et al (2008)

Relative to other Canadian provinces, the average age of roads and highways (Chart 33) and of bridges and overpasses (Chart 34) is mixed. Prince Edward Island stands out with the youngest average infrastructure in part owing to the heavy weight given to the Confederation Bridge. Newfoundland and Labrador has the third oldest road network and bridges in Canada, although the trend to newer infrastructure only began in the past few years (Gagnon, et al, 2008). The average age of roads and bridges has fallen somewhat in Nova Scotia since 2001, but remains high. In New Brunswick, significant

recent investment in the road and bridge networks have reduced the average age of these assets.

Chart 34: Average Age of Bridges and Overpasses, Canadian Provinces, Years, 2007



Source: Statistics Canada, Gagnon, et al (2008)

Aggregate infrastructure density in the Atlantic provinces is among the highest in Canada, both in terms of public infrastructure and public and private transportation infrastructure. As well, the average age of the road and bridge infrastructure is mixed, with notably older infrastructure in Nova Scotia and Newfoundland and Labrador. While it is certainly possible that the existing stock of infrastructure in Atlantic Canada could be deployed more efficiently and effectively, we cannot conclude that aggregate infrastructure in Atlantic Canada is inadequate. While more infrastructure is almost always beneficial for productivity, there is certainly a point at which diminishing returns will be reached. As a result, we must look elsewhere for recommendations to improve the productivity performance of Atlantic Canada.

5.6. Competitive Intensity

International experience, overall, supports the existence of a strong link between open and competitive markets (competitive intensity) and innovation and productivity. The OECD has done extensive work on the drivers of innovation and productivity. An important component of this work has involved the building of a set of quantitative indicators of product market regulation based on questionnaires sent to OECD member governments covering three domains: state control, barriers to entrepreneurship and barriers to trade and investment. The main conclusion from this OECD research is that regulatory reforms promoting competition tend to boost productivity.

Pertaining specifically to Canada, OECD researchers find that Canada's overall market regulation ranking fell from fourth to eighth among OECD countries from 1998 to

2003. Recent OECD research based on the indicators finds that if Canada would have followed the reforms of the least restrictive country in 1995, productivity growth between 1996 and 2003 would have been 1 percentage point higher per year. This represents an almost 50 per cent increase relative to the actual level of productivity growth over that period (Sharpe and Currie, 2008).

Other researchers have also conducted important research on the relationship between competition and innovation and productivity. Michael Porter, whose work has focused on the importance of competition for innovation and productivity, shows that local competition and vigorous domestic rivalry promotes success in international markets. As was noted earlier, the McKinsey Global Institute (MGI) case studies have found that competition intensity has a positive effect on productivity. This effect comes from multiple factors, such as concentration (as long as it allows for intense competition), removal of trade protection, and deregulation. Other factors such as minimum wages, work rules and zoning laws also had an indirect effect on productivity. The MGI also highlights the fact that competition increases managerial innovation, and that managerial innovation is a key factor for increased productivity.

Openness in certain industries is particularly important for productivity growth. OECD research finds some evidence that financial markets are important to growth, through helping to channel resources towards the most rewarding activities and through encouraging investment. MGI highlights the airline, telecommunications and banking industries as cases in which deregulation has boosted productivity, and in which countries that have chosen to delay or forgo deregulation have consequently suffered lower productivity levels than the early deregulators. The automobile industry in Germany, France and the United Kingdom, the food processing industry in Japan, and many Swedish service industries are all examples highlighted by MGI of industries whose productivity performance has been hindered by trade protection.

Perhaps even more important than the market conditions under which a firm operates is the way its managers choose to react to those conditions. Competitiveness is the main driver of managerial innovation, but that managerial innovation (or lack thereof) is what affects productivity, first at the firm level, then the industry level, and ultimately at the national level.

5.6.1. Government Spending as a Share of GDP

A crude measure of the level of government involvement in the economy is the level of current (as opposed to capital) government spending as a share of GDP. Given that government tends to act in a way that is non-competitive, i.e. not responding to market signals and the price mechanism, a higher level of government spending can be suggestive of an economy with lower competitive intensity. However, this measure of competitive intensity is not without problems. A high level of government spending may not adversely affect competitive intensity; the key factor is the structure of government spending.

Table 18 provides estimates of current spending by all three levels of government in the ten provinces as a share of provincial GDP in 2006. Atlantic Canada, Manitoba, and Quebec have significantly higher levels of spending relative to GDP than Ontario, Alberta and British Columbia. The Canadian average was 34.7 per cent of GDP. Prince Edward Island had the highest spending of any province at 57.6 per cent. In Nova Scotia governments spent the equivalent of 53.4 per cent of GDP. In New Brunswick the figure was 50.4 per cent. In Newfoundland and Labrador governments spent 43.9 per cent of GDP, a level similar to Quebec and Manitoba. In contrast, governments in Ontario spent only 32.5 per cent of GDP, in British Columbia 32.4 per cent of GDP, and in Alberta 21.0 per cent of GDP.

Table 18: Government in the Economy, Reasons for the Gap in Current Government Spending as a Share of GDP, 2006

	Total Current Expenditure	Net Current Expenditure on Goods and Services	Current Transfers to Persons	Current Transfers to Businesses	Interest on the Public Debt
Level as a Share of GDP, Per Cent					
Canada	34.7	19.2	10.0	1.1	4.4
Newfoundland and Labrador	43.8	27.7	11.3	0.7	4.1
Prince Edward Island	57.6	32.6	17.0	1.9	6.1
Nova Scotia	53.4	31.7	14.3	1.0	6.4
New Brunswick	50.4	28.2	14.9	0.8	6.4
Quebec	44.9	22.3	13.4	2.3	7.0
Ontario	32.5	18.5	9.3	0.6	4.1
Manitoba	43.9	23.7	12.9	1.7	5.7
Saskatchewan	37.1	20.1	10.5	2.6	3.9
Alberta	21.0	12.5	5.7	0.8	1.8
British Columbia	32.4	17.9	9.8	0.8	3.8
Atlantic Canada	49.9	29.5	13.7	0.9	5.7
Contribution to Gap (Level as a share of GDP in province/region less level as a share of GDP in Canada) in Percentage Points					
Newfoundland and Labrador	9.1	8.4	1.3	- 0.4	- 0.3
Prince Edward Island	22.9	13.4	7.0	0.8	1.7
Nova Scotia	18.7	12.5	4.3	- 0.1	2.1
New Brunswick	15.7	9.0	4.9	- 0.3	2.1
Quebec	10.2	3.0	3.4	1.2	2.6
Ontario	- 2.2	- 0.7	- 0.7	- 0.5	- 0.3
Manitoba	9.2	4.5	2.9	0.6	1.3
Saskatchewan	2.4	0.9	0.5	1.5	- 0.5
Alberta	- 13.7	- 6.7	- 4.3	- 0.2	- 2.5
British Columbia	- 2.3	- 1.3	- 0.2	- 0.3	- 0.5
Atlantic Canada	15.2	10.3	3.7	- 0.2	1.4

Source: Appendix Table 58p, author's calculations based on Statistics Canada estimates.

In Table 18, we translate the relative levels of spending into a gap with Canada by subtracting the Canadian level of spending as a share of GDP from the

provincial/regional level of spending as a share of GDP. For instance, Nova Scotia has a gap of 18.7 percentage points in government spending, because in Nova Scotia government spending is 53.4 per cent of GDP, while in Canada as whole it is only 34.7 per cent, a difference of 18.7 percentage points.

The lower panel of Table 18 explains the source of the gap in current total government spending by broad spending category: current expenditure on goods and service (including the labour compensation of government workers), currents transfers to persons (including social security and employment insurance), current transfers to business, and interest on the public debt. The figures in the leftmost column in the bottom panel of Table 18 are gap in percentage points. For instance, Newfoundland and Labrador has a level of government spending as a share of GDP that is 9.1 percentage points (26.2 per cent) higher than the Canadian average (43.8 per cent relative to 34.7 per cent). Of this 9.1 percentage-point gap, 8.4 percentage points (93 per cent of the gap) resulted from higher relative spending on goods and services.

In Prince Edward Island, government spending as a share of GDP was 22.9 percentage points (66.1 per cent) higher than the Canadian average. This gap was explained by higher relative expenditure on goods and services (13.4 percentage points or 58.5 per cent) and on transfers to persons (7.0 percentage points or 30.5 per cent).

In Nova Scotia, government spending as a share of GDP was 18.7 percentage points (53.9 per cent higher) than the Canadian average. Two-thirds of this gap was explained by higher current government expenditure on goods and services (65 per cent higher than average as a share of GDP). Higher current transfers to persons and higher interest on public debt explained the remaining gap with Canada.

In New Brunswick, government spending as a share of GDP was 15.7 percentage points higher than the Canadian average. Higher current spending on goods and services accounted for 9.0 points of the 15.7-point gap. Higher relative current transfer to persons accounted for 4.9 percentage points, while a higher public debt interest as a share of GDP accounted for 2.1 percentage points of the gap.

In sum, the Atlantic Provinces, especially the Maritimes, spent a considerably greater share of GDP on government than most other provinces in Canada. Higher current expenditure on goods and services as a share of GDP was by far the most important factor in explaining the higher relative level of government spending. Perhaps surprisingly, current transfers to business, with the exception of PEI, were lower as a share of GDP than the Canadian average. Transfers to persons were also much higher than the Canadian average in the Atlantic provinces, but contributed less to higher relative total government spending because they are a smaller category of expenditure than spending on goods and services.[43]

5.6.2. Public Administration Employment

[43] This analysis results in very similar conclusions if conducted on government spending per capita rather than on government spending as a share of GDP. See Appendix Table 58q.

One reason for higher relative levels of current government expenditure on goods and services could be differences in public administration employment. Another perspective on competitive intensity is the size of the public administration workforce. In 2007 in Atlantic Canada, the share of total hours worked in public administration was 63 per cent higher than in Canada as whole (Table 19). In Canada as a whole 4.8 per cent of total hours worked were in public administration. In contrast, in Atlantic Canada the average was 7.9 per cent. This ranged from a high of 8.6 per cent in Prince Edward Island to 7.2 per cent in New Brunswick.

Table 19: Hours Worked for All Jobs, Public Administration, 2007

	Total	Federal	Provincial and Territorial	Local, Municipal, and Regional
As a Share of Total Hours Worked in All Industries, Per Cent				
Canada	4.8	2.0	1.5	1.3
Newfoundland and Labrador	7.8	2.7	3.7	1.3
Prince Edward Island	8.6	4.8	3.0	0.8
Nova Scotia	8.5	4.9	2.0	1.6
New Brunswick	7.2	3.7	2.2	1.3
Quebec	5.2	1.9	2.0	1.3
Ontario	4.6	2.1	1.2	1.3
Manitoba	5.8	2.5	1.8	1.6
Saskatchewan	5.7	1.6	2.1	1.9
Alberta	3.9	1.2	1.3	1.4
British Columbia	3.4	1.5	0.9	1.1
Atlantic Canada	7.9	4.0	2.5	1.4
Relative to Canada = 100				
Newfoundland and Labrador	160	135	245	102
Prince Edward Island	177	238	200	60
Nova Scotia	175	240	133	122
New Brunswick	148	183	149	95
Quebec	107	95	132	97
Ontario	95	104	81	97
Manitoba	120	123	119	117
Saskatchewan	117	80	143	146
Alberta	81	61	85	107
British Columbia	71	74	59	80
Atlantic Canada	163	200	165	105

Source: Appendix Table 56a, author's calculations based on Statistics Canada estimates.

At the municipal level both Newfoundland and Labrador and New Brunswick had 1.3 per cent of hours worked occur in public administration, identical to the national average. Prince Edward Island had only 0.8 per cent of hours worked at the municipal level, while Nova Scotia had 1.6 per cent of hours worked at the municipal level.

In contrast, at the federal and provincial levels, the Atlantic provinces had significantly higher shares of hours worked in public administration. There is no question that at the federal level this high share reflects the large military presence relative to population. However, the reason for a large share of hours worked in provincial public administration, which does not include healthcare or education, is less clear. Newfoundland and Labrador has more than twice as many hours worked in provincial

public administration relative to the Canadian average, the highest level in Canada. In relative terms, Prince Edward Island has twice as many provincial public administration hours worked as the Canadian average, while Nova Scotia and New Brunswick have respectively 33 and 49 per cent more hours worked in provincial public administration than the Canadian average, all relative to total hours worked.

An investigation into the reasons for these dramatic differences in the relative shares of hours worked in public administration, especially at the provincial level, is outside the scope of this report. However, at the very least, these differences warrant further analysis and suggest potential inefficiencies at the provincial government level, and possibly federal government, in Atlantic Canada.

5.7. Key Findings

The fourth part of the report has reviewed in detail the drivers of productivity in Atlantic Canada for which data were available and which were deemed by the authors to be of the greatest relevance. The key findings of this review are as follows:

- Atlantic Canada has a significant gap with the rest of Canada in terms of machinery and equipment available per hour worked. This gap exists within industries and cannot be entirely explained by the different industrial structure of Atlantic Canada.

- Atlantic Canada generally has higher university enrolment and graduation rates than Canada as a whole, but the share of the population with postsecondary qualifications is generally lower than in the rest of Canada. This paradox may be in part because lower earnings for highly skilled graduates in Atlantic Canada incent skilled workers to leave the region.

- In spite of low levels of business sector research and development spending as a share of GDP, firms in Atlantic Canada appear to be as innovative as firms in the rest of the country. This paradoxical finding suggests that, as might be expected for a small region, Atlantic Canada is adopting technology from outside rather than developing it internally.

- A considerably smaller share of workers in Atlantic Canada is employed in very large establishments than in Canada as a whole. This finding suggests that firms in Atlantic Canada are not taking advantage of economies of scale which could increase productivity.

- Atlantic Canada is significantly less urbanized than the rest of Canada. Less urbanization likely means that advanced degree holders and the firms that employ them are less likely to locate in Atlantic Canada than in other regions of the country. Lower levels of urbanization also reduce network effects that can lead to higher productivity.

- Atlantic Canada does not appear to suffer from a shortfall in the amount of public infrastructure. Indeed, there is some evidence that resources that could be better

deployed elsewhere are locked up in public infrastructure that is not needed. There is some evidence that the infrastructure in Quebec and the US northeast is in need of improvement, in order to reduce the costs of transportation between Atlantic Canada and the rest of North America.

- Atlantic Canada has far more hours worked in public administration as a share of total hours worked, particularly at the provincial level, which suggests that there may be scope for efficiencies in the provision of government services.

6. Policy Options

This section explores policy options in the areas of taxation, regulation and human capital for improving the productivity performance of Atlantic Canada.

6.1. Tax Policy

Tax policy can have an important impact on productivity performance through its effects on incentives. Relative taxation levels are among the few measurable and most certain factors affecting businesses investment decisions, and thereby the level of machinery and equipment—an important determinant of productivity levels. As such, taxes are often given significant weight in business decisions about where to invest. This section begins by explaining why taxation design matters and how tax reform does not necessarily mean a smaller role for governments. The second sub-section focuses on the state of taxation in Atlantic Canada relative to other provinces. The third sub-section discusses sales taxes, the fourth corporate income tax, the fifth property taxes, the sixth industry-specific tax incentives and other preferential programs, and the seventh part discusses personal income taxes. The final section summarizes key findings.

6.1.1. High Taxes Are Not Incompatible with Strong Economic Performance

Conventional wisdom is that higher taxes stifle economic growth. Yet, there is no consensus either among the public or among economists about the optimal size of government. Indeed, Sweden and Denmark are often cited as examples of countries with high public spending (and high taxes) and strong economic performance (Brooks and Hwong, 2006 and Kesselman, 2004). In the economic literature, the focus of research has shifted from an analysis of aggregate taxation and economic performance to evaluating specific tax and spending policies.

Taxes impose an economic cost above and beyond the amount collected by the government, because taxes introduce economic distortions. For example, income taxes reduce incentives to work at the margin. High income taxes will lead to lower than optimal time at market work and more than optimal time at informal work and leisure. A recent survey of the literature on the magnitude of tax distortions in Canada shows clear differences in the efficiency of different taxes (Baylor, 2005). The least economically efficient[44] taxes are those on capital income, followed by corporate income taxes, personal income taxes, wage taxes, and consumption taxes. Not only are consumption taxes less distorting than capital and corporate income taxes, but the difference is substantial. For example, one study suggests that a one-per-cent-of-GDP shift from

[44] One way to assess the efficiency of a tax is to measure the amount of economic activity, measured in dollars, that does not occur as the result of a tax; in economics this loss in efficiency is called "deadweight loss." For example, a tax on personal income could result in individuals working less than they otherwise would if taxes were lower or non-existent. The output that is not produced as a result of reduced working hours is the deadweight loss. Deadweight loss is inefficient, because while people are willing to work, they do not. They do not because they cannot capture enough of the benefit from the additional time spent working to outweigh the value of the leisure time they would have to forego.

corporate income tax to consumption tax would lead to a 1.7 per cent increase in steady-state GDP.[45]

As noted in Sharpe (2007), the cost of capital is a key determinant of investment decisions and therefore productivity. Ab Iorwerth and Danforth (2004) find increasing evidence that lowering the cost of capital would have a significant impact on firm investment and that policy initiatives should be focused on permanent changes in the cost of capital.

6.1.2. The Overall Business Tax Regime in Atlantic Canada

In 2007, tax revenues relative to GDP in Atlantic Canada were generally above the national average (Table 20). In Canada, provincial and local governments collected tax revenues equivalent to 14.6 per cent of GDP in 2007.[46] In comparison, in Prince Edward Island, Nova Scotia, and New Brunswick total tax revenues as a share of GDP were similar to levels in Ontario, lower than levels in Quebec, but notably higher than levels in Saskatchewan, Alberta, and British Columbia. Newfoundland and Labrador had the lowest tax revenues as a share of GDP of any Canadian province, with the exception of oil-rich Alberta. Newfoundland and Labrador's low tax ratio reflects the heavy reliance of the government on revenue associated with energy production rather than taxes.

Table 20: Provincial and Local Government Tax Revenues, As a Share of GDP, Per Cent, 2007

	Canada	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC
Total Tax Revenues	14.6	9.4	15.8	15.7	14.8	19.8	15.6	14.8	13.9	8.3	12.8
Personal Income Taxes	4.7	3.0	4.8	5.2	4.4	7.4	4.7	4.6	3.2	3.0	3.6
Corporation Income Taxes	1.3	0.7	0.9	1.3	0.9	1.4	1.6	0.6	1.1	1.4	0.9
Consumption Taxes	3.9	3.8	6.6	5.5	5.3	5.0	4.1	4.8	4.2	1.5	4.4
Property and Related Taxes	3.3	0.9	2.7	3.1	3.2	3.6	4.1	3.3	3.2	2.0	3.1
Other Taxes	1.3	1.0	0.8	0.6	1.1	2.5	1.2	1.5	2.2	0.6	0.8

Source: CSLS calculations based on Statistics Canada data.

[45] Baylor (2005) also notes that in the only model for which it was evaluated, increases in tax depreciation rates or capital cost allowances (CCA) rank highest in terms of welfare gains.

[46] Not all government revenues are from taxation. For example, a substantial amount of provincial revenues also come from transfers from other levels of government, crown corporations dividends, health and drug insurance premiums, contributions to social security plans, sales of goods and services, investment income (including royalties) and other revenue from own sources.

Box 1: The Comprehensive Review of New Brunswick's Tax System

In June 2008, the Government of New Brunswick launched the first comprehensive review of that province's tax system in more than two decades. The review had the objectives of ensuring that "New Brunswickers can keep even more of their hard-earned dollars to save and invest" and "to make the province more attractive for business, investment, and people, by establishing a tax structure that is more competitive globally, resulting in job creation, income generation, and a bright future for New Brunswickers."

In a discussion paper, the New Brunswick Department of Finance explicitly set out the guiding principle of the reform of the tax system as generating a larger share of provincial revenues from consumption taxes and a smaller share from personal and corporate income taxes. This principle strongly favours productivity growth, because it favours savings and investment.

The discussion paper set out a series of options to restructure the tax system organized into five categories:

1. Reduce and simplify New Brunswick personal income tax by replacing the current four brackets to either two brackets or a single rate (flat tax).
2. Introduce a non-refundable child tax credit of up to $400 per child and a universal child care benefit of $600 for every child.
3. Promote economic and job growth by reducing the corporate income taxes and non-residential property taxes.
4. Create a carbon tax to encourage energy efficiency.
5. Offset personal and corporate income tax reductions with increases in consumption taxes.

The discussion paper was released in June 2008. In December 2008, a parliamentary committee recommended that the Government introduce a flat personal income tax, introduce the child tax credit and benefit, reduce the general corporate income tax rate to 5 per cent, not introduce a carbon tax, increase the Harmonized Sales Tax (HST) to offset corporate and personal income tax reduction and provide a credit for low income earners, and reduce the non-residential property tax rate.

The Government responded to the tax reform initiative in its 2009 budget. The key initiatives were

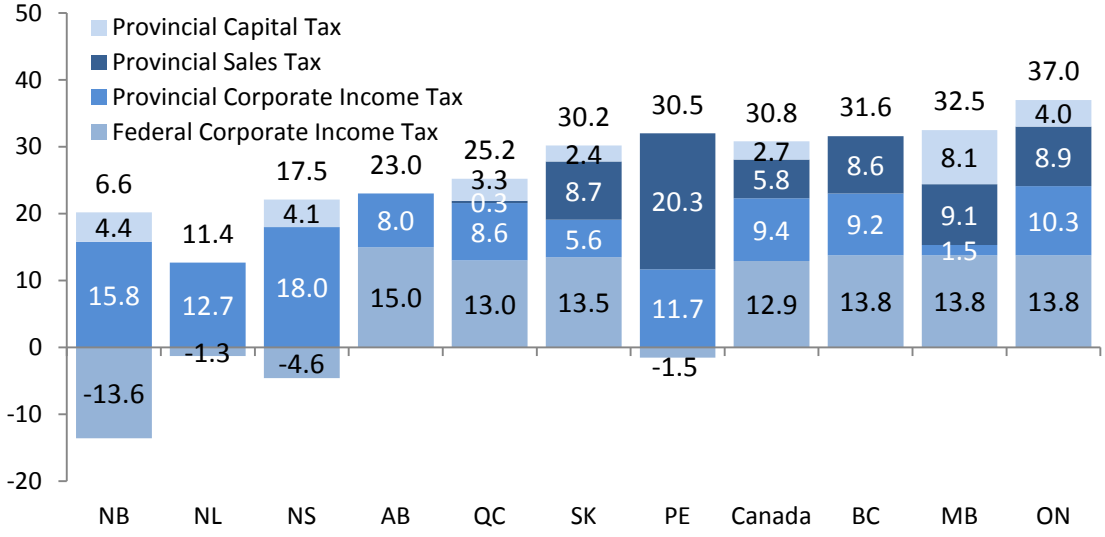
- A reduction in personal income tax rates over four years with the introduction of two rate brackets: 9 per cent and 12 per cent.
- A reduction in corporate income tax rates from 13 per cent in 2008 to 8 per cent in 2012.
- Temporary tax credits to reduce the cost of investment in forestry and to support the pulp and paper industry.
- An increase in the small business limit for corporate income tax from $400,000 to $500,000.
- Limits on the increase in property taxes beyond the rate of increase of the Consumer Price Index.

Overall, these measures are positive. Relative to the discussion paper, it is somewhat disappointing that the Government chose to spend so much on personal income tax reductions rather than corporate income tax reductions (by 2012 $323 million vs. $37 million). Nonetheless, in terms of statutory rate, New Brunswick is on track to have the lowest corporate income tax rate in Canada in 2012.

The Maritime provinces relied more heavily on consumption taxes than corporate income taxes than other Canadian provinces. The only exception was Newfoundland and Labrador (3.8 per cent), which ranked second only to Alberta (1.5 per cent) in having the lowest consumption taxes as a share of GDP. Favouring consumption taxes over corporate income taxes is an investment friendly policy, that, all else being equal, should lead to higher investment, a higher capital-labour ratio (capital intensity), and higher productivity. From this point of view, it seems that Atlantic Canada is doing well. However, to this point, we have not examined how tax design impacts productivity.

When analyzing the effects of taxes on investment, it is important to consider the impact of taxes on marginal, or incremental, investment decisions (i.e. the decision to employ one more unit of capital). A key measure of the tax on investment is the marginal effective tax rate (METR) on capital, which is defined as the tax on an incremental dollar of income from additional investment.[47] A positive METR indicates that the tax system discourages investment. In 2007, Atlantic Canada, with the exception of PEI, had the lowest METRs in Canada (Chart 35). Moreover, Finance Canada (2008) expects Newfoundland and Labrador, Nova Scotia, and New Brunswick to maintain this tax advantage to 2012 (Chart 36). Since business investment decisions are forward-looking, where the METR will be in 2012 is more meaningful than where it was in 2007. However, this projection assumes that governments will follow through on their commitments to reduce taxes, another source of uncertainty for business.

Chart 35: Marginal Effective Tax Rates on Capital, by Province, 2007



Source: Chen, et al. (2007). Although the CD Howe Institute has published METR's for 2008, they have not published a breakdown by type of tax. As a result, this chart cannot yet be updated to 2008.
Note: Federal corporate income tax rates in the Atlantic provinces are negative due to the Atlantic Investment Tax Credit.

[47] More technically, the METR is the tax wedge between pre-tax and post-tax rates of return on a marginal unit of capital invested, expressed in percentage terms relative to the pre-tax rate of return (Chen, 2000).

Box 2: The Comprehensive Review of Nova Scotia's Tax System

Like New Brunswick, the Government of Nova Scotia is also reviewing its tax system, although this review appears to have received less attention outside of the province than New Brunswick's review. The review was launched in the spring of 2008 and will

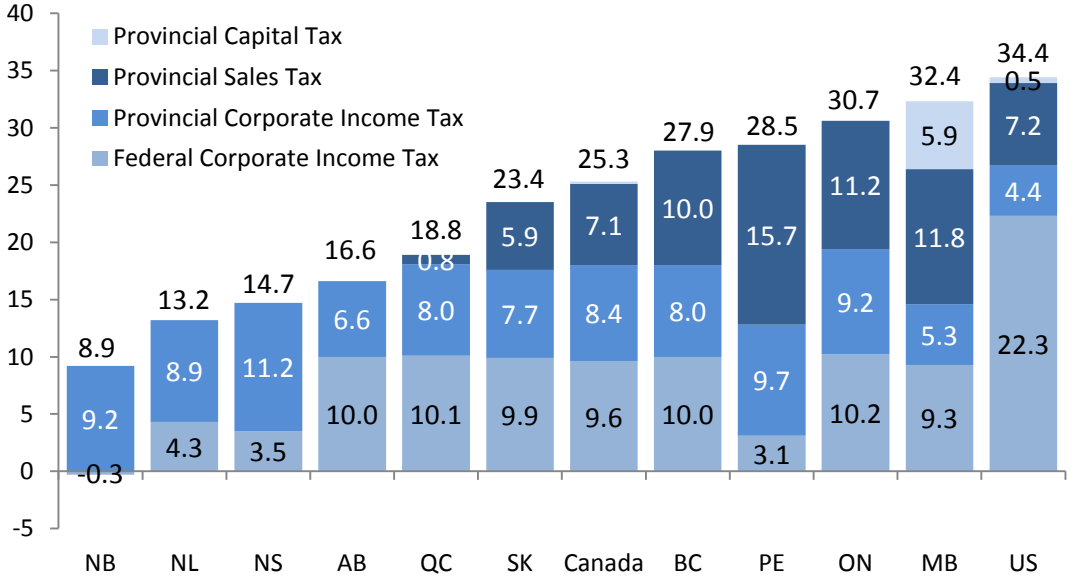
- Assess the level of burden and fairness of the tax system;
- Compare Nova Scotia's tax system to other jurisdictions in Canada and internationally;
- Identify best practices in tax policy; and
- Quantify the impact of taxes on household and business choices that drive the economy.

The review is in its early stages and so far little information has been released publicly about the likely outcome.

Source: http://www.gov.ns.ca/finance/en/home/taxation/taxreview/default.aspx

Prince Edward Island stands out as having a high METR on capital, in comparison to the other Atlantic Provinces. The reason, to which we will return in the next sub-section, is that PEI imposes an important burden on investment through its provincial sales tax.

Chart 36: Projected Marginal Effective Tax Rates on Capital, by Province, 2012



Source: Finance Canada (2008) (Chart 3.10).

But even METRs do not tell the whole story of the effect of taxes on productivity. When different classes of assets and different industries are treated differently by the tax system, even low METRs may not have the desired effect on investment and

productivity. This issue is particularly relevant to Atlantic Canada and will be explored in more detail below.

6.1.3. Sales and Consumption Taxes

Atlantic Canada, with the exception of Prince Edward Island, has one of the most productivity-friendly sales tax regimes in Canada. The adoption of a Harmonized Sales Tax (HST) in 1997 by New Brunswick, Nova Scotia, and Newfoundland and Labrador allows for an analysis of the impact of shifting from a retail sales tax (which taxes business inputs) to a value-added tax (VAT). Smart (2007) analyzed real business gross investment in the Atlantic provinces following the 1997 HST reform and finds that investment in machinery and equipment was 12.1 per cent above trend following the reform (up to 2005), after controlling for country and provincial fixed effects.[48] Ontario's and British Columbia's recent decisions to harmonize their PST with the GST are steps in this direction.

PEI should harmonize its PST with the federal GST, or adopt a VAT of its own, as soon as possible. The economic downturn presents an opportunity to do so, since firms must pay the PST on inputs even when they are not profitable. On the consumer side, a major political hurdle to harmonization is alleviated, because the inflation generated when the tax base for the PST is broadened to mirror the GST would occur when other sources of inflation, like rising energy costs and demand pressure, are in abeyance.

Outside of PEI adopting VAT, it seems unlikely that sales tax policy is going to offer an easy path to higher productivity for Atlantic Canada. However, there is potential to further strengthen the productivity-improving nature of tax policy in the Atlantic provinces by increasing HST rates while further reducing more distorting taxes like the capital taxes and corporate income taxes. This possibility is raised by the New Brunswick Department of Finance in its discussion paper of 2008, and has been recommended by a legislative committee in New Brunswick (Box 1). In the spring of 2009, New Brunswick did commit to further reducing corporate income tax rates to 8 per cent by 2012, but did not raise the HST.

6.1.4. Provincial Corporate Income Taxes

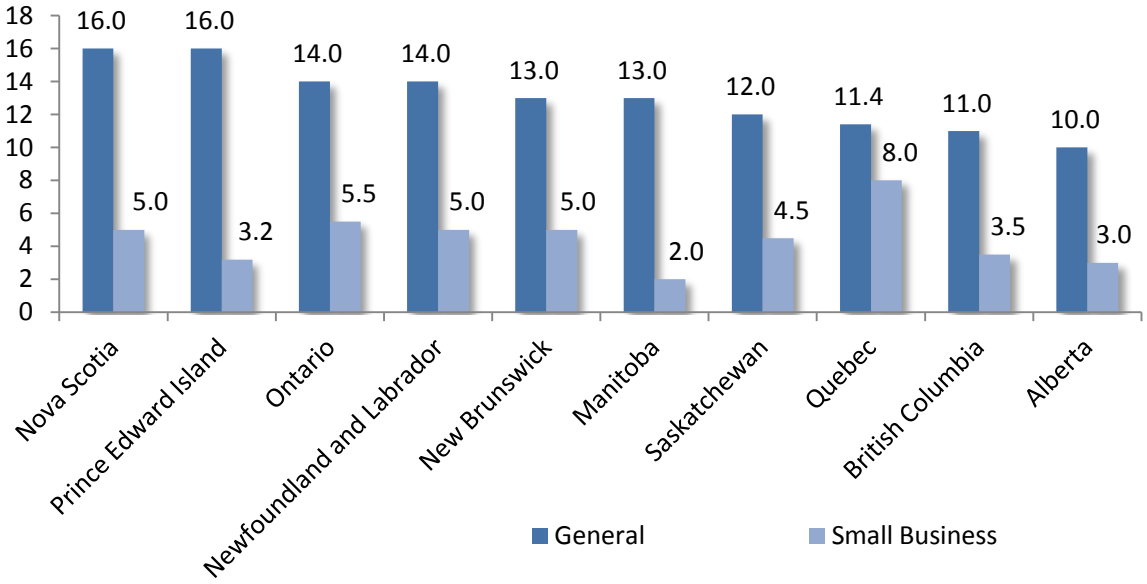
Another tax that can affect investment both in physical capital and in research and development, and therefore productivity, is corporate income tax (CIT). Since CIT is levied on profits, it reduces the return to capital. All else being equal, a lower return will result in a lower level of capital stock, capital intensity, research and development spending, and labour productivity.

In Atlantic Canada, statutory corporate income tax rates are high compared to other provinces (Chart 37). Prince Edward Island and Nova Scotia both have statutory

[48] Country fixed effects capture changes in investment in Canada after 1997 unrelated to HST reform and provincial fixed effects capture changes in investment in the HST provinces unrelated to HST reform. This estimate also excludes the mining, oil and gas sector in case the results are confounded by unrelated changes in oil and gas capital investments. If the sector is included, M&E investment grows 16.7 per cent above trend following the reform.

rates of 16.0 per cent, the highest in Canada. Newfoundland and Labrador was a close second with a rate of 14.0 per cent, the same level as Ontario. New Brunswick had a statutory rate of 13.0 per cent, the same level as Manitoba. Overall, Quebec and the Western provinces had a decided advantage over Atlantic Canada in terms of statutory corporate income tax rates.

Chart 37: Statutory Provincial Corporate Income Tax Rates, Per Cent, July 1, 2008



Source: KPMG 2008a and 2008b.
Notes:
1. Saskatchewan (10%) and Newfoundland and Labrador (5%) have lower rates for manufacturing and processing income.
2. The small business threshold is $400,000 except in Ontario and Saskatchewan ($500,000) and Alberta ($460,000).

As noted previously, statutory rates do not tell the whole story. It is important to look at the contribution of provincial corporate income taxes to the marginal effective tax rate on capital investment. Based on announced tax reductions, Finance Canada (2008) estimates that METRs from provincial CIT will fall significantly over to 2012 (Chart 36). Going forward, it will be important to ensure that these projected reductions do indeed take place if the Atlantic provinces are to expand the tax advantage most of them have built over the other provinces in terms of METRs.

6.1.4.1. Small Business Taxes

While the overall picture for corporate income taxes (CIT) in Atlantic Canada is positive from a productivity perspective, there are some features that should be highlighted as potential problems. A prominent feature of the CIT in Atlantic Canada, and in other provinces, is the preferential treatment of small businesses. As of 1 July 2008, the CIT rate on small business income up to $400,000 in Atlantic Canada was far

lower than the general CIT rate (Chart 37).[49] Preferential tax treatment for small businesses is a consistent feature across provincial tax structures.

There are no clear externalities justifying lower CIT for small businesses (Hendricks, Amit and Whistler, 1997), and an unequal tax treatment may create unwanted distortions. Arguments for favourable tax treatment of small businesses generally point to the increased need for cash in order to grow, as well as to relatively large compliance costs. Paradoxically, compliance costs are increased by programs targeting small business, including much greater R&D tax credits for small businesses. A key distortion is that small businesses face a disincentive to invest for growth because they would then have to pay a higher corporate income tax rate. Jack Mintz (2008) underlines a number of other potential distortions generated by the preferential tax treatment of small businesses, including the possibility that high-income investors could reduce personal taxes by leaving their income in small Canadian-controlled corporations, the creation of private management companies to benefit from the $500,000 capital tax exemptions, and the tendency for some high-tech employees to form their own start-ups to benefit from the much greater R&D tax credits for small business.

A realignment of the general CIT rate with the small business CIT rate would create a more neutral tax system. It would be preferable if such realignment were to result from lower general CIT rather than higher small business CIT if welfare gains are to be maximized.[50] A good first step would be for Atlantic provinces to refrain from lowering small business tax rates, thereby opening fiscal room for even lower general CIT rates. While raising small business CIT rates at the same time as lowering the general CIT rate would also be appropriate from an economic point of view, the political cost of such a policy might be more significant.

6.1.4.2. Atlantic Investment Tax Credit

A particularly important feature of the corporate income tax systems in Atlantic Canada is the Atlantic Canada Investment Tax Credit (AITC) offered by the Government of Canada. The AITC is a tax expenditure and therefore fluctuates in value with the investment and economic cycle, but revenue foregone by the Government of Canada has ranged from $162 million to $420 million from 2003 to 2006, the latest year for which estimates were available (Finance Canada, 2009). Under this scheme, companies receive a tax credit for 10 per cent of net investment in equipment and buildings in manufacturing, processing, mining, oil and gas, logging, farming, and fishing. Credits which exceed federal tax payable can be carried back to reduce federal tax in the three previous years or carried forward up to ten years. This credit applies only to Atlantic Canada and Québec's Gaspé region. This credit explains the negative METRs resulting from federal corporate income taxes (Chart 35), and partly explains the exceptionally low

[49] The federal government also has a lower CIT rate for small businesses, 11.0 per cent in 2008 compared to 19.0 per cent for larger businesses.

[50] The recent review of New Brunswick's tax system discussed earlier (Box 1) also proposes to realign general and small business CIT rates in an attempt to provide a more neutral tax system more conducive to economic growth (New Brunswick Department of Finance, 2008).

METRs in the manufacturing and forestry sectors that will be explored in the discussion of sector-specific tax policy, below.

If governments want to increase productivity in the Atlantic provinces by fostering investment, reforming the AITC would be an obvious place to start. This credit should be expanded to cover all industries and asset types in order to reduce tax distortions and promote the efficient allocation of capital.

6.1.4.2. Research and Development

Newfoundland and Labrador, Nova Scotia, and New Brunswick each offer a refundable research and development tax credit worth 15 per cent of eligible scientific research and experimental development expenditures (SR&ED). The design of these credits appears almost identical to the federal credit and is harmonized with the federal SR&ED tax credit. Although the SR&ED credit is not usually included in the calculation of the METR, Chen and Mintz (2008: 3) estimate that SR&ED tax credits would lower the METR by about two percentage points on average, but have a more important effect on the communications sector (see discussion below on sector-specific tax policy).

6.1.5. Capital Taxes

Until recently a common feature of corporate income tax design in Nova Scotia and New Brunswick has been the presence of capital taxes. These types of tax are an especially strong disincentive to businesses looking to invest, and both provinces have announced the elimination of capital taxes. In 2005, the Government of New Brunswick announced that the Large Corporations Capital Tax would be gradually reduced and fully eliminated in 2009. In Nova Scotia the Large Corporations Tax is being gradually reduced from 2007 to 2012, at which point it will also be eliminated. For both provinces, the elimination of capital taxes is an excellent policy which cannot be realized soon enough. Eliminating capital taxes in Atlantic Canada as of 2012, with the exception of those levied on financial institutions (see below), will help the region maintain its tax advantage for investors over other provinces and the United States.

6.1.6. Property Taxes

High property taxes discourage investment. All else equal, firms will invest in jurisdictions with lower taxes. Given the limited range of fiscal instruments available to municipalities, low residential property tax rates often mean that firms pay higher taxes. For this reason, looking at the business-to-residential ratio of property taxes is a good indicator of the property tax burden being borne by firms.

In New Brunswick the provincial and municipal governments both levy property taxes. Real property is classified as either residential (owner-occupied or non owner-occupied) or non-residential property; the same is true in PEI. In Nova Scotia, there is no provincial property tax, and municipalities set rates. In Newfoundland and Labrador municipalities set rates, and commercial rates vary by type of business being undertaken on the premises.

Atlantic Canada's residential-commercial property tax mix is fairly typical of Canada. A larger burden of property taxation tends to fall on business rather than residential owners. Table 21 shows that most large cities in Canada levy higher property tax rates on businesses than residential owners. Yet, business-to-residential property tax ratios tend to be fairly modest in Atlantic Canada; the most skewed tax system in Canada is in Toronto where properties under the industrial class are taxed at five times the rate of residential properties. Many smaller cities have identical rates for both businesses and residential owners. For example, Armstrong (2007) finds that nine out of 15 local governments in the Greater Calgary area had identical business and residential property tax rates in 2006. Moreover, all 15 local governments, with the exception of Calgary, had business-to-residential tax ratios below 1.75. In Calgary, however, Armstrong (2007) estimated that in 2006 the ratio of non-residential to residential property taxes, including a business tax of 7.09 per cent of assessed value, was 5.57.

Kesselman (2008) identifies three potential objectives involved in the allocation of property taxes: equity, economic efficiency and economic development. In general, high ratios of business to residential property taxes have been justified with the "ability to pay" principle, that is, the owners of business properties should shoulder a larger proportion of the tax burden because they are wealthy. In the case of property taxes, this argument has little traction because of the potential, and actual, disconnect between property ownership and profitability and wealth (Kesselman, 2008: 13-15).

Another way to distribute the burden of taxation that meets some fairness criteria is to tax properties according to the value of the services provided to them. By this measure, businesses are grossly overtaxed. In addition to fairness, aligning property taxes with service provision also has the benefit of supporting "economically efficient decisions by both households and businesses" and augmenting "efficient investment decisions and a more productive economy" (Kesselman, 2008: 18). On the other hand, while taxing the beneficiaries of municipal services may be theoretically sound, it faces many implementation challenges.[51]

If changes to the property tax regimes of the Atlantic provinces are to be politically palatable, new revenue sources for cities must be found. Increasing user charges, allowing municipalities to piggyback on a provincial value-added tax (HST except in PEI) or reducing provincial property tax rates (New Brunswick and PEI) would be economically efficient options to consider. The last two options would increase the fiscal room for municipalities and may simultaneously need a tightening of provincial constraints on the municipalities' tax ratios by property class.

[51] Kesselman (2008) notes, among other issues, that businesses also benefit from having densely populated and high income neighbourhood to draw clients and workers from.

Table 21: Property Taxes, Selected Cities, 2006-2009

St. John's - 2009	**Residential**	**Commercial***				
Total Property Tax Rate	1.10	1.72				
Tax Multiple from Residential Rate	1.00	1.56				
Charlottetown - 2008	**Residential**	**Commercial**				
Total Property Tax Rate	2.17	3.86				
Tax Multiple from Residential Rate	1.00	1.78				
Halifax - 2008-09	**Residential**	**Commercial**				
Total Property Tax Rate	1.30	3.71				
Tax Multiple from Residential Rate	1.00	2.85				
Saint John - 2006	**Residential Owner-Occupied**	**Residential Non Owner-Occupied**	**Non-Residential**			
Total Property Tax Rate	1.815	3.315	4.895			
Tax Multiple from Residential Rate	1.00	1.83	2.70			
Fredericton - 2008	**Residential Owner-Occupied**	**Residential Non Owner-Occupied**	**Non-Residential**			
Total Property Tax Rate	1.44	2.97	4.40			
Tax Multiple from Residential Rate	1.00	2.07	3.06			
Ottawa - 2008	**Residential**	**Multi-Residential**	**New Multi Residential**	**Commercial Office**	**Industrial**	**Large Industrial**
Total Property Tax Rate	1.2460	1.9820	1.2460	4.6210	4.9920	4.2870
Tax Multiple from Residential Rate	1.0000	1.5907	1.0000	3.7087	4.0064	3.4406
Montréal - 2008	**Residential**	**Multi-Residential**	**Non-residential**			
Total Property Tax Rate	1.18	1.263	4.24			
Tax Multiple from Residential Rate	1.00	1.07	3.59			
Toronto - 2008	**Residential**	**Multi-Residential**	**New Multi-Residential**	**Commercial**	**Industrial**	
Total Property Tax Rate	0.875	2.383	0.875	4.120	4.336	
Tax Multiple from Residential Rate	1.000	2.723	1.000	4.709	4.955	
Calgary - 2008	**Residential**	**Non-Residential**	**Farm Land**			
Total Property Tax Rate	0.46	1.131	1.37085			
Tax Multiple from Residential Rate	1.00	2.46	2.98			

Note: Not all classes and their corresponding rates are presented here. For example, the city of Ottawa has about 22 different rates depending on the class of property and whether it is occupied or not. Toronto has ten different property classes. Saint John and Calgary both have only three different property classes. *St. John's also levies a second property tax called the business occupancy tax, which varies by the type of business operated from 0.271 per cent for agricultural land to 6.895 per cent for banks, trust companies, and credit unions. It also charges a utility tax of 2.5 per cent on gross revenue.

Sources: Municipalities, see Appendix Table 69.

Priority should be given to measures that constrain the tax rates and/or tax rate ratios that municipalities can apply to the business and industry property categories. In the case of communities heavily reliant on one or two major firms, typically in the resource sector, the province might wish to provide some form of fiscal compensation, at least for a transitional period. Many other reforms of the property tax in Atlantic Canada also warrant investigation.[52]

Overall, since property taxes are fairly similar in Atlantic Canada and the rest of the country, it seems unlikely that they offer a policy route to close the productivity gap. Property taxes can certainly be administratively burdensome for business, but it seems unlikely that the impact on investment, an important driver of productivity, would be that different from other regions of Canada. Moreover, businesses' location decisions have been found to be relatively inelastic to property taxes. A review of empirical research suggests that a 10 per cent increase in taxes is associated with a 1.5 to 8.5 per cent decrease in business activity. This relative inelasticity is due to the importance of market or resource proximity for certain businesses such as retailers and oil producers for example (Bartik, 1992). Even with the relatively low responsiveness of business location decisions, very high rates of property tax on businesses can discourage expansion of existing businesses in the province and deter new businesses from locating there. The case for property tax reform is most pressing in Newfoundland and Labrador, where taxes vary by type of business, and can be as high as nine per cent on chartered banks in Corner Brook, for example. Newfoundland and Labrador should follow Nova Scotia in eliminating differential tax rates based on type of business.

6.1.7. Personal Income Tax

Personal income taxes affect productivity, because higher skilled, and therefore higher paid, workers must be paid more if personal income taxes are higher. Having highly skilled workers is important for productivity for two principal reasons. First, highly skilled workers by definition embody more human capital, a key driver of productivity in and of itself. Second, skilled workers are complementary to capital investment. Firms have no incentive to invest in advanced capital goods unless skilled workers can be found to use these investments effectively. The attractiveness of Atlantic Canada as a destination for investment is contingent at least in part on the quality and skills of its workers. Thus, one way to increase the region's productivity is to attract highly skilled workers. Personal income tax (PIT) rates may in certain cases be a material factor in the decision of highly skilled individuals to stay in or move to a province.

However, PIT is only one of many factors that affect location decisions. The cost of living and the benefits of a particular location, its quality of life, are also important factors. The cost of living in Atlantic Canada is between 25 per cent and 65 per cent

[52] In an examination of British Columbia's property tax regime Kesselman (2008) discusses potential reforms that could further economic development objectives. For example, he proposes taxing elastic (usually structures) and inelastic (usually the land) components of property at different rates. Such proposals are certainly relevant to any comprehensive review of property tax in Atlantic Canada, but their relevance to investment is not as clear.

lower than other regions of Canada and the United States (KPMG, 2006).[53] A lower cost of living means that workers in Atlantic Canada can enjoy the same material standard of living as workers in other regions, but on smaller incomes. An important implication of this principle is that personal income taxes can be higher, compensation lower, and business labour costs competitive, all at the same time. Indeed, KPMG (2006) found that labour costs in Canada were 11.5 per cent lower than US costs and that Atlantic Canada's labour costs were 21 per cent lower. Given such low labour costs, firms could likely afford to pay higher salaries to attract skilled workers to offset the higher taxes.

Table 22: Statutory Average Personal Income Tax Rate by Province in 2008

Taxable Income (dollars)	Federal	AB	BC	MB	NB	NL	NS	ON	PE	QC	SK
10,000	-4.6	0.0	-0.8	-0.6	**0.0**	**0.0**	**0.0**	0.0	**0.0**	-5.1	0.6
20,000	6.2	1.3	1.1	5.8	**4.3**	**4.6**	**4.6**	3.1	**5.5**	4.0	5.4
30,000	8.8	4.0	3.3	7.3	**6.7**	**5.6**	**6.1**	4.9	**6.7**	7.2	7.1
40,000	10.5	5.3	4.1	8.5	**8.1**	**7.4**	**8.2**	5.8	**8.1**	8.9	7.9
50,000	12.7	6.2	4.8	9.3	**9.5**	**8.5**	**9.5**	6.7	**9.2**	10.4	8.9
60,000	14.2	6.9	5.3	9.9	**10.5**	**9.3**	**10.4**	7.1	**10.0**	11.4	9.6
70,000	15.3	7.3	5.7	10.5	**11.2**	**10.3**	**11.3**	7.6	**10.8**	12.1	10.0
80,000	16.4	7.6	6.3	11.4	**11.9**	**11.0**	**12.0**	8.6	**11.5**	12.8	10.4
90,000	17.5	7.9	7.0	12.1	**12.5**	**11.5**	**12.6**	9.6	**12.1**	13.6	10.7
100,000	18.3	8.1	7.6	12.6	**12.9**	**12.0**	**13.3**	10.4	**12.5**	14.2	10.9
110,000	19.0	8.3	8.2	13.0	**13.2**	**12.4**	**13.8**	11.0	**13.1**	14.7	11.1
120,000	19.6	8.4	8.8	13.4	**13.6**	**12.7**	**14.3**	11.5	**13.5**	15.1	11.4
200,000	23.3	9.1	11.1	15.0	**15.3**	**14.0**	**16.3**	13.9	**15.5**	16.8	12.9

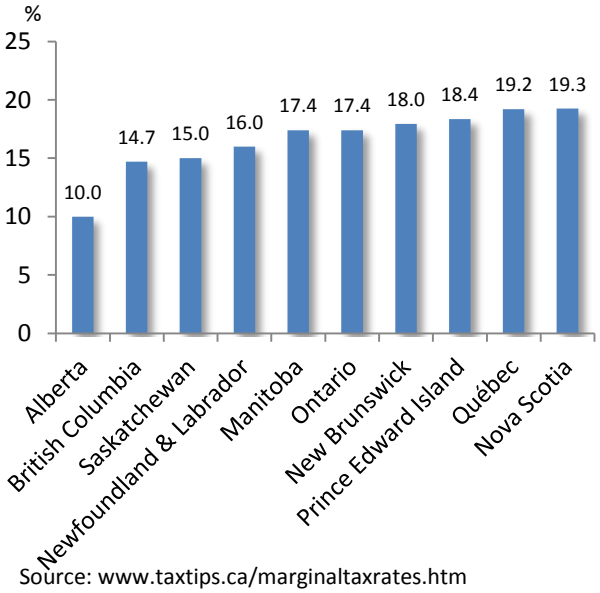
Source: http://www.taxtips.ca/taxrates/taxcomparison.htm, reflects rates as of June 11, 2008.
Note: Each taxpayer pays the federal tax in addition to the provincial tax for their province. Assumes employment income for a single person. Net of federal tax abatement for Quebec. Ontario includes the Ontario Health Premium.
Note: Since the Canadian PITs apply to individuals, the income levels above relate to the individual and not the family.

A good first approximation of the burden imposed by personal income taxes in each province is the average tax rate for individuals. Table 22 presents average PIT rates in 2008 in all ten provinces at different levels of income. At all levels of income, residents of Atlantic Canada face higher average statutory personal income tax rates than residents of almost any other province. At the bottom of the scale, the only province with a higher average PIT rate is Saskatchewan, which has a rate of 0.6 per cent for individuals earning $10,000. At the high end of the scale, for those earning more than $80,000 per year, Atlantic Canada is undercut by Alberta, British Columbia, Saskatchewan and Ontario. Rates in Atlantic Canada are high but are comparable to those of Manitoba and Quebec.

[53] Based on "an eight-month study (that) covered 17 industry sectors, examining more than 2,000 individual business scenarios and combining more than 30,000 items of data. The basis for comparison was the after-tax cost of business start-up and operation over a 10-year horizon" (KPMG, 2006).

When discussing the attractiveness of Atlantic Canada for highly skilled workers, it is also informative to look at the highest marginal PIT rate, that is, the rate that applies to an additional dollar earned by high income earners. Again, Atlantic Canada generally performs poorly (Chart 38). While Newfoundland and Labrador stands out as having a relatively low top marginal rate, New Brunswick, Prince Edward Island, and Nova Scotia have respectively the fourth, third, and first highest top marginal PIT rates among Canadian provinces.

Chart 38: Highest Provincial Marginal Personal Income Tax Rate in 2008



Source: www.taxtips.ca/marginaltaxrates.htm

Overall, personal income taxes in Atlantic Canada are high, but not out of line with the rates of the other high-tax provinces, Quebec and Saskatchewan. While rates are no doubt a disincentive for some skilled workers, Atlantic Canada offers a cost of living that would more than offset this financial disincentive. For this reason, it seems likely that the high PIT rates are neither a major impediment to productivity growth nor that lowering personal income tax rates would offer major productivity benefits, certainly in comparison to some of the other recommendations offered in this report.

6.1.8. Sector-Specific Tax Policy

Across Atlantic Canada, different sectors of the economy face significantly different marginal effective tax rates (METRs) on capital (Table 23). These differences stem in part from the differential CIT rate between small and large companies, which favours sectors where small business is more important. Some differences in METRs across sectors result also from provisions of the federal corporate income tax, which are mirrored in Atlantic provinces' CITs because they piggyback on the federal CIT.

The negative METRs on forestry and manufacturing in the Atlantic provinces imply that firms in these sectors may not be able to use all of their tax benefits "if they cannot claim accelerated cost deductions and tax credits on marginal investments against income earned on inframarginal profits" (Chen and Mintz, 2008: 4). This means that firms may not be able to fully benefit from the generous tax treatment they receive if they cannot deduct investment costs from profits earned on on-going projects, not the projects for which they are making the investment on which they are claiming the cost deductions. In practice, the METR will in effect be less negative when companies carry forward deductions to use against income in future years.

The lack of neutrality in tax rates across sectors, even if it is not caused by differences in statutory tax rates, is unwarranted and leads to a misallocation of investment and capital. Capital that could be more productively employed in one sector is allocated based on tax efficiency, not economic efficiency. Jorgenson and Yun (2001) recommend that the tax burdens on all forms of assets be equalized. Much of the productivity benefits of tax rate reductions that have taken place in the Atlantic provinces can be undone if the treatment of different asset classes and sectors becomes too unequal. Scarce investment dollars will flow into less than optimally productive investment projects, and productivity growth will be lower than potential.

It is clear from Table 23 that Atlantic Canada will have difficulty attracting firms that provide high-productivity service jobs if the tax system continues to favour forestry, manufacturing, and utilities at the expense of communications, wholesale and retail trade, and other service industries.

Table 23: Marginal Effective Tax Rates on Capital Investment in Canada, by Industry and Province, Per Cent, 2008

	Forestry	Utility	Construc-tion	Manufa-cturing	Whole-sale Trade	Retail Trade	Trans-port	Communi-cations	Other Services	Aggre-gate
Canada	11.0	30.7	38.5	19.3	35.1	33.7	28.1	39.3	36.5	29.1
Newfoundland and Labrador	-42.7	NA	28.0	-14.1	26.6	28.0	23.7	27.3	26.5	15.0
Prince Edward Island	-58.2	NA	46.6	-30.1	42.2	40.1	38.0	49.8	45.3	33.6
Nova Scotia	-21.6	29.4	32.7	-3.1	32.8	32.7	27.8	31.8	30.7	20.7
New Brunswick	-27.5	25.8	28.8	-1.6	28.9	28.9	23.7	27.9	27.0	11.8
Quebec	3.0	27.9	30.8	10.4	31.3	31.1	25.4	30.0	30.8	21.5
Ontario	20.8	34.4	44.0	24.2	39.4	38.4	33.7	46.2	42.4	34.8
Manitoba	4.9	35.2	43.6	6.8	39.9	38.7	35.4	45.9	43.9	33.8
Saskatchewan	14.3	28.5	36.2	23.1	33.6	32.2	27.0	38.6	35.1	28.6
Alberta	15.7	21.9	24.7	21.3	24.8	24.8	20.3	23.9	23.2	22.0
British Columbia	19.6	29.5	38.7	24.1	34.2	33.0	27.1	41.0	36.3	30.9

Source: Appendix Table 70. Chen and Mintz (2008) Table 1. C.D. Howe Institute and School of Policy Studies, University of Calgary.
Note: These rates are for medium and large corporations. The marginal effective tax rate is calculated as the annualized value of corporate income tax, capital tax and sales tax paid on capital purchases as a share of the gross rate of return on capital.

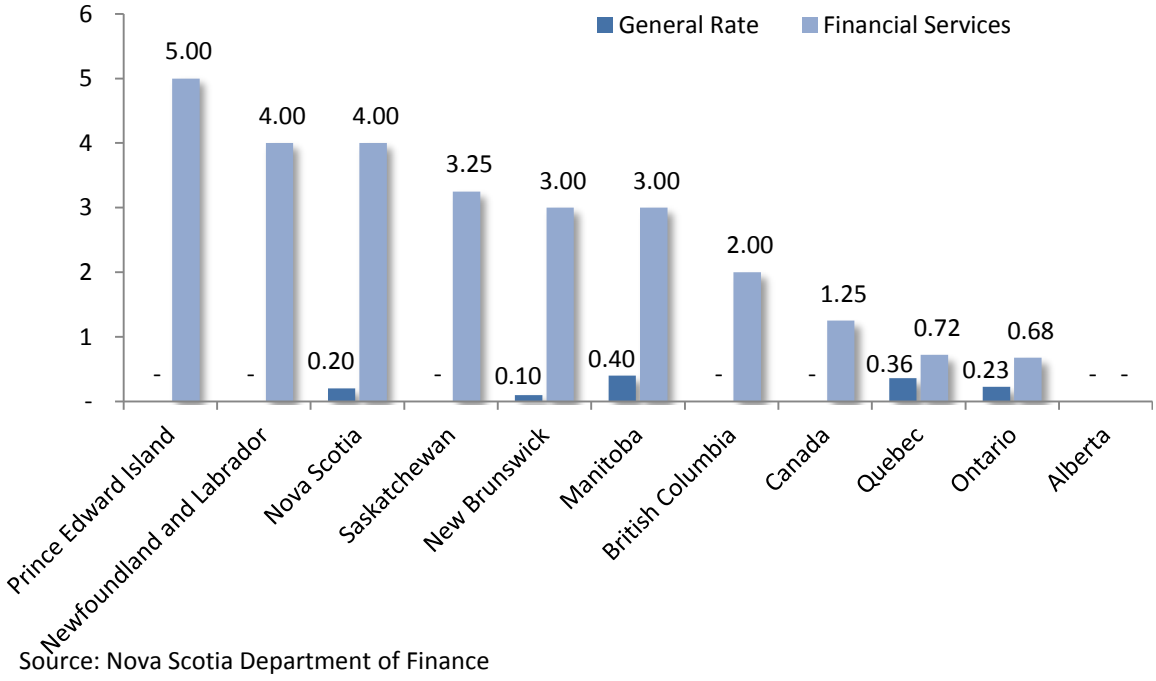
6.1.8.1. Taxes on the Financial Sector

Like many Canadian provinces, the Atlantic provinces have largely eliminated capital taxes, but continue to levy capital taxes on financial services firms. Capital taxes on financial services firms are particularly high in the Atlantic provinces. These taxes could help to explain the conspicuous absence of a significant financial services sector in the Atlantic provinces, as was noted in part 3 of the report. At that point, we noted the significant negative impact on Atlantic Canada's level of productivity of having small financial services sector in relation to the rest of Canada, since jobs in financial services tend to have high levels of productivity. The high rates of tax imposed on financial services firms are a strong deterrent to any new firms entering the market. Capital taxes are almost universally recognized as poor public policy. Very few advanced economy

still use capital taxes, and Canada is one of only six out of 30 OECD countries to do so (Gauthier, 2007).

In New Brunswick, the Financial Corporations Capital Tax is levied on taxable financial capital in excess of $10 million of financial institutions; it is deductible from taxable income for federal and provincial corporate income tax purposes. In Prince Edward Island the government has steadily increase the Financial Corporation Capital Tax since it was introduced in 1988, from 1.5 per cent to 5.0 per cent since 2004.

Chart 39: Capital Taxes in Canada, Per Cent, 2009



Source: Nova Scotia Department of Finance

Some Atlantic provinces impose taxes on insurance companies. Nova Scotia levies a special tax on insurance premiums collected by insurers. Insurers are required to remit to the government taxes of 3.0 per cent of the value of gross life, accident, and sickness premiums and 4.0 per cent of gross premiums on other type of insurance.[54] Newfoundland and Labrador imposes a tax of 4.0 per cent on all premiums.[55] Because these taxes favour non-insurance corporations, all else being equal, they distort the market and result in an inefficiently small amount of insurance being provided in Nova Scotia and Newfoundland Labrador.

6.1.8.2. Other Sector-Specific Tax Measures

The Atlantic provinces offer a number of other sector-specific tax measures. Appendix C provides a summary. Newfoundland and Labrador stands out for the number of such measures, including those directed at manufacturing and processing, film and video, mining, and resort property development. Nova Scotia targets tax credits at the

[54] http://www.gov.ns.ca/finance/en/home/insurance/insurancetaxes.aspx
[55] http://www.fin.gov.nl.ca/fin/insurancetax.html

film and digital media industries, while New Brunswick only targets the film industry. Apart from the tax on financial corporations already noted, PEI does not appear to have any sector-specific business tax measures.

While most of these tax measures are fairly small in scope, in all cases, the desirability of maintaining such measures should be reviewed. Those in Newfoundland and Labrador are significant and are likely distorting business decisions, and the rationale for favouring the manufacturing sector over other sectors of the economy should be reviewed. The film tax credits are small, but given that they exist in most Canadian provinces, they are unlikely to cause significant distortions across provinces. All provinces may wish to review the cost effectiveness of such credits, but there is a coordination problem, since the first province to eliminate such credits would likely see film companies move to another province.

6.1.9. Key Findings

- While tax revenue as a share of GDP remains high in the Atlantic provinces relative to the rest of Canada, good tax design mitigates many of the problems that often result from high taxes.

- In Newfoundland and Labrador, Nova Scotia, and New Brunswick, marginal effective tax rates on capital are low by Canadian standards as a result of the harmonization of the provincial sales taxes with the federal Goods and Services Tax in 1998 and the Atlantic Investment Tax Credit.

- Prince Edward Island maintains a non-harmonized retail sales tax (Revenue Tax or PST) that significantly increases the cost to business of investing in new machinery and equipment. Like Ontario, PEI should harmonize its PST with the federal GST as soon as possible. The economic downturn presents an opportunity to harmonize, since firms have to pay PST on inputs even if the firm is not profitable, and there is little fear of inflation when the tax base for the PST is broadened to mirror the GST.

- The Atlantic provinces and the federal government should continue to reduce statutory corporate income tax rates, in order to spur investment. Governments should refrain from further widening the gap between small and large business corporate income tax rates, since this distortion does not improve productivity.

- The Atlantic Investment Tax Credit should be reformed to encompass all industries and asset types as proposed by Mintz and Smart (2003). This measure would significantly reduce the METR on investment in Atlantic Canada at a reasonable cost and would thereby significantly increase productivity in the region.

- Personal income taxes in Atlantic Canada are high, but not out of line with the rates of the other high-tax provinces, Quebec and Saskatchewan. While rates are no doubt a disincentive for some skilled workers to work in the region, Atlantic

Canada offers a cost of living that would appear to more than offset this financial disincentive.

- Tax systems in the Atlantic provinces tend to favour forestry, manufacturing, and utilities at the expense of communications, wholesale and retail trade, and other service industries. Provincial governments should frequently review the desirability and cost-effectiveness of favouring some sectors over others, since governments are seldom able to pick winners. The objective should be a tax system that treats all asset classes equally to avoid giving businesses incentives to invest in technologies based on tax, rather than economic/business, considerations.

- Financial services firms in all of the Atlantic provinces face high capital taxes in comparison to other provinces. Insurance companies in Newfoundland and Labrador and Nova Scotia face taxes on insurance premiums collected. Since part three of this report showed that the finance, insurance, real estate rental and leasing sector accounts for an important part of the productivity gap with Canada, the Atlantic provinces should eliminate capital taxes on financial institutions and taxes on insurance premiums.

6.2. Regulation

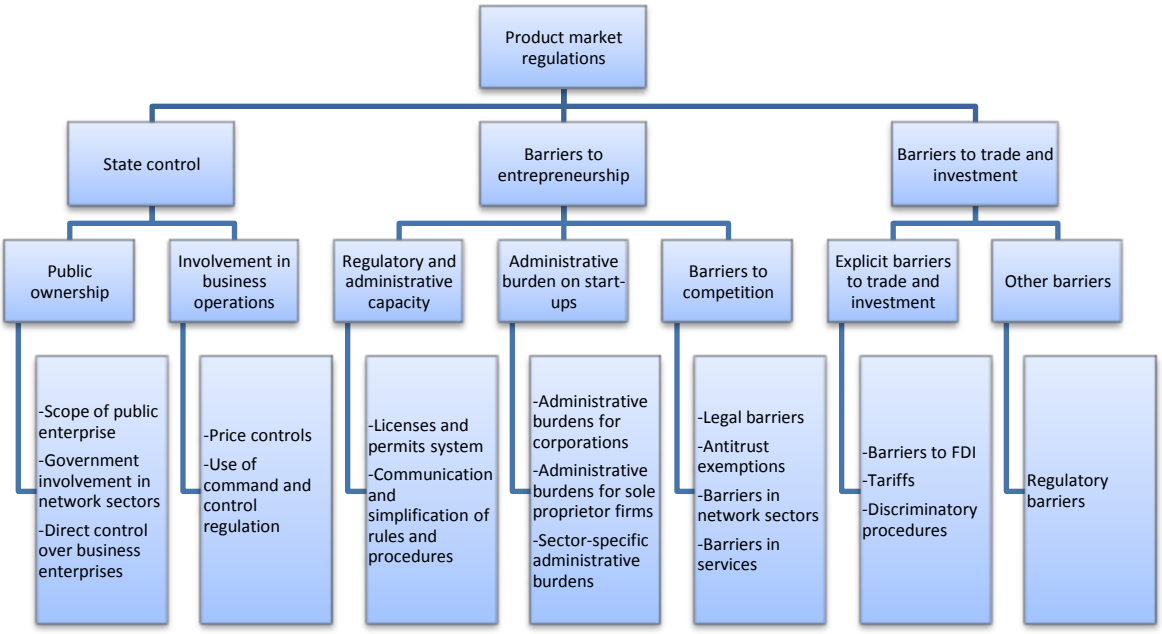
Competitive intensity is an important driver of productivity (OECD, 2002). If businesses have to expend more resources complying with regulatory requirements, less value will be added to final products. More importantly, if regulation, like entry barriers to certain industries, is too strict, then consumers will pay higher prices for lower quality goods and services than would otherwise be the case. That said, some regulation is clearly desirable to correct market failures. Indeed, some regulation may thereby improve productivity. Regulation is therefore an important policy area to examine when analyzing policies to improve productivity, but regulation can difficult to measure. The framework we use to evaluate the regulatory environment in Atlantic Canada is that of the Organisation for Economic Cooperation and Development (OECD) (Figure 1).

Unfortunately, the OECD does not produce estimates of product market regulation for Canadian provinces, and conducting such an analysis is outside the scope of this report. As a result, the approach we take is to use the framework of the OECD as a guide in discussing the most important features of the regulatory system in Atlantic Canada. A 2005 report by the OECD noted that competitive forces in Canada are strong, and administrative and economic regulations are among the lowest in the OECD (Maher and Shaffer, 2005). However, they did find some causes for concern. First, the regulated conduct doctrine exempts anti-competitive behaviour when required by regulation, and therefore exempts large parts of the economy from competition law. The authors also noted that this situation was particularly problematic with regard to provincial government regulation.

Based on this finding, this report will focus on whether provincial regulation in Atlantic Canada may be having a stronger anti-competitive effect than in the rest of Canada. The authors point to manufacturing as a sector that is very competitive in

Canada, partly owing to strong competition from abroad. Since manufacturing is a relatively small sector in Atlantic Canada, in terms of its share of hours worked, relative to the rest of Canada, all else equal we would expect Atlantic Canada to have weaker competition than the rest of the country.

Figure 1: OECD Product Market Regulation Analytical Framework



Source: Wölfl et al (2009)

Second, Maher and Shaffer (2005) note that restrictions on internal trade continue to exist, and that these restrictions appear to particularly affect professional services, a sector in which fewer Atlantic Canadians work than in the rest of the country and a sector with a lower level of productivity in Atlantic Canada than in the country as whole. Atlantic Canada should support the Council of Federation's initiatives to reduce anti-competitive interprovincial regulations. The initiative of the First Ministers to introduce two key amendments to the Agreement on Internal Trade (AIT) in the winter of 2009 is very welcome in this regard. One amendment will provide that any worker certified for an occupation by a regulatory authority of one province or territory is to be recognized as qualified for that occupation by all other provinces and territories. The other amendment provides for revised government-to-government dispute resolution including monetary penalties of up to $5 million for non-compliance with AIT obligations (Prime Minister of Canada, 2009).

In a broader sense, there is ample qualitative evidence to suggest that barriers between provinces are increasing the costs of doing business and thereby discouraging the investment required to achieve higher productivity. Cirtwell (2009) notes that changes could be made to the *Canada Transportation Act* and the *Canada Marine Act* to allow Atlantic Canadian firms, particularly ports, to compete with global competitors on a level playing field. Beale (2007) mentions a single business registry and consolidation in government services as measures that would further reduce costs and improve quality.

Beale urges the Atlantic provinces to take inspiration from the Trade Investment and Labour Mobility Agreement between Alberta and British Columbia to improve regional cooperation.[56]

Third, Maher and Shaffer (2005) note that competition has largely been absent from the electricity sector, and that competition could probably be improved in other utilities, transportation and warehousing. While in the past reforms have had the objective of attracting private investment, they note that full competition has yet to emerge in production and retail markets. Similarly, they note that the lack of competition in the airline industry is a cause for concern. Generally, the utilities and transportation and warehousing sectors have seen particularly weak labour productivity growth in 2000-2007 relative to other sectors of the economy (Table 24). The Government of Canada should promote inter-provincial and international transmission capacity.[57] Provincial governments should introduce competition into the electricity sector; in particular, they should separate generation from transmission and distribution. Since reforming its electricity sector in the mid 1990s, Alberta has shown the way in this regard. The problems encountered in Ontario's electricity sector reforms are not a reason not to proceed. Indeed, the lessons from Ontario's experience should be a further reason to be confident about avoiding the same mistakes.[58]

Table 24: Labour Productivity Growth in Highly Regulated Sectors, Average Annual Rate of Change, Per Cent, 2000-2007

	Canada	Newfound-land and Labrador	Prince Edward Island	Nova Scotia	New Brunswick
All Industries	0.90	3.65	1.42	1.34	1.59
Utilities	- 1.36	1.03	- 6.45	1.33	- 0.89
Transportation and Warehousing	0.27	- 0.38	2.73	- 1.19	0.81

Source: Appendix Tables 17-17d.

Finally, Maher and Shaffer (2005) note that Canada has more significant restrictions on foreign ownership than almost any other OECD country, notably in airlines and telecommunications and broadcasting. Foreign ownership restrictions on airlines lead to higher prices, which effectively isolate Atlantic Canada from Canadian, North American, and world markets. The Government of Canada should move to reduce or eliminate foreign ownership restrictions on airlines and restrictions on cabotage, the right of foreign-owned carrier to fly domestic routes within Canada.

There is also information available on regulation from the Statistics Canada Survey of Regulatory Compliance Costs. This survey looked at the compliance costs of small- and medium-sized establishments (fewer than 500 employees) with 11

[56] Beale (2007) offers an excellent example of the costs imposed by regulation in regard to beer manufacturing and distribution.
[57] The recent announcement by the Governments of New Brunswick and Maine to study the feasibility of a new transmission corridor for electricity exports to the US northeast is very welcome news. (Communications New Brunswick, 2009).
[58] For a perspective on the operational implementation of electricity industry reform in Atlantic Canada see Weil (2003).

regulations[59] in five industrial sectors: manufacturing; retail; professional, scientific and technical services; accommodation and food services; and other services. Estimates are available for five regions of Canada: Atlantic, Quebec, Ontario, the Prairies, and British Columbia. The businesses surveyed represented about 40 per cent of revenue for small and medium businesses across all industries.

This survey found that regulatory compliance costs were in fact lower in Atlantic Canada ($2,300 per establishment) than in any other region.[60] At the national level, there was also significant variation in costs by sector, with manufacturing having the highest costs ($4,400 per establishment). Costs were just under $2,800 in retail trade and just under $2,600 in scientific and technical services. Unsurprisingly, small businesses also faced much higher compliance costs per employee than larger business, reflecting the fixed nature of many compliance costs with respect to employment (Statistics Canada, 2006).

The results from the Survey of Regulatory Compliance Costs do not contradict the findings of the OECD that significant improvements can still be made in Canada's (and Atlantic Canada's) regulatory environment. The survey focused on a fairly narrow segment of the economy and looked only at the cost internal to business of regulation. Arguably more important costs are imposed on the economy in the form of deadweight losses resulting from lack of competition in the heavily regulated sectors mentioned above, utilities, transportation, and telecommunications. As well, measuring the internal cost of regulatory compliance does not capture the costs and productivity losses associated with differences between jurisdictions in regulatory requirements or the trade, investment and labour mobility barriers that exist between jurisdictions. Indeed, while regulatory costs within the Atlantic provinces may be lower than the national average, firms operating across the Atlantic provinces may experience higher compliance costs by virtue of their need to comply with multiple regulatory regimes within a small market. As such regulatory compliance cost reduction initiatives, currently in place in most provinces, are welcome, but can only be a small part of regulatory reform.[61]

Atlantic Canada is fundamentally a small and relatively isolated part of North America. For this reason, openness to foreign trade and investment are relatively more important than for larger jurisdictions like Ontario, Quebec, and New York. Regulation of telecommunications, energy, and airlines, therefore, may be having an especially detrimental effect on Atlantic Canada's productivity performance. In essence, higher costs, resulting from unnecessary or inefficient regulation make Atlantic Canada more isolated than it should be based on geography. The tourism and the knowledge economy will be important drivers of Atlantic Canada's future productivity growth, therefore burdening these sectors with high transportation, communications, and energy costs is ultimately self-defeating.

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[59] The 11 regulations in-scope for this survey are payroll remittances, record of employment, T4 summary/individual T4s, workers' compensation remittances and claims, T1/T2 income tax filing, federal/provincial sales taxes, corporate tax instalments, corporate registration, mandatory Statistics Canada surveys, municipal operating licences and permits and provincial licences and permits.

[60] The highest compliance costs were in Ontario ($3,100 per establishment).

[61] Many jurisdictions have undertaken regulatory burden reduction initiatives, usually targeted at small and medium enterprises. Such an initiative exists at the federal level in the form of the *Paperwork Burden Reduction Initiative*. In Atlantic Canada Newfoundland and Labrador has a *Red Tape Reduction Initiative*, Nova Scotia has a *Better Regulation* initiative, and New Brunswick has a *Red Tape Reduction Initiative*.

Box 3: Lessons for Atlantic Canada from the Celtic Tiger

Ireland shares many similarities with Atlantic Canada. It is on the fringe of a massive free-trade area, there are strong cultural and historical linkages, and both regions have been economically depressed at various times in the recent past. A key difference between Atlantic Canada and Ireland has been the latter's economic success since the late 1980s, which has earned it the reputation as the Celtic Tiger. Many ask the question, what can Atlantic Canada learn from Ireland?

As was noted in part III of this report, in 1989, Ireland and Atlantic Canada had roughly the same level of labour productivity, adjusted for purchasing power parity (**Error! Reference source not found.**, p.31). Over the following 18 years Ireland experienced vigorous labour productivity growth, at almost twice the rate of Atlantic Canada, even when fast-growing Newfoundland and Labrador is included. By 2007, labour productivity in Ireland was higher than any province in Atlantic Canada except Newfoundland and Labrador, which benefitted hugely from oil and gas development (Chart 12, p.32). The value added for every hour worked in Ireland in 2007 was similar to that of Germany and the United Kingdom, while Atlantic Canada was more similar to Portugal, Spain, and Finland. But unlike some other countries with fast-growing productivity, Ireland has no oil and gas, so how did it achieve labour productivity growth that was so much better than in Atlantic Canada?

In a comprehensive study of Ireland's recent economic performance, Honohan and Walsh (2002) find that the outstanding growth of the economy was mainly the result of a restructuring of the economy away from agriculture and a catching up of productivity levels outside of agriculture with levels already achieved in other countries. This explanation is unsurprising as it describes economic growth in most countries. The question of why this happened when it did is more interesting.

Honohan and Walsh argue that the underlying preconditions for structural change and catch-up productivity growth were already in place, but held up by macroeconomic policy errors. They identify three type of factors that all contributed to the turnaround: factors that had slowly been developing for decades and which did not change radically during the period of the turnaround; factors that fail in quantitative terms because they were not large enough to account for the increase in output; and third, the removal of obstacles to growth.

The key slowly developing factor was the underlying quality of education of the Irish, which had improved significantly with the introduction of free secondary education in 1967. Tax concession for exporters were also a longstanding advantage that was more fully exploited starting in the late 1980s. The authors also note the high relative underlying quality of Irish institutions including rule of law, public administration, and depth and efficiency of the financial system. They also point out that a key institutional flaw was a system that allowed the policy errors of the 1970s to occur, largely negating the benefits of institutional strengths. Finally, the authors note that Ireland's common language with the United States, its openness to Europe, and ability of the Irish to adopt advanced technology were probably advantageous, but difficult to measure.

Factors that Honohan and Walsh identify as having the correct timing and which no doubt had an impact on the turnaround, including a catalytic effect beyond their direct growth effect, were the flow of EU structural funds, the devaluations of 1986 and 1993, and the revitalized promotion of tourism and inward foreign direct investment (FDI), including offshore financial services. They cite airline deregulation as an important part of the significant and sustained growth of tourism in

Ireland.

Box 3 continued

Finally the authors highlight income tax reductions and social partnerships that reduced labour relations problems and fostered employment growth as important barriers that were removed. Overall, Honohan and Walsh conclude that Ireland's improved economic performance was the result of strong policy on a broad front.

Interestingly for Atlantic Canada, they state:

> With an economy that amounts to only about 1 per cent of either euro-area of US GDP and is extremely open to trade and factor flows, and with a currency that has mostly been pegged to an external unit, Ireland has many characteristics of a relatively small region of a larger economy rather than those we associate with a sovereign country.

They point out that relative to many US states, the Irish performance in the 1990s was in many ways unexceptional.

The parallels between Ireland and Atlantic Canada are uncanny, but some differences are obvious:

- Atlantic Canada shares Ireland's underlying strengths. It has an educated workforce, strong rule of law, good public administration, and the cultural affinity of Atlantic Canadians with both Europe and North America.
- As Ireland benefitted from EU structural funds, Atlantic Canada benefit from Canadian federal transfers, which can be used to build infrastructure. At the same time, while in recent years Atlantic Canada has benefit from the low interest rates that come from a stable monetary policy environment provided by the federal Government, it has never had the option that the Irish exercised on two occasions to devalue its exchange rate, rendering its exports more attractive.
- Openness to trade and investment is a potential difference between Ireland and Atlantic Canada. While Atlantic Canada can export to Canada's free trade partners, import barriers, including to international labour mobility, persist. Given the potential of tourism as an engine for Atlantic Canada's economy, the relatively highly regulated air transport sector is clearly an impediment to productivity growth. The punitive tax regime applied to the financial sector is also problematic if Atlantic Canada is to follow Ireland's lead.
- Finally, Atlantic Canada seemingly has favourable labour relations by most measures. And this report has discussed in detail the strengths and weaknesses of Atlantic Canada's tax regimes.

Atlantic Canada can learn a lot from the experience of Ireland, but learning must be followed with action if Atlantic Canada is to increase its productivity and living standards.

6.3 Human Capital

Earlier, we have established that while Atlantic Canada generally has higher university enrolment and graduation rates than Canada as a whole, its share of the population with postsecondary qualifications is generally lower than in the rest of Canada. Given this evidence, it appears that policies aimed at improving productivity and income in Atlantic Canada must consider more than human capital alone, and should additionally focus on innovation and fundamental economic reform.

The problem of below-average incomes and productivity in Atlantic Canada can almost be framed as a problem of coordination. On one hand, it does not appear that a policy aimed at a large-scale human capital expansion would be effective, since the consequent highly educated people would have little outlet for their newly acquired skills in the currently limited knowledge-intensive industries located in Atlantic Canada. The job seekers would be likely either to migrate to other provinces or to remain in Atlantic Canada and partially lose their skills in unemployment or unskilled employment. At the same time, primary industries could possibly suffer if part of their workforce was substantially displaced due to workers leaving employment to return to university in response to the human capital policy. But on the other hand, an innovation policy aimed at providing opportunities for highly skilled workers would likely be ineffective on its own as well, since the new businesses would languish without immediate access to a large and highly-skilled workforce. It has so far not proven possible for the prevailing economic structure and incentives in Atlantic Canada to coordinate a human capital expansion and an expansion in innovative businesses together.

The question that naturally follows is whether the government can devise a policy to better coordinate the realization of these objectives. Presumably this would be in the form of some sort of support, either to highly skilled people to stay in Atlantic Canada while suitable employment opportunities develop, or to knowledge-intensive businesses to pay temporary workers from out of the Atlantic provinces while Atlantic Canadians obtain higher educational qualifications. But it is important to realize that the sort of fundamental changes such policies are aimed at will undoubtedly lead to calls for further support. If knowledge industries are to develop on a large scale in Atlantic Canada there will be a need to expand the infrastructure of cities to support the requirements of the new firms, and to expand the residential and transportation infrastructure required as the rural population begins to migrate or commute to the cities to take advantage of the new opportunities. In other words, the initial policies that are required for transforming the Atlantic Canadian economy can be narrowly classified as either human capital policies or innovation policies, but ultimately they must become much broader urbanization policies if they are to be successful.

Of course, much cost-benefit work needs to be done before such policies can be contemplated, much less designed and implemented. The intention here is merely to say that, if Atlantic Canada wants to grow and have per capita income and productivity closer to the Canadian average, human capital is the channel through which it must achieve this and that the only way to improve human capital is in tandem with the expansion of knowledge industries and more generally the urban infrastructure. If these policies are not

implemented, Atlantic Canada is not likely to excel beyond its current level of convergence to the Canadian average, but neither will substantial economic policies need to be designed and funded. On the other hand, if the substantial policies are indeed eventually implemented, the probability that growth will follow appears to be quite high, although the ability of that growth to make the funding worthwhile is still questionable. Uncertain as the benefits may be, however, it is worth noting that such broad policy objectives are similar to the local networks and interactions envisioned by Acs, de la Mothe and Paquet (1996) as an effective way to facilitate knowledge-based growth in Canada in general.

It should also be noted that such broad and essentially urban development policies do not entail, contrary to what some believe is necessary, that the knowledge economy will grow only as the primary economy dies. The knowledge economy can grow proportionally while the primary sector shrinks relatively, but this could entail constant or even growing absolute employment in primary industries if the workforce of the knowledge economy is drawn from students and the unemployed within Atlantic Canada and workers from other provinces or even countries. Given the importance and performance of primary industries, this may actually be preferable to the typically proposed strategy of helping primary workers through a transition to employability in knowledge jobs. A separate skills initiative may even be called for in primary industries.

In fact, it is somewhat of a false dichotomy to say that Atlantic Canada has the choice between fundamental economic change and growth on the one hand and relative stagnation on the other. While the knowledge economy is almost universally regarded as the way to future prosperity in general, the case of Newfoundland in the late 1990s has shown that the availability and extraction of natural resources can also be sufficient conditions for growth and high levels of productivity and income per capita, at least in the short term. It may even be possible that a more cost effective policy than the large scale expansion of knowledge industries in Atlantic Canada is to give generous subsidies aimed at making the primary industries in the Atlantic provinces even more prosperity generating than they already are. This could also be matched with policies to actively encourage the out-migration of highly educated people in Atlantic Canada to existing knowledge economies in Montreal, Toronto, Ottawa, Saskatoon and Vancouver. Of course, the negative aspects of such policies, such as environmental harm caused by aggressive resource extraction and the cultural costs associated with the depopulation of historical regions, would also have to be considered.

For the most part, these are all issues well beyond the scope of a modest look at human capital and productivity in Atlantic Canada. Nonetheless, it remains fairly clear that any human capital strategy in Atlantic Canada will have to be inextricably linked to an innovation strategy and broader economic change to be effective in improving the income per capita and productivity performance of Atlantic Canada relative to Canada.

7. Conclusion and Recommendations

Overall Atlantic Canada is doing well. The region's productivity and standard of living, measured by GDP per capita, have improved significantly since the early 1980s, and the gap with Canada has narrowed. Due in large part to the exceptional labour productivity growth of the mining and oil and gas sector, Newfoundland and Labrador experienced the fastest labour productivity growth of any province in Canada between 1981 and 2007, 2.36 per cent per year. The Maritime provinces all saw labour productivity growth that was essentially the same as the Canadian average over the period, 1.28 per cent per year.

In current dollar terms, there remains a substantial gap in labour productivity levels between Canada as a whole and the Maritimes provinces. Thanks in large part to the rapid increase in energy prices in the 2000s, Newfoundland and Labrador had a level of labour productivity almost 50 per cent higher than the Canadian average. Nova Scotia and New Brunswick had labour productivity levels at about 80 per cent of the national average and PEI had a level 70 per cent of the national average. This divergence in labour productivity levels between Newfoundland and Labrador and the Maritimes is a significant trend that emerged in the 1990s and has persisted.

A number of factors underlie the labour productivity gap between the Maritimes and the rest of Canada. Differences with Canada in industrial structure explain about 30 per cent of the labour productivity gap in Nova Scotia, 20 per cent in New Brunswick, and under 10 per cent in PEI. Beyond industrial structure, a number of factors help to explain the poor productivity performance of the Maritimes.

- Atlantic Canada has a significant gap with the rest of Canada in terms of machinery and equipment, particularly information and communications technologies, available per hour worked. This gap exists within industries and cannot be entirely explained by the differing industrial structure of Atlantic Canada.

- Based on a review of a number of indicators, workers in Atlantic Canada embody less human capital than workers in other parts of the country.

- The available information suggests that firms in Atlantic Canada are less innovative than firms in the rest of the country. This weakness is evidenced by very low levels of business sector research and development spending as a share of GDP.

- A considerably smaller share of workers in Atlantic Canada is employed in very large establishments than in Canada as a whole. This suggests that scale economies that support innovation and machinery and equipment investment may not be as strong in the Atlantic provinces as in the rest of Canada.

- Atlantic Canada is significantly less urbanized than the rest of Canada. Less urbanization likely means that university degree holders and the firms that employ

them are less likely to locate in Atlantic Canada than in other regions of the country.

- Atlantic Canada does not appear to suffer from a shortfall in the amount of public infrastructure. Indeed, there is some evidence that resources that could be better deployed elsewhere are locked up in public infrastructure that is not needed. At the same time, there is also some evidence that infrastructure outside of Atlantic Canada, which links the region to the North American economy, is in need of improvement.

- Atlantic Canada has far more hours worked in public administration as a share of total hours worked, particularly at the provincial level, which suggests that there may be scope for efficiencies in the provision of government services.

Building on these findings, we recommend policy changes in a number of areas to accelerate productivity growth in Atlantic Canada and to close the gap with Canada as a whole. Governments in Atlantic Canada, including the Government of Canada where applicable, should

- **Reduce distortions across asset classes and sectors.** Tax systems in the Atlantic provinces tend to favour forestry, manufacturing, and utilities at the expense of communications, wholesale and retail trade, and other service industries, including through the Atlantic Investment Tax Credit. The federal and provincial governments should frequently review the desirability and cost-effectiveness of favouring some sectors over others, since governments are seldom able to pick winners. The objective should be a tax system which treats all asset classes equally to avoid giving businesses incentives to invest based on tax, rather than economic/business, considerations.

- **Eliminate capital taxes, including on financial institutions.** Financial services firms in all of the Atlantic provinces face high capital taxes in comparison to other provinces. The finance, insurance, real estate rental and leasing sector accounts for an important part of the productivity gap with Canada.

- **Prince Edward Island should harmonize its retail sales tax with the federal Goods and Service Tax (GST).** PEI maintains a non-harmonized retail sales tax (Revenue Tax or PST) that significantly increases the cost to business of investing in new machinery and equipment. PEI should harmonize its PST with the federal GST as soon as possible. The economic downturn presents an opportunity to harmonize, since firms have to pay PST on inputs even if the firm is not profitable, and there is little fear of inflation when the tax base for the PST is broadened to mirror the GST. Ontario and British Columbia took this approach in the spring and summer of 2009.

- **Continue to reduce corporate income tax rates.** Lower corporate income taxes will spur investment and create a comparative advantage for the Atlantic region. At the same time, governments should also refrain from further widening the gap

between small and large business corporate income tax rates, since this distortion does not improve productivity.

- **Reduce restrictions on competition in utilities, transportation, and telecommunications.** The Atlantic provinces and Canada as a whole can learn from successful reform initiatives in other jurisdictions to improve competition in these sectors, which have experienced weak productivity growth over since 2000.

- **Continue to reduce interprovincial barriers to trade, investment and labour mobility.** While the details of any initiatives will reflect regional priorities, the Atlantic provinces should be inspired by the efforts of the Governments of British Columbia and Alberta in the Trade, Investment, and Labour Mobility Agreement.

- **Ensure that borders remain open to trade and investment and further reduce barriers where they exist.** Atlantic Canada is a small economy in a small country, but its strategic location between Europe and North America offers an opportunity to gain huge new markets for exports, including tourism. Larger markets mean more opportunities to take advantage of scale economies and attract new sources of investment. Recent initiatives of the US Government aimed at increasing security on the Canadian border have a potential to impair flows of trade, people, and investment.

- **Improve cooperation to create efficiencies in government service delivery.** In the Atlantic provinces the share of hours worked in provincial public administration, not including health and education, was 65 per cent higher than the national average in 2007. It seems likely that there is significant scope to improve efficiency and thereby reduce taxes through economies of scale in service delivery.

Atlantic Canada has historically been Canada's poorest region. While the gap in GDP per capita has narrowed over the past few decades, it remains sizeable, except in Newfoundland and Labrador, which has seen outstanding economic and productivity growth as a result of the development of off-shore oil and gas reserves. In principle, there is no reason why the Maritimes should be the poorest region in Canada. The Maritimes benefit from a stable democracy, the rule of law, sound macroeconomic policies, an educated population, rich natural resources, and a moderate climate. However, to date, these strong fundamentals have not been fully harnessed to make Atlantic Canada a world leader.

Going forward, this report suggests a number of areas that are worthy of further research:

- The links between economic well-being and labour productivity in Atlantic Canada need to be better understood. Relationship between productivity and economic security, inequality, and environmental quality could be further examined.

- This report briefly compared personal income and GDP per capita, and this comparison suggested significant differences, particularly in Newfoundland and Labrador. It is certainly true that all of the benefits of the energy boom have not gone to residents of the province. Further research could explore the impact of a number of factors, including energy prices and interprovincial migration, on this relationship.

- Another issue is the need to better understand differences in price levels across provinces and regions within provinces. At the moment, no comprehensive estimates equivalent to the national Consumer Price Index are publicly available in level terms.

Appendix A: Analytical Framework[62] for Productivity Growth Decomposition

To begin with we note that at any given point in time.

$$P \equiv \frac{Q}{H} = \frac{\sum Q_i}{H} = \frac{\sum H_i P_i}{H} = \sum P_i\, h_i \qquad (1)$$

where

$$P = Aggregate\ labour\ productivity\ level$$
$$P_i = Labour\ productivity\ level\ in\ sector\ i$$
$$H = Aggregate\ hours\ worked$$
$$H_i = Hours\ worked\ in\ sector\ i$$
$$h_i = Share\ of\ hours\ worked\ in\ sector\ i$$
$$Q = Aggregate\ real\ output$$
$$Q_i = Real\ output\ of\ sector\ i$$

Equation (1) says that aggregate labour productivity *P* is equal to the weighted average of labour productivity in each of the sectors that make up the economy. The weight for each sector is its share of the total number of hours worked in the economy.

Because we are interested in how shifts in hours worked across sectors affect aggregate labour productivity growth, we must move beyond a single point in time. Equation (2) expresses the absolute change in aggregate labour productivity from period 0 to period 1, $\Delta P = P^1 - P^0$, where superscripts denote the period.

$$\Delta P = \sum h_i^0 \Delta P_i + \sum P_i^0 \Delta h_i + \sum \Delta h_i \Delta P_i \qquad (2)$$

In equation (2) h_i^0 and P_i^0 are respectively the share of total hours worked in sector *i* and the level of labour productivity in sector *i* in period 0, expressed in dollars.

In order to obtain economically meaningful sectoral contributions to aggregate productivity growth, we adjust the second term of equation (2) by subtracting the average level of labour productivity $\bar{P}^0$ from the level of labour productivity in each sector in period 0, P_i^0. In the third term, we subtract the average change in labour productivity $\Delta\bar{P}$ $\Delta\bar{P}$ from the change in labour productivity in each sector, ΔP_i ΔP_i. The first adjustment ensures that an increase in the hours share in a sector with a below-average labour productivity level makes a negative contribution to aggregate labour productivity growth. The second adjustment also ensures that an increase in the hours share in a sector with below-average absolute growth in labour productivity makes a negative contribution to aggregate labour productivity growth. The result of these adjustments is equation (3):

$$\Delta P = \sum h_i^0 \Delta P_i + \sum (P_i^0 - \bar{P}^0)\Delta h_i + \sum \Delta h_i (\Delta P_i - \Delta\bar{P}) \qquad (3)$$

[62] This section follows Sharpe (1990).

We are able to subtract $\bar{P}^0$ and from equation (2) because the terms $\Delta\bar{P}\Delta h_i$ and $\bar{P}^0\Delta h_i$ each sum to zero across all sectors, since $\bar{P}^0$ and $\Delta\bar{P}$ are constant and all changes in hours share Δh_i sum to zero across sectors.

The three terms in equation (3) represent respectively the within-sector, reallocation level and reallocation growth effects. The within-sector effect captures the change in labour productivity within a sector. The reallocation level effect indicates whether changes in hours share have favoured sectors with above- or below-average labour productivity levels. The reallocation growth effect is the sum of the product of the absolute change in the share of hours worked and the absolute change in the labour productivity level for each of the *i* sectors. It measures whether an economy is subject to a phenomenon akin to Baumol's cost disease, i.e. the tendency of labour to move towards sectors with relatively small absolute increases in labour productivity. A negative reallocation growth effect at the aggregate level means that labour is moving to sectors with relatively smaller absolute labour productivity increases.

There are some limitations to this analysis. First, the analysis assumes that differences in technological, institutional, and market structures across sectors lead to differences in average levels of labour productivity, even if marginal products are the same. It also assumes that when a sector loses or gains labour, the changes in output per hour are equal to the sector's average output per hour worked. Second, these results are sensitive to the level of disaggregation. For instance, we use 18 sectors. If within a sector, resources shift from one subsector to another, and these subsectors have different levels of labour productivity, then the measured impact of the reallocation effect on aggregate labour productivity growth would be different.

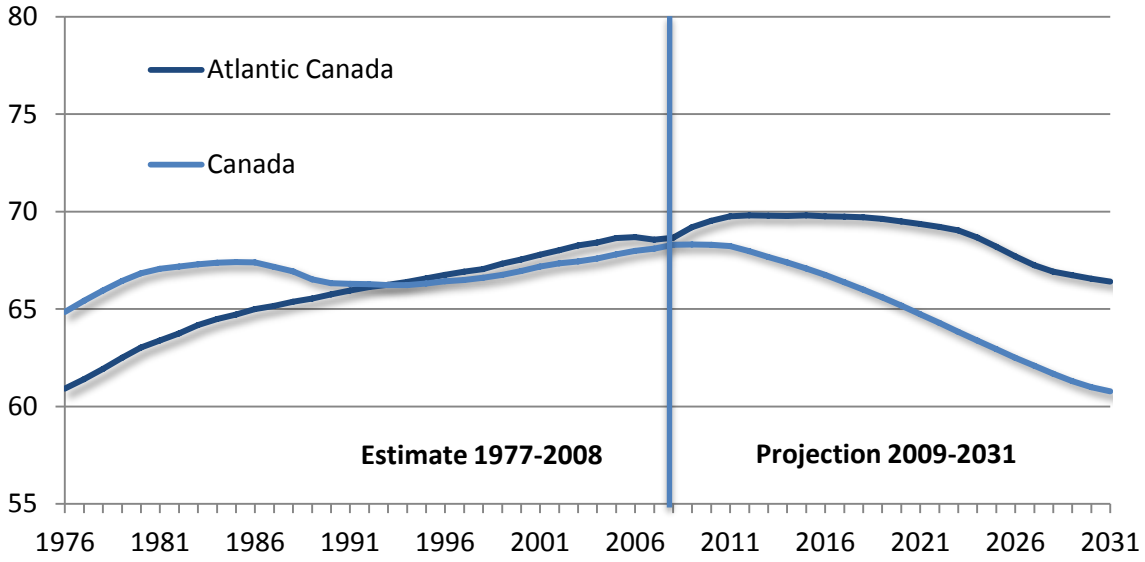
Appendix B: The Future of Living Standards in Atlantic Canada

If increases in real GDP per capita in Atlantic Canada are to continue in the future at a rate similar to that experienced between 1981 and 2007, labour productivity growth will have to accelerate in order to offset the coming declines in the share of the population that is of working age. Statistics Canada projects that the share of the population that is of working age will peak in Atlantic Canada, and Canada as a whole, around 2010. Declines will begin soon after and are projected to continue through 2031 (Chart 40). This pattern will be broadly similar across the Atlantic provinces, with some variation as to the timing and magnitude of the decline (Chart 41). For instance, New Brunswick is projected to experience an increase in the share of the population of working age until 2023-24, and the peak will be much higher than in other provinces. Since the working age population will soon begin to decline, and because it is unlikely that there is significantly more scope to increase the labour force participation of the working age population, improvements in labour productivity will be required to further raise real GDP per capita.

What does the future hold for living standards in Atlantic Canada? The answer will depend primarily on the growth of labour productivity. Table 25 presents one scenario. In this case, we maintain the assumptions about the changing age structure of the population embodied in Chart 40 and Chart 41, that is, gradual declines in the share of the population of working age in Canada and the Atlantic provinces from 2007 to 2031. Next, we assume that each Atlantic province does no more than maintain its position in terms of GDP per capita relative to Canada. In practice this means that every province and Canada as a whole experiences the same rate of real GDP per capita growth, 1.67 per cent per year. This growth rate is the average rate of per capita real GDP growth observed over the period 1981-2007 in Canada as a whole. Finally, we assume that Atlantic Canadians will not want to work more, this means that there will be no change in average weekly hours worked, employment as a share of the labour force, and labour force as a share of the working age population.

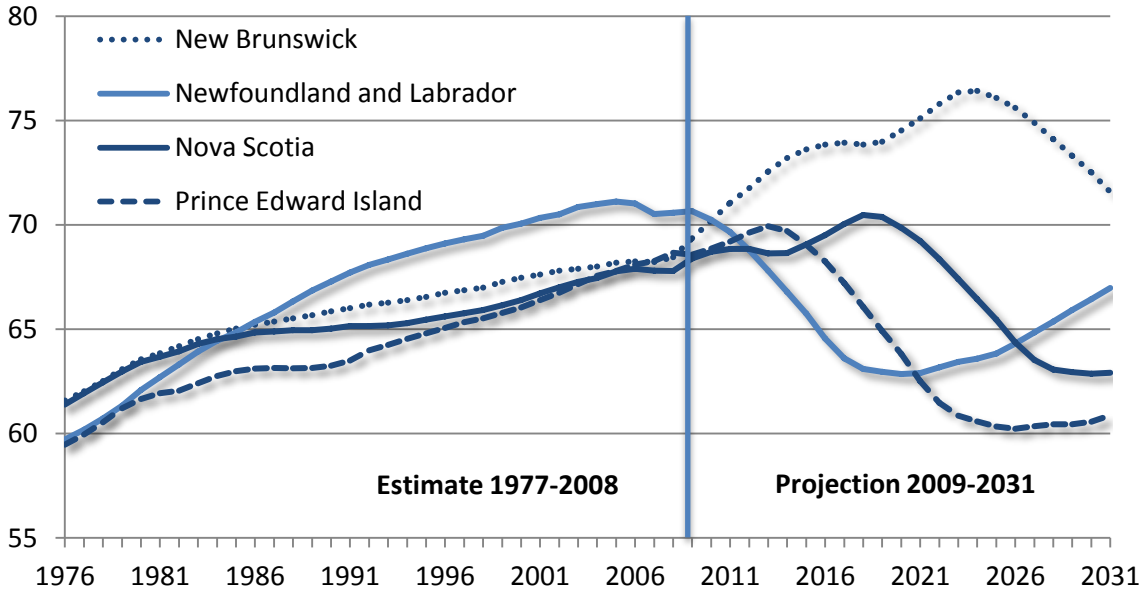
Based on these assumptions, we can see that over the next 24 years, Atlantic Canada will have to increase its trend rate of labour productivity growth in order not to lose ground with the rest of Canada from 1.52 per cent per year from 1981-2007 to 1.90 per cent from 2007 to 2031. However our assumptions imply that Canada will have to raise its labour productivity growth from 1.28 per cent per year to 2.15 per cent per year in order to maintain the rate of real GDP per capita growth that it experienced over the 1981-2007 period.

Chart 40: Working Age Population (Aged 15-64) of Canada and Atlantic Canada, As a Share of Total Population, Per Cent, 1976-2031



Source: Statistics Canada Labour Force Survey estimates of population extrapolated by the CSLS using the growth rates from Statistics Canada Population Projection Scenario 3: medium growth, medium migration trends.

Chart 41: Working Age Population (Aged 15-64) of the Atlantic Provinces, As a Share of Total Population, Per Cent, 1976-2031



Source: Statistics Canada Labour Force Survey estimates of population extrapolated by the CSLS using the growth rates from Statistics Canada Population Projection Scenario 3: medium growth, medium migration trends.

Table 25: Scenario 1: Not Falling Behind, Projected Decomposition of GDP per Capita, Canada and Atlantic Canada, 2007-2031

	Real GDP per Capita	Labour Productivity	Average Weekly Hours per Employed Person	Employment as a Share of the Labour Force	Labour Force as a Share of the Working Age Population	Working Age Population as a Share of the Total Population
	A	B	C	D	E	F
	(Chained 2002 Dollars)		(Hours)	(Per Cent)		
2007						
Canada	40,079	44.4	1.8	94.0	80.0	68.1
Atlantic Canada	38,890	51.4	1.9	86.4	70.2	70.6
Newfoundland and Labrador[1]	30,040	34.1	1.8	89.7	81.7	68.5
Prince Edward Island	30,771	36.5	1.8	92.0	76.8	67.7
Nova Scotia	31,755	36.5	1.8	92.5	76.7	68.6
New Brunswick	32,811	39.3	1.8	90.8	75.6	68.7
2031						
Canada	59,587	74.1	1.8	94.0	80.0	60.6
Atlantic Canada	57,819	80.7	1.9	86.4	70.2	66.8
Newfoundland and Labrador	44,661	57.2	1.8	89.7	81.7	60.6
Prince Edward Island	45,749	58.4	1.8	92.0	76.8	62.8
Nova Scotia	47,211	51.8	1.8	92.5	76.7	71.9
New Brunswick	48,781	60.4	1.8	90.8	75.6	66.4
Average Annual Rate of Change 2007-2031, Per Cent						
Canada	1.67	2.15	0.00	0.00	0.00	-0.49
Atlantic Canada	1.67	1.90	0.00	0.00	0.00	-0.23
Newfoundland and Labrador	1.67	2.18	0.00	0.00	0.00	-0.51
Prince Edward Island	1.67	1.98	0.00	0.00	0.00	-0.31
Nova Scotia	1.67	1.47	0.00	0.00	0.00	0.19
New Brunswick	1.67	1.81	0.00	0.00	0.00	-0.14
Relative Contribution to the Growth of GDP per Capita, Per Cent						
Canada	100.0	129.2	0.0	0.0	0.0	-29.2
Atlantic Canada	100.0	114.0	0.0	0.0	0.0	-14.0
Newfoundland and Labrador	100.0	130.7	0.0	0.0	0.0	-30.7
Prince Edward Island	100.0	118.8	0.0	0.0	0.0	-18.8
Nova Scotia	100.0	88.3	0.0	0.0	0.0	11.7
New Brunswick	100.0	108.5	0.0	0.0	0.0	-8.5

Source and Notes:

A: Real GDP per capita, chained 2002 dollars, population estimates from Statistics Canada for 2007. Projected to grow at the average rate for Canada in all provinces from 2007 to 2031, 1.67 per cent per year.

B: Real GDP per hours worked, chained 2002 dollars, hours from Statistics Canada Labour Force Survey for 2007. For 2031 projections based on assumed growth in GDP per capita of 1.67 per cent per year, and demographic assumptions about working population as a share of total population from Statistics Canada population projections (Appendix Table 1c).

C-F: Employment, labour force, and working age population data from Statistics Canada Labour Force Survey for 2007. Average weekly hours per employed person, employment as a share of the labour force, and labour force as a share of the working age population are assumed to remain constant. Working age population as a share of the total population projection is from Statistics Canada (Appendix Table 1c).

1. Newfoundland and Labrador appears here to have a lower level of GDP per capita than Canada in 2007. As we have seen above, this is not the case when GDP per capita is estimate in current dollars. The difference between GDP per capita in current and chained dollars reflect changing relative prices, especially the price of oil. The comparison of GDP per capita levels at a point in time should be done in current dollars.

An alternative—and more optimistic—scenario would be for Atlantic Canada to close the GDP per capita gap with the rest of Canada (Table 26). Assuming that labour productivity in Canada as a whole will grow at 2.15 per cent per year, probably a safe upper bound, and that demographics will play out as forecast by Statistics Canada, the Atlantic provinces will need to significantly increase their labour productivity growth rates to close the real GDP per capita gap with Canada. For instance, Atlantic Canada as a whole will need to increase labour productivity growth from 1.52 per cent per year (1981-2007) to 2.66 per cent per year in order to close the gap by 2031. Prince Edward Island would have the greatest challenge, being the least productive province in 2007. It would have to increase labour productivity growth almost three fold, from 1.32 per cent per year (1981-2007) up to 3.41 per cent per year from 2007 to 2031.

Table 26: Scenario 2: Close the Gap, Decomposition of GDP per Capita, Canada and Atlantic Canada, 2007-2031

	Real GDP per Capita	Labour Productivity	Average Weekly Hours per Employed Person	Employment as a Share of the Labour Force	Labour Force as a Share of the Working Age Population	Working Age Population as a Share of the Total Population
	A	B	C	D	E	F
	(Chained 2002 Dollars)		(Hours)		(Per Cent)	
2007						
Canada	40,079	44.4	1.8	94.0	80.0	68.1
Atlantic Canada	32,811	39.3	1.8	90.8	75.6	68.7
Newfoundland and Labrador[1]	38,890	51.4	1.9	86.4	70.2	70.6
Prince Edward Island	30,040	34.1	1.8	89.7	81.7	68.5
Nova Scotia	30,771	36.5	1.8	92.0	76.8	67.7
New Brunswick	31,755	36.5	1.8	92.5	76.7	68.6
2031						
Canada	59,587	74.1	1.8	94.0	80.0	60.6
Atlantic Canada	59,587	73.8	1.8	90.8	75.6	66.4
Newfoundland and Labrador	59,587	83.2	1.9	86.4	70.2	66.8
Prince Edward Island	59,587	76.2	1.8	89.7	81.7	60.6
Nova Scotia	59,587	76.1	1.8	92.0	76.8	62.8
New Brunswick	59,587	65.5	1.8	92.5	76.7	71.9
Average Annual Rate of Change 2007-2031, Per Cent						
Canada	1.67	2.15	0.00	0.00	0.00	-0.49
Atlantic Canada	2.52	2.66	0.00	0.00	0.00	-0.14
Newfoundland and Labrador	1.79	2.03	0.00	0.00	0.00	-0.23
Prince Edward Island	2.89	3.41	0.00	0.00	0.00	-0.51
Nova Scotia	2.79	3.11	0.00	0.00	0.00	-0.31
New Brunswick	2.66	2.46	0.00	0.00	0.00	0.19
Relative Contribution to the Growth of GDP per Capita, Per Cent						
Canada	100.0	129.2	0.0	0.0	0.0	-29.2
Atlantic Canada	100.0	105.6	0.0	0.0	0.0	-5.6
Newfoundland and Labrador	100.0	113.0	0.0	0.0	0.0	-13.0
Prince Edward Island	100.0	117.7	0.0	0.0	0.0	-17.7
Nova Scotia	100.0	111.2	0.0	0.0	0.0	-11.2
New Brunswick	100.0	92.7	0.0	0.0	0.0	7.3

Source and Notes:

A: Real GDP per capita, chained 2002 dollars, population estimates from Statistics Canada for 2007. Projected to grow at a rate that would result in each province having the same GDP per capita as Canada in 2031.

B: Real GDP per hours worked, chained 2002 dollars, hours from Statistics Canada Labour Force Survey for 2007. For 2031 projections based on growth rates required to close the real GDP per capita gap with Canada as a whole, given demographic assumptions below.

C-F: Employment, labour force, and working age population data from Statistics Canada Labour Force Survey for 2007. Average weekly hours per employed person, employment as a share of the labour force, and labour force as a share of the working age population are assumed to remain constant. Working age population as a share of the total population projection is from Statistics Canada (Appendix Table 1c).

1. Newfoundland and Labrador appears here to have a lower level of GDP per capita than Canada in 2007. As we have seen above, this is not the case when GDP per capita is estimate in current dollars. The difference between GDP per capita in current and chained dollars reflect changing relative prices, especially the price of oil. The comparison of GDP per capita levels at a point in time should be done in current dollars.

Appendix C: Sector Specific Tax Policy

Table 27: Selected Sector-Specific Tax Measures, Atlantic Canada, 2009

Newfoundland and Labrador	
Manufacturing and Processing Profits Tax Credit	A tax credit on the profits from manufacturing and processing establishments permanently located in Newfoundland and Labrador. The credit results in a reduction of the CIT rate on this type of income from 14.0 per cent to 5.0 per cent.
Film and Video Tax Credit	Refundable provincial CIT credit of 40.0 per cent of eligible local labour costs, but may not exceed 25.0 per cent of production costs or $3 million per corporation. Corporation must also pay at least 25.0 per cent of wages and salaries to residents of Newfoundland and Labrador.
Financial Corporations Capital Tax	Tax of 4.0 per cent on capital allocated to the province of banks, loan, and trust companies with permanent establishments in Newfoundland and Labrador. For companies with aggregate capital of less than $10 million, the first $5 million in capital is exempt from the tax.
Insurance Companies Tax	Tax of 4.0 per cent on all premiums collected in Newfoundland and Labrador.
Mining Tax	Tax of 15.0 per cent on the net income of mine operators carrying out mining activities in Newfoundland and Labrador. Net income equals gross revenue less allowable expenses including, operating and processing, depreciation, pre-production, exploration, crown royalties, processing and smelting allowances, and other prescribed deductions.
Mineral Rights Tax	Tax of 20.0 per cent on royalty receipts less certain deductions including legal expenses incurred in the collection of the royalties and payment of rents or royalties to other persons.
Resort Property Investment Tax Credit	Tax credit of 45.0 per cent of the purchase price of Qualifying Resort Development Property Units of a Qualifying Resort Development Complex outside the North East Avalon.
Prince Edward Island	
Financial Corporation Capital Tax	Tax of 5.0 per cent on the paid-up capital in excess of $2 million of banks, trust, and loan companies.
Nova Scotia	
Film Tax Credit	Refundable CIT credit for costs directly related to the production of films in Nova Scotia, equal to the lesser of 50.0 per cent of eligible Nova Scotia labour expenditures or 25.0 per cent of total expenditures made in Nova Scotia.
Digital Media Tax Credit	Refundable CIT credit for costs directly related to the development of interactive digital media products in Nova Scotia, equal to the lesser of 50.0 per cent of eligible Nova Scotia labour expenditures or 25.0 per cent of total expenditures made in Nova Scotia.
Insurance Taxes	Tax of 3.0 per cent on gross life, accident and sickness premiums, and 4.0

	per cent on gross premiums other than life, accident and sickness premiums.
New Brunswick	
Film Tax Credit	CIT credit equal to a maximum of 40.0 per cent of eligible salaries paid to New Brunswick residents. Wages in excess of 50.0 per cent of the total costs of production are not eligible for consideration.
Financial Corporations Capital Tax	Tax of 3.0 per cent on taxable capital of financial institutions in excess of $10 million. Tax paid is deductible from taxable income for federal and provincial corporate income tax purposes.

Source:
Newfoundland and Labrador: http://www.fin.gov.nl.ca/fin/businesstax.html
Prince Edward Island: http://www.gov.pe.ca/pt/taxandland/index.php3?number=51486&lang=E
Nova Scotia: http://www.gov.ns.ca/finance/en/home/taxation/businesstax/default.aspx
New Brunswick: http://www.gnb.ca/0024/tax/index.asp

Appendix D: Growth Accounting

This appendix uses new estimates of real output, labour quality, and capital stock to perform an exercise called growth accounting. Growth accounting decomposes changes in productivity into the changes associated with labour quality and composition (labour composition), the amount and quality of capital per worker (capital intensity), and a residual called multifactor productivity (MFP).

The estimates discussed in this appendix were prepared by Statistics Canada for the Centre for the Study of Living Standards. While the estimates were prepared for the period from 1997 to 2007, this appendix focuses on the period from the business cycle peak in 2000 to the business cycle peak in 2007, in order to reduce the impact of cyclical factors on the analysis. The estimates are only available in indexes, which allow the calculation of growth rates, but not of relative levels. Given that the focus of this report is on level comparisons, the focus on growth rates of these estimates means that they have been included as an appendix. As well, estimates are only available for the market sector, a special aggregation that excludes healthcare and social assistance, educational service, and public administration. For this reason, these estimates are not completely comparable with those presented in the body of this report.

Table 28: Sources of Growth in the Market Sector by Province, 2000-2007

	Canada	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC
	Average annual rate of growth										
Output	2.6	5.8	2.2	2.2	2.1	2.1	2.1	2.5	1.7	3.9	3.4
Total Hours	1.5	1.2	1.2	0.9	0.7	0.7	1.3	1.1	0.3	3.2	2.7
Labour Composition	0.5	0.7	0.6	0.2	0.4	0.5	0.5	0.5	0.9	0.4	0.0
Capital Services	4.0	2.1	4.0	2.1	3.2	2.2	3.0	2.7	2.6	8.0	4.1
Capital Stock	3.0	1.2	2.5	1.2	2.8	1.7	2.1	1.9	0.5	6.7	3.2
Capital Composition	0.9	0.9	1.5	0.9	0.4	0.5	0.8	0.8	2.1	1.2	0.8
Capital Services Intensity	2.4	0.9	2.7	1.2	2.5	1.4	1.7	1.6	2.3	4.7	1.4
	Percentage point contributions to labour productivity growth										
Labour Productivity (Output per hour)	1.1	4.5	1.0	1.3	1.3	1.4	0.8	1.4	1.4	0.7	0.7
Labour Composition	0.3	0.3	0.3	0.1	0.2	0.3	0.3	0.3	0.4	0.2	0.0
Capital Services Intensity	1.1	0.6	1.1	0.5	1.0	0.6	0.6	0.7	1.4	2.6	0.5
Capital Stock	0.8	0.3	0.7	0.3	0.9	0.5	0.5	0.5	0.3	2.1	0.4
Capital Composition	0.2	0.2	0.4	0.2	0.1	0.1	0.2	0.2	1.1	0.4	0.1
Multifactor Productivity	-0.2	3.7	-0.4	0.6	0.1	0.5	-0.2	0.4	-0.4	-1.9	0.1
	Percent contributions to labour productivity growth										
Labour Productivity (Output per hour)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Labour Composition	26.5	5.7	33.4	11.2	17.7	21.3	41.5	19.4	27.6	24.5	1.5
Capital Services Intensity	97.5	12.4	111.7	37.7	77.9	43.2	80.3	48.6	102.2	340.9	81.3
Capital Stock	74.1	7.0	69.7	22.0	67.0	33.3	58.2	34.1	21.0	285.8	64.1
Capital Composition	22.8	5.3	40.9	15.5	10.6	9.7	21.7	14.3	80.8	51.6	16.6
Multifactor Productivity	-21.9	81.2	-44.8	50.7	4.2	35.1	-21.8	31.5	-29.7	-258.9	17.1

Source : Unpublished Statistics Canada Estimates
Growth rates calculated by the CSLS.

We can see from Table 28 that the exceptional growth rate of labour productivity in Newfoundland and Labrador (4.5 per cent per year relative to 1.1 per cent per year in Canada) was entirely due to growth that was not explained by growth in either capital or labour. We know from the body of this report, that this strong MFP growth reflects the exceptional labour productivity gains that have resulted from the increased importance of

the mining and oil and gas extraction sector. The Maritime provinces grew at approximately the same rate as the country as a whole. Nova Scotia saw less rapid growth in capital services intensity, while MFP growth was faster.

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