September 2015

151 Slater Street, Suite 710
Ottawa, Ontario K1P 5H3
613-233-8891
csls@csls.ca

CENTRE FOR THE STUDY OF LIVING STANDARDS

The Key Challenge for Canadian Public Policy: Generating Inclusive and Sustainable Economic Growth

Don Drummond, Evan Capeluck and Matthew Calver

CSLS Research Report 2015-11

September 2015

Abstract

Recent economic and fiscal projections produced by the Centre for the Study of Living Standards suggest that revenue growth over the next 23 years in most provinces and territories will be insufficient to maintain recent increases in health expenditures while holding other spending constant on a real per capita basis. Motivated by these fiscal challenges, we present a series of policy recommendations for Canada's governments at all levels to foster greater economic growth. Higher GDP not only offers a means to raise government revenues, it also directly raises the well-being of Canadians. We consider options to boost economic growth in two broad ways. First, by boosting Canada's productivity performance through policies promoting private and public investment, education, technological innovation and diffusion, and trade. Second, by tapping into Canada's underutilized labour supply, particularly by assisting women, older workers, persons with disabilities, Aboriginal people, and immigrants in successfully participating in the workforce. The recommendations in this report are guided by the Organization of Economic Co-operation and Development's green growth and inclusive growth frameworks and by the idea that government should take a more active role in supporting the economic activities of individuals and businesses.

The Key Challenge for Canadian Public Policy: Generating Inclusive and Sustainable Economic Growth

Table of Contents

The Key Challenge for Canadian Public Policy: Generating Inclusive and Sustainable Economic Growth

Executive Summary

Recent studies have raised concerns about the long-run sustainability of growth in spending by Canada's provincial and territorial governments. In particular, it has been suggested that growth in spending, especially rising health expenditures, will outpace growth in revenues so that provincial and territorial governments will persistently run significant deficits. Over time, a large debt will accumulate, raising concerns about fiscal stability.

In order to meet these fiscal challenges, provincial and territorial governments will need to control spending growth, particularly in health, but they should also try to boost economic growth. Stronger economic growth will allow governments to meet the dual challenges of giving our children an economy with greater opportunities than those which we have enjoyed while also allowing governments to continue to provide the services which Canadians expect.

This report offers a series of public policy recommendations aimed at generating economic growth. While we make recommendations which are relevant for governments at the federal, provincial/territorial, and local levels, we emphasize options available to provincial and territorial governments for two reasons. First of all, there are fewer concerns about the fiscal situation of the federal government. The federal government is much less exposed to the health sector. The recent introduction of a cap on growth in health transfers to the provinces to no more than nominal GDP growth and the gradual increase in the age of entitlement for both Old Age Security and the Guaranteed Income Supplement from 65 years of age to 67 have reduced the federal government's future spending obligations. Furthermore, the federal government only faces a moderate debt burden at present compared to some of the provinces. Second, many studies have previously examined ways to raise GDP in Canada, but most have focused almost exclusively on federal policy instruments, ignoring the considerable influence the provinces and territories have on growth not only within their own boundaries, but also at the national level. Collectively, the provincial governments are about as large as the federal government in terms of spending and revenues.

Governments in Canada have for several decades pursued strategies to generate economic growth. These efforts have generally followed a "market-based" framework which has been recommended by economists and prestigious international organizations such as the Organization for Economic Co-operation and Development (OECD). This approach focuses on making an economy more competitive in hopes that greater growth, largely through enhanced productivity, will occur.

The logic of the market-based approach is still considered sound. Indeed, we recommend that remaining elements of the market agenda, such as removing internal and external barriers to trade and adopting value-added sales taxes where retail sales taxes still exist should be completed.

But at the same time, we must step back and assess the success of the market-based strategy in producing economic growth. At present, the reforms do not appear to have accomplished as much as governments had hoped for.

First, at a macroeconomic level, market-based reforms have not yielded the strong productivity growth which was expected. Indeed, since 2000 Canada's productivity growth has been weak not only relative to Canada's own historical record, but relative to recent performance in many other countries as well. Second, the benefits from the modest economic growth which has occurred have not been widespread, as has been the case in many other countries. Instead, most of the gains have been concentrated in the hands of those at the top of the income distribution. Third, Canada's economic growth has been incompatible with environmental sustainability.

So, while we recommend completing the "market-based" agenda, we also think that new approaches are warranted. These new approaches should be based upon the new frameworks of inclusive growth and green growth which are now being championed by the OECD.

These inclusive and sustainable approaches to growth will likely need to be delivered by governments applying a somewhat more activist set of public policies than those traditionally associated with a market-based approach.

To this end, we recommend policies such as expanding public infrastructure, but only on projects that satisfy benefit-cost tests; offering businesses more information and mentorship on how to take advantage of trading and investment opportunities; and providing more support to those who have been left behind in education and the workplace.

This call for more activist policy might be met with trepidation. It should be. The record of activist public policy is not very good. All too often, the result has been distortions of the marketplace and increased public debt. But the alternative, the continuation of the status quo, should not be acceptable to Canadians and their governments. Canada can and must do better economically, socially, and environmentally. This requires going in new directions.

The time has come to go beyond the status quo and pursue inclusive, sustainable growth strategies. These need to be applied at the federal, provincial, and territorial levels. Success will only be achieved if governments raise the bar for effectiveness and efficiency of programs to an unprecedented height.

Fiscal Challenges Facing Canada's Provinces and Territories

The Centre for the Study of Living Standards has constructed a series of projections of growth in revenues and expenditures for each provincial and territorial government to assess their long-term fiscal stability. These projections are provided in detail in the report "Long-term Fiscal and Economic Projections for Canada and the Provinces and Territories, 2014-2038," which was released in July 2015.

In our projections, revenues are assumed to grow at approximately the same pace as nominal GDP. We assume that inflation will rise at the Bank of Canada's current target rate of 2 per cent annually and project growth in real GDP by making several assumptions regarding population growth, labour force participation rates, average hours worked, and labour productivity growth based upon recent trends. At the national level, our projected average growth rate of real GDP of 1.6 per cent annually from 2014 to 2038 is quite similar to recent projections by TD Economics and the Parliamentary Budget Office. This suggests that growth in real GDP will be more modest than the rate of 2.0 per cent observed between 2000 and 2014. We assume that labour productivity will grow at a rate of 1.0 per cent annually and that labour supply will grow at a rate of 0.6 per cent. We expect the growth in labour supply to be driven by growth in the working age population of 0.9 per cent annually, dragged down by reductions of 0.1 per cent annually in the employment rate and 0.2 per cent annually in the average hours worked of those employed. This projected reduction in hours worked reflects recent shifts from full-time to part-time work.

We estimate that growth in GDP would be sufficient for the provinces and territories to maintain spending in real per capita terms (the only growth in spending would be from population growth and inflation, Scenario A in Exhibit 1). However, it is expected that provincial health spending will increase in real per capita terms for two reasons. First, assuming no improvement in the efficiency of health spending, increases in per capita health expenditures will likely be necessary to achieve further improvements in health care demanded by the public, especially if prices in the health sector continue rising faster than inflation. Second, the aging population will require increased real per capita spending just to maintain the existing quality of health care.

Consequently, we think that the more reasonable test of fiscal stability is to ask whether the projected revenue growth rate will exceed the projected growth rate of expenditures if nominal health care expenditures continue to grow at the same pace as observed over the 2000-14 period when real per capita health expenditures and the price deflator of health services both increased significantly (Scenario B in Exhibit 1). Under this more realistic scenario, we find that spending would grow faster than revenues in almost every province and territory (the exceptions being Manitoba and British Columbia). Keep in mind that this scenario assumes no real per capita growth in non-health spending.

Several options are available to provincial and territorial governments to address this impending fiscal challenge. One option is for provincial/territorial and local authorities to reduce the rate of growth of health spending, hopefully through increased efficiency of spending rather than reductions in quality. A second option is to raise tax rates to make up the shortfall, but this would be unpopular and would have economic costs. Less attention is typically paid in this context to a third option: find ways to raise economic growth rates. Faster growth in GDP would raise revenues, narrowing the gap between projected revenues and expenditures. While finding ways to rein in spending is undoubtedly part of the solution, this report examines policy options for governments in Canada to increase the growth rate of real GDP.

Exhibit 1: Difference Between Projected and Required Nominal GDP Growth, by Scenario for Provincial Public Spending Growth, Percentage Points, Provinces and Territories, 2014-2026 and 2026-2038

	2014-2026		2026-2038	
	Scenario A	**Scenario B**	**Scenario A**	**Scenario B**
All Provinces	0.62	-0.37	0.83	-0.34
Newfoundland and Labrador	0.99	-0.51	1.34	-0.53
Prince Edward Island	0.72	-0.91	0.87	-1.18
Nova Scotia	0.60	-1.37	0.90	-1.53
New Brunswick	0.68	-0.67	0.94	-0.72
Quebec	0.51	-0.19	0.79	-0.05
Ontario	0.54	-0.38	0.72	-0.36
Manitoba	1.29	0.11	1.43	0.05
Saskatchewan	1.08	-0.37	1.33	-0.46
Alberta	0.46	-1.25	0.67	-1.48
British Columbia	1.05	0.37	1.24	0.50
Yukon	0.64	-0.29	1.10	-0.17
Northwest Territories	-0.93	-1.78	-0.69	-1.80
Nunavut	0.68	-0.47	0.66	-0.79

Note: This table provides the percentage point difference between the baseline projections for nominal GDP growth and the rate of nominal GDP growth required for revenues to grow at the same pace as expenditures. The three scenarios for required nominal GDP growth are outlined below:

1) Scenario A assumes that public spending will be constant in real per capita terms, with growth in nominal per capita expenditure at the assumed inflation rate (2.0 per cent).
2) Scenario B assumes that non-health spending will be constant in real per capita terms, with growth in nominal per capita non-health spending at the assumed inflation rate (2.0 per cent). However, it assumes that health will be positive in real per capita terms, with growth in nominal per capita health spending at the historical growth rates in nominal per capita health spending in 2000-2014 (which range from 3.6 to 6.1 per cent).

Source: CSLS calculations based on Statistics Canada and Canadian Institute of Health Information data.

Raising Real GDP

Our goal is to identify options for governments in Canada to boost real GDP growth. While we focus on options for provincial and territorial governments, many of the recommendations which we consider are relevant for government at the local and federal levels. Not only would greater growth in GDP in a jurisdiction benefit all levels of government through higher tax revenues, it also directly benefits Canadian individuals and businesses through rising incomes and employment. Higher incomes translate into a higher overall standard of living.

What can governments do to foster real GDP growth? All policies which raise real GDP must do so in one (or both) of two ways. Either the policy must increase the number of hours worked (either by increasing the number of people working or the number of hours worked per worker) or it must increase labour productivity (the amount of output produced per hour worked). These are the only two options because:

$$Real\ GDP = (Output\ per\ Hour\ Worked) * (Hours\ Worked)$$

Thus we organize our analysis and recommendations into two categories. First we examine the major sources of growth in labour productivity, assess how Canada performs in these areas, and identify options for improvement. Then we consider how Canada performs in terms of labour supply and a number of options to increase the amount of hours being worked.

This report presents a wide range of recommendations for economic growth. Many of these are guided by a small number of core themes or principles. Taken together, these recommendations represent an approach to economic growth based on inclusivity, sustainability, and a more active role for government in supporting market participants. We will briefly describe these guiding ideas before providing an overview of options to enhance real GDP growth.

Overarching Themes

Inclusive Growth

The OECD, in its 2014 report *All on Board: Making Inclusive Growth Happen*, defines inclusive growth as a new approach to economic growth that aims to improve living standards and share the benefits of increased prosperity more evenly across social groups.

The OECD inclusive growth framework is "inclusive" in two senses:

First, inclusive growth recognizes that well-being is determined by far more than just GDP. A multitude of other factors must be considered when developing optimal policy. These include health, economic security, the environment, safety, education, housing, and work life balance.

Inclusive growth recognizes that, while GDP and fiscal balance are important, they are only means to achieve the more important goal of maximizing well-being. While there are many policy options which may lead to similar economic growth, some may be more desirable than others from a well-being perspective.

Second, inclusive growth emphasizes the importance of including all people in the benefits of economic progress. While this could, in principle, be achieved by redistributing any gains from economic progress, we are more interested in the idea that inclusiveness can be a source of improvement in economic performance. In particular, the poor, non-employed, and marginalized in society may represent a significant opportunity to increase output. Improving economic outcomes of underperforming businesses and individuals not only directly benefits these people and organizations, it can also raise aggregate performance. Policies aimed at economic inclusion can have spillover benefits in terms of lower crime rates, better health, and less reliance on social assistance, which can ease the spending burden on governments.

Green Growth

The OECD has also developed a "green growth" framework which offers ways to promote economic growth while at the same time restricting negative impacts on the environment. The OECD defines green growth "as a way to pursue economic growth and development, while preventing environmental degradation, biodiversity loss and unsustainable natural resource use. It builds on existing sustainable development initiatives and aims at identifying cleaner sources of growth, including seizing the opportunities to develop new green industries, jobs and technologies, while also managing the structural changes associated with the transition to a greener economy."

Green growth is closely linked to inclusive growth in the sense that it includes consideration of the environmental consequences of actions when making decisions about economic policy. What is best for growth is not always best for environment. However, there are ways to achieve growth in environmentally sustainable ways. Where relevant, we note policy options to support green growth.

We recommend that governments focus on four specific policy areas where action should be taken towards environmentally sustainable growth now:

- Accept the Ecofiscal Commission recommendations on carbon pricing as a starting point to explore where and how best to integrate market-based instruments into environmental/economic action (Appendix D);

- Consider where public investment in infrastructure should give priority to integrating green objectives into medium- and long-term infrastructure requirements;

- Consider the role of green technology as a major business opportunity in meeting growth and environmental objectives; and

- Federal and provincial governments should engage major urban centres in a partnership approach to growth, We recommend that more explicit bridging strategies with cities should be adopted to accomplish inclusive and sustainable growth.

Active Government

The past several decades have seen most governments in Canada implement a series of market-oriented reforms which economists generally agreed would result in a surge of economic growth. The results were disappointing – growth in recent years has been lackluster. This is not to say that these market-oriented policies were ineffective or should be reversed, as economic growth likely would have been worse without them. To the contrary, we recommend that governments finish adopting the standard market-oriented reforms, particularly regarding changes in taxation and removing barriers to trade.

However, the failure of Canada's market-oriented reforms to generate a golden age of economic prosperity suggests that simply creating a level playing field for competition and then

passively hoping that growth will happen may not be the best approach. Government can do more to support actors to make optimal decisions in the competitive marketplace. Throughout this report, we identify many opportunities for the government to play a role in mentoring businesses and individuals, providing information, and offering assistance to those who struggle to participate in the Canadian economy.

Raising Labour Productivity

Productivity growth in Canada has been dismal in recent years, both when compared historically and when compared internationally. Business sector labour productivity, as measured by output per hour, grew at an average annual rate of 1.0 per cent in Canada between 2000 and 2014. This is down from an average growth rate of 1.7 per cent from 1989 to 2000. Over the 2000 to 2014 period, the United States experienced annual productivity growth of 2.4 per cent.

We consider the major sources of productivity growth to better understand why Canada may be performing so poorly in recent history and what governments can do about it. In particular, we consider policies to improve investment (both private and public), technological progress, education, and the micro-economic environment.

Private Investment

Capital accumulation is one of the major drivers of labour productivity growth. Workers who make use of a greater stock of machinery and equipment, non-residential buildings, engineering construction, and intellectual property products tend to be able to produce more output. Sufficient investment in maintaining and increasing the capital stock relative to the number of workers is critical for productivity growth. Statistics Canada reports that growth in capital intensity has accounted for two-thirds of business sector labour productivity growth in this country since 1980.

Since 2000, business non-residential investment has been relatively stable at 12-13 per cent of nominal GDP in Canada. This is roughly in line with the average over the 1961-2000 period. But there have been important offsetting shifts in two components of business investment in the 2000s. Engineering construction has jumped from around 2 per cent of GDP to nearly 6 per cent because of massive investments in resource industries, particularly in the oil and gas sector. Meanwhile, machinery and equipment has fallen from around 7 per cent of GDP to 4 per cent, reflecting the weakness of investment in information and communications technology (ICT). Indeed, in 2013 ICT investment per worker in the Canadian business sector was only 51.1 per cent of that of the United States.

Weakness in machinery and equipment investment has been identified as an important contributor to Canada's poor productivity. It is not straightforward in this context to know what governments should do to spur more business investment. Certainly jurisdictions with relatively high rates of taxation on capital investment should address that problem. An answer may lie in the observation from Deloitte's 2013 study entitled "The Future of Productivity: A Wake-up Call for Canadian Companies" that one-third of firms surveyed did not know they were under-investing relative to their competitors. Government may be able to guide private investment to

more optimal levels by extending mentoring services so that businesses better understand their under-investment and how to address this situation.

Public Investment

The public sector also makes valuable contributions to Canada's capital stock. Public investment boosts economic growth, both by increasing demand in the short term which reduces any output gap and by raising supply in the long term in providing the future public capital needed for private sector production.

Gross public sector investment in Canada, as a share of nominal GDP, fell from around 6 per cent in the early 1960s to 3 per cent in the late 1990s. It then rose in the 2000s, peaking at 4.5 per cent in 2009-2010 during the economic crisis when it was used as a counter-cyclical policy tool. By 2013 it had declined to 3.5 per cent.

The long-term fall in the share of public sector investment in GDP is seen as evidence of underinvestment and indeed as contributing to slower business sector productivity growth, given the complementarities between public and private investment. The validity of the concept of an aggregate infrastructure gap requires the identification of a large number of specific projects that exhibit attractive rates of returns (both private and social) based on cost-benefit studies.

Canadian governments should take advantage of low interest rates and the current output gap to increase public investment. While the accumulation of debt is a concern, economists generally agree that what is more important for economic growth and stability is to avoid having too large of a debt to GDP ratio. Generally, we wish to avoid increasing the debt to GDP ratio out of concern that it will become too high. Running deficits need not be inconsistent with a goal of not raising the debt to GDP ratio, provided that the deficits are small enough that the debt does not grow faster than GDP. Temporarily running larger deficits to fund valuable public investments while stimulating the economy during periods of poor economic performance are justifiable. However, governments must be careful to ensure that the projects being funded are the best use of public funds.

Several areas stand out as potential priorities for public investment. Trade gateways such as pipelines and rail infrastructure could raise output by preventing bottlenecks in the shipment of commodities to market. Investments in maintenance and green infrastructure today may offer the opportunity to reduce costs in the long run.

Technological Innovation

The development and diffusion of new technologies has long been identified as a key source of economic growth by economists. Research and development (R&D) is the discovery of new knowledge and the application of this knowledge to fill market needs. R&D spending is generally understood to be a key input to innovative activity. Gross expenditures on R&D are performed by business, higher education, and government.

R&D spending by government and business as a percentage of GDP has fallen significantly in Canada in recent years. Canada's gross R&D expenditure as a share of GDP fell from 1.87 per cent in 2008 to 1.55 per cent in 2014. Despite policymakers' efforts to boost R&D spending, Canada's gross R&D intensity in 2014 had receded to its 1987 level; business R&D intensity has declined to the level last seen in 1992; and government R&D intensity was at a historic low.

Governments in Canada, especially the federal government, have been attempting for decades to boost business expenditures on R&D through tax credits and direct subsidies. The overall decline in business R&D spending suggests these programs have not been particularly successful. The federal government offers the Scientific Research and Experimental Development (SR&ED) tax credit and all provincial governments, except Prince Edward Island, have their own R&D tax credit programs. A number of commentators have noted that government support for business R&D in Canada, relative to other OECD countries, is disproportionately through tax credits. In addition, the incremental impact of tax credits on business R&D spending has not been well documented.

We suggest that provincial, territorial, and federal governments rigorously evaluate their R&D tax credit programs to determine whether they are leading to additional R&D and if they are cost effective. Governments should consider rebalancing R&D support from tax credits to more direct grants and subsidies. Governments should also increase their own spending on R&D, particularly in areas where they may be able to create a competitive advantage, such as resources and green technology.

While R&D is important for the development of new technologies, only a small proportion of Canadian firms (around 20,000) actually engage in R&D activities. However, almost all firms adopt and use modern technologies. A case can be made that the diffusion of best practice techniques and organizational practices to the largest possible number of firms is more important for aggregate productivity growth than the creation of new products and processes through R&D.

Firms of course already have an incentive to adopt best practices to cut costs and develop a competitive advantage. But firms, especially small and medium-sized firms, face a variety of barriers to the adoption of advanced technologies, including insufficient resources to monitor and assess the latest technological developments in their field domestically and internationally, the high cost of acquisition of these technologies, and the lack of skilled workers to implement them.

Industry and trade associations and management consultancies already play a role in assisting firms to adopt technologies, but government may be able to provide further assistance. Governments in Canada should review and evaluate their current programs supporting the diffusion of technologies and practices among firms, benchmarking these programs against the best programs globally. More resources should be devoted to programs which are found to be effective.

Governments should take special note of the potential of the global clean technology industry. Given the classic market failures associated with R&D, governments should consider

building on successful models of direct subsidies to clean technology and models of clean technology developed in partnership with businesses, universities/colleges, and other levels of government.

Education and Human Capital

Not only does education make individuals more productive through developing skills and knowledge, well-educated workers may also raise the productivity of those who they work and interact with through knowledge sharing. Education also generates many non-market benefits for society. These include increased rates of charitable giving and volunteerism, greater social cohesion, reduced reliance on social assistance, lower crime rates, and better individual decisions related to health, finances, family size, and job search. Such externalities, evidenced by high social returns to higher education, provide a strong rationale for government subsidization of education.

The educational attainment of Canadians has increased rapidly since 1990. The percentage of the population 15 years and over with a college or trade certification has increased from 21.8 per cent to 31.4 per cent from 1990 to 2014, while the proportion with a university degree has increased even more, from 10.9 per cent to 22.9 per cent. The proportion of the working age population with post-secondary education has hence increased from 32.7 per cent to 54.2 per cent, and is currently the highest in the OECD. Statistics Canada estimates that increased labour composition, or human capital, has accounted for one-quarter of the business sector labour productivity growth in Canada since 1980.

The following four points summarize our perspective on education

- Education is a significant contributor to economic development and Canada's performance on international tests reveals that we would benefit economically from better educational outcomes, especially in mathematics and numeracy. There is tremendous variation in educational outcomes across Canada's provinces and territories, almost as wide as the range observed across OECD countries. If the underperforming provinces improved to the present national average, Canada would have some of the best educational results of any country. Increased participation in higher education and improved outcomes for disadvantaged and at-risk groups would be especially beneficial.

- There are a range of outcomes that need to be measured to determine the contribution and quality of postsecondary education ranging from basic skills such as literacy and numeracy to higher cognitive skills such as problem solving, critical thinking and communication and a set of personality and behavioural attributes such as resilience, teamwork and time management. All of these are essential to success in life and employment.

- The discussion should be focussed on what outcomes and objectives we hope to achieve with postsecondary education and rigorous measurement of whether those objectives and outcomes are in fact being achieved, rather than on the secondary issue of funding.

- A new organization needs to be created, or an existing organization tasked, with responsibility for collecting, analyzing and disseminating the required data on higher education outcomes and how these meet current and prospective labour market needs.

Micro-economic Environment

A number of structural or micro-economic policies influence economic growth, including international and internal trade policy, competition policy, foreign investment policy, and policies affecting telecommunications and electricity.

The overall impact of trade agreements on the Canadian economy is difficult to measure. Nevertheless, it is clear that heightened global economic integration is here to stay and Canada and Canadian businesses must do their utmost to take advantage of the opportunities offered. That means accelerating the diversification of our export base beyond our major markets of the United States and Europe and beyond concentration in a few products including largely unprocessed natural resources.

The federal government and many of the provinces offer services to help companies tap into new markets. For small- and medium-sized enterprises this can be challenging. As many of the recent trade agreements around the world have been bilateral or at most regional, exporters might face myriad rules of origin that are not easy for smaller companies to understand and abide by. Smaller firms may lack the scale to make the investment in understanding these rules worthwhile. Governments, both federal and provincial, can do more to help these firms enter global markets through mentoring, opening doors in new markets and interpreting global trade rules.

We are far from the first to note the irony of Canadian efforts to establish free trade agreements with other countries when there is not free trade within Canada. A single domestic market where there are no internal barriers should be established. Marketing boards with production quotas for agricultural products are particularly problematic as they push up consumer prices and, most importantly, represent a serious impediment to securing international trade agreements.

Competition boosts productivity growth through a “market selection effect” (reducing the market share of less productive firms), a “restructuring effect” (increasing the incentive to reduce costs) and an “entry effect” (lower cost firms entering the market). Consequently, policies that enhance competition are favourable for productivity growth and should be encouraged.

Increasing Labour Supply

In addition to labour productivity, long run economic growth is also driven by the supply of labour. The supply of labour is determined by the working age population (i.e. persons aged 15 years and over), the labour force participation rate (i.e. the share of the working age population engaged in the labour market), and the average number of hours worked per labour force participant.

The working age population is determined by the rate of natural increase (i.e. persons turning 15 minus deaths) and net migration. Note that population growth will not improve GDP on a per capita basis unless the additional population generates above average economic output. Raising birth rates is not a viable or cost-effective solution, especially not in the 23 year timeframe of our projections. Immigration can help, but it is not the panacea that some commentators suggest, particularly not at the existing immigration rate and with the relatively poor performance of recent immigrants compared to earlier cohorts.

Increasing the labour supply of the anticipated working age population is a more promising approach. At first glance, there may be limited scope to do this because Canada is already a very strong performer internationally in terms of labour supply and current performance is reasonably strong when compared historically.

Nonetheless, there are a few general approaches which should be taken to increase labour supply of the Canadian population broadly. These include:

- Creating an appropriate incentive structure which encourages individuals to work through carefully designed tax and income assistance schemes. In particular, policies which lead to high marginal effective tax rates which disincentivize work should be reformed.

- Investing in education and skills development, particularly in areas which are expected to be in high demand in the future.

- Improving quality and dissemination of labour market information to facilitate efficient decision making by workers, firms, students, and educational institutions.

While these approaches will have a positive impact on labour supply generally, given Canada's already strong performance in this area, it may be more effective to specifically target several segments of the Canadian population which we know to have significantly lower participation rates when compared to the general population. We consider the major barriers to working for women, older workers, persons with disabilities, Aboriginal people, and immigrants and how governments may be able to assist these groups in participating more in the Canadian economy.

Women

While the female participation rate is very high when compared to historical levels, it has settled at a level lower than the male participation rate. In 2014, Canadian men aged 25-54 had a participation rate of 90.5 per cent while women of the same age only had a participation rate of 81.9 per cent. The main explanation for this is that many women leave the workforce to care for newborn children and choose not to return. Policies related to parental leave and childcare can encourage women to return to work following childbirth. In particular, we suggest that governments consider options to enhance maternity and parental leaves to be more flexible and sufficiently generous to maintain attachment to the workforce and take action to improve access to and affordability of childcare.

Women are also hesitant to enter certain fields which are traditionally male dominated. This may lead to a significant misallocation of female labour with negative consequences for female employment prospects and productivity. From an early age, schools and governments should actively encourage women to pursue any occupation. In particular, greater efforts should be directed towards increasing the number of women in science, technology, engineering, and mathematics (STEM) fields and the trades.

Older Workers

The participation rate of those aged 25-54 in 2014 was 86.2 per cent. For those aged 55-69 it was only 53.7 per cent. As Canadians approach the traditional retirement age of 65, many wish to work less or are forced to do so because of ailing health. However, many would like to continue working, sometimes on a more limited basis, but face conditions which discourage them from doing so.

Legal impediments to working beyond a certain age have largely been eliminated. However, there remain disincentives in some public and private pension schemes which financially penalize those who continue to work. These disincentives should be reduced or eliminated.

Many older workers would like to continue working, but only on a part-time basis. Government should encourage employers to provide more flexible work arrangements to older workers. Barriers to employing workers under more flexible conditions such as ceilings on payroll contributions which create an incentive to hire full-time rather than part-time employees should be addressed. Furthermore, government should take the lead in offering flexible work arrangements to aging public sector workers.

Older workers also often have difficulty finding comparable work if they are laid off. Time-limited wage subsidies for older long-term workers who accept a lower paying job after being laid off may be a way to keep these individuals in the workforce.

Persons with Disabilities

The age-standardized participation rate of Canadians age 15-64 without disabilities in 2012 was 79.2 per cent. For those with disabilities, the age-standardized employment rate was only 55.6 per cent. Disabilities, by definition, limit the ability to work. However, too much emphasis is often placed on how a worker is disabled rather than on what workers with disabilities are able to do.

There are several ways that government can improve labour force participation rates of persons with disabilities. Earlier diagnosis of disabilities and intervention when workers first apply for short-term leave may keep more individuals in the workforce. Assistance with retraining and workplace accommodation should begin before problems become more severe.

Processing times for benefit applications and appeals need to be reduced so as to reduce the amount of time which applicants are forced to remain out of the workforce to support their

claim. Information and administration of benefits should be consolidated to make accessing disability benefits as simple as possible for those entitled to them.

There are a wide range of types and severities of disability. Disability benefits need to be designed so that they do not discourage those who can continue to work from doing so. Any financial disincentives inherent in disability benefit policies should be identified and reduced or eliminated. Partial disability benefits should be available to those with less severe disabilities, ideally with a requirement to participate in the labour market.

Aboriginal People

The poor labour market performance of Aboriginal Canadians is a persistent problem which needs to be addressed. For instance, Aboriginal identity people aged 25-64 had a participation rate of only 71.7 per cent in 2011. The participation rate of the non-Aboriginal population in this age group was 80.6 per cent. Labour market performance is especially poor for First Nations people living on reserve. The participation rate of the First Nations population aged 25-64 living on reserve was only 60.0 per cent.

Aboriginal people face several barriers to participation in the Canadian economy. Social problems, such as poor health and high crime rates, are especially high among the Aboriginal population and can interfere with labour market participation. Governments should offer additional support to address social problems plaguing Aboriginal communities.

Aboriginal high school and post-secondary completion rates, especially at the university level, remain far below those of the general population. Further investments in facilities and educators on reserve are necessary to ensure all Aboriginal children have access to a high quality education. Curricula may need to be redesigned to be more engaging and greater control over Aboriginal education on reserve should be placed in the hands of Aboriginal people, along with assistance in administrative capacity and accountability.

Immigrants

Those aged 25-54 born in Canada had a participation rate of 87.7 per cent in 2014. Those who had immigrated to Canada had a somewhat lower participation rate of 82.6 per cent, despite the fact that many of those in this subpopulation were selected based on educational and economic characteristics.

One option to improve immigrant performance is to change how immigrants are being selected. Besides putting even further emphasis on economic factors in immigration decisions, the balance between short-term and long-term economic concerns needs to be reconsidered. The federal government needs to focus on finding long-term solutions to shortages of skilled workers, rather than relying on the temporary foreign worker program. Provincial governments need to strike a better balance between short and long-term needs in their nominee programs, informed by better labour market information.

The second approach which we advocated to improve immigrant labour market performance is to offer more assistance to recent immigrants with language training and skills upgrading.

Conclusion

There are clear motivations for governments to take action to raise real GDP. Higher incomes improve the well-being of citizens directly and ease fiscal constraints, allowing for lower taxation or enrichment in public services. We have provided an overview of the major sources of economic growth and suggested a series of policies which build upon earlier market-oriented reforms to promote growth in an inclusive and environmentally friendly manner by providing greater government support for market participants.

There is no single policy which will guarantee massive gains to economic growth. In order to generate significant improvements, deep and broad reforms are needed. Many of the policies which we recommend are complementary with each other and with market-based reforms which have already been implemented.

The Key Challenge for Canadian Public Policy: Generating Inclusive and Sustainable Economic Growth[1]

I. Introduction and Context

Several recent reports (for example, Beckman et al., 2014 and Cameron et al., 2014) have expressed concern over the long-term fiscal stability of the provinces and territories. These studies tend to depict spending, largely driven by health, outstripping revenue growth such that the provinces and territories run persistent deficits and hence growing debt. Less concern is typically expressed over the long-term fiscal prospects of the federal government due to its lower exposure to the health sector, the introduction of a cap on growth in major transfers to the provinces to no more than nominal GDP growth, the phased increase in the age of entitlement for Old Age Security and the Guaranteed Income Supplement, and its moderate current debt burden.

An obvious approach to addressing longer-term fiscal instability at the provincial-local level is to rein in spending growth, particularly in the health sector, hopefully through efficiency gains rather than quality losses. An alternative option is raising tax rates but this would bring its own economic costs and alienate the electorate. Less attention is typically paid to the prospect and benefits of actions to raise provincial and territorial economic growth rates. That would tend to raise revenue growth and in turn narrow and possibly close the gap with projected rates of spending growth.

This report begins with a summary of our own projections made in the spring of 2015 for provincial and territorial economic, revenue and spending growth rates from 2014 to 2038 (Drummond and Capeluck, 2015). The purpose of these projections is to test whether revenue growth, with existing tax rates, is likely to be sufficient to fund public spending growth. In the test we consider three spending growth scenarios. We find that most provinces and territories should have sufficient economic and revenue growth to fund spending that remains flat in real, per capita terms. In numerical terms, that means spending growth is just under 3 per cent per annum over the 24-year-period examined. However, we do not believe it is realistic that spending will be held to that low a growth rate. If non-health spending is flat in real per capita terms but health spending grows at the same rate as experienced since 2000, then almost all provinces and territories would run persistent deficits at existing tax rates. We feel this is a more realistic spending scenario to contemplate. Hence it is strongly desirable to contemplate actions that might raise revenues by enhancing economic growth.

This report is largely dedicated to policies for provincial and territorial governments to strengthen economic growth in their jurisdictions, although many of the recommendations in this report are also relevant for federal and local governments. Most analyses of growth policies

[1] This report was written by CSLS Board member Don Drummond and CSLS economists Evan Capeluck and Matthew Calver with input from CSLS Executive Director Andrew Sharpe and CSLS Board Members Pierre Fortin and Alan Nymark. We would like to thank Jasmin Thomas, Nico Palesch, and Erika Rodrigues for their valuable contributions to the report. Direct any questions to don.drummond@queensu.ca or matthew.calver@csls.ca.

focus on the national level and federal government levers. But the provinces and territories have many of their own policy levers which can be used to boost economic growth.

We are well aware that the task of achieving fiscal stability through stronger economic growth is rather heroic. The average growth rate gap between spending and revenue growth in the spending scenario we consider most realistic is between 0.34 and 0.37 percentage points per year. Lest this not seem like a large number, consider that a growth rate increment of 0.34 percentage points is almost one-quarter the growth rate projected under our base case scenario (1.4 per cent). Further, as it is a growth rate it accumulates to a very large increase in the level of output over time. Consider that the initial estimate of the increase in the level of GDP from the Free Trade Agreement (FTA), one of the most important economic reforms ever implemented in Canada, was 3 per cent (Jackson, 2003). If that were achieved over a 10-20 year period then the incremental impact on growth would be just less than 0.15 to 0.3 per cent per annum. Furthermore, it has proven difficult ex post to verify such a large output increase from the FTA. The point is not to be negative but rather to be realistic that there are likely few silver bullets. It is very unlikely that any single policy will generate sufficient growth. That is why we examine a very large number of policy reforms to enhance provincial and territorial economic growth. To achieve the required growth effect, reform will have to be deep and broad.

We firmly believe the quality of the enhanced growth matters deeply. It must be environmentally sustainable. Otherwise, the stronger growth simply generates environmental costs that may not be fully captured in the economic statistics but have real effects on Canadians.

And the growth must be inclusive as well in the sense that it benefits most Canadians and not just a select few. A compelling advantage of achieving fiscal sustainability through enhanced economic growth as opposed to spending cuts or tax increases is that the economic growth raises the standard of living of Canadians. And the more inclusive the growth, the more broadly the standard of living effect will be felt. Economic gains concentrated among the wealthiest might bring a fiscal dividend, especially with the progressivity of the personal income tax system. But aside from some trickles, that would do little for lower-and-middle income Canadians. On the other hand, inclusive growth benefits everyone. Further, greater participation in the economy of lower-income Canadians delivers a double benefit of not only raising revenues but also directly reducing social spending and indirectly reducing health spending as there is a strong association between income and health.

In our analyses of options to raise provincial and territorial economic growth rates we put considerable emphasis on achieving sustainable and inclusive growth. Yet we feel we have just scratched the surface of these important dimensions of growth and intend to delve further into these areas in future work.

A. The Fiscal Challenge: Economic and Fiscal Projections for the Provinces and Territories

Appendix A provides an overview of projections of economic growth for all provinces and for each province and territory between 2014 and 2038.[2] Assuming that government revenues will grow at the same pace as nominal GDP, these projections are indicative of capacity to finance public spending.

Three different fiscal projections are presented here based upon differing assumptions about how government spending will grow over time.

The baseline projection assumes that public spending will remain constant in real per capita terms, with growth in nominal per capita expenditure at the assumed inflation rate (2.0 per cent). The results of our baseline projections for nominal GDP growth indicate that, by and large, provincial/territorial governments are able to meet the test of balancing revenue growth with growth in expenditures on public services over the 2014-2038 period, but only provided that the latter is unchanged in real per capita terms (*i.e.* grows in line with inflation and the population) and that the provinces return to fiscal balance quickly.

In particular, the nominal GDP growth rates required for revenues to keep pace with growth in public spending are lower than the baseline projections for nominal GDP growth for almost every province and territory, indicating that the provincial/territorial governments are expected to be able to fund public expenditures that are constant in real per capita terms (Table 1). The Northwest Territories is the only exception, which results from its poor projected labour productivity performance (-0.5 per cent). Aggregated at the national level, projected revenue growth will outpace the baseline projection of spending growth by 0.62 percentage points each year between 2014 and 2026 and 0.83 percentage points each year between 2026 and 2038.

However, it may not be reasonable to assume that public spending will grow in line with inflation and population growth because public spending has been increasing faster than inflation on a per capita basis in recent history. Therefore, we developed two alternative scenarios for public spending growth: alternative scenario A and alternative scenario B.

As in the base case, alternative scenario A assumes that public spending will grow in line with inflation and population growth. However, unlike in the base case, public spending is divided into two components: health and non-health spending. While it is reasonable to assume that the deflator for non-health spending will grow in line with the assumed inflation rate (2.0 per cent), this is a difficult assumption to make for the deflator for health spending, which exhibited annual growth of 2.8 per cent at the national level during the 2000-2014 period. Therefore, in alternative scenario A, we assume that the deflator for health spending will grow at the same pace as in 2000-2014, while growth in the deflator for non-health spending remains at 2.0 per cent.

[2] These projections are presented and discussed in greater detail in Drummond and Capeluck (2015).

But this test may also not be the appropriate one. We believe that there will be more spending pressure than that consistent with keeping real per capita spending constant. Historically, we have consistently seen significant real enrichment in health spending. Furthermore, the ageing of the population alone is expected to add 0.9 percentage points per year to growth in health care costs (CIHI, 2014). Consequently, to maintain health care quality there will be additional cost pressures beyond those associated with inflation and population growth.

Table 1: Difference Between Projected and Required Nominal GDP Growth, by Scenario for Public Spending Growth, Percentage Points, Canada and the Provinces and Territories, 2014-2026 and 2026-2038

	2014-2026			2026-2038		
	Base Case	**Scen. A**	**Scen. B**	**Base Case**	**Scen. A**	**Scen. B**
All Provinces	0.62	0.33	-0.37	0.83	0.52	-0.34
Newfoundland and Labrador	0.99	0.56	-0.51	1.34	0.88	-0.53
Prince Edward Island	0.72	0.38	-0.91	0.87	0.51	-1.18
Nova Scotia	0.60	0.28	-1.37	0.90	0.56	-1.53
New Brunswick	0.68	0.31	-0.67	0.94	0.55	-0.72
Quebec	0.51	0.36	-0.19	0.79	0.63	-0.05
Ontario	0.54	0.22	-0.38	0.72	0.38	-0.36
Manitoba	1.29	0.87	0.11	1.43	0.98	0.05
Saskatchewan	1.08	0.57	-0.37	1.33	0.77	-0.46
Alberta	0.46	-0.16	-1.25	0.67	-0.02	-1.48
British Columbia	1.05	0.95	0.37	1.24	1.14	0.50
Yukon	0.64	0.33	-0.29	1.10	0.75	-0.17
Northwest Territories	-0.93	-1.16	-1.78	-0.69	-0.93	-1.80
Nunavut	0.68	0.24	-0.47	0.66	0.17	-0.79

Note: This table provides the percentage point difference between the baseline projections for nominal GDP growth and the rate of nominal GDP growth required for revenues to grow at the same pace as expenditures. The three scenarios for required nominal GDP growth are outlined below:

1) *The base case assumes that public spending will be constant in real per capita terms, with growth in nominal per capita expenditure at the assumed inflation rate (2.0 per cent).*
2) *Alternative scenario A assumes that public spending – divided into health and non-health spending – will be constant in real per capita terms, with growth in nominal per capita non-health spending at the assumed inflation rate (2.0 per cent) and nominal per capita health spending at the historical growth rates in the deflator for health spending in 2000-2014 (which range from 2.2 to 3.6 per cent).*
3) *Alternative scenario B assumes that non-health spending will be constant in real per capita terms, with growth in nominal per capita non-health spending at the assumed inflation rate (2.0 per cent). However, it assumes that health will be positive in real per capita terms, with growth in nominal per capita health spending at the historical growth rates in nominal per capita health spending in 2000-2014 (which range from 3.6 to 6.1 per cent).*

Source: CSLS calculations based on Statistics Canada and Canadian Institute of Health Information data.

To recognize these real demand pressures, we developed alternative scenario B, which assumes that health spending will grow at the historical per capita nominal rate from 2000 to 2014. With this higher rate of growth for health expenditure, revenues must grow faster than the rate of inflation and population growth for provincial/territorial governments to balance their budgets. We think that this scenario represents the appropriate test of fiscal sustainability.

Our research suggests, as seen in Scenario B of Table 1, that almost every provincial/territorial government would be unable to maintain fiscal balance over the 2014-2038 period, unless they raise taxes, cut real per capita non-health expenditure programs in real per

capita terms, manage health spending more efficiently, obtain more federal transfers, or are successful in accelerating economic growth through appropriate fiscal measures. The only exceptions are Manitoba and British Columbia. Nationally, we project that provincial spending will grow at an annual rate 0.37 percentage points faster than revenues between 2014 and 2026. Prospects are not much better from 2026 to 2038, when we expect annual expenditure growth to be 0.34 percentage points greater than annual revenue growth.

B. Boosting Real Economic Growth

Changes in policy will be necessary to address the significant gap between growth in revenues and expenditures facing the provinces in the coming decades. Reducing expenditures through government cutbacks or increased efficiency is one approach which should be considered, but the emphasis of this report will be on options to increase revenues through economic growth.[3] Raising GDP often receives less attention than cutting spending or raising taxes, but it is preferable because a higher GDP would not only raise revenues, it would also directly improve the standard of living of Canadians. GDP represents the income that goes to the individuals and firms that work and invest in their provinces. It is a simple measure of living standards and is an important part of economic well-being.

There has been a great deal of angst in recent years about stagnating real wages of the middle class and widening income disparities. And one can no longer blindly predict that stronger labour productivity growth will go directly into strong real wage growth (that relationship has been altered in most developed countries in recent years as shown in Harrison, Sharpe and Arsenault, 2008). But it will become even more difficult to raise wages, for anybody, if there is not sufficiently robust economic growth and a good part of that growth being based on productivity gains. While the report focuses on the link from economic growth to revenues and the capacity to fund public services, let us not forget that economic growth is also essential for well-being.

Nominal or current dollar GDP can be decomposed into real GDP and price changes, as expressed by the GDP deflator. Although we used nominal GDP for the economic projections since government revenues are expressed in current dollars, real GDP is where the action is for at least two reasons. First, the inflation target is determined by a joint decision between the Bank of Canada and the Government of Canada and is unlikely to rise persistently above 2 per cent which is the midpoint of the target range (1-3 per cent) which has been unchanged since 1991. While, in principle, the federal government can instruct the Bank of Canada to target a higher inflation rate, it would be reluctant to do so. While higher inflation would raise revenue growth it would also raise expenditure growth and nominal interest rates so it would not help much to balance budgets even if the provincial and territorial governments could control it. Second, commodity prices are largely out of the control of Canadian actors, although resource-exporting provinces would benefit greatly from a sustained commodity boom which could generate

[3] A two-pronged approach is needed to ensure fiscal balance: the enhancement of GDP and the pursuit of efficiency gains within government. While it is the first of these challenges that is the focus of this report, it is also vital to consider options that exist for addressing the second issue, as one of the authors of this report has previously done (Commission on the Reform of Ontario's Public Services, 2012).

inflation. For these reasons, this report will focus on how to promote growth in real, rather than nominal GDP.

Real GDP can be decomposed into labour productivity and the quantity of labour used in production:

$$Real\ GDP = (Output\ per\ Hour\ Worked) * (Hours\ Worked)$$

All policies which aim to boost GDP must, by definition, either raise labour productivity (output per hour worked) or increase the number of hours being worked, or both.

C. An Inclusive, Sustainable Approach to Growth

There are many different approaches to generating economic growth. We do not shape the policy recommendations in this report around a singular goal of bolstering economic growth and revenues. For example, economic growth that flowed narrowly to the wealthiest Canadians might be good for government revenues given the progressivity of personal income taxes. But it would not be inclusive growth and it would not reduce the need for income transfers to low and modest-income Canadians. Growth should also be environmentally sustainable. In brief, we believe looking at ways of improving economic performance offers the opportunity to not only finance public services but to achieve a more inclusive, sustainable economy as well. These goals are not incompatible.

A major development in recent years has been the movement by international agencies such as the OECD and World Bank and national governments of major countries such as France and the United Kingdom from GDP-based metrics of economic performance and social progress to well-being-based metrics. As part of the OECD's work in the well-being area, the organization has developed frameworks to both better understand and foster inclusive growth and sustainable green growth. These frameworks are not especially well known in Canada, particularly at the level of provincial/territorial governments.

i. Green Growth

The OECD, in its Interim Report of the Green Growth Strategy (OECD, 2010), has highlighted "growing concerns about the environmental unsustainability of past economic growth patterns and increased awareness of a potential future climate crisis have made it clear that the environment and the economy can no longer be considered in isolation."

Going forward, the OECD makes the case that "a strategic vision is necessary to ensure the policies that governments will implement are the most appropriate from an economic efficiency, environmental integrity and social equity point of view, as well as coherent both at a national and an international level."

The OECD defines green growth "as a way to pursue economic growth and development, while preventing environmental degradation, biodiversity loss and unsustainable natural resource use. It builds on existing sustainable development initiatives and aims at identifying cleaner

sources of growth, including seizing the opportunities to develop new green industries, jobs and technologies, while also managing the structural changes associated with the transition to a greener economy."

The OECD stresses that green growth policies "need to be embedded in a coherent, integrated strategy covering demand and supply aspects, both economy-wide and at the sectoral level. This will ensure that "green growth is … a transforming dynamic for both production processes and consumer behaviour."

The OECD has identified the following specific instruments to implement a green growth agenda.[4]

- Putting a price on a pollution source or on the over-exploitation of a scarce resource through mechanisms such as taxes, natural resource charges, or tradable permit systems.

.

- Regulations when market failures result in a weak response of agents to price signals.

- A combination of taxes, tradable permits and/or performance standards in cases of multiple and varied sources of pollution.

- Policies to support green technologies and innovation in areas characterized by strong market size and learning-by-doing effects and which involve high entry costs.

- Avoidance of subsidies to green activities, given the potentially large budgetary costs, their limited impact on incentivizing reductions in the environmentally harmful activities and potentially distortive effects on competition and trade.

- Use of voluntary instruments and information-based instruments such as energy efficiency ratings and eco-labelling, as complementary tools to other policies in the environmental policy mix.

ii. Inclusive Growth

The OECD, in its 2014 report *All on Board: Making Inclusive Growth Happen* (OECD, 2014), defines inclusive growth as a new approach to economic growth that aims to improve living standards and share the benefits of increased prosperity more evenly across social groups.

This approach to growth is "inclusive" in two senses. First, it includes a wide range of indicators of well-being when assessing growth and evaluating policy options as opposed to only GDP. Similarly to green growth, inclusive growth recognizes that factors such as health, the environment, and economic security directly affect well-being. When evaluating policy options,

[4] For a review of the relative strengths and weaknesses of the different instruments of a green growth agenda, see De Serres, Murtin and Nicoletti, 2010.

one must consider not only the impact on GDP, but also any consequences for these other factors with the goal of maximizing growth in aggregate well-being.

The OECD has constructed an index of living standards for OECD countries incorporating annual household real net adjusted disposable income per capita, the unemployment rate, life expectancy, and income inequality. The OECD's index differs from most other indices of well-being in that the weighting of factors is determined using a willingness-to-pay based approach rather than arbitrary subjective weights.[5]

While this report will focus on how to raise GDP, many of the policies which we recommend could have positive impacts on other aspects of well-being.

The second sense in which this approach to growth is "inclusive" is that it emphasizes an equitable distribution of the gains from economic prosperity. The OECD observes that inequalities in both incomes and outcomes such as health conditions, employment opportunities and educational attainment have reached unprecedented levels in many countries (in the post-war period). Inclusive growth strives to achieve aggregate growth while reducing these inequalities. Given the progressive nature of Canada's income tax system, reducing pre-tax inequality may not strike the reader as the best way to tackle fiscal challenges. However, reducing inequality may help meet fiscal challenges in several ways.

Those at the lower end of the income distribution tend to have relatively little education, poorer health, higher crime rates, and greater reliance on social assistance. Improving the economic performance of low income individuals may not raise income tax revenues as much as raising the incomes of the rich, but it may ease the burden on government spending to support these individuals.

Moreover, low income and people who do not work represent a large source of untapped potential. It may be easier to identify ways to raise the productivity and labour supply of those who are unskilled or not working than to obtain more output from those who are already working long hours at highly valued jobs.

Since equality of income and opportunity are important determinants of growth and well-being, inequality in these areas can undermine growth prospects in the long term. In May 2015, the OECD released a report entitled *In It Together: Why Less Inequality Benefits All* (OECD, 2015). This study found compelling evidence that high inequality harms economic growth. The rise in inequality observed between 1985 and 2005 in 19 OECD countries reduced cumulative growth 4.7 percentage points between 1990 and 2010. The report noted that what matters for growth is not just that the poorest are falling behind, but that inequality affects lower-middle and working class families. It is the losing ground of this group that reduces social mobility and economic growth. The OECD concluded that a tipping point has been reached and inequality can no longer be treated as an afterthought.

[5] The Centre for the Study of Living Standards has applied the OECD's inclusive growth index to assess the contribution of advances in different fields of health to increased life expectancy and living standards (Calver, 2015a).

The OECD highlights the following observations on policy in the context of its inclusive growth agenda:

- Sound macro-economic policies are a pre-condition for sustained growth, employment and poverty alleviation, but they can also generate some trade-offs between equity and efficiency.

- Fiscal policy can contribute to economic stability while mitigating income inequality.

- Cuts in benefits relative to earnings, and tighter eligibility have reduced the redistributive impact of the systems, from offsetting one half of the rise in inequality in pre-tax incomes in the mid-1990s to about one quarter.

- Where desirable, measures can be taken to finance additional redistributive spending; There is still much room for raising more tax revenue by combating tax avoidance and evasion, reducing those tax expenditures that chiefly benefit the better-off, and raising tax rates on immovable property, as well as taxes and duties on intergenerational wealth transfers.

- Policies can tackle unemployment and in-work poverty without hampering labour market efficiency; A combination of high replacement ratios made conditional on strictly-enforced work-availability requirements, as part of a well-designed "activation" package compound both efficiency and strong social protection.

- A broad range of actions can make education policy more growth-friendly and pro-inclusiveness. Education is more effective the earlier it starts. More investment to increase pre-school enrolment among economically and socially deprived households should therefore be a priority.

- Pro-competition reform in product markets can do much for growth and inclusiveness, but there are trade-offs.

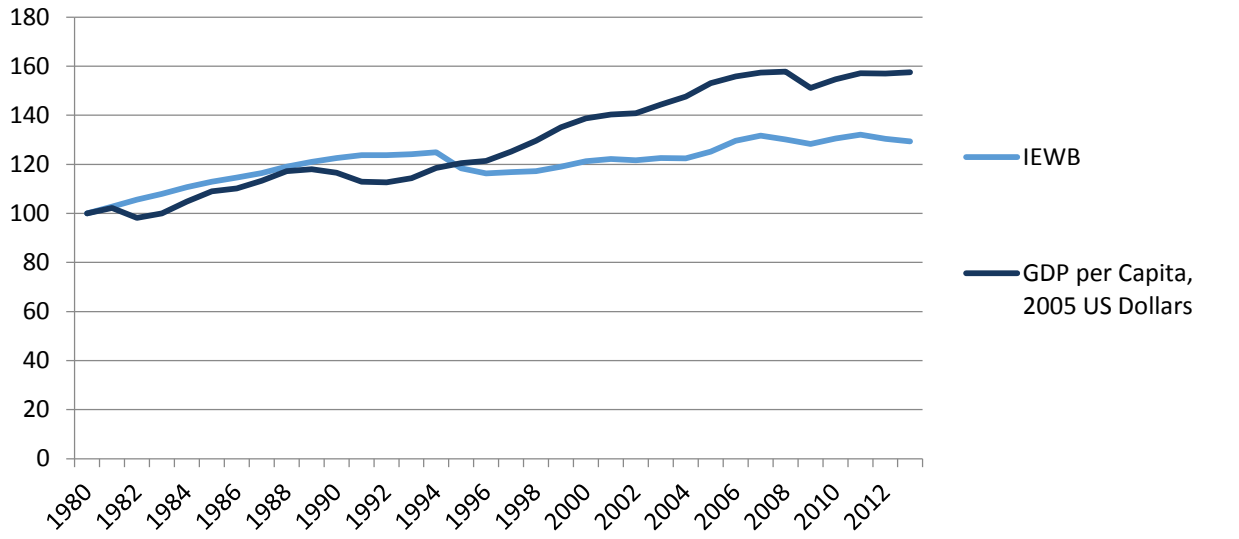
- Innovation policies tend to focus on productivity and growth objectives, rather than on how the fruits of growth are distributed. By contrast, innovation policies aimed at enabling "bottom-up" initiatives can do much to create synergies that support inclusive growth.

- Entrepreneurship which creates new ideas and products, and exploits niches that others have missed, should be open to all. Policies to make entrepreneurship more inclusive include financial assistance in the form of competitively based awards, soft loans or monthly payments to the unemployed who wish to start a business, better provision of child-care facilities, establishing networks of education involving experienced entrepreneurs, and reducing bureaucratic hurdles.

The index of economic well-being (IEWB) developed by the Centre for the Study of Living Standards (CSLS) has emphasized the importance of well-being as a broader objective of

policy. The IEWB aggregates outcomes in terms of consumption flows, wealth stocks, equality, and economic security to produce a more comprehensive measure of economic well-being. Of course, growth in the components of the IEWB is related to growth in GDP per capita and productivity, but the relationships can be complex (Sharpe, 2002), and other aspects of economic performance also matter. While both GDP per capita and the IEWB have grown in Canada over the last 23 years, one can see that growth in GDP per capita was quite a bit higher (Chart 1), suggesting that it overstates growth in economic well-being.

Chart 1: Growth of Index of Economic Well-Being and Real GDP per Capita, Canada, 1980-2013, (1980=100)



Source: IEWB calculated by CSLS. GDP per capita taken from table A21 of Database of the Index of Economic Well-being for Selected OECD Countries and Alberta, 1980-2013, available online at http://www.csls.ca/iwb/oecd.asp.

D. Roadmap

This report is organized as follows. Following the introduction, most of the content is in the second and third sections which correspond to the two broad approaches which can be taken to generate economic growth. The second section discusses the major determinants of productivity growth in Canada including investment, technological progress, education, and the macro- and micro-economic environments. Recent performance in these areas is evaluated along with a discussion of policy options. The third section considers options to increase labour supply. Several approaches are considered, but most attention is focused on underutilized segments of the population, specifically women, older workers, persons with disabilities, Aboriginal peoples, and immigrants, and how to improve the labour market outcomes of those in these groups. The fourth section provides a short conclusion. A list of policy recommendations is provided in the fifth section.

II. Policies for Raising Labour Productivity Growth

While there is a long list of factors influencing economic growth, technological progress is the principal driver of productivity growth, and in turn economic growth, in the long run. New technologies can either be developed domestically through the creation of new knowledge (e.g. research and development) or imported from aboard. These new technologies are generally embodied in capital goods and require skilled workers to be effectively used; hence the importance of both physical and human capital investment. Economic growth also requires that the economic environment provide the appropriate incentives for firms to invest and produce, both at the macroeconomic level (e.g. rule of law, adequate aggregate demand) and at the microeconomic level (e.g. tax regimes, competition).

This section of the report is organized into five discussions of the major sources of productivity growth, an examination of how Canada has performed in these areas in recent history, and an analysis of how governments in Canada may be able to improve performance. We open with a few general principles for productivity policy. The second subsection discusses private investment in Canada, both public and private. The third subsection looks at research and development spending and patents as indicators of innovation and discusses policy options to spark the development and adoption of new technologies in Canada. The fourth subsection considers education and human capital. The fifth subsection discusses the macro-economic environment in Canada with an emphasis on government debt burdens. The sixth subsection describes the micro-economic environment, particularly trade, foreign investment and competition policy. The seventh subsection provides a short discussion of the linkages between economic growth and inequality.

A. General Principles for Sound Productivity Policy

While economic growth remains a mystery to economists (Helpman, 2004), there is broad agreement among economists on certain general principles that foster productivity advance. While these principles will be discussed at various points throughout the report, it is useful to highlight them at this time.

- Few firms actually operate at the frontier of technical knowledge and practice. Consequently, moving the largest number of firms possible to the technological frontier through the faster diffusion and quicker adoption of best-practice techniques can contribute to productivity growth.

- Much productivity growth at the aggregate level arises from the reallocation of resources from declining to expanding firms, sectors and regions (Harberger,1990); The reduction or removal of barriers to movement between firms, sectors and regions can boost reallocation effects and increase productivity growth.

- Underused resources represent a deadweight loss to the economy. High levels of utilization of labour and capital mean that the maximum output from a given level of

inputs can be attained. A fully employed economy is the best tonic for productivity growth (and societal well-being).

- There is no necessary trade-off between equity and growth and many equity-enhancing policies that promote inclusion, such as integrating underrepresented groups into the work force, have positive effects on growth.

- A neutral tax system with uniform tax rates across firms, sectors, and regions can play an important role in ensuring that resources are allocated to their most productive use. This fosters productivity growth.

- Broad tax bases and low rates have been found to be more favourable to economic growth than narrow tax bases which force higher tax rates to protect the revenue take.

- Adoption of a tax structure that gives preference to consumption taxes over income and capital taxes is more favourable to productivity and economic growth.

B. Investment

i. Private investment

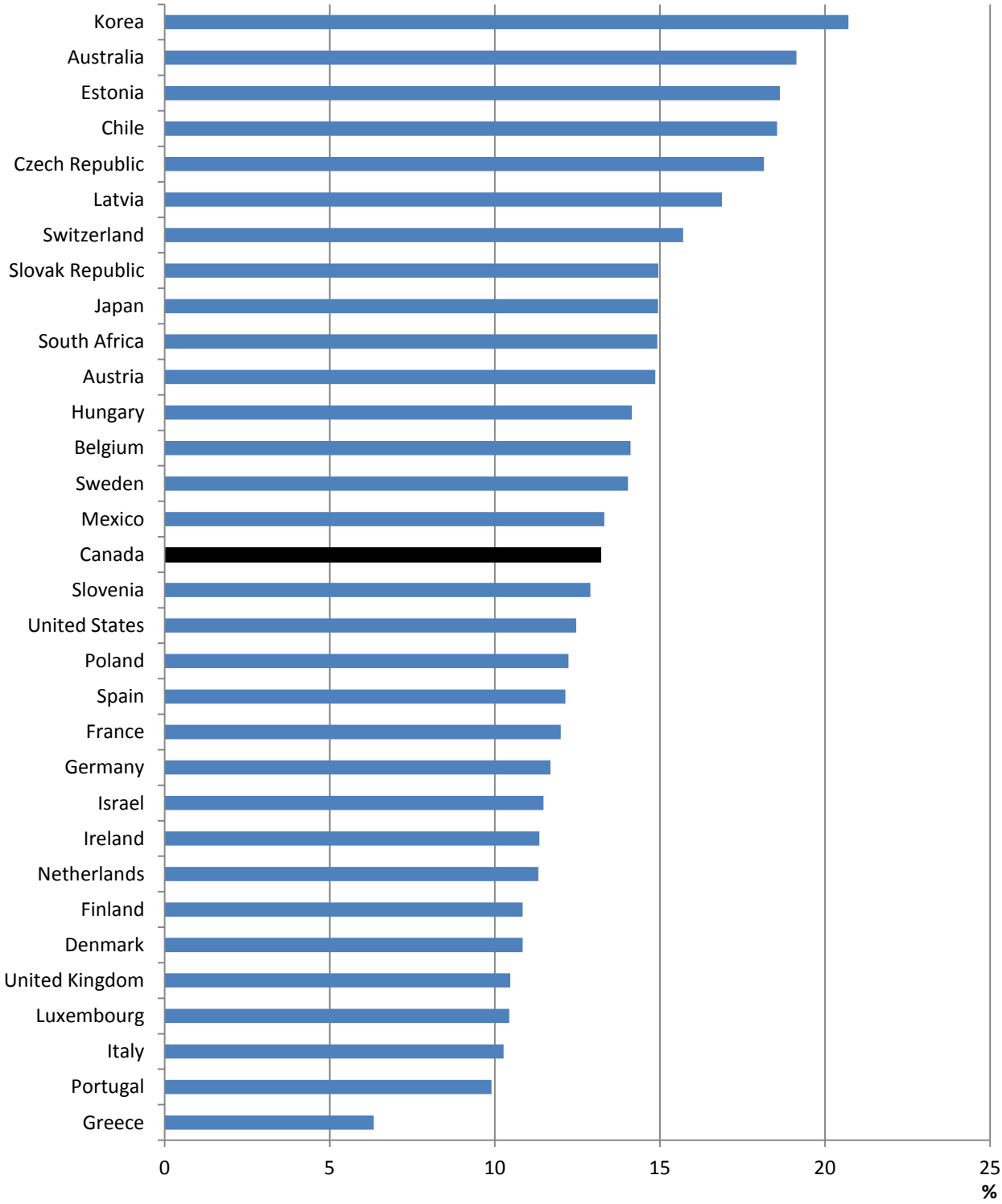
a. State of Business Investment in Canada

Private sector investment in new machinery, equipment, structures, and knowledge is a major source of productivity growth. A higher level of capital intensity (capital per worker) typically increases the amount of output per worker. Many technological improvements are also embodied in new capital. This section briefly outlines the historical and recent trends of business investment in Canada, as measured by gross, business fixed, non-residential investment as a share of nominal GDP. A more detailed analysis of private investment in Canada is presented in Appendix B.

In 2013, business sector investment in Canada represented 13.23 per cent of GDP. This is about an average performance when compared internationally. Chart 2 shows Canada's business investment intensity in 2013 compared to a subsection of other OECD members. Of the 32 countries for which data were available, Canada's business investment intensity fell largely in the middle of the pack. It ranked higher than most of the Western and Southern European countries (Greece, Portugal, Italy, Belgium, Poland, Spain, France, Germany, the United Kingdom, Denmark, Finland, the Netherlands, Ireland and Slovenia) as well as Israel and the United States.

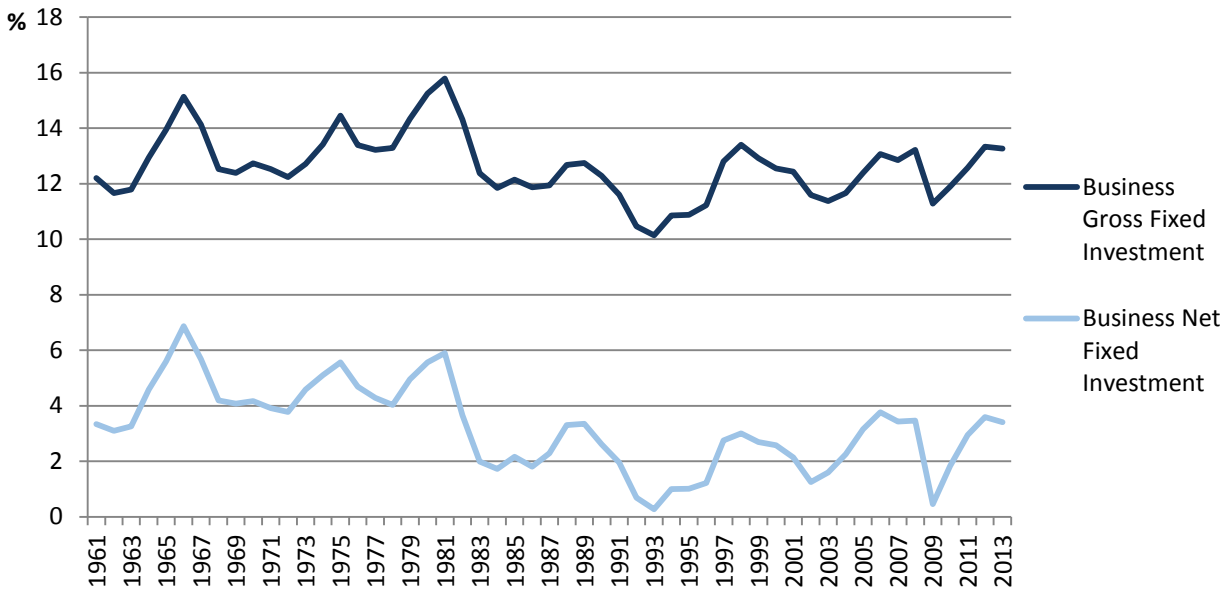
Canada was however ranked below a variety of Eastern and Central European countries (Estonia, Czech Republic, Latvia, Slovak Republic, Austria and Hungary) as well as Mexico, Japan, Australia, Korea.

Chart 2: International Comparison of Business, Gross Fixed, Non-Residential Investment, Share of Nominal GDP, Per Cent, 2013



Source: CSLS calculations based on OECD Data. Dataset 1: Gross Domestic Product and Dataset 12: Government deficit/surplus, revenue, expenditure and main aggregates

Chart 3: Business Sector (All industries – Government Sector) Gross and Net Fixed, Non-Residential Investment, Share of Nominal GDP, Per Cent, Canada, 1961-2013



Note: Business Net Fixed Investment calculated using Linear Depreciation.
Source: CSLS Calculations based on Statistics Canada Data. CANSIM tables 031-0005, 380-0017, 384-0064.

Within Canada, business investment relative to GDP has been relatively low on average over the last 30 or so years when compared to historical levels. Chart 2 shows the gross and net business investment across Canada from 1961 to 2013. Investment is quite volatile, but it generally fluctuated around 14 per cent of GDP between 1961 and 1981. Since 1981, it has cycled around a lower level of about 12 per cent.

Depreciation (the difference between gross and net business investment) as a share of GDP has remained fairly stable through time, ranging from approximately 8.10 to 9.00 per cent from 1961 to 1977, after which the range broadens slightly and becomes greater, with depreciation fluctuating between approximately 9.00 and 11.00 per cent. This slight increase can be partially attributed to the increasing tendency of investments to have shorter life spans – computers and other information and communications technologies (ICT) investments, for example, have a far shorter life span than do traditional business investments, such as buildings. Chart 4 breaks total gross business investment (as a per cent of GDP) down into four major components (intellectual property products; non-residential buildings; engineering construction; and machinery and equipment), revealing a few interesting trends.

Intellectual property products (IPPs), which consist of software, research and development, and mineral exploration and evaluation, saw a steady increase in their share of GDP, from 0.55 per cent in 1961 to 2.35 per cent in 2001, after which it has remained approximately steady at a little above 2 per cent.

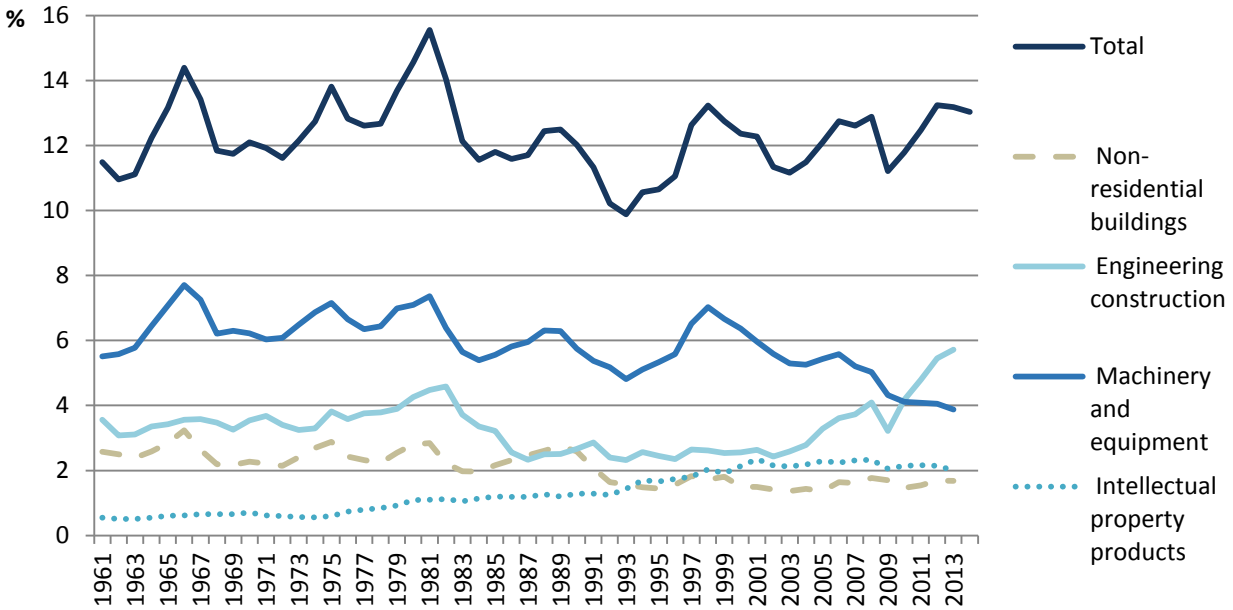
Business investment in non-residential buildings has gone through two distinct phases: from 1961 to 1991 there was regular fluctuation between approximately 2 and 3 per cent per

annum, while between 1991 and 2014 the range of fluctuation was narrower and at a lower level, namely between 1.35 and 1.75 per cent.

Business investment in engineering construction (such as for highways, sewers, bridges and oil and gas pipelines) gradually rose from 3.56 per cent of GDP in 1961 to 4.58 per cent in 1982, after which it rapidly fell to 2.32 per cent in 1987, where it approximately remained until 2002, at which point it began rising again, more than doubling to a share of 5.71 per cent of nominal GDP in 2013. The recent increases in business engineering construction investment as a percentage of nominal GDP can be mostly explained through business resource development investment, which has seen a boom in specific provinces, most heavily in Alberta and Newfoundland and Labrador.

Machinery and equipment, which has historically been the largest component of business investment, has seen its share of nominal GDP rise and fall between a range of 5.50 per cent and 7.70 per cent from 1961 to 1990, after which the share decreased to a low of 4.81 per cent by 1993. Following a temporary recovery to 7.03 per cent in 1998 there has been a steady decrease in business investment in machinery and equipment, falling to a 52 year low of 3.87 per cent in 2013, a decrease representing almost half of the proportion achieved in 1998. 2010 saw annual business investment in engineering construction overtake machinery and equipment as the largest single component of total fixed, non-residential investment in Canada for the first time in the recorded data, and the gap between the two has widened ever since.

Chart 4: Nominal Total Gross Business, Fixed, Non-Residential Investment by Component, Share of Nominal GDP, Per Cent, Canada, 1961-2013



Source: CSLS calculations based on Statistics Canada data. CANSIM tables 031-0005, 380-0064, 384-0038, and 380-0017.

One subcomponent of machinery and equipment, information and communications technology (ICT) is thought to be particularly important for productivity growth in recent years.

Chart 5 shows the development of ICT business investment in Canada since 1961. Beginning in the 1960s and lasting well into the early 90s, ICT investment as a share of nominal GDP increased fairly steadily, increasing from 0.90 per cent in 1961 to 1.85 per cent in 1995. At that point there was a steep increase all the way up to 2.58 per cent in 2000. However, business ICT investment has steadily declined over the course of the next 13 years to 1.97 per cent of nominal GDP, a figure still well above the historical range.

Compared to other nations, Canada's investment in ICT as a proportion to total investment is middling, placing far behind the progress of the United States, Sweden and Denmark, while at the same time being significantly ahead of nations like Korea and Italy.

The general trend of less private investment (relative to GDP) in recent years when compared to historic rates can be observed in almost all provinces (Chart 6). Only Alberta and Newfoundland and Labrador exhibit shares of business sector investment in GDP in 2013 when compared to 1981. The elevated levels of private investment in these two provinces are likely largely attributable to the oil and gas boom. Large decreases were measured in Nova Scotia (14.53 to 7.89 per cent), New Brunswick (15.30 to 6.80 per cent), Ontario (12.59 to 8.00 per cent), and British Columbia (16.72 to 12.01 per cent).

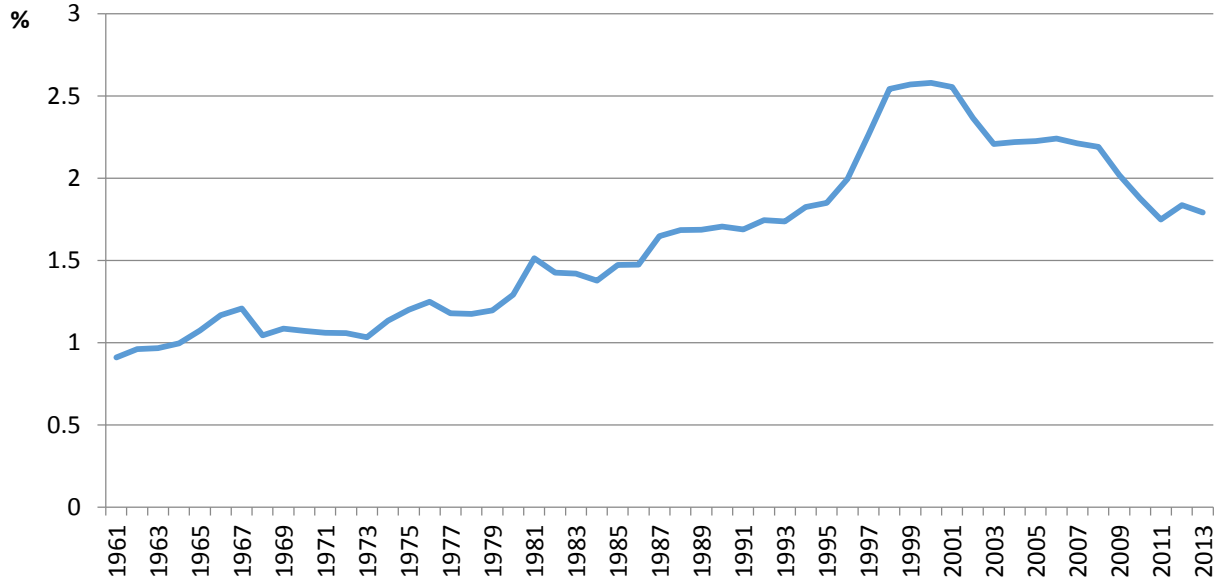
Breaking down annual provincial business investment intensity by component shows that the greatest variation amongst provinces is the proportion of engineering construction investment undertaken. Provinces that experienced increases in business investment intensity from 1981 to 2013, namely Alberta and Newfoundland and Labrador, have a dramatically larger proportion of business investment in engineering construction, 16.70 and 13.15 per cent respectively, than Canada overall (5.71 per cent) or any of the other provinces. Saskatchewan, which held its total business investment relatively steady from 1981 to 2013, also has a larger share of engineering construction investment, 10.45 per cent.

There is far less variation amongst the provinces in the shares of other components of business investment. Non-residential business investment operates within a very narrow band, within most provinces, falling within the range of 1.45 to 1.87 per cent. The exceptions are Newfoundland and Labrador, which saw a far greater proportion of 5.04 per cent and New Brunswick, in which businesses invested only 0.94 per cent of GDP in non-residential capital.

IPP business investment ranges from 0.87 per cent in Nova Scotia to 2.54 in Newfoundland and Labrador, with no data available for PEI.

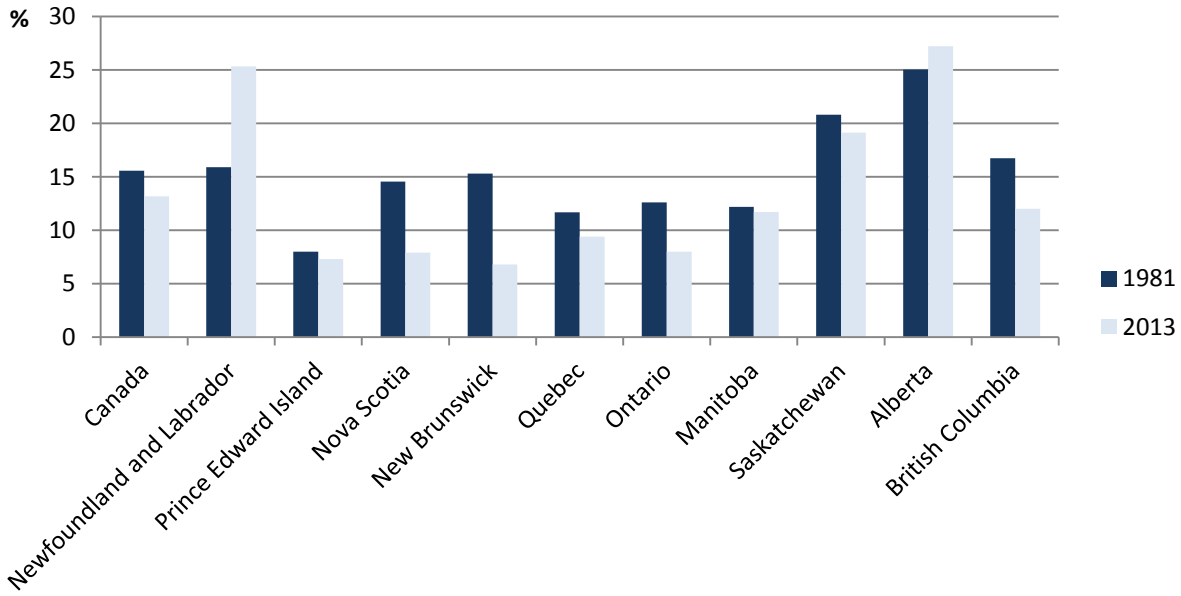
Provincial business investment in machinery and equipment falls within a range of 2.98 per cent in Ontario to 6.22 per cent in Alberta.

Chart 5: Business Sector (All industries – Government Sector) Gross Fixed, ICT (Computers and Electronics, Software) Investment , Share of Nominal GDP, Per Cent, Canada, 1961-2013



Note: 1961-1976 figures do not include business software investment, Data not available.
Source: CSLS calculations based on Statistics Canada Data. CANSIM tables 0031-0006, 380-0017 and, 384-0064

Chart 6: Business Sector (Total industries – Government Sector) Gross Fixed, Non-residential Investment, Share of Nominal GDP, Per Cent, Canada and the Provinces, 1981 and 2013



Note: 2013 PEI Total Business Gross Fixed Investment figure does not include IPP figures.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables, 380-0017, 384-0038, and 380-0064.

The key findings from the previous parts are briefly outlined below.

- Fixed gross business investment has, since 1981, fluctuated around approximately 12 per cent of nominal GDP, approximately 2 percentage points below the 1961-1981 average of approximately 14 per cent.

- A dramatic increase in engineering construction investment intensity since 2001 has been offset by a decrease in machinery and equipment investment intensity, and the steady increases of IPP investment intensity have been somewhat offset by slightly lower investment intensity in non-residential housing.

- Beginning in the 1960s and lasting well into the early 90s, ICT investment as a share of nominal GDP increased fairly steadily, increasing from 0.90 per cent in 1961 to 2.58 per cent in 2000. Having reached this high point, business ICT investment went on to steadily decrease over the course of the next 13 years to 1.97 per cent of nominal GDP, a figure still well above the historical range.

- Canada-wide trends in business investment intensity and net business capital stock have been mostly replicated on the provincial levels, the major exceptions being the provinces that have seen large amounts of resource development since 2000, Alberta and Newfoundland and Labrador, and, to a lesser extent, Saskatchewan.

- Among thirty-two countries, Canada ranked sixteenth in terms of the intensity of private investment. It ranked higher than most of the Western and Southern European countries, as well as Israel and the United States, while being ranked below most of the Central and Eastern European countries measured, as well as Chile, Korea, Mexico, Australia and Japan.

b. Explanations and Policy

A key mechanism to improve labour productivity is to increase business investment. Particularly in the case of machinery and equipment, new investment typically fosters the adoption and diffusion of the latest technologies. This allows for increased production and lower costs with constant or fewer labour inputs. Unfortunately, as has been noted above, Canadian businesses do not invest as much as their counterparts in many other countries. For example, throughout the 2000s, Canadian investment in M&E as a share of GDP ranked 11th out of the 16 countries against which the Conference Board of Canada (2011) benchmarks Canadian economic performance. Much has been made of the investment gap with respect to the United States, but Canada has been further behind Switzerland, Japan, Italy, Austria, Australia, Denmark Sweden and Germany.

Over time various explanations have been offered for the under-investment by Canadian businesses. Most of them have failed the test of time. The low value of the dollar seemed a valid explanation prior to the 2000s as much of Canadian investment is imported and the weak dollar increased the price. But the dollar traded at parity and even above the value of the U.S. dollar for a number of years and still Canadian business investment did not close the international gap. The typical inflation and interest rate differential against Canada has been

offered as an explanation. But since the adoption of the inflation regime in the early 1990s, Canadian inflation has been low and stable and there has been little premium in Canadian interest rates over those in the United States. The high rate of taxation of capital has been a common explanation. But as documented in the section on taxation, the rate of tax on capital has been slashed in Canada. We went from having one of the highest tax rates to the middle of the pack within the OECD and the lowest within the G7, far below that of the U.S., the country we often point out as having strong business investment. Yet the investment gap lives on.

Recent probes of the Canadian investment gap shed some new light. Unfortunately, the light is more on a better definition of the problem than on the solution. The Centre for the Study of Living Studies identified that within the overall investment gap with respect to the United States, the gap in ICT investment accounts for a large share of the labour productivity gap. Digging one level further, the CSLS identified computer software as the main culprit.

The CSLS reported that in 2012, Canadian business sector ICT investment per worker was only 58.2 per cent that of the U.S. level. Computer investment per worker in Canada exceeds that in the U.S. Communications investment per worker is 61.8 per cent that of the U.S. level while software investment is only 40.7 per cent, having fallen from 58.5 per cent in 1987. Within Canada, Ontario has the highest investment in software per capita while Newfoundland & Labrador, Saskatchewan, Nova Scotia and Manitoba have the weakest.

One third of the Canada-U.S. software gap can be accounted for by Canada's lower labour productivity, Canada's lower intensity of software-intensive industries and lower Canadian wages for software developments.

The software gap can also be tracked by sector. Together, information and cultural services, management and enterprises and professional, scientific and technical services accounted for almost two-thirds of the Canada-U.S. software gap.

This sharper definition of the problem is helpful. It at least refines the questions that must be answered. But it still does not explain the 82 per cent of the software gap that is not due to the three factors that can be quantified. And it does not answer why investment is so weak in information and cultural services, management of companies and enterprises and professional, scientific and technical services.

No doubt lower corporate taxes would be helpful. But they have come down a lot and Canada is in the middle-of-the-pack among global competitors. Firms often ask for further tax preferences with accelerated capital consumption allowances being a favourite. Indeed, in the April 21, 2015 federal Budget, manufacturing and processes businesses received a 10-year extension of their accelerated CCA provision. This was not extended to services. And the rate of taxation in general is higher in Canada on services than goods, especially manufacturing. Still, there are at least two reasons to be skeptical this is a tax matter. First, as noted, taxes on corporations, including those in the services sector, have already come down a lot and the investment gap has not narrowed. Second, accelerated CCA is really only the equivalent of an interest free loan (write off the asset sooner, but have less to write off later). That can be

important for a liquidity-strapped firm, but it seems unlikely to be the trigger that will unleash much stronger investment.

Deloitte (2013) has provided a different perspective on the investment gap in Canada. On the basis of interviews with executives of almost 1000 companies, they determined that over one-third of companies believe they are spending at levels equal to or above their peers when in fact their investments are below the grade. In Deloitte's view, companies need better information on investment levels by their competitors.

Indeed, on a general level, lack of information has been a problem at getting to the bottom of the Canadian investment gap. Historically the micro-business data files of Statistics Canada have been confidential and only accessible by Statistics Canada researchers. That is now changing and companies and researchers are getting access. But there are limitations to the data and to date a fairly small pool of researchers have used the data. So it may be several years before better answers are obtained. Additionally, many small and medium-sized businesses may lack the capacity to analyze this data. The government could assist in interpreting this information and mentoring businesses on the need and opportunities to make additional investments.

Difficulty in accessing capital and in particular venture capital has been cited as a factor behind the private investment gap in Canada. But here too it is not clear what the real problem is. Indeed it is a classic chicken-and-egg issue. Three facts of Canada's venture capital industry are most likely related. First, there is very little private investment. Second, the corollary is that public money, federal and provincial, dominates the market. Third, rates of return have been persistently negative (Remillard, 2015). The explanation linking the three facts may be that governments have provided too much venture capital relative to the industry's demand and that has depressed returns and is keeping private money out of the market. The lesson to be drawn from this is that federal and provincial governments must get a better handle on the demand for venture capital before they put in any more money and may, as the federal government is doing with Labour Sponsored Venture Capital (LSVCCs), withdraw to a degree in order for a sustainable private market to develop.

Weakness in Canadian business investment, in general and in R & D, has been identified as an important source of weakness in Canada's productivity. Yet explanations are hard to come by. They may well rest more in the realm of culture than hard economic policies. It is not straightforward in this context to know what the provinces and territories should do to spur more business investment. Certainly those with relatively high rates of taxation on capital should address that problem. An answer may lie in Deloitte's (2013) observation that a surprisingly large number of firms don't seem to know what is going on in their industry. That may not at first seem a rationale for government intervention. But perhaps the "market failure" is a lack of information. And the public sector could address this. First, by providing better information, as Statistics Canada is beginning to do with the micro-business files. Second, by assessing the information for small and medium-sized businesses because the raw data provided Statistics Canada is difficult to interpret. Third, by mentoring businesses on the need and opportunities to invest more.

The conclusion of this section on private business investment is that governments should:

- Reduce their rates of taxation on capital where they are relatively high
- Extend mentoring services so that businesses better understand their under-investment and how to address that

c. Tax Policy and Investment

Different types of taxes have differing influences on the long-run determinants of growth such as capital formation, foreign direct investment, savings and labour supply. There is a tight consensus in the Canadian and international economics and public finance literature on the hierarchy of tax sources from the most to least damaging economic effects.[6]

This hierarchy is illustrated below with estimates of the per cent steady state increase in GDP resulting from a one per cent reduction in government revenues from a series of taxes according to a 2004 Finance Canada Working Paper (Baylor and Beausejour, 2004). This is particularly instructive because it puts numerical values on the long-run damage to real GDP from increases in each major revenue source:

% Steady State Increase in GDP for 1% of GDP Reduction in Government Revenue

Increase in capital cost allowances	4.39
Personal capital income tax	3.36
Sales tax on capital goods	3.05
Corporate income taxes	1.94
Personal income taxes	1.29
Payroll taxes	0.66
Consumption taxes	0.19

A similar ordering of taxes from most to least economically damaging can be found in many other sources including the OECD (see for example OECD, 2010c, and Arnold, 2008). The Finance Canada study was focused on federal sources of taxation so did not look at property taxes. Studies which include property taxes typically find them the least economically damaging with the rationale the tax usually falls on an immovable asset. In most of these other sources the order from most to least economically damaging goes corporate income taxes, personal income taxes and social security contributions (typically a form of payroll tax), value-added sales taxes and finally property (or immovable) taxes. The theory, backed by the empirical work, is that taxes on high mobile factors of production and taxes that destroy capital formation and long-term

[6] Another theme in the Canadian and international reviews of the effects of taxation on economic growth is that it is best to have broad tax bases and low tax rates as opposed to narrow tax bases which force higher tax rates to protect the revenue take. Many of the exemptions and deductions in provinces' personal and corporate income tax bases come from the "common" federal tax base. But a lot are imposed by provinces. The question must be posed whether the narrowing of tax bases which typically benefits a few justifies the higher tax rates faced by all others. The section on business subsidies will address this issue directly for corporate taxation.

savings are the most damaging to economic growth whereas consumption taxes (broad-based) and property taxes are the least damaging.

Many of the Canadian and international analyses of the effects of taxation on economic growth use predictions from economic models that capture the long-term determinants of growth. For the OECD, Arnold (2008) complemented this approach by examining the actual experiences of 21 OECD countries over a 35-year period to see if shifts in the structure of taxes (the level of taxes being controlled for) affected economic growth. Like other studies, the order of taxes from most to least economically-damaging is corporate income taxes, personal income taxes, consumption taxes and finally property taxes (particularly recurrent taxes on immovable property). The study also found that progressivity in personal income taxes negative impacted economic growth.

The sort of logic behind the Finance Canada and international studies ordering sources of taxation by their damage to the economy is evident in the recent report by the Quebec Taxation Review Committee (March 2015) where it was recommended that Quebec do a tax shift to bolster economic growth. While the Committee's analysis and recommendations are specific to Quebec, they are at the same time highly pertinent to all provinces. All provinces should carefully study the Committee's report for applicability to their situation.

The Committee's recommendations are grounded in a ranking of taxes according to their economic impacts as estimated by the Quebec Ministry of Finance's general equilibrium model. In the order of most to least economically damaging, the estimated long-run increases in real GDP from a $1 billion reduction in each tax source (made revenue neutral through offsetting adjustments) are:

Tax on capital	1.37%
Personal income tax	0.72%
Corporate income tax	0.60%
Payroll tax	0.55%
Quebec sales tax	0.43%
User fees	0.43%

The empirical estimates of the GDP impacts of changing each revenue source are broadly in line with the results from the Finance Canada and OECD studies although there are certainly some differences which may reflect provincial as opposed to national effects, the particulars of Quebec's tax structures and differences in models. Note that Quebec estimates personal income taxes as being slightly more damaging than corporate income taxes whereas the OECD studies have the reverse order. The Finance Canada study broke personal income taxes into capital and other income sources and found the capital part more damaging than corporate income taxes but the taxation of other sources of personal income tax less damaging.

From the analysis of the differentiated effects of the various taxes on economic growth, the Quebec Committee on Taxation recommended a large shift away from personal income taxes, corporate income taxes and payroll taxes toward higher consumption taxes. Most forms of consumption taxes are recommended to be increased including the Quebec sales tax, specific

taxes on gasoline, tobacco and alcohol and a variety of user fees. The Committee also recommended substantial base broadening for all major revenue sources by reducing or eliminating a large number of exemptions and deductions. The Committee estimates that such a shift in taxation (revenue neutral in total) would increase Quebec's GDP 1.9 per cent in the long run and create more than 20,000 jobs.

The provinces and territories, as well as the federal government, have made impressive progress over the past 15 years in restructuring taxation to be less damaging to economic growth. In particular, capital taxes, the worst form of taxation for growth, have been eliminated in the general form. Some provinces still have capital taxes on large deposit-taking institutions, however. Corporate income taxes have been reduced substantially. All but British Columbia, Saskatchewan and Manitoba have abandoned their so-called "retail" sales taxes in favour of a broad-based value-added tax. The moniker "retail" sales tax is misleading in that much of the revenue comes from business inputs, including capital. As per the table above from Finance Canada, sales taxes on capital goods are very harmful to the economy so the shift to a value-added tax has been growth friendly and the remaining provinces with sales taxes should do likewise. Personal income taxes remain high in most provinces and territories relative to historical burdens and particularly relative to most places in the United States. In particular, the top marginal income tax rates – the amount of tax paid on the last dollar earned – are high at high income levels and even higher for many low-and-modest income families as they lose a variety of social benefits as income rises. These high marginal effective tax rates reduce labour supply and savings and hence impinge on economic growth.

Duanjie Chen and Jack J. Mintz release an annual report on global tax competitiveness (the latest is "The 2014 Global Tax Competitiveness Report: A Proposed Business Tax Reform Agenda," February 2015). Chen and Mintz measure the marginal effective tax rate on capital investment in 95 countries. In 2005 Canada had the highest tax rate of the G7 and the OECD and the fifth highest of the full set of 95 countries. With federal and provincial capital and corporate income tax cuts, Canada's position improved by 2012 to the seventh highest within the G7 (ie., the lowest), 19th highest within the OECD and 48th highest within the full set of 95 countries. In other words, Canada had the most competitive corporate income tax regime within the G7 and was in the middle of the pack compared to OECD and a larger group of OECD and emerging economies. Chen and Mintz document how Canada's position has deteriorated since 2012, not so much because of tax increases here, but because other countries have cut their taxes while the movement to lower taxation on capital largely stalled in Canada. For 2014 Canada retained its position as the most competitive within the G7 but slipped from 19th highest in 2012 to 14th highest within the OECD and from 48th highest to 37th highest among the 95 countries. It is interesting to note that the United States, often the reference point used for Canadian aspirations on key variables such as investment and productivity, has one of the highest rates of taxation on capital among the 95 countries and its corporate tax burden is much higher now than Canada's. This demonstrates in a simplistic fashion that while the rate of tax on capital may be an important variable, other factors lead to the American superiority over Canada on investment and productivity.

Chen and Mintz also calculate the marginal effective tax rates on capital for each province. Manitoba, British Columbia and Saskatchewan have higher rates than the Canadian

average. These three provinces rank among the large high-tax countries of the world. A good part of the explanation for their relatively high tax rates is that they continue to levy the retail sales tax which, as explained above, taxes capital inputs.

The tax reform agenda Chen and Mintz recommend is a federal corporate income tax rate of 11 per cent (presently large corporations face a 15 per cent rate and small corporations 11 per cent; the latter is being phased down in the April 2015 Budget to 9 per cent) and a provincial rate of nine per cent with the revenue losses recaptured through base broadening. They recommend these single rates be applied to all firms regardless of size in contrast to the current situation where the federal and provincial governments give lower tax rates to small businesses. Chen and Mintz also urge British Columbia, Saskatchewan and Manitoba to either adopt a value-added sales tax or establish refunds to effectively remove provincial sales taxes on capital inputs.

An opportunity for a further shift toward consumption taxes is levies on carbon emissions. There is a broad consensus that action is necessary to reduce greenhouse gas emissions in order to limit further increases in global temperatures. The market price fails to fully capture the true cost of fossil fuels as those who produce emissions do not have to pay for the environmental damage which affects everyone else. Government intervention is required to adjust the price of carbon so that the market can achieve a more socially efficient outcome. Such intervention could take the form of a carbon tax, which directly raises the price of emissions, or a cap-and-trade system, which caps the amount of emissions and allows a market for emissions permits to allocate these emissions to those who are willing to pay the most for them.

Ideally, the coverage of carbon pricing should be as broad as possible – all emissions should be properly priced. Efforts should also be coordinated across provinces. Co-ordination is important to avoid free-riding – any given jurisdiction may be tempted not to raise the price of carbon in order to gain a competitive advantage while leaving the burden of achieving environmental benefits on others. Closely related to this, carbon leakage resulting from the movement of emissions from regions with high carbon prices to those with low (or no) carbon prices can reduce the effectiveness of efforts to reduce emissions. While harmonized carbon pricing across Canada is ultimately desirable, advancing different carbon pricing policies at the provincial level may be the more practical path forward. Immediate action is necessary[7] and it will be faster for provinces to take action individually than to wait for a consensus. Implementing carbon pricing at the provincial level allows for provinces with varying situations to adopt the most effective policies for themselves. It also allows for some experimentation among different approaches, which may be useful in determining the best carbon pricing policy for Canada to eventually converge towards.

Three provinces have already taken action to price emissions. British Columbia has a carbon tax and Quebec applies a price to carbon through a cap-and-trade system. Alberta's Specified Gas Emitters Regulation (SGER) represents an intensity-based system. This system requires major emitters to reduce their emissions intensity (emissions per unit of output

[7] Delay in reducing emissions is expected to be very costly. For example, the National Round Table on the Environment and the Economy (2012) estimates that waiting until 2020 to implement policies sufficient to reduce Canadian emissions to 65 per cent below 2005 levels by 2050 would cost $87 billion dollars more than immediately implementing policies to achieve the same objective.

produced) by up to 12 per cent relative to a benchmark level. Those who exceed their targets can sell credits to those who fail to do so, but emitters also have the option to pay $15 per ton into a carbon technology fund for each ton of emissions above the target (Wood, 2015). Ontario has recently expressed its intent to price carbon as well. Only about 3 per cent of emissions in Alberta are actually priced under its SGER, so the impact has been limited so far. The tax in British Columbia has had a more significant effect. Fuel use per capita declined by 16 per cent in BC over the 6 years following the introduction of the tax while it increased by 3 per cent in the rest of Canada. This did not have a clear negative impact on BC's economy, as it grew at an annual rate of 1.8 per cent over the period compared to 1.3 per cent in the rest of the country (Canada's Ecofiscal Commission, 2015).

Such pricing of carbon can raise substantial amounts of revenue – B.C. realizes $1.2 billion per year from a tax of $30 per tonne of carbon. This potential source of revenue should not, however, be thought of as a potential source of funding for deficit reduction or new spending. Instead, it should be used to reduce other, more damaging taxes, or to fund environment matters. B.C. has gone the former route and Quebec the latter. A tax shift involving a price on carbon offers the dual opportunities to address a major environment challenge while making the tax structure more growth-friendly.

Another theme in the Canadian and international reviews of the effects of taxation on economic growth is that it is best to have broad tax bases and low tax rates as opposed to narrow tax bases which force higher tax rates to protect the revenue take. Many of the exemptions and deductions in provinces' personal and corporate income tax bases come from the "common" federal tax base. But a lot are imposed by provinces. The question must be posed whether the narrowing of tax bases which typically benefits a few justifies the higher tax rates faced by all others.

Both federal and provincial governments tend to offer tax breaks for small businesses. A common motivation for this is that it facilitates growth by overcoming a capital market failure by providing small firms with more after-tax income to undertake expansion.[8] However, there may be some concern that tax breaks for small firms provide a disincentive for firms to grow large enough that they would be classified as large. Dachis and Lester (2015) found that firms do indeed cluster around small business thresholds for the Small Business Deduction (SBD) and the enhanced Scientific Research and Experimental Development (SR&ED) investment tax credit, but the thresholds are high enough that the impact on investment by small firms is very small. Nonetheless, Dachis and Lester (2015) find that these small business tax credits have a significant social cost because these tax breaks come at the cost of lower government spending or higher taxes elsewhere. Larger firms tend to be more productive, so support for small business relative to large businesses leads to an expansion of the small business sector at the expense of large businesses and lowers aggregate productivity. Dachis and Lester (2015) estimate that eliminating supports for small businesses and instead lowering the general corporate tax rate facing all firms would be a more effective means way to encourage growth.

[8] The special roles of small businesses in innovation and job creation are also sometimes used to motivate subsidies or tax breaks.

In summary, the basic messages from this analysis of taxation are:

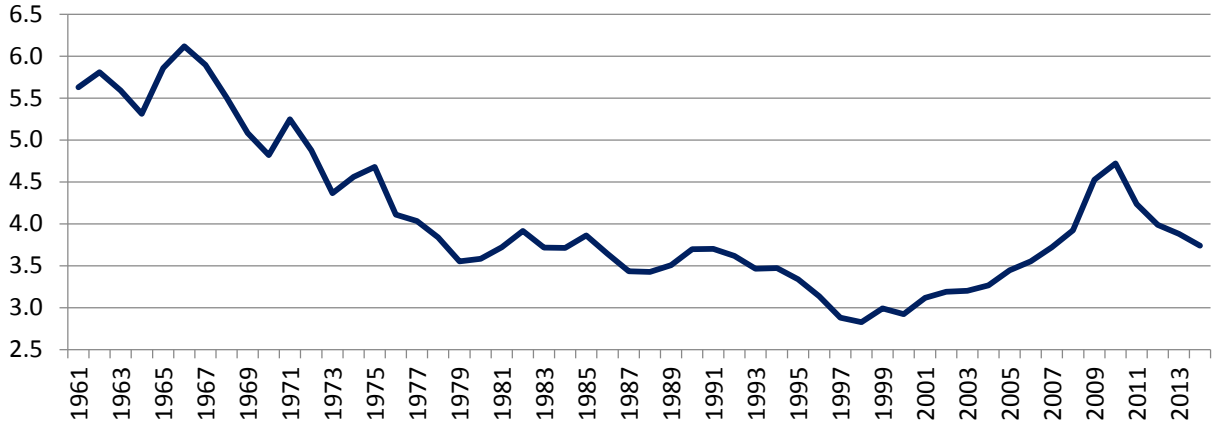
- To the extent feasible, reduce taxes on capital (directly and through sales taxes), corporate income, and personal income and shift the burden onto consumption taxes. This is especially relevant for the remaining provinces with retail sales taxes (which tax business inputs including machinery and equipment).

- Broaden tax bases by eliminating special preferences that distort markets;

- Take the opportunity of a further tax shift using a price on carbon to reduce other forms of more economically-damaging taxes while addressing environmental concerns

ii. Public Investment

Chart 7: General Government Gross Fixed Investment, Share of Nominal GDP, Per Cent, Canada, 1961-2014



Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017 and 380-0064.

This sub-section takes a brief look at historical trends in gross public investment.[9] The next sub-section reviews the literature on the state of Canada's public infrastructure as well as the effect of public investment on productivity growth.

General Government Gross Investment

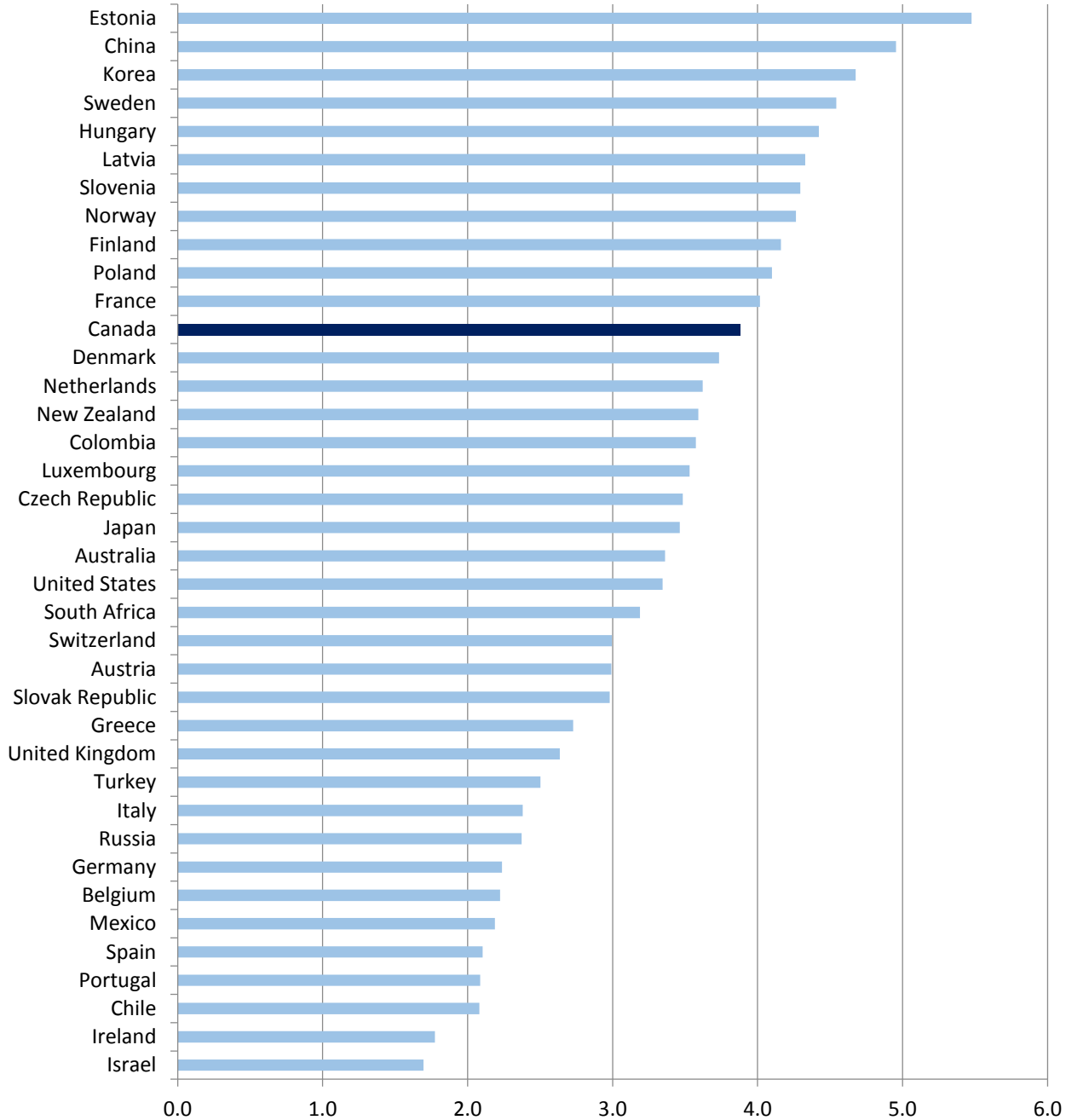
At the national level, the intensity of gross public investment, defined as the share of gross public investment in nominal GDP, was 3.7 per cent in 2014 (Chart 7).[10] This represents an increase from the historical low of 2.8 per cent in 1998, but remains well below the range observed in the 1960s (5.1 to 6.1 per cent). The recent surge in public investment reflects the adoption of stimulative fiscal policy measures in response to the 2008-09 recession. The intensity

[9] A more detailed examination of trends in public investment is provided in Appendix B.

[10] General government gross public investment includes investment by all resident government units (*i.e.*, federal, provincial, territorial, local, and Aboriginal governments) and all resident non-market, non-profit institutions that are controlled and mainly financed by resident government units (*e.g.*, hospitals, colleges, and universities). It is important to note that government business enterprises are not classified within general government.

of gross public investment fell 1.0 percentage point from 4.7 per cent in 2010 to 3.7 per cent in 2014, as the economy recovered and governments began to implement fiscal tightening.

Chart 8: International Comparison of General Government Gross Fixed Investment, Share of Nominal GDP, Per Cent, 2013

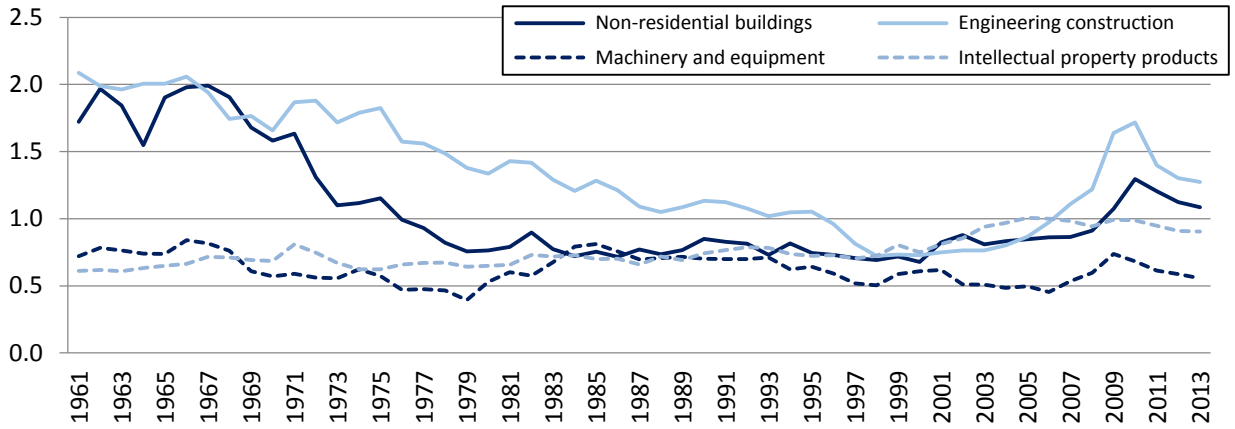


Note: The data for Turkey are for 2011. The data for China, Colombia and Russia are for 2012.
Source: CSLS calculations based on OECD data.

Although Canada's public investment intensity is well below its historical levels, it remains above average internationally. Chart 8 presents an international comparison of gross

public investment intensity in 2013.[11] Among thirty-eight countries, Canada ranked twelfth in terms of the intensity of gross public investment. Generally speaking, Canada ranked behind emerging economies in Eastern Europe (Estonia, Hungary, Latvia, Slovenia, and Poland), the Nordic countries (Sweden, Norway and Finland), and emerging economies in East Asia (China and Korea). Canada ranked ahead of most economies in Western Europe, Central Europe and Latin America, as well as the United States, Japan, Australia and New Zealand.

Chart 9: Government Sector Gross Fixed, Non-Residential Investment by Component, Share of Nominal GDP, Per Cent, Canada, 1961-2013



Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017, 380-0064 and 031-0006.

Chart 9 breaks down the intensity of gross public investment by type of investment for the 1961-2013 period.[12] It shows that the dramatic decline in gross public investment intensity from 1966 to 1998 was primarily due to falling public investment in non-residential buildings and engineering structures.[13] In particular, non-residential buildings accounted for 1.3 percentage points (or 44.4 per cent) of the 2.9 percentage-point decline in gross public investment intensity, while engineering construction accounted for 1.3 percentage points (or 46.1 per cent). Public investment in machinery and equipment (M&E) has been much more stable over time, accounting for only 0.3 percentage point (or 11.6 per cent) of the decline in gross public

[11] It is important to note that institutional differences between countries, such as differences in terms of the extent of public ownership and the size of the public sector, may account for a large part of the disparities in gross public investment intensity. Generally speaking, countries with a larger public sector (as a share of GDP) should also have higher public investment intensities, *ceteris paribus*.

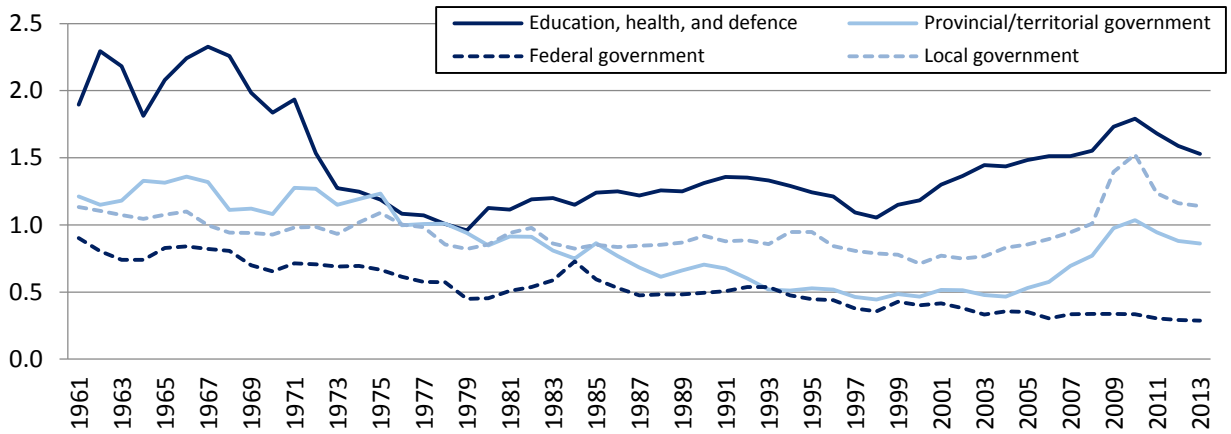
[12] Chart 7 is based on general government fixed investment data from the expenditure accounts. In contrast, Chart 9 was created using gross fixed, non-residential investment data for the government sector from the flows and stocks tables. There are two important differences between the *general government* figures presented in Chart 7 and the *government sector* figures presented in Chart 9. First, general government and the government sector are different concepts. In contrast to general government, the government sector is an industry concept which is composed of establishments in the following industries: educational services (NAICS code 61), health care and social assistance (NAICS code 62), and public administration (NAICS code 91). Second, the government sector figures exclude gross public investment in residential structures, while the general government figures do not.

[13] Engineering structures is more or less equivalent to public infrastructure. Non-residential buildings include: hospitals, universities, colleges, elementary schools, warehouses, manufacturing plants, offices buildings, etc.

investment intensity from 1966 to 1998. In contrast, the intensity of gross public investment in intellectual property products (IPP) increased 0.06 percentage point between 1966 and 1998.

Between 1998 and 2013, the intensity of gross public investment increased 1.2 percentage points. This was largely the result of renewed investment in engineering construction, which contributed 0.6 percentage point (or 47.0 per cent) to the overall increase, and non-residential building, which contributed 0.4 percentage point (or 33.4 per cent). Public investment in M&E and IPP contributed much less to the increase in gross public investment intensity from 1998 to 2013, at 0.05 percentage point (or 4.4 per cent) and 0.09 percentage point (or 7.5 per cent), respectively.

Chart 10: Government Sector Gross Fixed, Non-Residential Investment by Level of Government, Share of Nominal GDP, Per Cent, Canada, 1961-2013



Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017, 380-0064 and 031-0005.

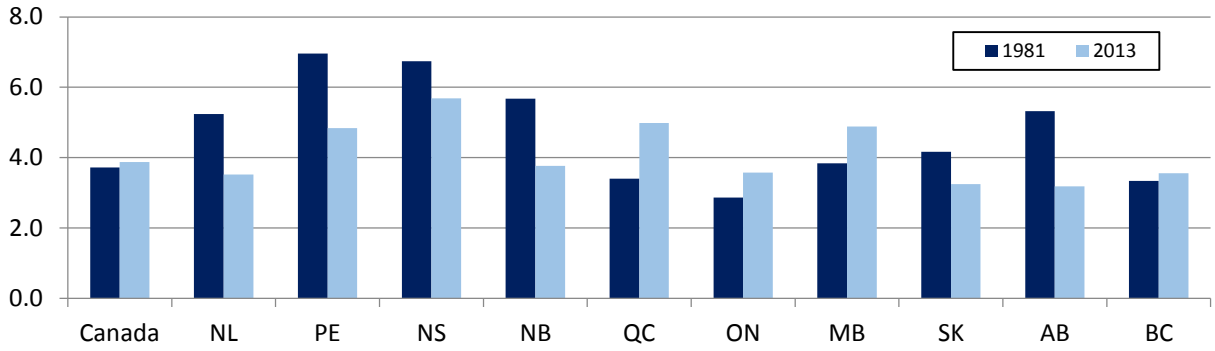
Between 1961 and 2013, trends in gross public investment intensity were quite dissimilar across the different levels of government (Chart 10).[14] The federal government exhibited the largest decline from 1961 to 2013 (0.62 percentage point or 46.5 per cent of the total decline), followed by education, health and defence (0.37 percentage point or 27.7 per cent) and provincial governments (0.35 percentage point or 26.5 per cent).[15] It is also interesting to note that the massive falloff in gross public investment intensity in the 1960s and 1970s was largely attributable to decreases in education, health and defence, which declined from a high of 2.3 per cent in 1967 to a low of 1.0 per cent in 1979. All levels of government increased gross investment intensity since 2005, with the exception of the federal government.

In 2013, the intensity of gross public investment varied greatly across the provinces (Chart 11). The intensity of gross public investment was highest in Nova Scotia (5.7 per cent), followed by Quebec (5.0 per cent), Manitoba (4.9 per cent), and Prince Edward Island (4.8 per

[14] It is important to note that Chart 10 provides information on the levels of government that are spending on public investment, not the levels of government that are actually funding public investment.
[15] The education, health and defence category includes the investment activities of multiple levels of government; however, the vast majority of this category is attributable to provincial governments.

cent). In contrast, the intensity of gross public investment was lower than the national average (3.9 per cent) in the remaining provinces. Alberta and Saskatchewan recorded the lowest intensities of gross public investment in 2013, at 3.2 per cent in both provinces.

Chart 11: General Government Gross Fixed Investment, Share of Nominal GDP, Per Cent, Canada and the Provinces, 1981 and 2013



Source: CSLS calculations based on Statistics Canada data. CANSIM table 384-0038.

Between 1981 and 2013, gross public investment intensity fell in six provinces (the Atlantic provinces, Saskatchewan, and Alberta) and rose in the remaining four. The intensity of gross public investment decreased the most in Alberta (2.1 percentage points), followed by Prince Edward Island (2.1 percentage points), New Brunswick (1.9 percentage points), and Newfoundland and Labrador (1.7 percentage points). In contrast, the intensity of gross public investment increased the most in Quebec (1.6 percentage points).

The key findings from the previous part are briefly outlined below.

- The intensity of public investment is still well below the levels exhibited in the 1960s. This was mostly driven by lower intensity of public investment in engineering construction and non-residential buildings.

- The intensity of public investment strengthened after 2000, following a prolonged period of weakness in the 1980s and 1990s. The recent increase in public investment intensity was driven by increased public investment in engineering construction and, to a lesser extent, non-residential buildings. However, much of the recent improvement in public investment intensity was linked to stimulus spending, and the intensity of public investment has fallen somewhat since 2010.

- In 2013, the intensity of gross public investment varied greatly across the provinces. The intensity of gross public investment was highest in Nova Scotia, followed by Quebec, Manitoba, and Prince Edward Island. The intensity of gross public investment was lower than the national average in the remaining provinces. Between 1981 and 2013, the intensity of public investment fell in six provinces (the Atlantic provinces, Saskatchewan, and Alberta) and rose in the remaining four.

- Among thirty-eight countries, Canada ranked twelfth in terms of the intensity of public investment in 2013. Canada ranked behind emerging economies in Eastern Europe, the Nordic countries, and emerging economies in East Asia, while Canada ranked ahead of most economies in Western Europe, Central Europe and Latin America, as well as the United States, Japan, Australia and New Zealand.

iii. Public Infrastructure: Literature Review and Policy Recommendations

What types of expenditures can be characterized as public investment? In the previous sub-section, public investment referred to fixed, non-residential capital formation. This includes infrastructure (*e.g.*, for public roads, bridges, airports, and water and wastewater networks); non-residential building (*e.g.*, schools and hospitals); machinery and equipment (*e.g.*, computers, laboratory equipment, and vehicles); and intellectual property products (*e.g.*, research and development and software). However, public spending on education and health, which is typically categorized as current expenditure rather than investment, is a critical component of human capital accumulation and therefore can also be interpreted as a form of public investment.

Given that there are sections devoted to innovation and human capital, we will focus on infrastructural outlays in this sub-section, a topic which has received a great deal of attention in the media and by policymakers. In particular, this sub-section presents alternative evidence on the current state of public infrastructure in Canada, discusses the important role played by public investment in infrastructure as a driver of improvements in living standards, and offers a clear set of policy recommendations.

a. Should We Target a Specific Level of Investment?

It is not immediately clear what level (or even what range) of infrastructure investment is desirable at the macroeconomic level. Should governments set a target for net infrastructure investment intensity or real per capita growth in net infrastructure investment? Alternatively, should governments set a target for the share of the stock of infrastructure in nominal GDP or the real per capita stock of infrastructure?

It may be undesirable to set a target for the level of public investment, as it may force governments to invest in projects for which the costs outweigh potential benefits. Governments should invest in projects based on their individual merits. In other words, governments should only invest in projects for which the potential benefits outweigh the costs.

While governments should not invest in large, expensive projects without conducting thorough cost-benefit assessments, it is important for governments to spend an adequate amount on the maintenance of existing infrastructure. Unlike investments in new projects, which may come in fits and starts, investments related to the maintenance of existing infrastructure will likely be quite stable over time.

Investments in infrastructure are needed in response to population growth, the expansion of economic activity and trade, technological change, and the decay of older infrastructure. As the population expands, governments will need to build hospitals, roads, water and waste

systems, and schools. The expansion of trade and economic activity also requires an expansion of public infrastructure to facilitate increased utilization of roadways, ports, airports, border crossings and other vital components of public infrastructure. Investment in public infrastructure is also necessary to maintain or replace older public infrastructure.

Technological change provides opportunities to invest in new types of infrastructure and to update existing infrastructure (*e.g.,* green infrastructure and smart infrastructure). Well-designed transit systems, low-carbon energy production, smart electrical grids, and upgraded water and sanitation facilities can protect the environment, improve public health, and support the economy. As infrastructure tends to be a long-term investment, it is crucial that infrastructure investments made today are capable of meeting environmental goals decades into the future. Otherwise, costly upgrades and wasteful replacements may become necessary. The International Energy Agency (2011) estimates that for every dollar not invested in green energy in the power sector between 2011 and 2020, $4.3 would need to be spent between 2021 and 2035 to reach a targeted level of global emissions by 2035.[16] Investment in green infrastructure can also serve to anchor private sector beliefs about government commitment to green growth, encouraging innovation and complementary investments.

Much of Canadian infrastructure is already locked in over the medium to long term, but there are many opportunities to upgrade existing infrastructure. For example, train tracks can be upgraded to utilize intelligent traffic management systems, diesel-fueled cranes at ports could be replaced with electric ones, smart metering of water and electricity could help businesses and households make optimal use of these resources, and smart grids could distribute electricity more efficiently (OECD, 2010d). Resulting energy savings from such improvements would not only have a positive impact on the environment, they would also boost energy productivity.

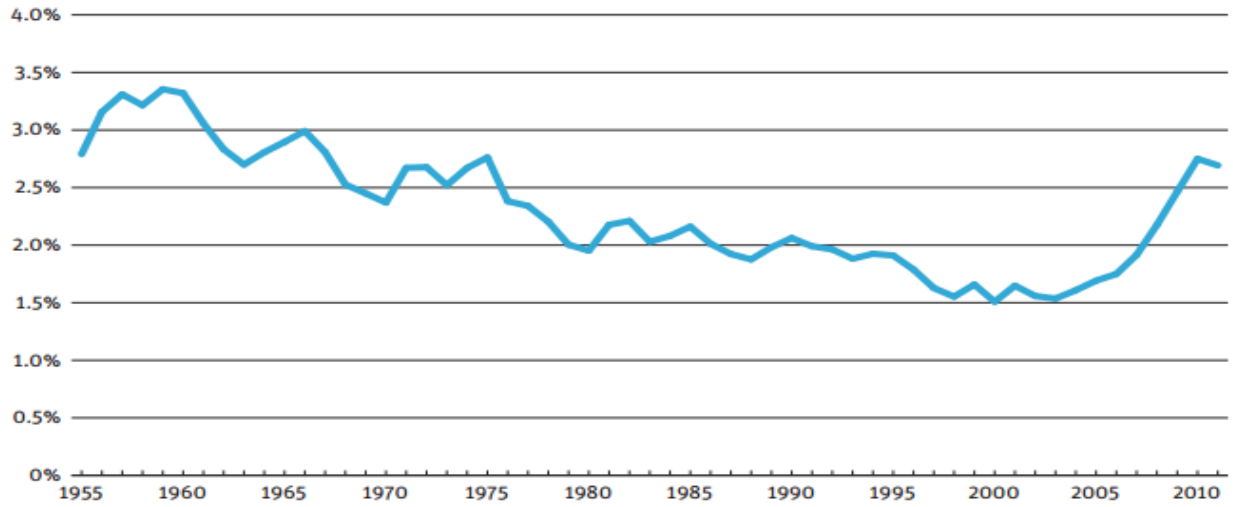
There is no reason to expect the need for infrastructure investment to grow at a constant rate over time, such as the rate of nominal GDP growth or the rate of population growth. For example, worsening traffic conditions may require substantial short-term investments in highways and public transportation. However, following this short-term investment, governments could greatly reduce the level of public investment. For example, as was shown earlier in this section, a great deal of public investment was undertaken in the 1960s, which would have allowed for lower levels of investment for some time. However, more recently, much of this older public infrastructure has become outdated and required replacement, which explains the recent uptick in the intensity of public investment.

Relying mainly on trends in the intensity of infrastructure investment, Mackenzie (2013:3) argues that Canada currently has a significant infrastructure gap, meaning that "there is a monumental gap between the infrastructure work we currently undertake and what is needed to restore a state of good repair and to build for the needs of the future." However, Mackenzie (2013:4) argues that the infrastructure gap is a chronic problem in Canada, as it has been "developing slowly over decades of underinvestment." Mackenzie (2013) points to four factors

[16] This study estimates that 80 per cent of the targeted carbon emissions in 2035 were already "locked-in" by the existing capital stock in 2011. Reducing these emissions would require upgrading or replacing the capital which already exists. Half of these locked-in emissions were estimated to be in the power sector because of long lifetime of capital in this sector.

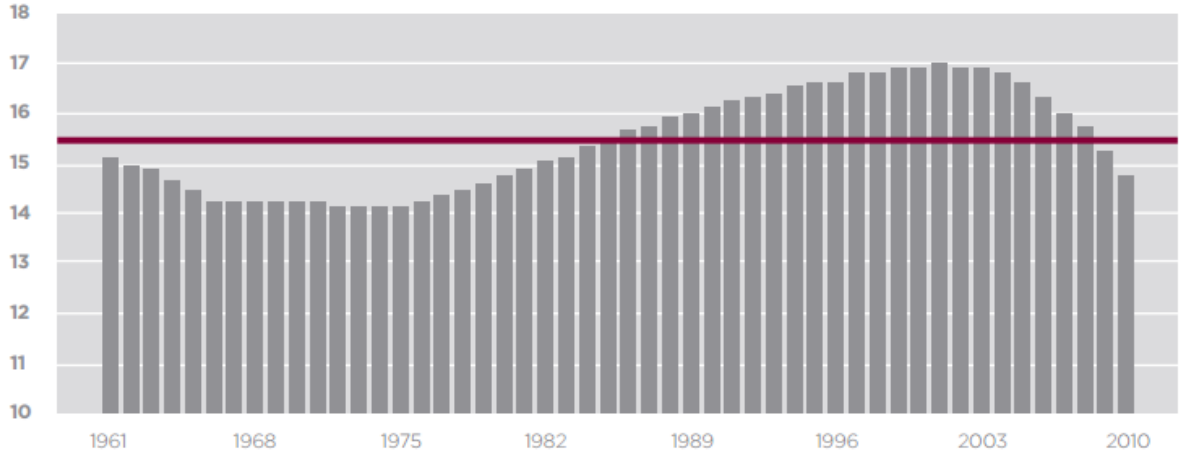
to explain the underinvestment in infrastructure: 1) growing fiscal imbalance among federal, provincial and local governments; 2) a gradual deterioration in federal funding for provincial and local governments; 3) the emergence of budgetary balance as a paramount concern for governments; and 4) the application of private-sector accounting rules to public-sector budgets.

Chart 12: Public Investment in Infrastructure, Per cent of GDP, Canada, 1995-2011



Source: Mackenzie 2013, Chart 1

Chart 13: Average Age of Core Public Infrastructure in Canada, Years, 1961 to 2010



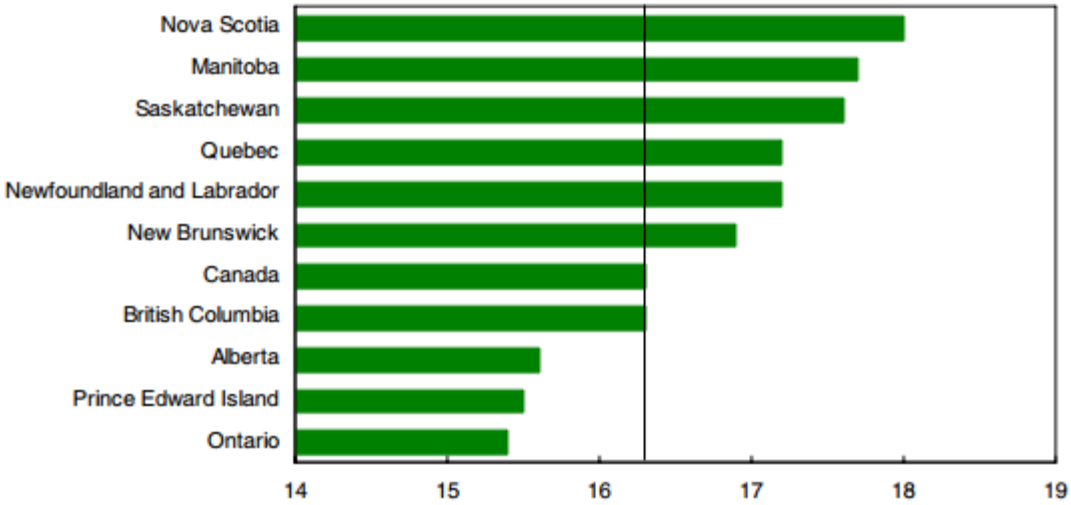
Source: Chart taken from Federation of Canadian Municipalities (2012b:7). Data ultimately from Statistics Canada's Investment and Capital Stock Division.

In contrast, Chart 13 suggests that the increased investment in public infrastructure in recent years has significantly lowered the average age of infrastructure in Canada. Owing to significantly lower investment in the late 1970s, the 1980s and the 1990s, the average age of infrastructure increased considerably from about 14 years in the earlier 1970s to a high of 17 years in 2000. However, the average age of infrastructure fell below 15 years by 2010. Chart 14 provides the average age of infrastructure by province in 2007. It shows that the average age of

infrastructure varies greatly across the provinces, which reflects differences in both the rates and composition.

In contrast to Mackenzie (2013), who relied mainly on trends in aggregate investment intensity, there are many studies that look at alternative sources of evidence of the existence of an infrastructure gap, including econometric studies, infrastructure audits, and studies examining the specific costs related to underinvestment (*e.g.*, congestion, pollution, border waiting times). This evidence may be more useful in helping government determine whether and to what extent there is a shortage of infrastructure investment in Canada, and to provide further direction regarding where governments should focus their infrastructure spending to obtain the highest return on investment.

Chart 14: Average Age of Core Public Infrastructure by Province, Years, 2007



Source: Statistics Canada (2008:7)

b. The Contribution of Public Investment in Infrastructure to Economic Growth

There are two broad ways of measuring the contribution of public investment in infrastructure to the economy – the macroeconomic approach and the microeconomic approach. The microeconomic approach involves using cost-benefit analysis to evaluate the desirability of individual infrastructure projects. This approach attempts to estimate change in well-being arising from an infrastructure project by accounting for the various benefits arising from the project (*e.g.*, health and safety improvements, fewer GHG emissions, job creation, trade expansion, etc.) as well as the costs. In contrast, the macroeconomic approach involves estimating the total effect of public infrastructure investment on economic growth. Most studies based on this approach look for a positive, causal relationship between the level of infrastructure investment and productivity growth and/or cost savings.

This sub-section summarizes the macroeconomic evidence concerning the contribution of public investment to economic growth.

Several authors have identified public infrastructure investment as a major driver of productivity growth in an economy. David Aschauer, an economist working for the Federal

Reserve Bank of Chicago, was the first economist to bring attention to the important role played by public investment in infrastructure in economic growth (Aschauer, 1989). Aschauer took the role of public investment in economic growth seriously. He argued that lower public investment in infrastructure accounted for much of the slowdown in productivity growth between the 1950/60s and the 1970/80s, a finding which was quite controversial at the time.

According to Vander Ploeg and Holden (2013:6), Aschauer's findings "sparked a new line of economic inquiry focused on the relationship between public infrastructure and productivity." Two general approaches have been used to estimate the macroeconomic effect of public investment: 1) a growth accounting framework with an aggregate production function that includes public capital; and 2) an econometric approach using time series or panel data. Bivens (2012:2) provides a useful review of the literature broken down by these two approaches.

Vander Ploeg and Holden (2013) conducted an extensive review on the literature on public infrastructure investment and economic performance. They suggest that, by and large, there is a consensus in the literature that public investment in infrastructure generates long-term productivity gains and, in turn, raises GDP. Public investment in infrastructure reduces costs for business and, in turn, increases profits. Higher profits mean greater private investment in productive capital which, in turn, raises employment, labour productivity and GDP.

In contrast, Vander Ploeg and Holden (2013) suggest that there is no consensus in the empirical literature on the magnitude of the effect of public investment on long-term economic growth.[17] In the beginning, Aschauer (1989) found a rate of return on public infrastructure investment (*i.e.*, the elasticity of business sector productivity with respect to public infrastructure investment) of about 40 per cent, double the estimated rate of return on private investment of about 20 per cent. His approach treated public capital as an input in the production function for the business sector. Aschauer's results were later challenged by scholars such as Gramlich (1994) and Sturm (1998), who found a significantly smaller impact of public capital on economic growth.

Wylie (1996), who examined the role of infrastructure investment in economic growth in Canada using a similar approach to Aschauer (1989), estimated that the rate of return on public investment was about 41 to 44 to per cent. However, the production function approach used by Wylie (1996), Aschauer (1989) and many others overestimates the impact of public infrastructure because, since the growth in public capital and MFP were similar in past decades, estimates of the rate of return to public capital often capture elements of MFP which, in turn, leads to an overestimation of public capital's effect on productivity growth (Macdonald, 2008). The opposite has also been true: the effect of public capital is frequently attributed to MFP, leading to the appearance of no relationship between public capital and productivity growth (Macdonald, 2008).

[17] According to Romp and De Haan (2007), the empirical literature is based on four broad approaches: 1) the production function approach, which looks at the relationship between public capital on business sector output when public capital is treated as an input in the business sector's production function; 2) the cost function approach, which looks at whether and to what extent an increase in the endowment of infrastructure decreases the cost of output; 3) endogenous growth models incorporating public infrastructure investment; and 4) analysis of the relationships between several variables, including the infrastructure stock, output and productivity, using econometrics without imposing a strict theoretical structure.

According to the Centennial Group (2009), who prepared a background report for UNCTAD, there is mixed evidence on the effect of public investment on economic growth, with some studies finding an insignificant relationship between public investment and economic growth. However, public investment in infrastructure is typically found to have a stronger relationship with productivity than aggregate public investment. Of a similar spirit, Bivens (2012:2), who conducted a review of the empirical literature for the United States, found that "public capital offers a higher rate of return than most forms of private capital." In particular, public infrastructure investment was found to have significant positive impacts on private-sector productivity, with estimated rates of return ranging from about 15 to 45 per cent, similar to the estimated rate of return on ICT investment (30 per cent).

Gu and Macdonald (2009:6) use a growth accounting framework to look at whether and to what extent public capital accounts for productivity growth in Canada. They show that public capital deepening contributed 0.2 percentage point per year to labour productivity growth in the business sector between 1962 and 2006, well below the contribution of private capital deepening (1.3 percentage points per year). These findings suggest that public capital deepening accounted for about 9 percent of labour productivity growth from 1962 to 2006. Similarly, Satya *et al*. (2004) found strong evidence of a significant effect of public infrastructure investment on the productive performance of twelve manufacturing industries in Canada.

Using the cost function approach, Harchaoui (1997) and Harchaoui and Tarkhani (2003) estimate the rate of return on public investment in terms of the cost savings associated with public capital. Harchaoui (1997) showed that public capital accounts for roughly 12 per cent of productivity growth in the business sector. Later, Harchaoui and Tarkhani (2003) re-examined this relationship using better data, and found that public capital accounted for about 18 per cent of the business sector multifactor productivity growth between 1961 and 2000. For every dollar increase in the amount of public capital, Harchaoui and Tarkhani (2003) estimated that the average benefit to the business sector in terms of cost savings was 17 cents per year.

More recent studies have applied more advanced econometric techniques to evaluate the relationship between public infrastructure investment and economic growth. Generally speaking, these studies provide evidence of a smaller role of infrastructure in economic growth compared to earlier studies such as Aschauer (1989).

Using cross-country data from 1950 to 1992, Canning and Pedroni (2008) show that infrastructure investment causes long-run economic growth but that there is substantial variation across countries. They were able to estimate the long-run return of infrastructure investment, controlling for short-run causal relationships. Canning and Pedroni also found that infrastructure capital is near the growth-maximizing level globally; however, it is below this level in some countries and above this level in others.[18] For example, they show that the stock of roads is below the growth-maximizing level in OECD countries, suggesting that there has been underinvestment in roads in OECD countries.

[18] According to Canning and Pedroni (2008:523), above the growth-maximizing level of infrastructure, "the diversion of resources from other productive uses outweighs the gain from having more infrastructure, [and] [b]elow this level, increases in infrastructure provision increase long-run income, while above this level an increase in infrastructure reduces long-run income."

In contrast, using panel data from public investment booms in twenty-one countries in Latin America, Africa and Asia over the past four decades, Warner (2014) provides econometric evidence of "only a weak positive association between investment spending and growth and only in the same year, as lagged impacts are not significant." This suggests that the long-term productivity effects of infrastructure are negligible. The positive same-year relationship could indicate "either reverse causality, as capital spending tends to be cut in slumps and increased in booms, or Keynesian demand effects, as spending boosts output in the short run." However, after looking at selected case studies, Warner (2014:63) concludes that the governance and implementation of many of these public investment booms were inefficient, ineffective and vulnerable to outside interests and corruption. This could explain the finding of a weak positive association between investment spending and growth.

Farhadi (2015) conducts a similar analysis using panel data for eighteen OECD countries between 1870 and 2009. She found that "growth in both labour productivity and total factor productivity are positively, but not substantially, influenced by growth in the stock of infrastructure," and that the rate of return on infrastructure investment exceeds the rate of return on private investment. However, the rate of return on infrastructure investment was lower than those on investment in M&E and structures.

Macdonald (2008) carefully examines the biases built into the methodologies used by previous authors and attempts to provide a better estimate of the rate of return to public capital in Canada. According to Macdonald, previous estimates have ranged from 0 to 50 per cent, which makes it difficult for policymakers to make informed investment decisions. He relies on both the cost function approach and the production function approach to "triangulate on what a reasonable impact from public capital could be" (Macdonald, 2008:7). The triangulated range for the rate of return on public capital was 5 to 29 per cent, with a mean of 17 per cent. Macdonald (2008:8) concludes that, "while it is difficult to place an exact number on the rate of return from public capital, it is larger than zero."

According to Vander Ploeg and Holden (2013), the magnitude of relationship between public investment in infrastructure and productivity growth depends on many factors. First, the relationship between infrastructure investment and productivity growth differs by type of infrastructure. For example, Aschauer (1989) found that, compared to public investment in military capital and other forms of non-military capital, public investment in core infrastructure (*e.g.*, roads, airports, public transit, and water and wastewater systems) had the biggest effect on productivity growth in the United States. Similarly, Wylie (1996) found that public investment in core infrastructure had a larger impact on labour productivity growth in Canada compared to public investment in schools, universities, hospitals and other institutions.

Second, the impact of infrastructure investment on productivity depends on the quantity and quality of the existing infrastructure stock. As noted in Vander Ploeg and Holden (2013:8), "maintaining and renewing existing infrastructure – especially core infrastructure – often provides higher returns than investing in new projects." This is especially true for countries like Canada with large infrastructure stocks, as there are diminishing returns to public infrastructure investment.

Third, the relationship between infrastructural outlays and productivity depends on the physical location of the investments. For example, Vander Ploeg and Holden (2013:6) found that "investments in urban areas tend to pay higher economic returns and we know that resource development requires a certain amount of rural infrastructure to be in place." In addition, there is evidence that public infrastructure investments that create or add to an integrated network are more likely to advance productivity (Centennial Group, 2009; Vander Ploeg and Holden, 2013). Investments that improved access to export markets are also likely to have a higher rate of return, such as the new international crossing between Windsor and Detroit. More importantly, reducing barriers and costs associated with exporting to emerging markets is a core element of a pro-growth strategy. Several studies demonstrate that public investment in transportation infrastructure (*e.g.*, roads, bridges, airports and seaports) promote regional trade expansion by lowering transportation costs (Scandizzo and Sanguinetti, 2009; Roland-Hurst, 2006).

It is also clear that public investment in infrastructure has a larger effect on GDP during economic downturns. Drawing on this observation, Vander Ploeg and Holden (2013) advocate for increased investment in Canada's public infrastructure for two reasons: 1) the cost of borrowing is extremely low; and 2) Canada currently has an output gap scenario, which means that increased investment in public infrastructure will stimulate economic activity without leading to runaway inflation. In such circumstances, increased public investment in infrastructure would be largely self-financing. For example, Bivens (2012:2) found that a plan to increase public infrastructure investment in the United States would be largely self-financing, as "a significant increase in public investment spending would boost jobs in the short run and pay enormous dividends in more rapid productivity growth in coming decades."

c. Policy and Planning Literature

The above literature review presented the macroeconomic evidence concerning the role of public infrastructure investment, which highlights the effect of public investment on economic growth. But the benefits of public investment in infrastructure go beyond simply raising GDP: they increase safety, improve health outcomes and quality of life, and reduce congestion and air pollution, among other things.

There are several reasons to favour the microeconomic approach (*i.e.*, the project-by-project cost-benefit approach) over the macroeconomic approach. First, evidence of a link between public infrastructure investment and economic growth can only tell us so much about the link between public investment in infrastructure and well-being, as measures of economic activity such as GDP are only loosely related to well-being. This evidence can tell us nothing about the impact of infrastructure investment on important welfare-improving factors, such as safety, health and the environment, among other things.

Second, the macroeconomic approach can only provide information about the average impact of infrastructure investment in economic performance but they cannot determine whether any given project will result in a net gain for the community. In other words, while the macroeconomic approach can tell us whether public investment in infrastructure has had a

positive effect on economic growth, it is only loosely related to well-being and sustainability, and it is not useful for project selection.

While the econometrics literature painted an ambiguous picture concerning the role of public investment in economic growth, there is a large policy and planning literature that estimates the size of the infrastructure gap (at both the global and local level) and demonstrates the need for a substantial increase in public investment in infrastructure to "close existing gaps in service provision and to deal with the multiple policy challenges of the future" (Centennial Group, 2009:6). These studies rely on the microeconomic approach and pay attention to alternative sources of evidence of an infrastructure gap. For example, Mackenzie (2013:3) draws attentions to many manifestations of underinvestment in infrastructure:

> "The evidence is clear, both in the statistics, and in the everyday experience of Canadians in every part of the country: in spine-jarring streets and highways; in mind-numbing and catastrophically wasteful traffic jams; in unresolved waste treatment problems and countless boil water orders; in the gradual decline in the state of repair of public property in older communities; in the struggles of rapidly-growing communities to keep up with the need for the basic nuts and bolts of urban civilization."

Many studies focus on the manifestations of underinvestment and estimate their cost to the economy. Other studies perform audits of the state of public infrastructure, which involve giving grades and estimating the cost of returning public infrastructure to "good" condition. This literature also highlights the amount of infrastructure investment required to adapt to climate change and to reduce GHG emissions. The Centennial Group (2009:8) concisely summarizes the general message of this literature:

> "Looking to the future, the evidence on the need for public infrastructure investment appears almost overwhelming. Indicators of infrastructure availability in many countries reveal obvious and enormous gaps. They highlight the number of households without access to clean water and basic sanitation services, the number of days when shortages in electricity or water are present, the frequency of intense road congestion, the excessive time required to bring goods to port or to unload them and the inadequacy of a country's per capita electrical generating capacity. Others reveal the sharp differences in infrastructure availability between urban and rural areas or the increasing logistical costs experienced by enterprises." (Centennial Group, 2009:8)

In this sub-section, we present the alternative evidence of underinvestment on core infrastructure (*e.g.*, roads, public transit, and water and wastewater systems). We focus on core infrastructure because more information is available and, unlike other forms of infrastructure (*e.g.*, electrical grids, telecommunications systems, rail, etc.) which involve a significant amount of private investment, core infrastructure is still almost entirely composed of public capital.

Commuting Time and Congestion

Average commuting time, the level of congestion and related indicators also provide evidence related to the need for infrastructure investment. Among 218 major cities in the world included in the TomTom Traffic Index, Vancouver ranked 20th in terms of the overall congestion level followed by Toronto (47th), Ottawa (59th), Montreal (75th), Edmonton (97th), and Calgary (101st) (Table 2). However, the Canadian cities included in the rankings differed in terms of their

issue areas. For instance, Toronto, and Montreal were the worst performers in Canada in terms of highway congestion, while Vancouver was the worse in terms of non-highway congestion.

Table 2: Comparing Congestion in Canada's Largest Cities, TomTom Traffic Index, 2014

	World Rank (Out of 218 Cities)	Canadian Rank (Out of 7 Cities)	Increase in Travel Times Relative to a Free Flow Situation (Per Cent)				
			Congestion Level	Morning peak	Evening peak	Highways	Non-highways
Vancouver	20	1	35	53	66	13	41
Toronto	47	2	31	53	66	24	35
Ottawa	59	3	28	52	63	20	32
Montreal	75	4	27	48	57	22	30
Edmonton	97	5	23	31	43	10	27
Quebec	n.a.	6	23	44	62	15	30
Calgary	101	7	22	35	45	15	25

Source: TomTom Traffic Index

According to Statistics Canada data, "the average time spent commuting to and from work nationwide increased from 54 minutes in 1992 to 63 minutes in 2005. In a year, that adds up to about 32 working days spent sitting in traffic (five more than in 1992)" (Coyne, 2011). In 2010, one-way average commuting time was 33 minutes in Toronto, followed by Montreal (31 minutes), Vancouver (30 minutes), Ottawa-Gatineau (27 minutes), Calgary (26 minutes), and Edmonton (23 minutes) (Table 3).

There are various costs associated with congestion including: the opportunity cost of lost time; higher fuel costs; increased wear-and-tear on vehicles and infrastructure; increased stress levels; increased incidence of vehicle accidents; environmental degradation related to increased GHG emissions; the associated reduction in GDP and employment; and the negative health effects of increased air pollution. We will now discuss three studies that have attempted to quantify the cost of congestion in Canada.

In a study using data from Canada's nine largest urban areas, Transport Canada (2006) found that urban recurrent congestion in Canada cost between $2.3 billion and $3.7 billion in 2002 dollar values.[19] Of these total costs, more than 90 per cent was due to time lost in traffic, 7-8 per cent was due to the direct cost of increased fuel consumption, and 2-3 per cent was due to the increased social cost of GHG emissions.

The estimated costs of congestion in Canada's nine largest cities are quite conservative, as they exclude many other costs associated with congestion. In particular, according to Transport Canada (2006), the following costs are excluded from their estimates: non-fuel vehicle operating costs (*e.g.*, wear-and-tear); costs associated with the increase in air pollution and noise; costs borne by the freight transportation sector; the costs of off-peak congestion; and the costs of non-recurrent congestion (*e.g.*, congestion due to bad weather, vehicle accidents, etc.).

[19] The cities included in the study were: Québec City, Montréal, Ottawa-Gatineau, Toronto, Hamilton, Winnipeg, Calgary, Edmonton, and Vancouver.

Similarly, in a study conducted for Metrolinx, HDR (2008) estimates that the cost of congestion in the Greater Toronto and Hamilton Area (GTHA) was $6.1 billion in 2006, with $2.2 billion (or 36.9 per cent) due to the time cost to auto users, $0.34 billion (or 5.5 per cent) due to the time cost to transit users, $0.48 billion (or 7.9 per cent) due to increased vehicle operating costs, $0.26 billion (or 4.2 per cent) due to the cost of accidents, and $0.03 billion (or 0.5 per cent) due to the social cost of vehicle emissions, and $2.7 billion due (or 45.0 per cent) to the reduction in GDP.

Table 3: Average Commuting Time to Work and Proportion of Workers by Selected Characteristics, 2010

	Commuting time				
	Average	Less than 15 minutes	15 to 29 minutes	30 to 44 minutes	45 minutes or more
	minutes	percentage			
Total Canada	**26**	**30**	**33**	**19**	**17**
Type of region of residence					
Census metropolitan areas of 1,000,000 or more residents†	30	19	33	25	23
Census metropolitan areas of 250,000 to 999,999 residents	25*	29*	38*	18*	15*
Census metropolitan areas of less than 250,000 residents	19*	41*	39*	13*	7*
Census agglomerations	19*	49*	31	11*	10*
Outside of census metropolitan areas and census agglomerations	23*	41*	29*	15*	15*
Census metropolitan area					
Toronto†	33	15	33	25	27
Montréal	31	20	27	27	27
Vancouver	30*	22*	33	25	21*
Ottawa–Gatineau	27*	15E	50*	21	14E*
Calgary	26*	21E	33	29	16E*
Edmonton	23*	27*	41	20	12E*
Mode of transportation					
Car or private vehicle†	24	31	36	18	15
Public transit	44*	5*	21*	30*	43*
Active transportation (walking or cycling)	14*	57*	27*	14*	F*

Source: Turcotte (2011:27)

HDR has conducted similar studies for large metropolitan areas in the United States. For example, HDR found that the total cost of congestion was found to be $11.0 billion in New York City and $7.3 billion in Chicago in 2006 (HDR, 2008:2).

In a report prepared for the Toronto City Summit Alliance, it was estimated that the annual cost of congestion in the GTHA increased to more than $5 billion per year between 1986 and 2006, with $3 billion due to the direct cost of congestion and $2 billion due to the impact of congestion on economic activity (Toronto City Summit Alliance, 2010).

There is also evidence that congestion has negative effects on public health and the individual welfare of Canadians. For example, after analyzing the results of the General Social Survey in 2010, Turcotte (2011:31) found:

> "Much more than commuting time, traffic congestion leaves people very dissatisfied. In the absence of traffic congestion, a large majority of workers said they were satisfied or very satisfied with their commuting times. For example, 24% of those who had commuting times of 45 minutes or longer but never experienced traffic congestion said they were dissatisfied with that length of

> time. The proportion was substantially higher (64%) for those who spent the same amount of time commuting but were caught in traffic at least three days a week."

Furthermore, according to Turcotte (2011:34), 38 per cent of individuals who experienced congestion at least three days a week said that most days were quite or extremely stressful, well above the 25 per cent reported by individuals who never encountered congestion in their commutes. This undoubtedly has implications for health outcomes, well-being, and worker productivity, which are negatively related with stress.

In addition to increasing stress levels, congestion is also costly to public health. Traffic-related air pollution increases the exposure of individuals in nearby communities and the commuters themselves to air pollutants (Agence de la santé et des services sociaux de Montréal, 2006; WHO, 2000). Toronto Public Health (2007) estimated that traffic-related air pollution was responsible for about 440 premature deaths, 1,700 hospitalizations and 200,000 restricted-activity days per year in Toronto. The study estimates that the mortality-related costs are about $2.2 billion per year, and that a 30 per cent reduction in vehicle emissions in Toronto would save about 189 lives and $0.9 billion.

A wide range of policies has been put forward as a way to reduce congestion in major urban centres. These policies also have the effect of reducing GHG emissions and therefore are an integral part of a green growth strategy. Many of these policies are focused on increasing the cost of commuting by vehicle to encourage people to seek alternative modes of transport, such as public transit, walking or biking, and carpooling. These policies are briefly outlined below.

- The proliferation of road pricing through the construction of privately-owned roads and/or the introduction of road pricing on public roads. There are many types of road pricing regimes, which are discussed at length by the Victoria Transport Policy Institute (VTPI, 2014). We will discuss road pricing in greater detail later on in this sub-section.

- Raising the price of gasoline and other fuels through higher taxes and other means to increase the cost of commuting by personal automobile.

- The expansion of High Occupancy Vehicle (HOV) lanes, High Occupancy Toll (HOT) lanes, express lanes and other programs to encourage ridesharing. This would be more effective if combined with other incentives to change mode of transport like road pricing.

- The introduction of central area levies on personal vehicles entering certain areas (*e.g.*, the downtown core on weekdays), which could depend on the time or day, level of congestion, or vehicle class.

- An increase in public investment directed at roadway capacity expansion.

- Increased public investment to expand and improve public transit systems, including heavy rail, light rail transit, buses, streetcars, and subways. Again, this would be more effective if combined with road pricing, which would encourage a shift in mode of transport from personal automobile to public transit.

- The spread of roundabouts, one-way streets, designated bicycle lanes and other "traffic calming" strategies aimed at improving traffic flow.

- Encouraging alternative working arrangements, such as alternative work schedules (*e.g.*, flextime, compressed workweek, and staggered shifts) and alternative work locations (*e.g.*, satellite offices and telecommuting).

- Encouraging the adoption of "smart growth" policies which: 1) support the development of compact and livable communities within existing urban areas that are well-connected to the public transit system; and 2) discourage urban sprawl (VTPI, 2014).

- The introduction or increase of levies on commercial parking, particularly in central areas which are often the destination for daily commuters.

Public Transit and Roadway Expansion

The potential effect of increased investment in public transit on commuting times is uncertain. While shifting commuters from the roads to the public transit system should lower congestion on public roads, it could lead to either an increase or decrease in average commuting times. Since average commuting times are much higher for public transit users than for individuals who drive to work, a reallocation of commuters from cars to public transit may actually increase average commuting time (Table 4). It would only lead to a decrease in average commuting time if the decreased congestion on public roads from a decrease in the use of personal vehicles was large enough to offset this reallocation effect. However, even if increased use of public transit did not reduce average commuting times, it would likely reduce both GHG emissions and congestion.

Table 4: Mode of Transportation and Average Commuting To Work, Montréal, Toronto and Vancouver, 2010

	Mode of transportation			Average commuting time to work		
	Toronto	Montréal	Vancouver	Toronto	Montréal	Vancouver
	percentage using public transit			minutes		
Mode of transportation						
Car†	...	...	...	29	30	25
Public transit	...	...	...	49*	39*	48*
Place of residence						
Central municipality†	29	41	32	33	28	27
Neighbouring municipalities	16*	11E*	17*	33	34*	31

Source: Turcotte (2011:29)

It may be difficult to encourage people to switch from cars to public transit since the former is often much quicker. Governments need to find way to increase the proportion of people using public transit. The easiest way to do this is to increase the cost associated with driving to work; this could be done by imposing higher taxes on gas and/or introducing tolls compressive road pricing regimes. Therefore, increased investment in public transit may be more effective in

reducing congestion and GHG emissions if done in conjunction with the introduction of measures to raise the cost of commuting in personal vehicles.

Duranton and Turner (2011) investigate the effect of provision of roads or public transit on vehicle-kilometers traveled (VKT) in the United States using city-level traffic data for the 1983-2003 period. They found that "VKT increases proportionately to roadway lane kilometers for interstate highways and probably slightly less rapidly for other types of roads" due to "increases in driving by current residents, increases in commercial traffic, and migration" (Duranton and Turner, 2011:2616). Duranton and Turner suggest that their findings support the existence of a "fundamental law of road congestion", where the extension of road is met with a proportional increase in traffic. They also found that the provision of public transportation had no significant effect on VKT. Consequently, Duranton and Turner (2011: 2645) suggest that neither road capacity expansion nor investment in public transit will reduce congestion, which "leaves congestion pricing as the main candidate tool to curb traffic congestion."

There is broad agreement that road capacity expansion is not an effective way to reduce congestion. It provides modest (if any) reduction in congestion, since a significant portion of added capacity is often filled with generated traffic during peak periods (VTPI, 2014; Coyne, 2011) (Table 5). In other words, an initial reduction in congestion levels from road capacity expansion will, sooner or later, generate additional traffic during peak periods. Ultimately, congestion is nearly as bad as it was before the investment. Road capacity expansion is "impeded by high costs, shortage of space in large cities, and local opposition" (Lindsey, 2009:285).

Table 5: Generated Traffic

Significant Generated Traffic	Depends on Circumstances	Little or no Generated Traffic
Flextime	Access Management	Road Pricing
Roadway Capacity Expansion	Intelligent Transportation Systems	High Occupancy Vehicle Priority
Highway Grade Separation	Commute Trip Reduction Programs	Distance Based Fees
Intersection Improvements	Transit Improvements	Freight Transport Management
Incident Detection and Management	Rideshare Programs	Speed Limit Enforcement
Motorist Information Systems	Traffic Calming and Roundabouts	
Ramp Metering	Vehicle Restrictions	
One-Way Streets		
Reversible Lanes		

Note: This table indicates whether a policy is likely to generate additional vehicle travel.
Source: Victoria Transport Policy Institute (2014)

There is less of a consensus concerning whether public transit expansion is able to reduce congestion. While Duranton and Turner (2011) and many other studies have found that public transit expansion is not an effective way to combat congestion, a compelling paper by Anderson (2014), which examined the effect of a sudden strike by Los Angeles transit workers in 2003 on traffic conditions, found that average highway delay increases 47 per cent when public transit

service ceased. Anderson concludes that public transit is much more effective in reducing congestion than previously suggested.

The Role of Road Pricing

Road pricing is broadly recognized as one of the most effective and efficient ways to reduce congestion. According to Lindsey (2009), road pricing can play three important roles: 1) serving as a Pigouvian tax to alleviate congestion and other traffic-generated externalities; 2) providing a signal to guide efficient investment decisions; and 3) supplying municipalities with revenues to either fund new infrastructure projects or to reduce reliance on more distortionary revenue sources. However, the case for road pricing as a Pigouvian tax depends on the severity of the negative externalities and whether it is feasible for commuters to change their mode of transportation (Lindsey *et al.*, 2008). While it is clear that traffic-related externalities are large – as demonstrated by the literature on the cost of congestion –, the ability of commuters to change their travel plans is contingent on the availability of public transit. Therefore, improved public transit systems are an essential part of an effective strategy to reduce congestion.

As described by Lindsey *et al*. (2008:245), road pricing is a broad concept which can take many forms:

> "Road pricing can be implemented in various ways: on individual links (traffic lanes or roads), on networks of links, within areas (the city center), and in a comprehensive manner through distance-based or time-based charges and/or satellite technology. The choice is driven by technological, practical, legal, institutional, and acceptability constraints, which may evolve exogenously or endogenously over time."

However, if road pricing is to be most effective in reducing congestion, fees should be higher during peak congestion periods. It is considered to be one of the most effective ways of reducing congestion because it leads to little (if any) generated traffic (Table 5). However, it is important to note that "road pricing applied on just one roadway may cause traffic to shift routes, increasing traffic congestion on other roads" (VTPI, 2014). Therefore, the adoption of comprehensive road pricing regimes (*i.e.*, road pricing on most major roads) or the introduction of distance-based fees may be more effective in reducing overall congestion levels.[20]

Although it is distinct from road pricing, distance-based fees have a similar effect on traffic. Distance-based fees are charges that depend on the number of kilometers driven over a particular period. By raising the marginal cost of driving, they should reduce the number of kilometres driven by motorists. These fees can be built into vehicle insurance or registration. Unlike road pricing, distance-based fees affect all travel, not just travel on specific roads or in certain areas. As a result, distance-based fees "provide congestion reduction benefits on surface streets without shifting traffic to other routes" (VTPI, 2014).[21]

[21] Note that distance based fees which do not incorporate time or location are not as effective as charging a fuel tax. A fuel tax amounts to a distance based fee, as it is proportional to the distance driven, but has the added bonus of encouraging fuel efficiency.

[21] Note that distance based fees which do not incorporate time or location are not as effective as charging a fuel tax. A fuel tax amounts to a distance based fee, as it is proportional to the distance driven, but has the added bonus of encouraging fuel efficiency.

The Ecofiscal Commission (2014) has recently recommended the adoption of road pricing to reduce GHG emissions. In particular, the Commission advocated for road congestion pricing and municipal user fees. They note that, since access to roads and other municipal infrastructure is free, there is natural tendency toward overconsumption of these resources. By putting a price of the use of roads, users will have an incentive to limit their usage.

A provocative article by Coyne (2011) makes the case for the introduction of widespread road pricing to combat congestion and reduce GHG emissions. Coyne argues that increased investment in public transit will not have a large effect on congestion, because increased availability of public transit will not necessarily lead to increased use by commuters. Furthermore, he asserts the expanding road capacity will not lead to any long-term reductions in congestion, as previously discussed. Given the uncertainty surrounding the effectiveness of public transit improvements and the purported ineffectiveness of roadway expansion, Coyne believes that road pricing is the only feasible policy response. He also notes that something like a GST tax credit could be introduced to compensate low-income households for cost of tolls on public roads, as road pricing is inherently regressive.

Given the inherent political sensitivities surrounding the introduction of tolls on public roads, it may be easier for governments to encourage the construction of private roads like the 407 ETR. As of 2008, there were only nineteen tolled facilities (both private and public) in Canada, twelve of which were bridges or tunnels between Ontario and the United States (Lindsey *et al*., 2008). Fees vary by vehicle type at all facilities, while electronic tolling was used at only six facilities. The 407 ETR was the only facility where fees varied by time of day (which is a much better way to reduce congestion at peak periods than having a time-invariant toll). In sum, there is a great deal of room to increase the coverage of road pricing in Canada.

Public-Private Partnerships (P3s)

Public–private partnerships are a long-term, performance-based approach to procuring public infrastructure that is funded and operated through a partnership of government and one or more private sector companies. P3s can take on many different forms, but they generally involve government contracting the construction and maintenance of infrastructure or the provision of public services to a firm (or consortium of firms) in the private sector. While many infrastructure projects have traditionally involved contracting firms in the private sector for construction, P3s are different in that they involve bundling the contracting of several tasks related to a project together and often involve a significant role for private sector partners in financing the projects.

P3s may leverage private sector investment, skills, and innovation to produce significant cost savings for the public. However, they are not always the best option. De Bettignies and Ross (2004) provide an overview of major factors which should be considered when determining if a P3 would be beneficial:

- *Ex Ante* Competition – In most cases, the private service provider will become a monopolist once selected, so any competition over service provision will need to occur before selection occurs. Consequently, is important that there be a sufficient number of feasible bidders who are capable of providing the service.

- Scarce Skills – The private sector may possess skills not available within the public sector. If these skills will be required throughout the life of the project, government may wish to assign these tasks to a partner in the private sector with the required skills in a way which provides incentives to utilize these skills efficiently.

- Poor Labour Relations – The private sector may offer a more efficient, flexible, and appropriately skilled labour force through better labour-management practices.

- Innovation – The private sector may be more innovative than the public sector. If this is the case, projects which may require novel approaches and creative thinking over an extended period of time may be better provided by the private sector.

- Risks – Public private partnerships are desirable if reallocation of risk from the public to the private sector would be advantageous. For example, the private sector may be better at handling construction-delay risk. If the private sector provider has some control over the level of risk, transferring the consequences may provide it with incentives to reduce these risks

- Economies of Scale – If the private sector is undertaking similar projects for other clients, a P3 may reduce costs through economies of scale.

- Measurability of Quality – There are some concerns that the quality of services will fall if provided by the private sector because it will have incentives to sacrifice quality if it would raise profits. If quality is easy to observe and measure, than this concern could be mitigated by stipulating the required quality when the partnership is formed. If measurement of quality is a serious problem, a P3 may be less desirable.

- Complementarities – If there are several tasks to be performed which can be done more efficiently by a single party than by two separate entities (for example, design and construction), then bundling contracts to the private sector through a P3 could be advantageous.

- Constraints on Public Sector Borrowing – P3s can spread government expenditures on a project out over a longer period of time by sharing the burden of financing initial construction with the private sector. Even if the public sector can borrow funds at a lower rate on average, the private sector may have a lower marginal borrowing rate (for example, if further borrowing might risk harming the government's credit rating).

Many public infrastructure projects in Canada now take the form of P3s. Some examples include the Barrie Transit Facility Project, the Biosolids Energy Centre in Victoria, the Edmonton Light Rail Transit System, and the Iqaluit International Airport Improvement Project.[22]

Infrastructure Audits

The Federation of Canadian Municipalities' (FCM) 2012 *Canadian Infrastructure Report Card* provides a detailed assessment of the current state of municipal infrastructure in Canada (FCM, 2012a). The report looks at four primary municipal-infrastructure asset categories: 1) drinking-water systems; 2) wastewater networks; 3) stormwater networks; and 4) municipal roads. To conduct this assessment, the FCM conducted a survey of 123 municipalities across Canada which asked representatives of each municipality to rate the physical condition of each asset type from very poor to very good.

Table 6: Physical Condition Assessment of the Infrastructure in Canadian Municipalities, Federation of Canadian Municipalities (2012)

Infrastructure	Replacement value of all assets (2009-10) (Note 1)	Rating (Note 2)	Assets in very poor and poor physical condition (Note 3)		Assets in fair physical condition (Note 3)	
			%	Replacement value	%	Replacement value
Municipal roads	$173.1 billion	Fair: requires attention	20.6%	$ 35.7 billion	32.0%	$ 55.4 billion
Drinking water	$171.2 billion	Good: adequate for now	2%	$ 3.4 billion	13.1%	$ 22.5 billon
Wastewater	$121.7 billion	Good: adequate for now	6.3%	$ 7.7 billion	25.7%	$ 31.3 billion
Storm water	$69.1 billion	Very good: fit for the future	5.7%	$ 3.9 billion	17.2%	$ 11.9 billion
Total	$538.1 billion			$50.7 billion		$121.1 billion

Notes:
1. The national level asset-replacement values were extrapolated using the asset-replacement values and the population served reported by all respondents, based on 33.7 million as the population of Canada for 2009-2010.
2. The ratings represent a distribution of the physical condition of the infrastructure (system or network), which comprises assets with long service lives. A well-managed system contains assets at various stages of deterioration that require different types of interventions (maintenance, repairs, rehabilitation or reconstruction) to provide the required level of service at the optimal cost. The ratings do not consider the capacity of the infrastructure to meet demand, since the data collected in this category was insufficient.
3. Not all respondents use inspection data to evaluate the condition of their infrastructure. When no inspection data was available, respondents in most instances used the opinions of qualified individuals to assess the condition of their infrastructure. This is generally the case for underground infrastructure, particularly stormwater and wastewater systems.

Source: Federation of Canadian Municipalities (2012a:20)

The report gave municipal infrastructure mixed grades: about 30 percent of municipal infrastructure ranked between "fair" and "very poor", driven by poor conditions in the largest component of municipal infrastructure, municipal roads (FCM, 2012a:64).

[22] Examples taken from P3 Canada's Project Map, http://www.p3canada.ca/en/about-p3s/project-map/

Among the four asset categories, drinking water and wastewater infrastructure were in "good" condition. According to the FCM (2012a:63), the municipalities surveyed generally reported that drinking water and wastewater infrastructure were in "good enough physical condition to meet current public needs and minimum performance standards." Stormwater infrastructure was in the best condition, receiving an overall rating of "very good" (Table 6).

In contrast, the municipal roads were generally in significantly worse condition across Canadian municipalities. Most importantly, the FCM (2012a:64) found that municipal roads require immediate attention, giving them an overall grade of "fair" meaning that the infrastructure "shows general signs of deterioration and requires attention, with some elements exhibiting significant deficiencies." Worryingly, 32 per cent of the surveyed roads were in "fair" condition and 20.6 per cent were in "poor" or "very poor" condition (FCM, 2012a:64).

The FCM (2012a:64) also demonstrates "the cost of delaying infrastructure repairs, rehabilitation or renewal." They emphasize the "importance of having an asset-management system in place, in order to establish practices that will increase the longevity of the assets and optimize investments in maintenance and rehabilitation" (FCM, 2012a:64).

In another report, the FCM provide a set of policy recommendations for the federal government designed to improve the condition of municipal infrastructure (FCM, 2012b). They provide a long list of policy recommendations, which is outlined below.

- Ensuring that funding is long-term and predictable;
- Investing to leverage additional funds from different levels of government;
- Renewing and improving the Gas Tax Fund and the Building Canada Fund;
- Creating a new Core Economic Infrastructure Fund to finance investments in core economic infrastructure (*e.g.*, transit, roads, bridges, water, wastewater, stormwater, etc.);
- Investing in public transit to reduce congestion;
- Explore public-private partnerships (P3s) and alternative financing options;
- Invest in innovative infrastructure.

d. Policy Recommendations

There are three important takeaways from this discussion. First, public investments in infrastructure have the potential to improve economic growth and well-being. Second, the need for additional infrastructural outlays is overwhelming in the face of existing infrastructure gaps (which are largest for municipal roads) and future policy challenges (such as climate change and trade diversification). Third, there is a great deal of uncertainty concerning the rate of return to public infrastructure investment, which highlights the importance of fostering the capacity of governments to conduct rigorous cost-benefit tests. To ensure a higher rate of return,

governments should focus on strategic investments that reduce trade barriers and extend the lifespan of productive infrastructure.

Recommendations related to public investment are outlined below.

- Governments should also take a holistic approach when evaluating the desirability of individual projects that looks beyond its impact on GDP and employment at its impact on health, safety and environmental outcomes, ensuring that their public investment strategy fits within a framework for green and inclusive growth.

- Consider the introduction of road pricing on public roads and encourage investment in highways like the 407 ETR in the GTHA to lower GHG emissions and provide low-congestion alternatives to commuters. Toronto City Summit Alliance (2010) suggests that tolls on GTHA highways would raise $1-2 billion in revenues, relieve congestion and encourage the use of public transit.

- Increase investment in public transit in an attempt to make it a feasible and desirable alternative for commuters. This should involve taking steps to shorten the average commute by public transit relative to driving.

- Extend the use of high-occupancy vehicle (HOV), high-occupancy toll (HOT) and express lanes to reduce both congestion and GHG emissions.

- Increase the availability of bicycle lanes in metropolitan areas to reduce congestion and GHG emissions and improve public health.

- Governments should take advantage of low interest rates and the current output gap to increase public investment. Given the lower interest rate at which the federal government can borrow, provincial governments should negotiate agreements with the federal government to access capital at these lower rates.

- Dedicate adequate funds to infrastructure maintenance and investment. It is much less expensive in the long run if more is spent in the short term to ensure that the lifespan of infrastructure is extended.

- Governments should conduct regular, comprehensive audits of the state of public infrastructure to identify the infrastructure gaps and prioritize investment spending.

- Consider P3s and other non-traditional forms of investment to leverage private investment as these leveraged funds mean higher levels of investment in infrastructure can be achieved. These alternate forms of investment should be done while seeking more opportunities to levy user fees.

- All infrastructure projects should be subject to rigorous cost-benefit studies and only be approved if they pass such tests.

- Public investment should focus on trade gateways and other "strategic investments" such as investment in pipeline and rail infrastructure to prevent bottlenecks for grain, oil, ore, and other products being shipped to market, as well as trade gateways like the Detroit River International Crossing.

- Promote the dissemination of best practices related to infrastructure management and investment across provinces and cities.

- Public investment policies should aim to meet multiple societal objectives, including the improvements of economic growth and well-being, as well as the reduction of GHG emissions. Well-designed public investment policies must be at the heart of any green and inclusive growth strategy.

- Remove remaining barriers to infrastructure investment, particularly for private investment and foreign direct investment.

C. Technological Change and Innovation

i. Trends in Expenditures on Research and Development in Canada: A Sorry Story

Research and development (R&D) is defined as the discovery of new knowledge and the application of this knowledge to fill market needs. Since new technologies are a major source of productivity enhancement, R&D is important to generating productivity growth. This section briefly summarizes expenditures on research and development in Canada at the national level between 2000 and 2014 and at the sub-national level between 2000 and 2012. A more detailed analysis of the data, which includes comparisons with other OECD countries, is presented in Appendix C.

Table 7 presents a summary of overall trends in R&D intensity by performing sector in 2000, 2008 and 2014. Between 2000 and 2014 gross domestic expenditures on research and development (GERD) intensity fell 0.32 percentage points from 1.87 per cent to 1.55 per cent of GDP. The fall in business expenditures on research and development (BERD) intensity of 0.35 points accounted for more than the overall GERD decline because of the increase in higher education sector expenditures on research and development (HERD) intensity (0.53 per cent to 0.63 per cent).

If one focuses on the more recent 2008-2014 period, the situation changes. The fall in GERD intensity is again 0.35 points, the same as the 2000-2014 period since there was no change in GERD between 2000 and 2008 when rising HERD intensity offset falling BERD intensity. Since 2008 R&D intensity in all three performing sectors has fallen: 0.23 points for BERD, 0.05 points for HERD and 0.05 point for government sector expenditures on research and development (GOVERD).

Table 7: Summary Table on R&D Intensity Trends by Performing Sector

	GERD					
	GERD	BERD	HERD	GOVERD		
				GOVERD	FERD	PERD
2000	1.87	1.13	0.53	0.204	0.189	0.015
2008	1.87	1.01	0.66	0.180	0.158	0.022
2014	1.55	0.78	0.63	0.132	0.117	0.015
Change 2000 to 2014						
Δ(2000-2014)	-0.32	-0.35	0.10	-0.072	-0.072	0.000
Contribution to Change	100.0	109.4	-31.3	22.5	22.5	0.00
Change 2008 to 2014						
Δ(2008-2014)	-0.32	-0.23	-0.03	-0.048	-0.041	-0.007
Contribution to Change	100.0	71.9	9.4	15.0	12.8	2.2
	Per Cent Distribution					
2000	100.0	60.4	28.3	10.9	10.1	0.8
2008	100.0	54.0	35.3	9.6	8.5	1.2
2012	100.0	50.3	40.7	8.5	7.6	1.0

Note: Federal government sector expenditures on research and development (FERD) and provincial government sector expenditures on research and development (PERD) add up to GOVERD.
Source: CSLS calculations based on CANSIM 384-0038 and 358-0001.

There are a number of additional conclusions that can be drawn from this analysis of R&D trends in Canada, including:

- Despite all the policy energy that has been focusing on boosting R&D in recent years, Canada's GERD intensity by 2014 had receded to the level it was at in 1987; BERD intensity has declined to the level last seen in 1992; and GOVERD intensity is at a historic low.

- It is not just in terms of the share of nominal GDP that R&D has fallen, but also in absolute terms. GERD in 2014 at $30.6 billion was down 2.9 per cent from a peak of $31.5 billion in 2011, BERD was down 6.9 per cent from its 2011 peak, and GOVERD is down 21.7 per cent from its 2010 peak.

The provincial R&D data show major shifts in regional performance.

- The collapse in GERD intensity in Canada between 2000 and 2012 (the most recent year provincial R&D data are available) was a Central Canadian phenomenon. While GERD intensity in Quebec and Ontario fell from an average 2.37 per cent in 2000 to 2.15 per cent in 2012, it rose from 1.09 per cent to 1.10 per cent in Atlantic Canada and from 1.06 per cent to 1.13 per cent in Western Canada. GERD intensity still remains twice as high in central Canada as in the rest of the country.

- By 2012 HERD intensity had surpassed BERD intensity in five Canadian provinces: Newfoundland and Labrador, Nova Scotia, New Brunswick, Manitoba and Saskatchewan.

- Provincial government expenditures on R&D (PERD), which represent only 1 per cent of total GERD, are very unevenly concentrated. In 2012, Alberta accounted for 44.6 per cent of PERD and was responsible for 74.3 per cent of the increase in total PERD spending between 2000 and 2012.

ii. Trends in Canadian Patenting

In order to incentivise the creation of new inventions, patent governing bodies grant firms and individuals patents for an invention to give them temporary rights (usually 20 years) to that invention (Hall and Harhoff, 2011).

In this section, patenting trends by Canadians will be examined in order to shed light on trends in innovative activity, under the assumption that the number of patents granted is indicative of the amount of innovation in a country. When using patents to assess the innovation in a country, it is important to keep in mind that a large increase in the number of patents may not necessarily correspond to a higher degree of innovation. Some patented inventions may have few applications and as a result, may not reflect innovation that can be put to use. There may also be factors which change the incentive to patent inventions without actually changing the amount of invention. Still, it is generally assumed that a greater number of patents likely corresponds to greater innovative activity

Table 8: Number of Patents Granted by the USPTO to Canadian Inventions, by Inventor(s), 1980-2012

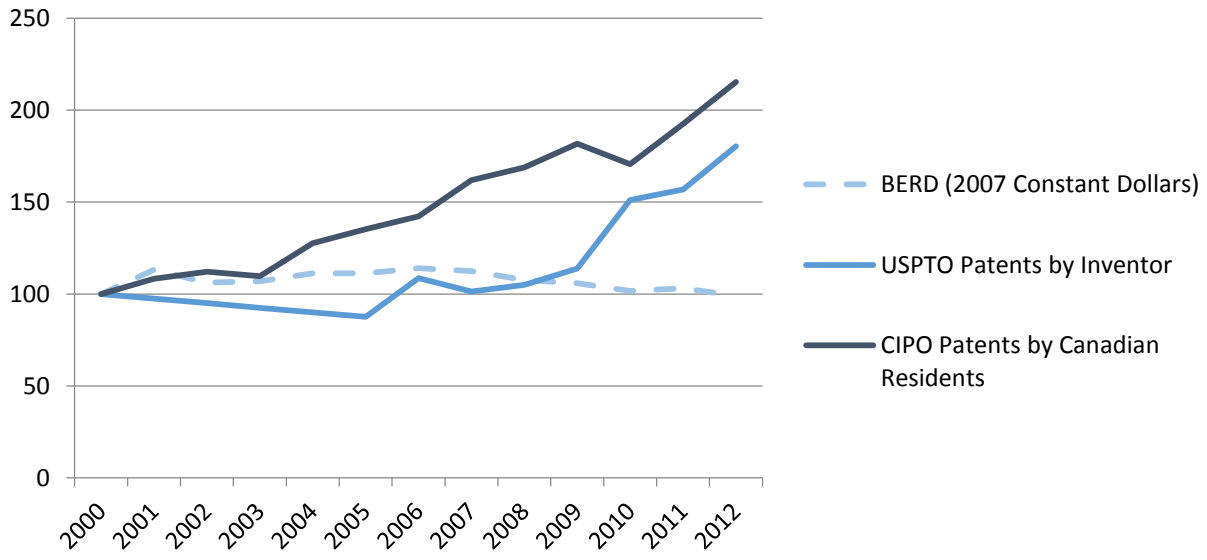
	USPTO Patents by Inventor	CIPO Patents by Canadian Residents
1980	1,140	1,450
1990	1,961	1,109
1995	2,239	743
2000	3,779	1,117
2005	3,307	1,511
2006	4,107	1,588
2007	3,827	1,809
2008	3,966	1,886
2009	4,300	2,029
2010	5,709	1,906
2011	5,926	2,150
2012	6,812	2,404
% Change 2005-2012	68.3	59.1
Annual growth rate, 2005-2012	7.7	6.9

Source: Rodrigues (2015)

In contrast to falling expenditures on research and development, the number of patents granted to Canadian inventors by the United States Patent and Trademark Office (USPTO) has

increased in recent years (Table 8 and Chart *15*).[23] The number of patents granted to Canadian inventors by the USPTO has nearly sextupled from 1,140 patents in 1980 to 6,812 patents in 2012. The (compound) average annual growth rate of USPTO patents to inventors increased from 5.6 per cent in the 1980-1990 period to 6.8 per cent in the 1990-2000 period. This growth stalled in the early 2000s, as the number of patents shrank, but the number of USPTO patents invented by Canadians improved dramatically after 2005, growing at an annual rate of 8.8 per cent from 2006 to 2012.

Chart 15: Indices of CIPO, USPTO Patents Granted to Canadian Inventors, and Nominal BERD Investment, 2000-2012 (Year 2000=100)



Source: Rodrigues (2015) and Appendix Table C5

Is the recent explosion in patenting inconsistent with declining expenditures on R&D? Rodrigues (2015) offers several suggestions as to why these two measures of innovative activity in Canada may display divergent trends:

- Rising patents represent the beginnings of a new innovation supercycle
- The number of patents granted in a given year does not necessarily reflect the level of business sector R&D in that year, but instead reflects the level of investment in previous years. There is a lag of about 3 years between when a patent application is filed and when the patent is granted. There is an additional lag between when R&D occurs and when the

[23] The number of Canadian patents varies depending upon which patent granting organization is considered and how one classifies the nationality of the patent. The figures cited here are based upon the nationality of the inventor, but this can differ from the nationality of the assignee, the patentholder who gains the right to commercialize the invention. This section is based on a larger analysis by Rodrigues (2015) which considers three different granting agencies (USPTO, Canadian Intellectual Property Office, and Triadic patents) with classifications by both assignee and inventor. The trend of patent growth is also observable in CIPO data and with USPTO patents by inventor, although rates of growth vary. Data limitations prevent analysis of the Triadic patents past 2008, so it is not clear if these spiked like USPTO patents did between 2009 and 2012.

application is filed, but it is unclear how long this lag tends to be. These lags may obscure the true relationship between R&D spending and patents.

- A given dollar of R&D expenditure may produce more patents now than it did in the past. This may due to the increases in technological efficiency that allow for more innovative activity at a lower cost, thereby leading to a greater number of patents with less investment spending involved.

- The number of patents issued may have increased due a greater importance of patenting in a few specific industries. For example, recent years have seen an increase in patent filings in electrical engineering, telecommunications and computer technologies (Hall et al, 2012). Due to their technical nature, these areas of innovation tend to rely less on secrecy and more on patenting. In the past, secrecy may have been a more viable option to protect less technical innovations.

- The answer may lie in compositional changes in R&D spending. For example, it could be that R&D spending has increased in a few specific sectors (ie ICT) where a dollar of research spending results in a relatively large number of patents while R&D spending has fallen in areas where relatively few patents are generated per dollar spent.

- R&D expenditure not linked to intellectual property may be another reason patenting has been increasing while the level of business sector R&D expenditures has been decreasing. Perhaps R&D spending could be divided into two types: spending related to patents and spending which does not. It may be that spending in R&D related to patents rose, increasing patents in recent years, but that this has been obscured by a large reduction in the components of R&D spending unrelated to patenting.

- Perhaps BERD is the wrong measure of R&D spending. Maybe spending on research by academics (HERD) is very important for patenting. While BERD has fallen since 2000, HERD has increased.

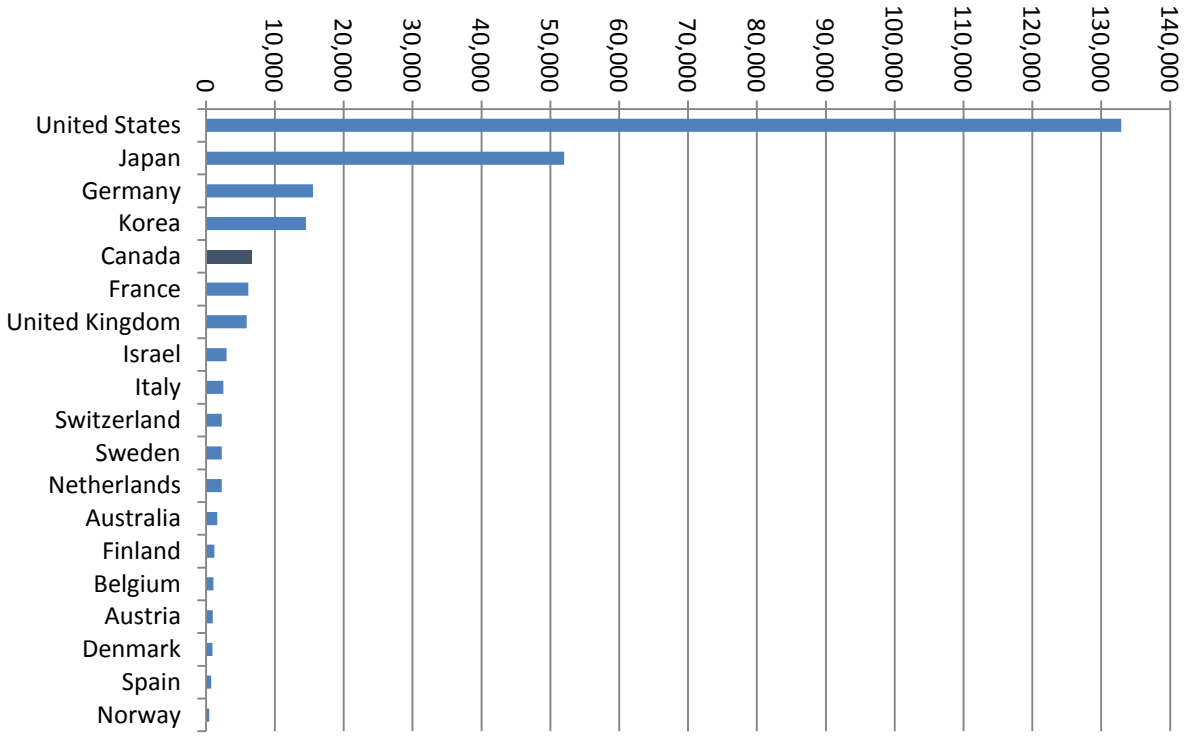
When compared internationally, Canadians are strong performers in terms of patents granted by the USPTO. Out of 34 countries, Canada ranked 5th in terms of the total number of USPTO patents granted by inventor's country of residence. Keep in mind that many of the countries which Canada is being compared to have much higher populations.

The USPTO data also reveals some interesting trends regarding the types of Canadian inventions which are being developed and patented. Canada's inventors were granted the largest share of patents in the physics category with 32.4 per cent of total patents in 2013 (Rodrigues, 2015). The second highest number of patents is found under the electricity classification with a share of 27.8 per cent of total USPTO patents issued to Canadian invented products in 2013. The relatively high share of patents under these two classifications may be regarded as an indication of a greater degree of innovation in these categories. In addition to having the largest shares of USPTO patents issued to Canadian inventors, the physics and electricity categories also exhibited the largest increase in shares between 2003 and 2013.

Furthermore, in 2012, information and communication technology (ICT) patents accounted for just over half of all USPTO patents issued with Canadian inventors at 51.4 per

cent in 2012. Between 2000 and 2012, the share of USPTO patented ICT inventions out of total USPTO patented inventions almost doubled, increasing from 26.2 per cent in 2000 to 51.4 per cent in 2012.

Chart 16: Total Patents Granted at the USPTO by Inventor(s)'s Country(ies) of Residence and Date of grant, OECD Countries, 2013



Source: Rodrigues (2015), OECD Patents Statistics, http://stats.oecd.org/Index.aspx?DatasetCode=PATS_IPC#

Patents are important to innovative activity because they encourage innovation and promote the exchange of technological information. In exchange for a temporary monopoly, patent holders disclose details of their invention as well as any previous research that led to the creation of said invention to the public (Brydon et al, 2014). This structure is aimed at rewarding innovation while simultaneously disseminating new knowledge that can lead to further innovation. Once the patent has expired, those who are 'skilled in the art' may replicate the invention or modify it, thereby allowing for faster diffusion of the innovation and potentially rendering it more efficient (Hall et al, 2012). Moreover, a patent holder may issue a licence[24] to a party that discovers an alternate use for their invention or a use[25] that the patent holder is not in a position to put into practice (Nelson and Mazzoleni, 1997). The discoveries of these alternate uses are usually made possible by the information contained in a patent, thus illustrating the social benefits patents carry.

[24] A patent license allows the owner of the license to use the invention or process in a way that would otherwise infringe on the patent. In return, the patent holder may receive royalties. It is important to note that the license does not transfer ownership of the patent. (From OECD 'Glossary of Patent Terminology')

[25] Can be the same use as the original patent holder. For example, a patent holder may lack the financing, resources, or expertise to mass produce an invention, but could issue a license to a firm which is not constrained in these ways.

There is no consensus among experts as to how Canadian intellectual property policy should change, if at all, to promote innovation and productivity growth. Consequently, we do not offer any recommendations regarding intellectual property other than researching the effectiveness of Canada's intellectual property policies.

iii. Policies Related to Innovation: An Array of Options

Canadian provincial governments have a clear motivation to improve Canada's innovation track record, given the link between innovation, productivity and wages. Moreover, there is an impetus for government involvement in fostering business R&D because of the vast array of empirical evidence that suggests that the benefits of R&D are not exclusive to the innovator. The "existence of spillovers means that a dollar of R&D investment by a firm returns greater value to the economy at large, and not just to the investing firm alone" (Jenkins, 2011, 3-1). Hence, it seems obvious that governments should provide incentives, such as "tax credits, grants and advisory services to induce firms to perform more R&D than they otherwise would" (Jenkins, 2011, 3-1). However, fostering higher levels of R&D in the business sector requires an understanding of business strategy and how certain incentives will encourage business to behave in one way or another.

This section reviews the key contributions to the literature on innovation policy and discusses policy options that will encourage businesses to engage in more R&D, or alternatively, policies that will help foster an environment where R&D policies will be more likely to be successful.

a. Jenkins Report

The most comprehensive recent analysis of innovation policy in Canada is the Jenkins report, published in 2011. The report notes that, given the recognized observation that "necessity" is the "mother" of innovation, any recommendations for innovation policy in Canada will have "much more impact on Canada's economic performance if they are complemented by a suite of policies to foster competition as recommended by the Competition Policy Review Panel , also known as the Wilson (2008) panel" (2011:2-9). Sharpe and Currie (2008) have also noted that competitive intensity is a key driver of innovation and productivity, yet there are several sectors in Canada that remain protected against competition due to various regulations, including restrictive foreign ownership rules.

Jenkins (2011) has also pointed out that "Canada's innovation gap is partly an education gap" (2011:2-14). In order to improve innovation performance in Canada, it will be essential to improve Canada's performance in the creation of talented, educated and entrepreneurial people. Jenkins (2011) notes that this will demand a "collaborative approach that brings together our post-secondary institutions, federal and provincial agencies, as well as industry and other partners to ensure appropriate recruitment, training and deployment for industrial innovation needs". Canada may have strong post-secondary attainment compared to other OECD countries, but it falls behind in terms of Bachelor's degree completion and is one of the poorest performers in terms of the number of doctoral degrees per capita (2011:2-14).

More importantly, Canada will need to make an effort to offset the "brain drain", otherwise known as the departure of educated Canadians to higher paying countries. For example, Canada can offset this "brain drain" by either encouraging doctoral graduates to remain within Canada post-graduation or focusing on creating an immigration system that targets necessary skill sets, which will give Canada "an opportunity to leverage the skills, insights and entrepreneurial talents of those born in other countries who come to Canada" (2011:2-15).

Jenkins (20112-15) also notes that "collaboration among businesses, governments and the higher education sector can contribute importantly to the conception and successful introduction of new products and processes" (2011:2-15). An effective collaboration among businesses, government and higher education depends on a solid link between the "supply-push" of research and discoveries with the "demand-pull" of firms seeking to exploit the commercial potential of new ideas. Hence, a system and culture must be developed that will encourage a larger depth and breadth of collaboration between Canadian businesses, higher education institutions and governments.

The report contains six main recommendations, broken down into further sub-recommendations.

As a first recommendation, Jenkins (2011) suggests the creation of an Industrial Research and Innovation Council (IRIC), with a clear business innovation mandate.[26] IRIC would also be charged with aiming to enhance the impact of programs through consolidation and improved whole-of-government evaluation. Jenkins (2011) proposes IRIC as an arm's-length funding and delivery agency which would become the common service platform for all appropriate federal business innovation support programs.

More specifically, IRIC, under Jenkins' (2011) recommendations, would take over the delivery of the Industrial Research Assistance Program (IRAP) and a commercialization vouchers pilot program. With delivery of IRAP transferred to IRIC, the budget for IRAP would be increased to enable it to "build on its proven track record of facilitating innovation by small and medium-sized enterprises (SMEs) throughout Canada" (2011:E-9).

Moreover, IRIC would create a national commercialization vouchers pilot program that would help SMEs connect with approved providers of commercialization services in post-secondary, government, non-profit and private organizations. IRIC would also undertake the establishment of a "national "concierge" service and associated comprehensive web portal to provide companies with high-quality, timely advice to help identify and access the most appropriate business innovation assistance programs for the individual firm" (2011:E-9). This task is especially important because there are currently more than 60 programs across 17 different government departments (Robert, 2011). IRIC would also be responsible for leading the development of a "federal business innovation talent strategy, working closely with provinces and relevant federal departments and agencies". This talent strategy would be concerned with increasing business access to, and use of, highly qualified and skilled personnel.

[26] This would include the delivery of business-facing innovation programs, the development of a business innovation talent strategy, and other duties over time.

Finally, IRIC would be responsible for "consolidating business innovation programs focused on similar outcome areas into a smaller number of larger, more flexible programs, open to a broader range of applicants and approaches" (2011:E-9). Once consolidated, or even pre-consolidation, IRIC would be responsible for evaluating the effectiveness of business innovation programs. This evaluation process would ensure a proper resource allocation going forward.

The second recommendation from Jenkins (2011) concerns the appropriateness of the current mix and design of tax incentives and direct support for business R&D and business-focused R&D. Governments in Canada, especially the federal government, have been attempting for decades to boost business expenditures on R&D through tax credits and direct subsidies. The overall decline in business R&D spending suggests these programs have not been particularly successful. The federal government has the Scientific Research and Experimental Development (SR&ED) tax credit and all provincial governments, except Prince Edward Island, have their own R&D tax credit programs. A number of commentators have noted that government support for business R&D in Canada, relative to other OECD countries, is disproportionately through tax credits. In addition, the incremental impact of tax credits on business R&D spending has not been well documented.

Quite simply, Jenkins (2011) recommends a simplification of the "tax credit system used to support SMEs" (Robert, 2011). This recommendation for simplification consists of a number of sub-recommendations. First, Jenkins (2011) argues for a simpler compliance and administration system that is based on labour-related costs "in order to reduce compliance and administration costs" (2011:E-10). Second, the panel argues for more predictable qualification through Canada Revenue Agency's system of pre-approval of eligibility.

Table 9: Effective Tax Rates on R&D, Canadian Provinces, 2004

Province	**Effective Tax Rate on R&D (%)**					
	2004 (All)	2004 Provincial Contribution	2012 (Large)	2012 Provincial Contribution (Large)	2012 (Small)	2012 Provincial Contribution (Small)
Alberta	-40.3	-5.3	-49.5	-8.2	-79.6	-8.6
British Columbia	-96.6	-61.6	-48.8	-7.5	-78.0	-7.0
Saskatchewan	-153.5	-118.5	-54.3	-13.0	-82.0	-11.0
Manitoba	-142.0	-107.0	-59.6	-18.3	-85.0	-14.0
Ontario	-112.7	-77.7	-44.8	-3.5	-80.1	-9.1
Quebec	-202.0	-167.0	-55.0	-13.7	-93.6	-22.6
New Brunswick	-151.0	-116.0	-55.8	-14.5	-83.6	-12.6
Nova Scotia	-146.2	-111.2	-54.4	-13.1	-83.4	-12.4
PEI	-35.0	0.0	-41.3	0.0	-71.0	0.0
Newfoundland	-139.5	-104.5	-56.3	-15.0	-83.4	-12.4

Note: PEI does not have a tax credit, so PEI shows the impact of the federal tax credit by itself.
Source: McKenzie (2005) and McKenzie (2012).

Jenkins (2011) also advocates for a more accountable system, where the performance of the main tax incentive program, the Scientific Research and Experimental Development (SR&ED) program, can be more appropriately evaluated. Finally, Jenkins suggests that these changes be phased in so that the business sector has time to plan and adjust accordingly.

Table 10: Tax Credit Programs, Provinces, 2015

Province	Program	R&D Tax Credit
NFL	Newfoundland and Labrador research and development tax credit	Refundable 15% of Eligible Expenditures
NS	**Nova Scotia research and development tax credit**	Refundable 15% of Eligible Expenditures
NB	**New Brunswick research and development tax credit**	Refundable 15% of Eligible Expenditures
ON	**Ontario innovation tax credit**	Refundable 10% of Qualified Expenditures
	Ontario business-research institute tax credit	Refundable 20% of Qualified Expenditures
	Ontario research and development tax credit	Non-Refundable 4.5% of Eligible Expenditures
	Ontario transitional tax debits and credits	--
MN	**Manitoba research and development tax credit**	Refundable 20% of Eligible Expenditures
SK	**Saskatchewan research and development tax credit**	Refundable 15% of Eligible Expenditures
AB	**Alberta scientific research and experimental development tax credit**	Refundable 10% of Eligible Expenditures Maximum Credit of $400,000 Refundable for CCPCs 10% of Eligible Expenditures Maximum Credit of $300,000
BC	**British Columbia scientific research and experimental development tax credit**	otherwise Non-Refundable 10% of SR&ED Qualified B.C. Expenditures
QC	**Research and development wage tax credit**	Refundable 14-30% of Eligible Expenditures $3 million limit
	University research and development tax credit	Refundable 14-30% of Eligible Expenditures $3 million limit
	Tax credit on fees paid to a research consortium	Refundable 14-30% of Eligible Expenditures $3 million limit
	Private partnership pre-competitive tax credit	Refundable 14-30% of Eligible Expenditures $3 million limit
PEI	--	--

Source: Canada Revenue Agency (2015) and PWC (2015).

Jenkins (2011) focuses almost exclusively on the federal scientific research and experimental development tax incentive regime in Canada. However, less well recognized is the generosity of the tax credit systems offered by some Canadian provinces for R&D. The generosity and complexity of the tax systems by province vary widely, but their presence cannot go unmentioned (McKenzie, 2005 and 2012).

As a result of the combination of federal and provincial tax credits for R&D, in 2004, every province saw negative effective tax rates.

These negative effective tax rates were driven by tax credits for R&D of 10 per cent or higher in almost every province. In 2014, these tax credits are still in place.

Hence, there may be a case to be made to introduce policies that would better coordinate and simplify the tax credit systems available across Canada, especially if there are concerns over the geographic concentration of R&D.

The third large recommendation under the Jenkins (2011) report concerns procurement. Essentially, business innovation "should be one of the core objectives of procurement" (2011:E-11). This recommendation also involves a number of sub-recommendations.

First and foremost, innovation should be the primary objective of procurement policies. Second, procurement requests should leave room for creativity, instead of providing detailed specifications that leave little room for innovative proposals. Third, major Crown procurements should be planned and designed that will provide opportunities for Canadian companies to become globally competitive subcontractors. Fourth, targets should be established for departments and agencies concerning R&D expenditures, including a sub-target for SMEs. This would include the evolution of the Canadian Innovation Commercialization Program (CICP) into a more permanent, larger program that "solicits and funds the development of solutions to specific departmental needs so that the government stimulates demand for, and becomes a first-time user of, innovative products and technologies" (2011:E-11). Finally, avenues should be explored for collaboration between provincial government and municipal governments "regarding the use of procurement to support innovation by Canadian suppliers," while fostering government adoption of innovation products that will help reduce the cost and improve the quality of public services.

The fourth recommendation put forth by Jenkins (2011) concerns the National Research Council (NRC). Essentially, the panel argues for the transformation of the NRC institutes into a constellation of "large-scale, sectoral collaborative R&D centres, involving business, the university sector and the provinces, while transferring NRC public policy-related research activity to the appropriate federal agencies" (2011:E-12). Jenkins (2011) believes that this evolution would require (a) an industry-oriented non-profit research organization mandated to undertake collective R&D and commercialization projects and services, (b) an institute engaged in basic research to be affiliated with one or more universities, (c) a part of a non-profit organization mandated to manage what are currently NRC major science initiatives, and (d) an

institute or unit providing services in support of a public policy mandate. Jenkins (2011) proposes a structure, oversight and funding scheme in the report.

The fifth recommendation in the report prepared by the panel under Jenkins (2011) concerns the accessibility of risk capital. Essentially, Jenkins (2011) proposes the establishment of new funds in risk capital where there are currently gaps for the benefit of high-growth innovative firms in the start-up stage and in the later stages. The final, and sixth recommendation, of the Jenkins (2011) report is for the introduction of a federal voice that can engage with provinces in a dialogue concerning the improvement of the coordination of innovation policies and their impact in Canada. Jenkins (2011) suggests that a minister be identified in the Government of Canada with a mandate to put "business innovation at the centre of the government's strategy for improving economic performance" (2011:E-13).

The Jenkins report also suggests the creation of an external Innovation Advisory Committee (IAC) with a "mandate to provide whole-of-government advice on key goals, measurement, and evaluation of policy and program effectiveness, the requirement for new initiatives responding to evolving needs and priorities going forward, and all other matters requiring a focused external perspective on the government's innovation agenda" (2011:E-13). Finally, the report suggests that the minister responsible for innovation "engage provincial and business leaders in an ongoing national dialogue to promote better business innovation outcomes through more effective collaboration in respect of program delivery, talent deployment, sectoral initiatives, public sector procurement, appropriate tax credit levels and the availability of risk capital" (2011:E-13).

b. OECD Research

The Jenkins report is the most applicable innovation policy report for Canada, since innovation policy is explicitly what the panel was asked to address. However, there are many other innovation policy documents that have implications for Canada, despite not being explicitly directed at Canada.

For example, the OCED (2011:21) notes that "fostering innovation requires addressing the entire innovation chain". Hence, if Canada wished to foster innovation, it would be wise to complement the existing supply-side policies with "well-designed demand-side policies" (OECD, 2011:25). Demand-side policies essentially aim to address problems related to "market introduction and the diffusion of innovations" (OECD, 2011:16). For example, there may be information asymmetries, where producers are not aware of user preferences, or users are not aware of innovations. There may also be a lack of interaction between users and producers or perhaps a high cost of switching between technologies. There could also be high entry costs or difficulties ditching technological path dependencies, especially in areas where there are crucial network effects. The most common instruments of demand-oriented policies are (1) innovation-oriented public procurement and (2) innovation-related regulations and standards.

Therefore, the OECD (2011) recommends that Canada introduce more demand-side policies. This is similar to Jenkins third recommendation; although the OECD (2011) does not specify which demand-side policies should be implemented.

The reason for the OECD's omission of particular recommendations is the OECD's recognition of the importance of policy mix. As would be expected, "even when countries have similar policy goals, the respective instrument mixes can be expected to differ as these mixes need to be adapted to the specific environment in which they are intended to work" (OECD, 2011:22). It is important for Canada to strike the appropriate balance between supply-side and demand-side policies, while also considering the balance between direct and indirect support for R&D. In addition, Canada should consider the balance between the number of policy instruments deployed: with too few instruments, Canada's innovation policy will not sufficiently accommodate market failures; with too many instruments, inefficiency might lead to a system where Canada faces a high cost and reaps few benefits from innovation policy. Finally, Canada must also strike a balance between publicly-funded investment in cutting-edge R&D and publicly-funded support of their application and diffusion. Hence, Canada must focus more heavily on balancing innovation policy across its many dimensions: direct/indirect, number, demand/supply, and type. Given Jenkins' (2011) proposals and recommendations, this would likely be the responsibility of IRIC.

c. Bhide

Bhide (2008) provides a good example of the implementation of an analysis that attempts to balance innovation policies. He studied the United States' innovation and R&D record. He argues that the United States should put more emphasis on innovation in services sectors. He notes that innovation in services tends to be non-technical and occur in incremental forms, requiring less R&D. He also notes that many of these services in the United States (like health care) are not traded. Hence, innovation in services benefits domestic employees and consumers directly. His logic applies quite nicely to the Canadian context; Canada's services also account for a major share of GDP. Hence, it would be reasonable for Canada to encourage innovation in services sectors. However, fostering innovation in services requires a well-designed and well-organized innovation policy system, given that the nature of innovation and the form of incentives in this sector differs widely from other, mostly private, sectors. This recommendation is not closely linked to any of the recommendations in Jenkins (2011), but it has similarities to the third recommendation given the extent of government involvement in services in Canada and Jenkins' (2011) push for procurement.

Aside from persuasive arguments toward service sector innovation, Bhide (2008) also emphasizes the significance of non-scientific knowledge in the conception of economic value from invention (OECD, 2011:23). Since much of the "economic value of invention comes through their incorporation into existing products" (OECD, 2011:23), innovation policy must also foster and fund "solutions to engineering problems" and "the creation of new designs" that will put innovations into practice, while equally encouraging the development of pricing, marketing and distribution systems for new innovations and new products. Quite simply, Canada must give more emphasis to the "contribution of actors [who] do not produce patents or publications" (OECD, 2011:23). Their role in the translation of invention into living standards is "not given appropriate recognition" (OECD, 2011:23).

Strengthening evaluation of policies and programs aimed at stimulating R&D and innovation should be increasingly important in the Canadian context, according to the OECD (2011). Jenkins (2011) also proposed increased emphasis on evaluation. From the OECD (2011: 24) perspective, "all significant programmes should be required to develop a formal evaluation strategy." Focusing on evaluation is important given "increased emphasis on discretionary public spending, a greater focus on accountability and transparency in policy, and the desire to minimize distortions arising from government actions while maximizing their impacts" (OECD, 2011:23).

Hence in summary, from the point of view of the OECD (2011), Canada's emphasis on the R&D tax credit is both good and bad. The R&D tax credit is good because all "actors and activities engaged in R&D can benefit from government support" (OECD, 2011:25). No specific sector or area is given precedence. However, the R&D tax credit is bad because it is unclear whether or not R&D spending in Canada is generating significant deadweight loss. Lester (2012) conducted a cost-benefit analysis of the SR&ED and the Industrial Research Assistance Program (IRAP). He concluded that the regular SR&ED credit generates a net economic benefit, but the enhanced SR&ED credit and the IRAP were both found to fail the cost-benefit test. Furthermore, it is important that Canada consider whether the right balance between the R&D tax credit and more focused sector-specific R&D programmes has been struck. Finally, the R&D tax credit focuses on driving innovation, but one of Canada's key barriers to stronger innovation performance "does not appear to be a lack of knowledge, but a lack of take-up in the market and commercialization" (OECD, 2011:25). Therefore, "balancing the support for R&D with support for other important features of innovation" (support for venture capital, business angels, or high-growth firms) may "enhance some of the other dimensions of innovation" and thereby increase Canada' innovation performance record (OECD, 2011:25).

The CSLS (2005: 3), similarly to the OECD (2011), has also noted that "one key insight is that the diffusion of technologies is intrinsic to the innovation process, since learning, imitation and feedback effects help to further develop the initial innovation." Thus, while domestic R&D in Canada is important and public policy should continue to encourage innovative activity, there are two main reasons why the extent of domestic R&D does not explain the entire link between productivity and innovation. First, Canada represents a tiny proportion of the global total of innovation. If R&D is used as a proxy for global innovation activity, Canada accounted for less than 3 per cent of the total in 2003. Second, there are very few firms in Canada that actually perform R&D. In 2004, only approximately 10,000 enterprises, accounting for less than one per cent of all businesses in Canada, performed R&D. Despite not engaging in R&D, however, the other ninety-nine per cent of firms in Canada do take up new technologies. Hence, the link between innovation and productivity is not simply explained by the extent of innovation, it is also explained by the extent of diffusion and adoption of innovations by other firms. Quite simply, diffusion is the necessary ingredient in the innovation-productivity link; without diffusion, "innovation and commercialization would have little economic and social impact" (CSLS, 2005:5).

However, as pointed out by other authors and by the CSLS (2005), the adoption of new technologies in Canada is not as rampant as would be desirable from a productivity perspective.

Hence, identifying barriers to technology adoption and developing policies to overcome these barriers may help increase productivity growth in Canada.

Fortunately, Statistics Canada research has identified a number of barriers to technology adoption in manufacturing firms. For example, manufacturing establishments identified nine barriers to technology adoption, including (1) overall cost of technology adoption, (2) lack of financial justification, (3) cost of technology acquisition, (4) need for market expansion, (5) cost of education and training, (6) time to develop software, (7) cost to develop software, (8) lack of technical support, and (9) worker resistance. The CSLS (2005:15) also identifies the "lack of leadership across firms on average" as another potential barrier to technology adoption that was not captured by Statistics Canada. Many of these barriers are especially important for small and medium-sized firms. If policies targeted the dismantling of these barriers technological adoption and diffusion in Canada may actually increase.

Despite the strong case to be made for diffusion policies based on market failures such as imperfect information, market structure and externalities, Stoneman (2002) notes that there has been minimal government activity in this area. There are a few notable programmes aimed at SMEs to counter issues of imperfect information, including regional innovation centres that provide consultancy services; systems to facilitate the adoption of specific innovations and technologies; "attempts to cluster firms in particular locations because of the cluster hypothesis, which states that geographically concentrated firms are more likely to exchange knowledge and ideas; and schemes to stimulate the formation of knowledge and technology-sharing networks.

It may be worthwhile for Canada to introduce additional programmes and schemes that promote diffusion and technology adoption by removing some of the barriers discussed above, thereby ensuring that diffusion policies are part and parcel of the innovation policy system. It would also be important for policymakers to address any barriers to technology adoption that may exist among other types of firms, like service firms.

d. Environmental Innovation

Innovations which lower greenhouse gas emissions will be especially important in the coming decades. Innovations which raise Canadian energy productivity (output per unit of energy consumed) can drive economic growth while simultaneously contributing to emissions targets. Reduced reliance on fossil fuels will make the Canadian economy less vulnerable to volatile oil prices. Developing and utilizing environmentally friendly technologies may also improve Canada's reputation among its trading partners.

Adopting green innovations is not necessarily unprofitable. The Porter Hypothesis, a claim that innovation arising from environmental innovation may increase profits by more than they are reduced by the regulation, has been debated by economists for over twenty years (Ambec et al., 2013). Porter and van der Linde (1995) argue that well-designed environmental regulation can spur innovation by signaling resource inefficiencies and potential improvements to firms, raising corporate awareness as the result of increased information gathering, reduce uncertainty regarding the value of environmental technology, pressuring firms to innovate, and reducing concerns about losing competitiveness during technological transition. Empirical

studies of the Porter Hypothesis support the notion that environmental regulation increases environmental innovation, although the evidence is mixed on the overall impact on business performance (Ambec et al., 2013).

There is some evidence suggesting that emissions reductions can actually improve firm profitability in some cases (Ambec and Lanoei, 2008; Khan et al., 2015). Recent work by OECD researchers (Albrizio et al., 2014) finds that increased stringency of environmental regulation did not negatively impact aggregate productivity growth in a panel of OECD countries over the last 20 years (increased stringency was even found to have a small positive effect in the short term). However, the effect varied considerably across industries and firms. Only the most productive industries and firms experienced increased productivity growth while those which were less productive were found to be negatively impacted.[27]

Besides direct benefits to the environment and energy productivity from adopting new technologies, green innovation also presents new business opportunities. A study by McKinsey and Company (2012) identifies several emerging green technologies which Canada may have a comparative advantage in producing. These include uranium mining, traditional and unconventional hydroelectric power, carbon capture and storage, bioenergy, and off-grid solar photovoltaic power. Given that the world will likely need to shift towards these technologies to lower greenhouse gas emissions, it may be sensible to encourage the development of a domestic industry manufacturing these products. Excess capacity in terms of capital and skills following the decline of Canadian manufacturing over the last several decades could be shifted towards the manufacturing of green technology. Indeed, a recent article in the Globe and Mail (Blackwell, 2015) highlights how several companies have taken advantage of subsidies under the province's 2009 Green Energy Act to transform former auto manufacturing assets into green manufacturing companies.

Government support of environmental innovation is likely necessary as the result of several externalities which lead the private sector to under invest in this area. As noted earlier in this report, the market price of carbon emissions is too low because it does not include the cost to society of environmental damage. This leads firms to underinvest in adopting new emissions reducing technology and to underinvest in research and development of these technologies. Other externalities arising from learning-by-doing and positive R&D spillovers can further lead firms to underinvest in environmental innovation relative to what is socially optimal. Pricing carbon through a carbon tax or cap-and-trade scheme could improve this market signal. Policymakers can also send positive signals to encourage innovation in this area by investing in green infrastructure (OECD, 2010d). Similarly, governments should take a leadership role in ensuring that government buildings and activities adopt environmentally sound technologies. The use of subsidies, tax credits, or regulations could also encourage innovation, but should be used more cautiously because of their potentially distortionary effects.

Further government action may be required in the development of basic research, which is central to the generation of technological breakthroughs. Research which leads to major breakthroughs can often be more costly, time consuming and uncertain, particularly in areas

[27] The temporary positive effect on aggregate productivity is likely driven in part by the exit of relatively unproductive firms.

where there may be significant barriers to entry for new firms or technologies. Government funding of basic research in this area should be increased. The Global Commission on the Economy and Climate (2015) identifies agriculture and bio-energy, buildings and construction, electricity networks, transport systems, and carbon capture, use and storage as areas in need of significantly more research, development, and demonstration.

The OECD has found that a large share of radical innovations supporting green growth is attributable to new and young firms (OECD, 2010d). Consequently, the OECD suggests that governments take steps to encourage new firms to innovate and attempt to enter the market, such as reducing administrative burdens for start-ups, promoting access to finance, and providing more favourable conditions for the restructuring of struggling businesses.

e. Policy Recommendations

Hence, in conclusion, there are a number of policy recommendations in the literature that will arguably lead to increased innovation.

In general, Canadian governments at the federal and provincial levels may want to consider introducing:

- rigorous evaluations of their R&D tax credit programs to ascertain whether these programs are leading to additional business R&D, and if so assess the cost effectiveness of these programs;

- a rebalancing of support for business R&D spending from tax credits toward direct grants and subsidies;

- competition policies that will foster greater competition in the Canadian landscape and thereby encourage innovation;

- education policies that lean toward enhancing the number of baccalaureate graduates and doctoral graduates in fields linked to science and technology;

- immigration policies and systems that target individual prospects for participation in an innovation sector;

- tax policies, or other incentive-based policies, that lessen the extent of the “brain drain”

- institutional policies that encourage the collaboration between business, higher educational institutions and governments;

- demand-side innovation policies;

- innovation policies that foster innovation in the services sector in Canada;

- policies that foster engineering solutions for new innovations;

- policies that foster the use of innovation in new designs;
- policies that foster the development of pricing, marketing and delivery of new innovations;
- increased spending on R&D, especially in areas where they can create a competitive advantage, such as resources and green technologies
- successful models of clean technology developed in partnership with businesses, universities/colleges, and other levels of government;
- an innovation system that balances the number and complexity of innovation policies;
- a system of evaluation for the innovation policy system in Canada;
- a review of current programs that promote the diffusion of technologies and assist firms in adopting best practices, benchmarking these programs against the international state of the art in the area;
- additional resources to programs that have been found effective in promoting the diffusion of technologies to both SMEs and larger firms that would likely not have adopted such technologies;
- a simplified system of tax credits across Canadian provinces.

In particular, Canadian governments at the federal and provincial level may want to consider introducing:

- an Industrial Research and Innovation Council (IRIC) to deliver and evaluate the federal and provincial governments' business innovation programs;
- a simplification of the tax credit system used to support SMEs;
- procurement strategies with the core objective of business innovation;
- the transformation of the institutes of the National Research Council into a series of large-scale, collaborative centres involving businesses, universities and the provinces;
- access to risk capital for high-growth innovation firms through the Business Development Bank of Canada;
- a clear, federal voice from the provinces that will guide coordination between the provinces and the federal government concerning innovation policies and programs.

D. Education and Human Capital

i. Private and Social Returns to Education

It is frequently argued that education can have positive effects on society above those captured by the individuals receiving the education. Such externalities are important, as they provide motivation for government subsidization of education expenditures.

Riddell (2006) reviews the academic literature on the social returns to education which he defines as "positive or negative outcomes that accrue to individuals other than the person or family making the decision about how much schooling to acquire." Individuals are only concerned with private returns while governments should focus on total returns (social and private).

Social returns can take many forms. Education is important for the production and dissemination of new knowledge, implying that it is important for innovation. Given that technological progress has been shown to be the major source of productivity growth in the long-term, well-educated individuals are drivers of aggregate economic growth. To the extent that knowledge serves as a public good, there may be dynamic externalities in terms of growth in living standards over time.

In addition to dynamic externalities, there can also be static externalities associated with higher levels of human capital. Not only will more educated workers be more productive, they may also raise the productivity of those who they work and interact with through knowledge sharing. There is a sizable literature exploring the role of concentrated pools of educated individuals in cities on local economic performance. For example, Peri and Shih (2013) used the immigration of foreign workers specializing in science, technology, engineering, and mathematics (STEM) to Canada to find evidence of a significant positive effect of introducing additional educated workers on the wages and employment of college educated Canadians.

Education is also understood to generate many non-market benefits for society.[28] These include improved outcomes for children, increased rates of charitable giving and volunteerism, greater social cohesion, reduced reliance on social assistance, lower crime rates, and better individual decisions related to health, finances, family size, and job searches. Many of these non-market benefits have significant effects on those other than the one whose education improved.

Higher levels of education will have important effects on government finances. Individuals with higher earnings as a result of higher education are less likely to require many forms of social assistance and will likely have higher taxable earnings (or be in higher tax brackets). Many of the non-pecuniary benefits of education may reduce government expenditures.

Economists have shown that the universalization of primary education in the 19th century and early 20th century, as well as the universalization of secondary education in the 20th century, has produced myriad benefits for both the economy and society. The next stage in this process

[28] Note that many non-market benefits are captured as private returns too.

appears to be movement toward universalization of post-secondary education, a process in which Canada is the world leader.

Several researchers have estimated the private and social returns in Canada. Unfortunately, estimating the social returns to education accurately can be very difficult. The best evidence comes in the form of "natural experiments." Given difficulty in making valid causal inference, many analyses restrict themselves to considering the impact on government finances.

Moussaly-Sergieh and Vaillancourt (2009) estimated social and private internal rates of return to university education in Canada compared to those with the next highest level of educational attainment. The social benefits of education in this study were limited to the effect on pre-tax earnings of individuals (this only captures the direct increase in government revenue).[29] They estimate that the annual social returns are substantial: about 9 cents per dollar invested in an undergraduate degree (Table 11) based on data in 2000. This is not quite as large as the private returns: the private internal rate of return was about 11.5 per cent for a male undergraduate degree and 14.1 per cent for a female undergraduate degree. The higher returns to female education are related to differences in earnings profiles across genders. Foregone earnings for women pursuing post-secondary education are not as great as those for men, which generates the higher rate of return (Moussaly-Sergieh and Vaillancourt, 2009).

Table 11: Estimates of Social and Private Internal Rates of Return to University Education, Annual, Canada, 2000

	Private Rates (%)		Social Rates (%)	
	Men	Women	Men	Women
Type of Degree				
Undergraduate	11.5	14.1	8.6	9.2
Masters	2.9	5.0	<0	2.1
PhD	<0	3.6	<0	4.1
Medicine	21.4	21.6	7.8	6.0
Undergraduate by Field of Study				
Education	9.0	14.0	8.2	11.9
Humanities	<0	9.5	<0	7.8
Social sciences (includes law)	10.8	14.0	10.2	11.9
Commerce	9.0	19.3	8.2	16.4
Biological sciences	9.0	7.6	4.7	2.7
Engineering	9.0	14.2	4.7	5.9
Health Sciences	18.1	17.7	9.7	7.6
Pure Sciences	9.0	14.0	4.9	7.6

Source: Moussaly-Sergieh and Vaillancourt (2009), Table 2

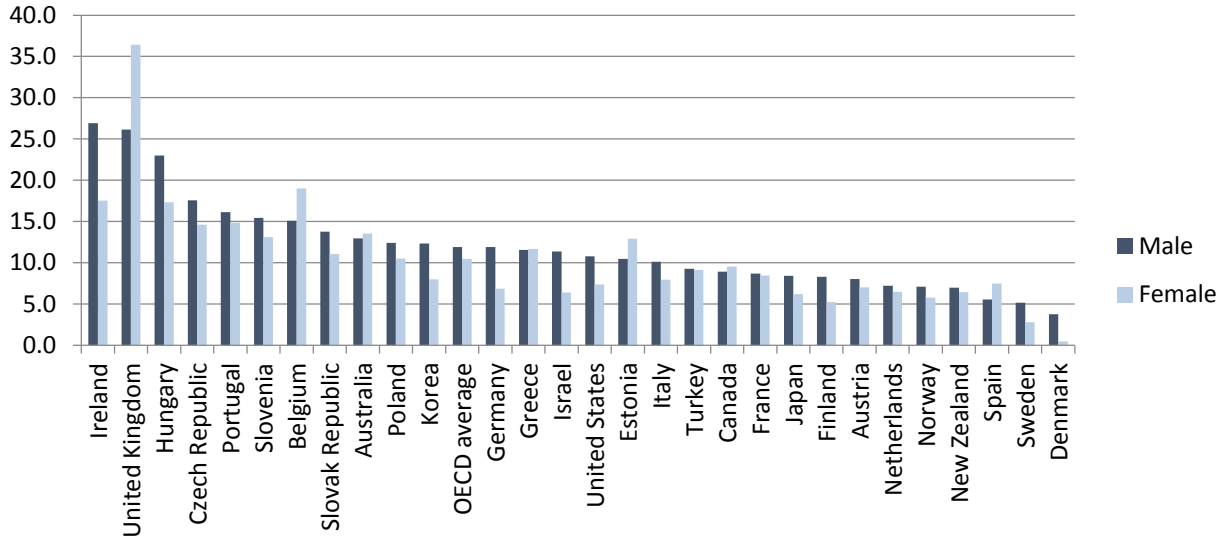
The returns can vary significantly by the level and subject of study. Returns are far lower on graduate degrees, particularly PhDs (rates of return are below zero for men). Social returns for undergraduate degrees are found to be highest for degrees in social science, education, and commerce, while they are relatively low in the humanities (nearly zero for men) and biological

[29] The social rates of returns calculated in this particular study include private costs and benefits.

sciences (Moussaly-Sergieh and Vaillancourt, 2009). The reader should keep in mind that these estimates do not factor in all social benefits, only the direct impact on pre-tax income. Knowledge externalities may significantly raise the social returns to graduate education. Non-market benefits are likely also substantial.

The OECD (2014a) provides relatively recent estimates of the returns to post-secondary (tertiary) education which are comparable across countries. These estimates are a bit broader in scope than those of Moussaly-Sergieh and Vaillancourt (2009), but they still do not include non-market benefits.

Chart 17: Public Internal Rate of Return to Tertiary Education by Gender, OECD, 2010



Source: OECD (2014a), A7.3a, A7.3b, A7.4a, A7.4b

Chart 17 presents estimates of the public internal rate of return (annual) to education for 29 OECD countries by gender. Canada ranks 19th for men (8.9 per cent) and 13th for women (9.5 per cent) in terms of the rate of return.

These estimates suggest that education remains a valuable investment for both individuals and governments. As such, there remains good reason to increase spending to support post-secondary education in Canada. The estimates presented above do not include many of the potential social benefits, so they likely understate the public return on investment.

Table 12: Estimates of Social Returns to Schooling

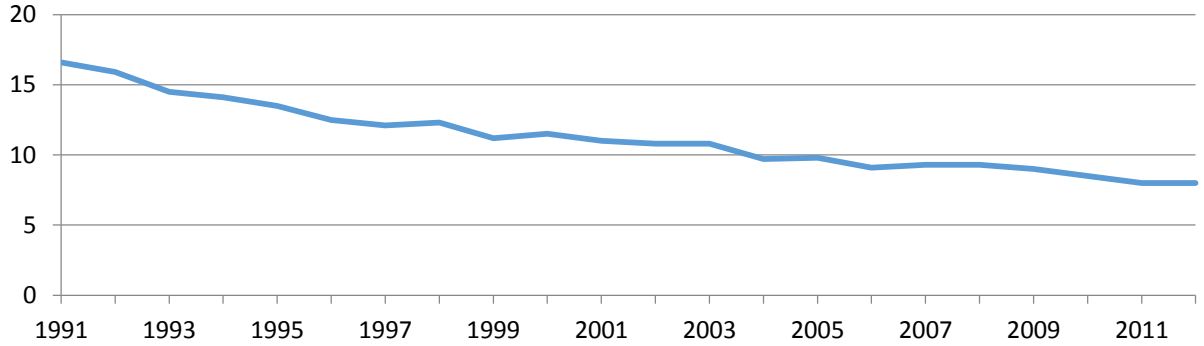
Social Benefit	Estimate of Social Returns to Schooling
Dynamic Externalities Associated with Economic Growth	1-2 Percentage Points
Static Knowledge Spillovers	1-2 Percentage Points
Non-Market External Benefits	3-4 Percentage Points
Social Benefits Related to Taxation	2 Percentage Points
Total	7-10 Percentage Points

Source: Riddell (2006)

Riddell (2006) provides some rough estimates of the likely social returns from specific sources based upon a review of the academic literature (Table 12). These estimates should be viewed with some caution, as they are largely based on evidence from the United States and tend to be more directly applicable to primary and secondary education rather than post-secondary.[30] Based on the literature, the total social rate of return to schooling is estimated to be in the range of 7-10 percentage points.

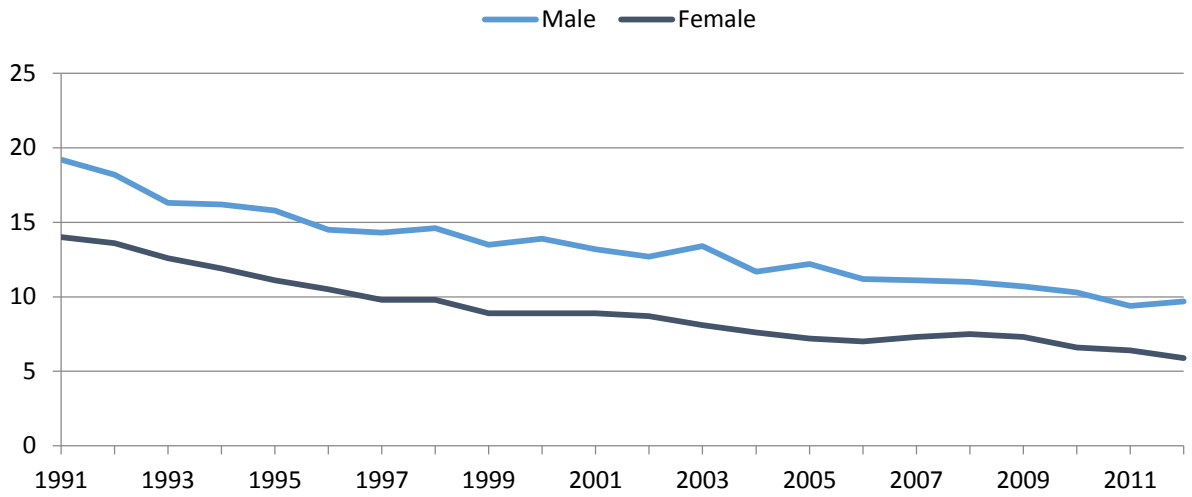
ii. Performance of the Secondary Education System

Chart 18: Drop-out rate, Canada, 1990-1991 to 2011-2012 (Per Cent)



Note: Figures are based on the academic year from September to April. Years correspond to the year in which the academic period ended.
Data produced by Statistics Canada. Labour Force Survey 2012.
Source: ESDC (2012).

Chart 19: Drop-out rate, by gender, Canada, 1990-1991 to 2011-2012 (Per Cent)

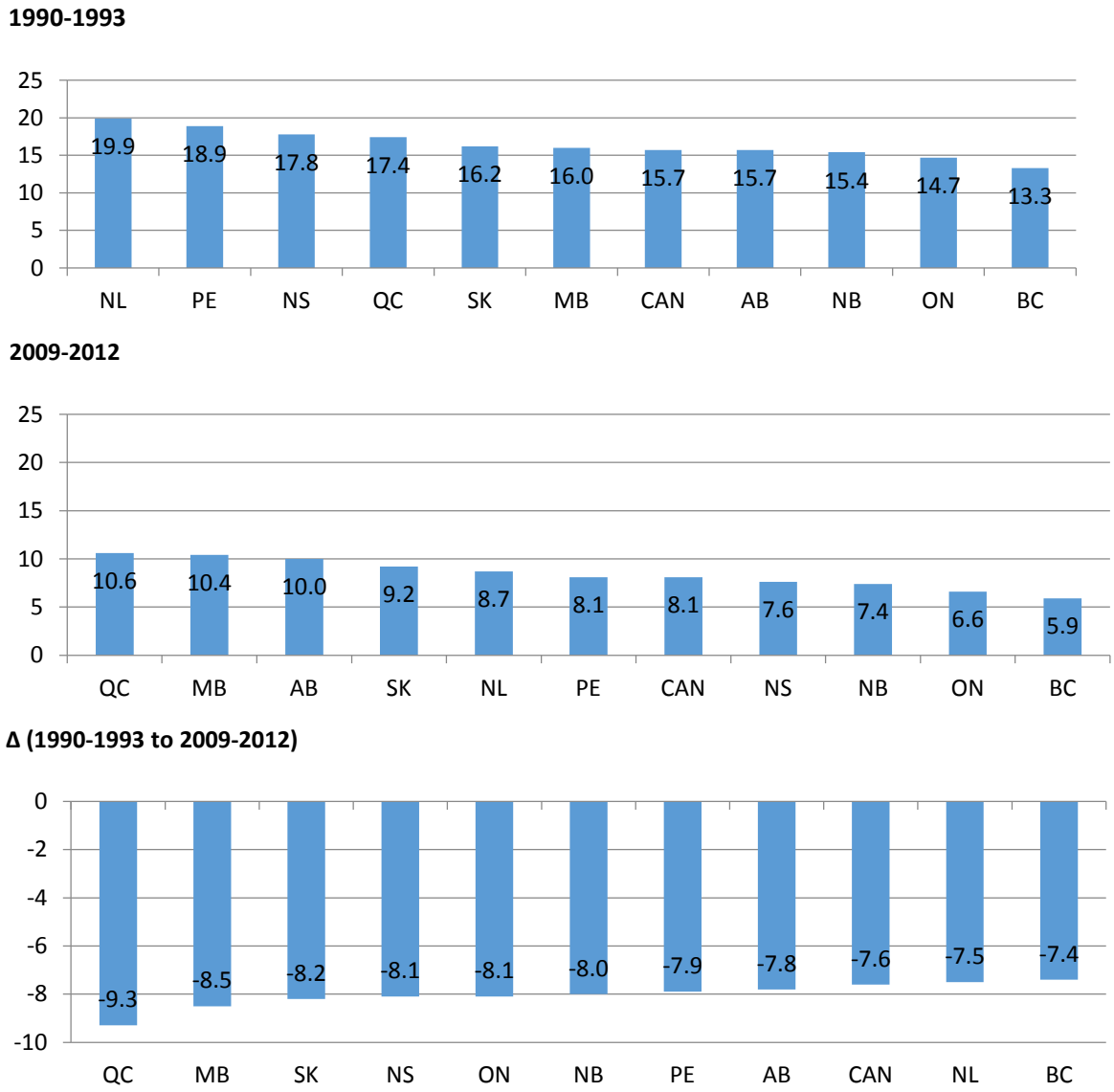


Note: Figures are based on the academic year from September to April. Years correspond to the year in which the academic period ended.
Data produced by Statistics Canada. Labour Force Survey 2012.
Source: ESDC (2012).

[30] This is because of a lack of studies providing high quality evidence in Canada and the fact that many quasi-experimental approaches used to estimate these returns have relied upon changes in compulsory education or child labour laws and thus are best suited to earlier levels of education.

The high school drop-out rate (referred to subsequently as drop-out rate) in Canada has dropped rapidly since the early-1990s, falling from 15.9 per cent in the academic year 1990-1991 to 8.0 per cent in the academic year 2011-2012 (Chart 18).[31] A key priority of provinces in recent years has been to reduce the drop-out rates and these numbers indicate that the provinces have been highly successful.

Chart 20: Drop-out rate, by region, 1990-1993 and 2009-2012 (Per Cent)



Note: Data are based on three-year averages for the academic years 1990-1991 to 1992-1993 and 2009-2010 to 2011-2012.
Data produced by Statistics Canada. Labour Force Survey 2012.
Source: ESDC (2012).

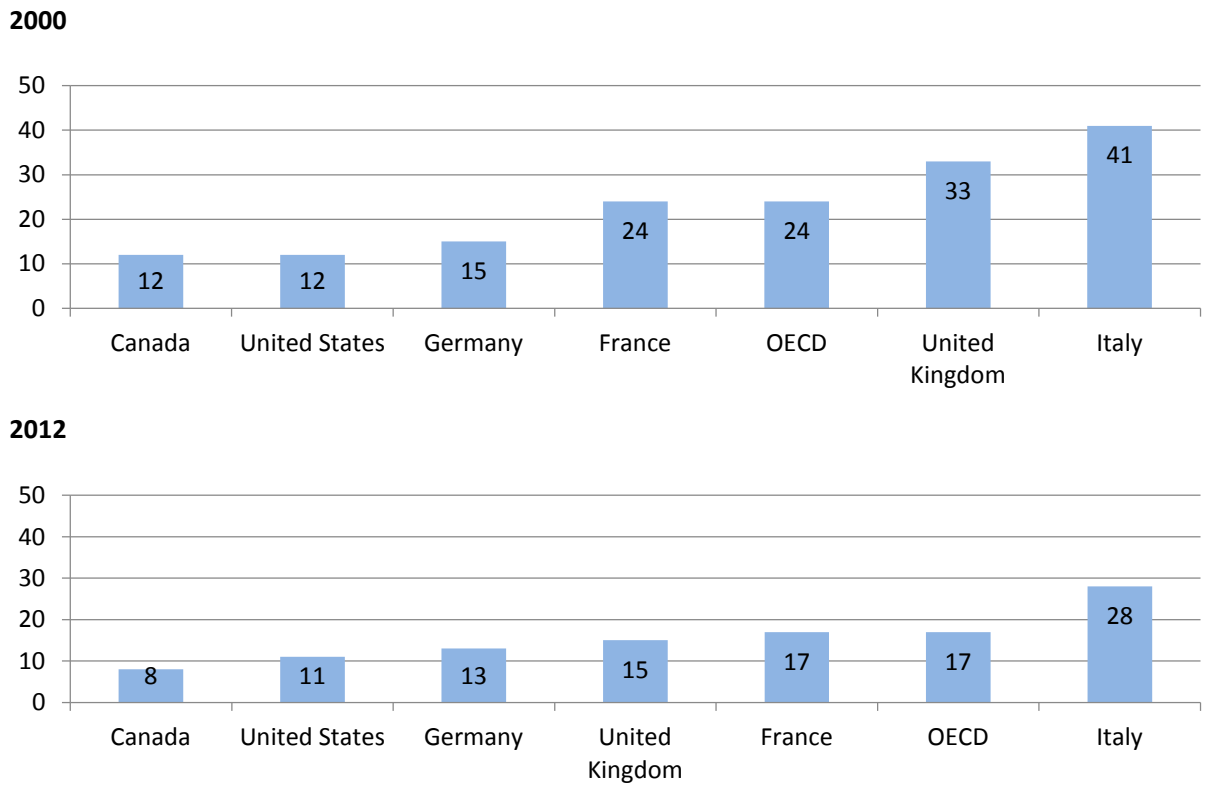
[31] Drop-out rates are calculated as the per cent of 20-24 year olds without high school education and who are not attending school.

When broken down by gender, female drop-out rates have been consistently lower than male drop-out rates, although the gap between males and females has narrowed slightly over the years: male drop-out rates fell from 19.2 to 9.7 per cent between 1991 and 2012, while female drop-out rates fell from 14 to 5.9 per cent (Chart 19). However, despite an absolute fall in the gap from 5.2 to 3.8, a male in 2012 was 1.64 per cent more likely to have dropped out, whereas in 2000, a male was only 1.37 per cent more likely to have dropped out than a female.

There is a large variance in the drop-out rates by province. In the academic years between 2009 and 2012, Quebec had the highest drop-out rate, followed by Manitoba and Alberta. British Columbia, Ontario and New Brunswick had the lowest (Chart 20). In the academic years between 1990 and 1993, this ranking was substantially different at the bottom end, where the three Atlantic provinces had the highest rate, but identical at the top end.

In 2012, Canada had the lowest per cent of the population aged 25 to 34 with an educational attainment of below upper secondary when compared to other G7 countries (Chart 21). The United States and Germany followed. The ranking of the top three was unchanged from 2000.

Chart 21: Educational Attainment, Below Upper Secondary, 25-34 Years, G7, Per Cent, 2012



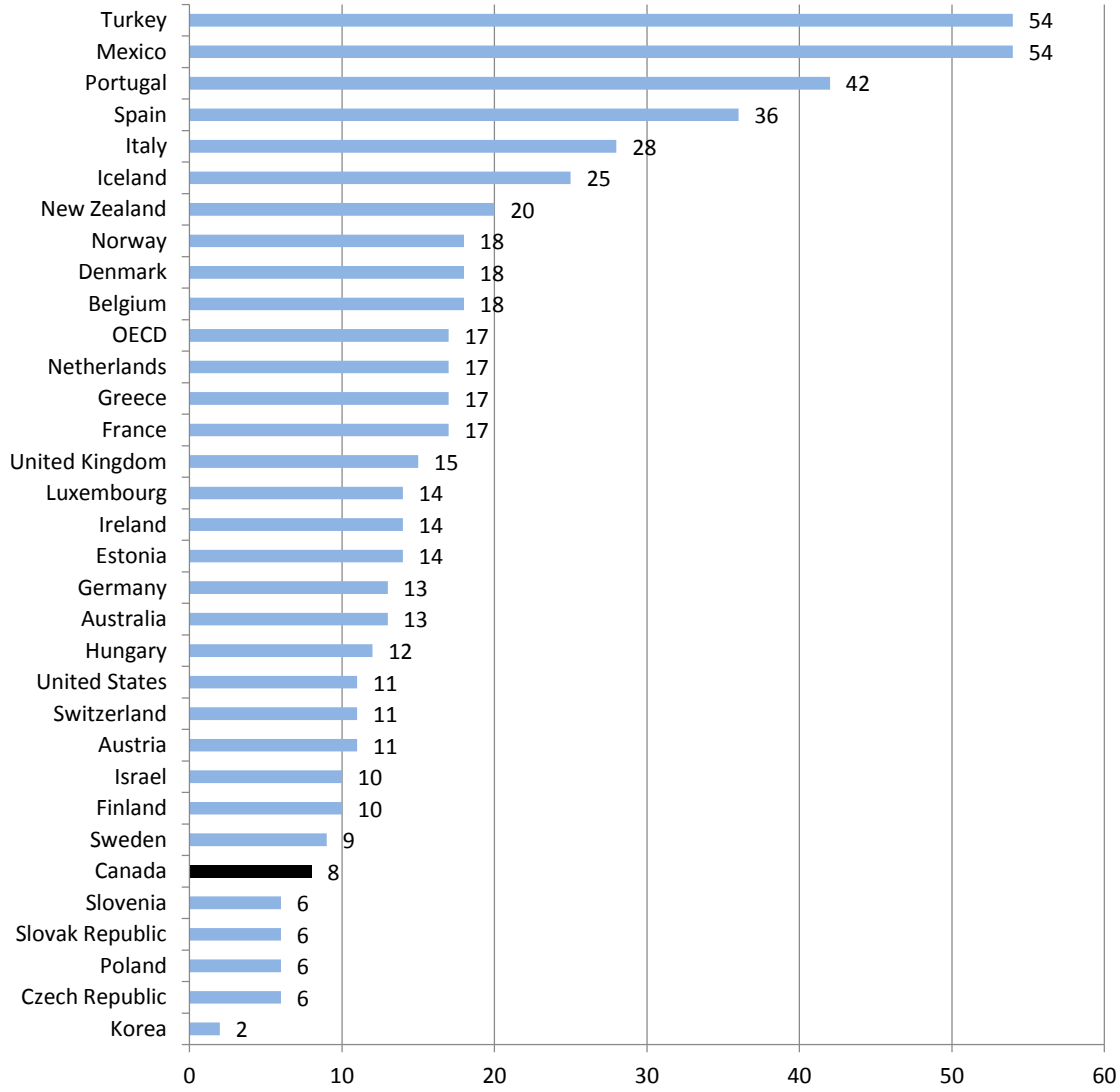
Note: Japan has been excluded due to missing data for 2012.
Source: OECD (2014a).

In 2012, Canada had the sixth lowest per cent of the population aged 25 to 34 with less than upper secondary education out of the 32 OECD countries. Korea ranked the highest with the

lowest per cent (2), followed by Czech Republic, Slovak Republic, Slovenia and Poland at six per cent (Chart 22).

The OECD has found a strong correlation between student achievement, as measured by the OECD's Programme of International Student Assessment (PISA), and economic activity (OECD 2010e). PISA is a standardized test given to 15-year-olds in 65 countries to evaluate competency in mathematics, reading and science. The OECD finding bodes well for Canada because only 3, 5 and 7 countries exceeded the Canadian averages in 2012 for mathematics, reading and science respectively. Another positive is that Canada's scores are not as heavily influenced by family socio-economic status as in most other countries, indicating greater equality of opportunity in Canada.

Chart 22: Educational Attainment, Below Upper Secondary, 25-34 Years, OECD, Per Cent



Note: Chile and Japan have been excluded due to missing data for 2012.
Source: OECD (2014a)

Yet despite the positives in Canada's PISA scores one must still ask the question of why Canada does not do better. Indeed, why are we not the best? Some might argue that smaller, more homogenous, centralized countries might have a natural advantage. But that is not certain. Canada's decentralized structure facilitates differing approaches to education and a chance to establish and adopt best practices.[32] Further, our higher degree of immigration is not a disadvantage for PISA scores because immigrant students score almost as well as Canadian-born students whereas there is a significant gap in most other countries.

Table 13: Average 2012 PISA Scores and Changes from Subject Base Year to 2012, Canada and Provinces

	Science		**Reading**		**Mathematics**	
	Score	**Change 2006-12**	**Score**	**Change 2006-12**	**Score**	**Change 2006-12**
OECD Average	*501*		*496*		*494*	
Canada	525	**-9**	523	-11	518	**-14**
Newfoundland	514	**-11**	503	-14	490	**-27**
Prince Edward Island	490	**-18**	490	**-28**	479	**-21**
Nova Scotia	516	-4	508	-13	497	**-18**
New Brunswick	507	1	497	-5	502	**-10**
Quebec	516	**-15**	520	**-16**	536	-1
Ontario	527	-10	528	-5	514	**-16**
Manitoba	503	**-21**	495	**-34**	492	**-36**
Saskatchewan	516	0	505	**-25**	506	-10
Alberta	539	-11	528	**-22**	517	**-32**
British Columbia	544	6	535	-3	522	**-16**

Note: The bolded changes are statistically significant from 0, at a 5 percent level, based on reported standard errors of the 2012 estimates, the relevant base year for each of science, reading, and mathematics, and a "link error to compare tests over time."

Sources: Bussière et al. (2001; 2004; 2007), Brochu et al. (2013) and calculations by author.
Table Taken from page 3 in Richards, John. (2014). "What Policies Work? Addressing the Concerns Raised by Canada's PISA Result," C.D Howe Institute.

The OECD analysis suggests a huge economic dividend to improving student competencies, as measured by PISA scores. Raising Canada's PISA scores by 25 points[33] for each of the three areas, which would put Canada in first place among countries in reading and science but still not quite the top in mathematics, is estimated by the OECD to add a discounted net present value of almost $4 trillion (US) to Canada's cumulative GDP over the period 2010 to 2090. Much of such an improvement in PISA scores could be achieved by bringing the

[32] There are advantages and disadvantages to both centralized and decentralized approaches to education. Researchers such as Cappon (2014) have argued that a national institution to set goals, coordinate policies, and evaluate performance would help improve national performance.

[33] PISA scores are scaled so that the mean score among OECD countries is 500 and the standard deviation is 100. Thus approximately two-thirds of students fall between 400 and 600 points.

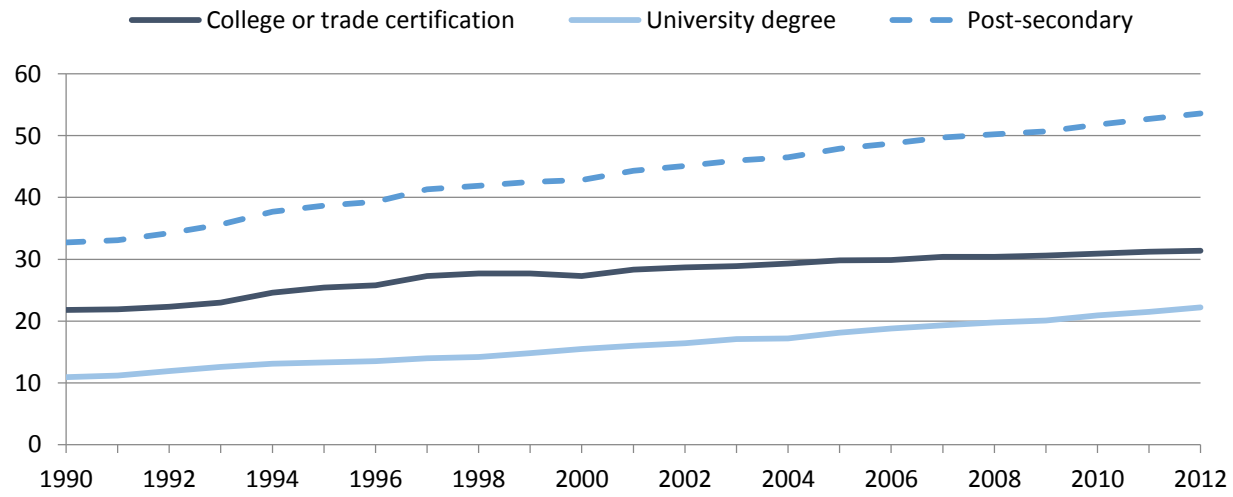
Canadian average up to the level of the top-performing province in each area (Quebec in mathematics and British Columbia in reading and science). Indeed, a good part of it could be achieved by bringing the provinces well below the Canadian average up to the existing average. In mathematics, PEI, Newfoundland & Labrador, Manitoba, Nova Scotia and New Brunswick are more than 10 points below the Canadian average (518) – the provinces are listed in the order of the furthest from average to the closest. In reading, Nova Scotia, Saskatchewan, Newfoundland & Labrador, New Brunswick, Manitoba and Prince Edward Island are more than 10 points below the Canadian average. And in science, the provinces more than 10 points below average are Newfoundland & Labrador, Nova Scotia, Manitoba and Prince Edward Island.

A troubling feature of the PISA scores is that Canada's results in mathematics have steadily declined since the current test was first given in 2003. The downward trend is evident in all provinces except Quebec and Saskatchewan. The decline is particularly prominent in Manitoba, Alberta and Newfoundland & Labrador. It is also worrying that in an economically and socially advanced country with mandatory schooling until age 16 that 13 per cent of boys and 14 per cent of girls in Canada are classified as "low achievers" in the OECD study. Again, the Canadian average could be substantially raised by lifting performance at the bottom.

A focus on improving PISA scores fits well with the findings of the Council of Canadian Academies Expert Panel on Science, Technology, Engineering and Mathematics (STEM) (Council of Canadian Academies, 2015) that it is critical to give young people great exposure to STEM skills even if that does not ultimately lead to a career in a STEM field. Developing the strong fundamental skills emphasized by PISA opens doors in terms of future educational and career opportunities. This is important for developing a robust and flexible labour force. Echoing a theme of this report, the panel also urged greater effort and creativity in involving females and aboriginal people in STEM skills.

iii. Quantity of Post-Secondary Education

Chart 23: Level of Education, 15 Years of Age and Over, 1990-2012, Per Cent

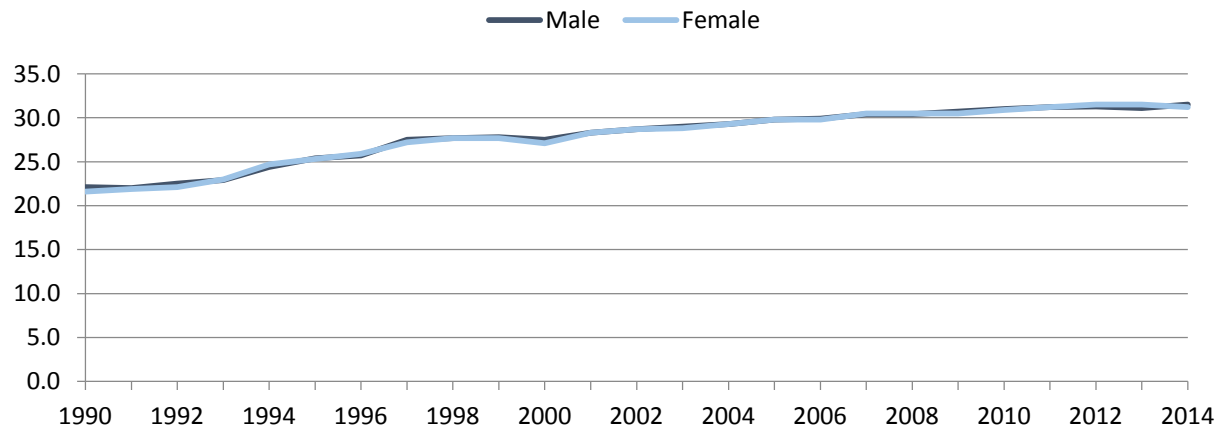


Note: HRSDC calculations based on Statistics Canada Table 282-0004.
Source: ESDC (2012).

With an increasing portion of jobs requiring post-secondary education, it is also important to look at Canada's standing on higher education. One of the more common statements is that Canada has the highest portion of adults in the OECD with some form of post-secondary education. This speaks to the relatively unique and strong position of Canada's colleges, although it also reflects Quebec's CEGEP which is sometimes viewed as a final part of a high school education and thus an artificial booster of Canadian PSE rates. On university attainment alone, Canada is in the middle of the pack within the OECD, but it used to be one of the strongest countries in the world in terms of university participation rates. And despite the strong overall rise in participation, there remain problems of access for important groups of Canadians. For example, low-income and Aboriginal youth have low participation rates.

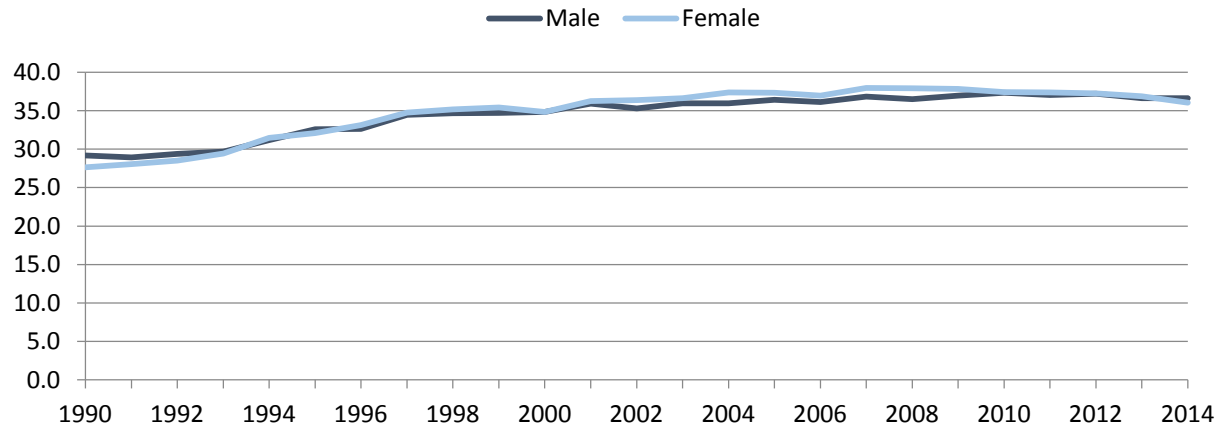
Chart 24: Completion of Post-Secondary Certifcate or Diploma by Gender, Population Aged 15 Years and Over, Per Cent

Population 15 and Over



Note: HRSDC calculations based on Statistics Canada Table 282-0004.
Source: ESDC (2012).

Population Aged 15 to 44



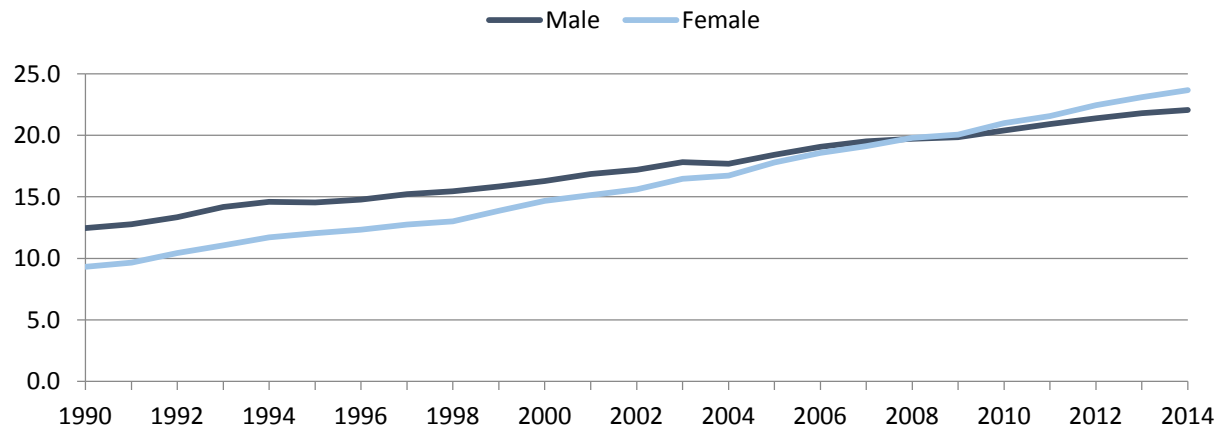
Source: CANSIM 282-0004.

The educational attainment of Canadians has been on the rise since 1990 (Chart 23). The per cent of the population 15 years and over with a college or trade certification has increased from 21.8 to 31.4 per cent from 1990 to 2012, while the per cent of the population 15 years and over with a university degree has increased from 10.9 to 22.2 per cent. Total post secondary increased from 32.7 per cent to 53.6 per cent.

When broken down by gender, the per cent of the population aged 15 and over with a post-secondary certificate or diploma is almost identical (Chart 24). However, the per cent of the population aged 15 and over with a university degree is not as balanced. In 1990, 9.3 per cent of females had a university degree, while 12.5 per cent of males had a university degree. In 2014, 23.7 per cent of females had a university degree, while 22.1 per cent of males had a university degree (Chart 25).

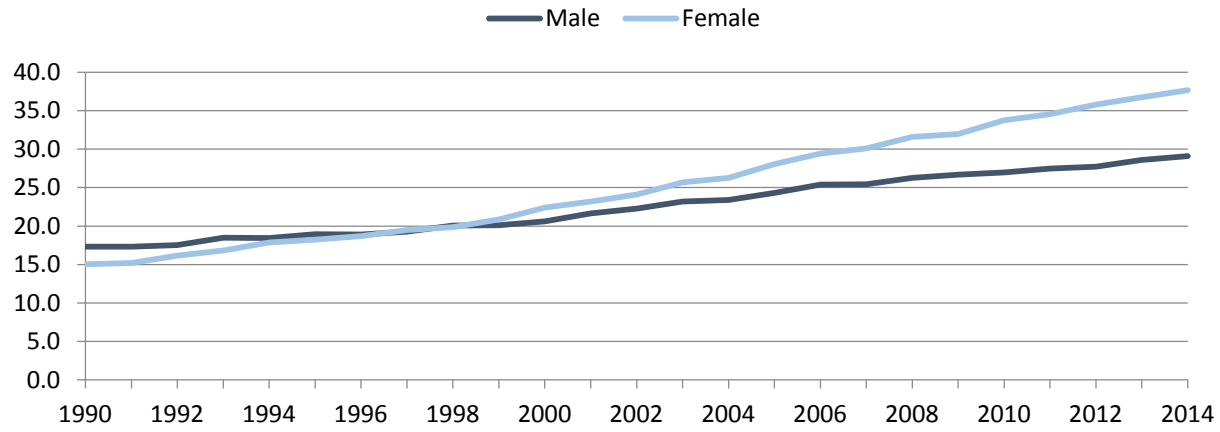
Chart 25: Completion of University Degree by Gender, Population Aged 15 Years and Over, Per Cent

Population Aged 15 and Over



Note: HRSDC calculations based on Statistics Canada Table 282-0004.
Source: ESDC (2012).

Population Aged 15 to 44



Source: CANSIM 282-0004.

When the breakdown by gender is done for the population aged 15 to 44, the extent of the reversal in the gap between men and women for university completion is heightened. In particular, the female-male gap changed from -2.3 percentage points to 8.6 percentage points.

Chart 26: Proportion of Canada Aged 15 Years and Over with College or Trade Certification (Per Cent)

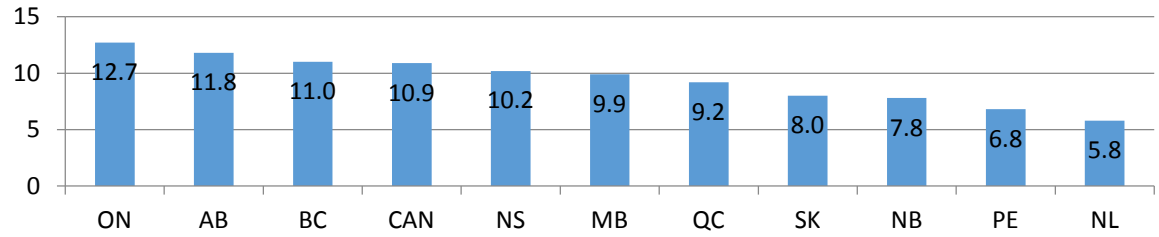
Note: HRSDC calculations based on Statistics Canada Table 282-0004.
Source: ESDC (2012).

In both 1990 and 2012, Ontario had the highest proportion of their population with a university degree, but it had one of the lowest proportions with a college or trade certification. In contrast, in 2012, Newfoundland and Labrador had one of the highest proportions of the population with a college or trade certificate and the lowest proportion with a university degree (Chart 26 and Chart 27).

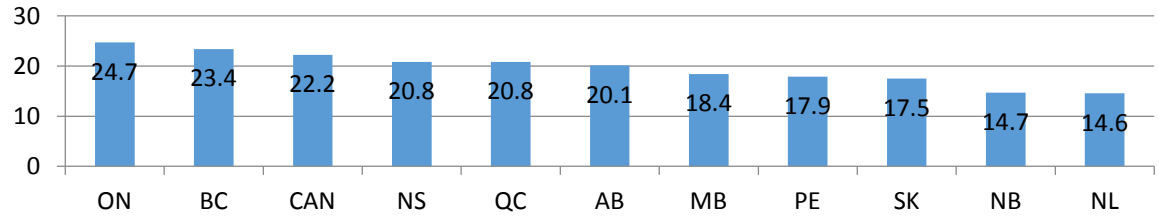
Newfoundland and Labrador saw the largest increase in its share of the population with a college or trade certification between 1990 and 2012, while British Columbia saw the largest increase in its share of the population with a university degree between 1990 and 2012.

Chart 27: Proportion of Canada Aged 15 Years and Over with a University Degree (Per Cent)

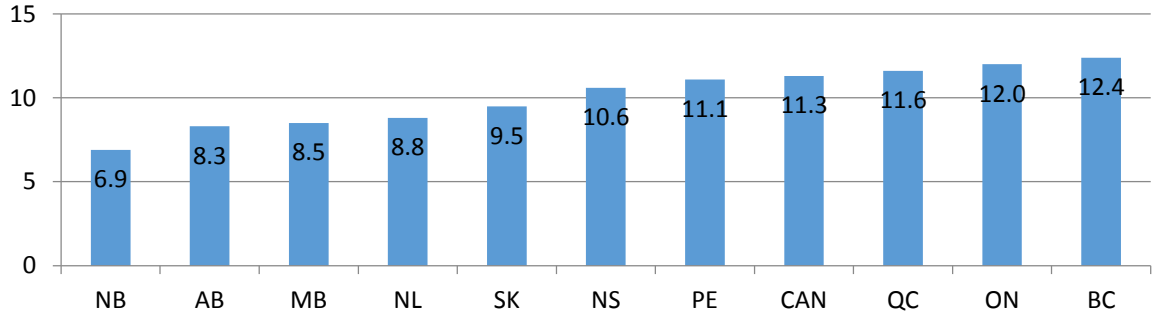
1990



2012



Δ (1990-2012)



:

Note: HRSDC calculations based on Statistics Canada Table 282-0004.
Source: ESDC (2012).

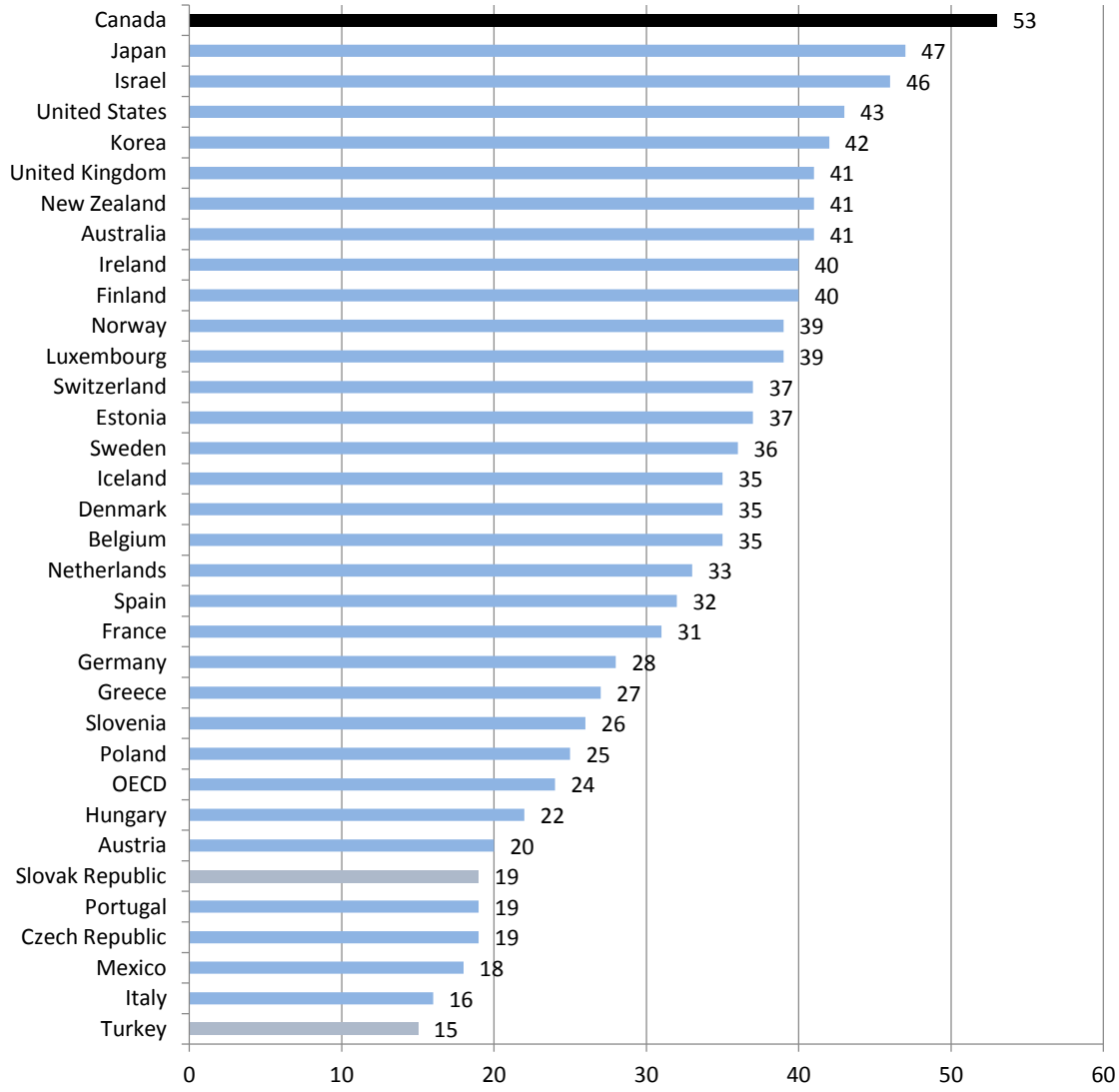
Chart 28: Educational Attainment, Tertiary, 25-64 Years, G7, Per Cent, 2012

Note: Japan has been excluded due to missing data for 2012.
Source: OECD (2014a).

In 2012, Canada had the highest proportion of the population aged 25 to 64 with tertiary education compared to G7 countries, followed by the United States (Chart 28). The ranking was unchanged from 2000.

When compared with all OECD countries, Canada still had the highest proportion of the population aged 25 to 64 with tertiary education, followed by Japan and Israel (Chart 29). However, when tertiary education is simplified to only university education, Canada's ranking drops to tenth (Chart 30). Hence, our strong tertiary performance is driven by high attendance at non-university post-secondary institutions.

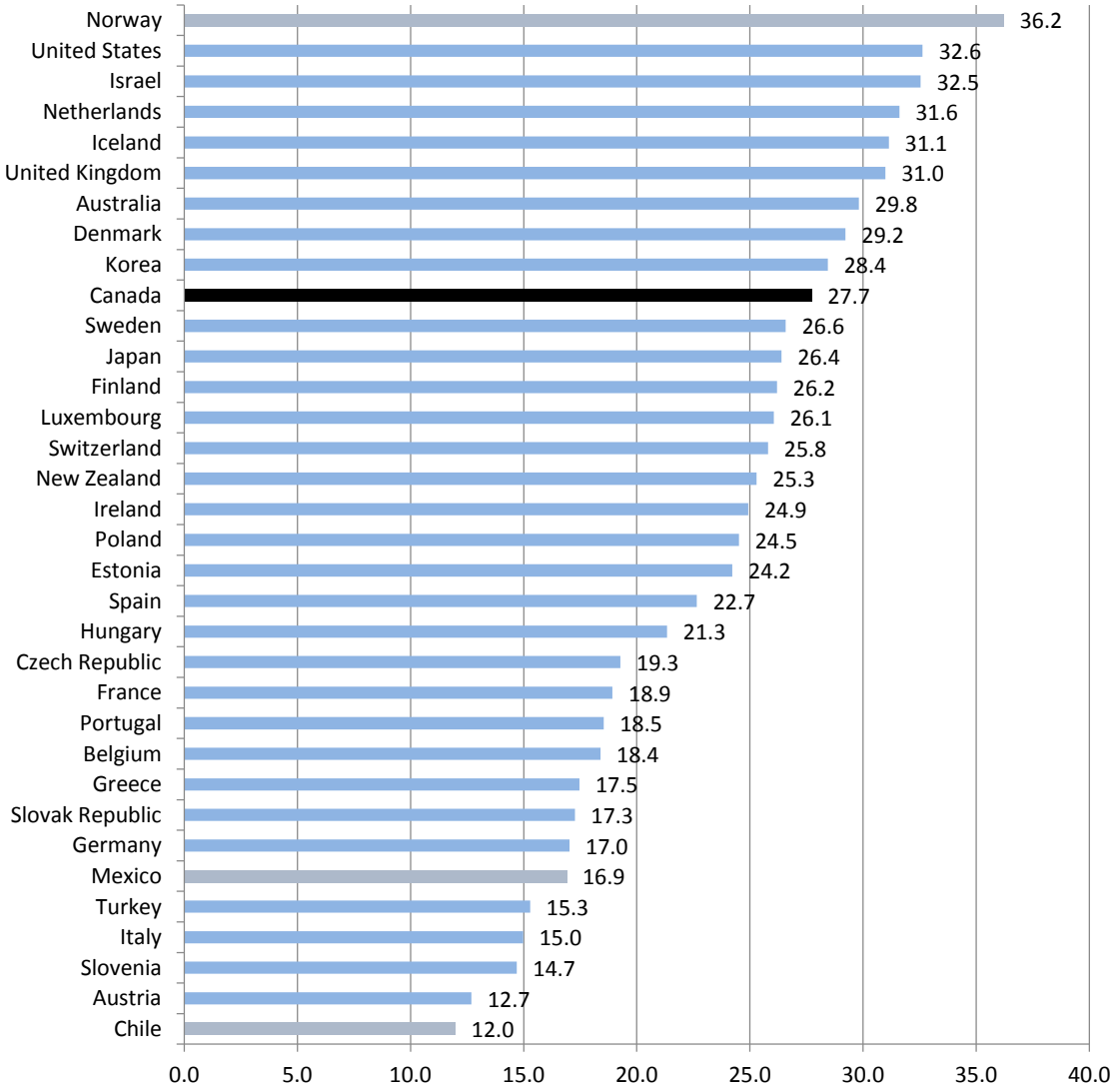
Chart 29: Educational Attainment, Tertiary, 25-64 Years, OECD, Per Cent



Note: Chile has been excluded due to missing data for 2012.
Source: OECD (2014a).

This under-representation is typically considered a financial issue. However, work by Ross Finnie (2009; 2014) suggests finances are just one of the impediments and perhaps not the most important. In fact, by far the strongest predictor of post-secondary education (PSE) participation is not family income, but parental education. Another indication of the importance of cultural influences over financial determinants is that the children of immigrants generally go to PSE at considerably higher rates than non-immigrants, regardless of family income level, reflecting the value that is attached to education by such families. Children coming from families that lack a strong appreciation for PSE are often not encouraged to pursue further education. Their marks in high school are often not sufficient to be accepted. Further, a survey of the CCL found that parents who had not attended post-secondary education underestimated the benefits of further education while overestimating the costs.

Chart 30: Educational Attainment, University, 25-64 Years, OECD, Per Cent



Note: Calculated as Type A plus Advanced Research Programs.
Source: OECD (2014a).

These barriers are especially prevalent among Canada's Aboriginal population, particularly at early stages of education. For Aboriginal youth, high school graduation is critical. The gap between Aboriginal and non-Aboriginal participation is substantially narrowed when high school graduates alone are included.

These cultural factors acting as impediments to broader participation in higher education suggest that funding support needs to be broadened by an array of other steps. For example, much better information is required on the returns to education – by level as well as by field of study – and this information must be made available to young people and their parents well before the students are finished high school.

Recent work by the Education Policy Research Initiative on matching student identification numbers with income tax returns is promising in this regard because it can give a more detailed and longer-run perspective on the returns to education as opposed to the snapshot from one year with the National Graduate Survey. For example, the results from the University of Ottawa showed that there were substantial differences in income across disciplines shortly after graduation but that for many of the disciplines incomes tended to converge over time, especially for those in the middle of the earnings pack within each discipline. Further analysis and results from other universities and colleges (such work is currently underway) will be required to make sound conclusions from such results but at least as a preliminary hypothesis it may be that the field of study is ultimately less important than is typically thought.

More effort is, therefore, required in high schools and even before to not only expose students to information on the overall benefits of PSE, and to have the chance to be prepared to attend PSE, but to also help them pick the appropriate form of post-secondary education. This could include giving children and youth exposure to colleges and universities in the form of campus visits, visits of faculty and alumni to schools, summer camps, et cetera. This would be especially important for young people from groups with generally low participation rates, where there is the most to gain. Where high school educations do not properly prepare students for success in post-secondary education additional support is required before university or college starts and during the early months to ensure students do not become discouraged and drop out or fail.

Concrete steps can be taken to broaden participation in higher learning, but at the same time we must look beyond enrolment and graduation statistics to consider the quality or outcomes of education. Here we can turn to the OECD's Programme of International Assessment of Adult Competencies. The good news is that Canadian adults do better than the OECD average on problem solving in technology-rich environments and are more engaged in information and computer technologies. But Canadians are only at the OECD average in literacy and below the average in numeracy. Canada has a higher portion of adults in the bottom category for both literacy and numeracy than the OECD average. As with the PISA scores, there are wide differences across provinces. On literacy, the following provinces are below the Canadian average: Nunavut, the Northwest Territories, Newfoundland & Labrador, New Brunswick, Quebec and Saskatchewan.

The PIAAC scores are shockingly poor given the high levels of education in Canada. They beg the question of what is being learned through the education experience. This is especially important as the OECD's work on education and economic growth identifies quality of education as being more important than duration.

iv. Quality of Post-Secondary Education

The theme of quality of higher education has been taken up by several business groups in Canada, including the Canadian Council of Chief Executives (CCCE) and the Chamber of Commerce. They have charged that Canadian post-secondary institutions do not maintain adequate quality and in particular are not producing graduates that are well-suited for the labour market.

In 2014, the CCCE (2014) did a survey of members (the largest companies in Canada) to determine what they seek in recruits. In general, the results weighed heavily on the so-called "soft skills" and less on "hard skills". In descending order of importance, the key attributes sought by CCCE members were: people skills/relationship-building; communication skills; problem solving skills; analytical skills; leadership skills; industry-specific knowledge and experience; functional knowledge; technological literacy; project management skills and creative thinking. The list squares with the 2013 Campus Recruitment and Benchmark Survey Report, sponsored by the Canadian Association of Career Educators and Employers (CACEE). They found employers most valued skillsets in applicants, in descending order of importance, to be communication skills (verbal), teamwork skills (works well with others), analytical skills, strong work ethic and problem-solving skills.

It is interesting to consider the skills sought by employers in the light of the seeming incongruence between high levels of education (in terms of participation and duration) of Canadians and the mediocre scores of adults on the PIAAC literacy and numeracy tests. Could it be that Canada's post-secondary education institutions are not teaching the right skills? It is difficult to provide a definitive answer because little is measured on what is taught and learned. In general, the statistics on post-secondary education report money spent, students enrolled and students graduated. It is presumed graduating students are well versed in discipline knowledge, although aside from some areas with protocols on accreditation, there are few standards to judge even this. But are students developing other skills in sufficient measure, especially those that employers say are critical to success in the economy such as: basic cognitive skills (literacy, numeracy); higher order cognitive skills (problem solving, critical thinking, communication) and; personality-related ("soft") skills (persistence, initiative, determination and attitude)? Judging from the PIAAC results and employers concerns (although on this front it should be noted that in the CCCE's survey of 2014, few employers indicated dissatisfaction with recruits) these areas of the learning experience are not given adequate attention.

The Higher Education Quality Council of Ontario (HEQCO) attempted to evaluate Canada's post-secondary institutions using a set of 34 indicators representing access, value to students and value to society. In brief, the goal was to evaluate outcomes on a broad basis, not just on the degree granted. As there are no official data for many aspects of these variables, HEQCO had to make some crude approximations of outcomes (Weingarten et al., 2015). Interestingly, they did not find a correlation between performance of universities and funding.

Looking at universities alone, HEQCO assessed overall provincial systems compared to all-province averages on outcomes and cost per student. At the positive and negative extremes respectively, Ontario and Nova Scotia were found to deliver above average outcomes with below average costs while Alberta and Saskatchewan had below average outcomes at above average costs.

Such work by HEQCO focusing on outcomes seems to offer a bridge between both the levels and duration of education and poor adult literacy and numeracy results and what education institutions and employers are focused on. That bridge involves going beyond simply reporting graduation rates. It means going well beyond focusing on teaching discipline-specific

knowledge. It means creating competency criteria for graduation that embrace as well broader cognitive and personality skills. And it means measuring these outcomes.

A focus on broader outcomes would be a rather revolutionary change in Canada's post-secondary education institutions. The fact that universities and colleges have not done so on their own suggests institutional resistance. This begs the questions of who should collect, compile, analyze and distribute the information that will be required and how should institutions be encouraged/coerced to change.

The custodian of the data should be largely independent of Governments and have a national focus. Statistics Canada could be charged and funded for the task. Or it could be done by an agency that parallels what the Canadian Institute of Health Information does in the health sphere. The Canadian Council on Learning (CCL) did some of this before it was disbanded recently. The federal government could and should play an active role in the funding, design and governance of the data entity. But the federal government should not be involved in setting the objectives for the outcomes.

Provinces could mandate universities and colleges to create broader competency criteria for degrees and teach, test and report on a much broader set of learning outcomes. If that were not viewed as sufficient, they could tie funding to such a conversion. The provinces should not, however, dictate to the institutions how to meet the objectives. Discretion on the means should be left with the institutions. Even under direction of the provinces, it might be difficult to persuade university and college faculty to radically change focus from degrees to competencies. It might be helpful to expand the concept of accreditation boards that are used for professional programs such as medicine and business. The accreditation board would set out the broader array of skills required in order to graduate. The focus would become the accreditation rather than the degree.

So far we have not addressed one of the common suggestions from business groups – provinces and their post-secondary education institutions should transfer resources into educating people in fields of strong present and especially future labour demand. This sounds great in practice but the fact is it is virtually impossible to predict where the jobs of the future will be. Errors could be costly in terms of leaving students with stranded skills and institutions with stranded capital. It seems better to properly equip college and university students with the abilities to adapt to change. This is one of the goals of focusing on competency criteria and a broader set of outcomes for graduation.

The following four points, contributed by Harvey Weingarten of the Higher Education Quality Council of Ontario (HEQCO), capture the essence of the above discussion:

1. Education is a significant contributor to economic development and Canada's performance on international tests reveals that we would benefit economically from better educational outcomes, especially in mathematics and numeracy. Better participation in higher education and outcomes with disadvantaged and at-risk groups would be especially beneficial.

2. There are a range of outcomes that need to be measured to determine the contribution and quality of postsecondary education ranging from basic skills such as literacy and numeracy to higher cognitive skills such as problem solving, critical thinking and communication and a set of personality and behavioural attributes such as resilience, teamwork and time management. All of these are essential to success in life and employment.

3. The discussion of the degree to which our postsecondary investment is contributing to a healthier and more robust economy and quality of life will not be solved by the incessant focus on funding – whether through tuition or government grant. The best analyses we have suggest that postsecondary performance is not predicted by funding levels. The discussion should be focussed on what outcomes and objectives we hope to achieve with postsecondary education and rigorous measurement of whether those objectives and outcomes are in fact being achieved.

4. We are well advised to create a body or task an existing one with collecting, analyzing and disseminating the required data on higher education outcomes

Many policy implications flow from this analysis of how improvements in education can bolster Canada's economic growth. Policymakers should:

- Ensure that post-secondary institutions have adequate funding to continue the upward trend in the proportion of the population with post-secondary education, maintaining Canada's position as the OECD country with the highest proportion of post-secondary graduates;

- Target the improvement of PISA scores. While all provinces should attempt to lift the results for all their students, particular attention should be paid to lifting underperformers, by province and by sub-group;

- Provide students with greater exposure to science, technology, engineering, and math (STEM) skills;

- Address cultural as well as financial issues that act as impediments to various groups such as low-income and Aboriginal students in participating in higher education

- Improve the collection and dissemination of information on employment and income prospects through better surveys of graduates;

- Broaden the focus of colleges and universities from number of graduates and subject-particular knowledge to outcomes on broader cognitive and personality skills; this should be done in the context of establishing competency criteria across fields and in each field of study;

- Shift funding of post-secondary institutions from being mainly driven by enrolment to giving incentives for quality of outcomes;

- Create a body or task an existing one with collecting, analyzing and disseminating the required data on higher learning outcomes

E. Macro-economic Environment

Macro-economic stability is a necessary but not sufficient condition for strong, sustainable economic growth. Stability means low, stable inflation, small government deficits and an exchange rate that is competitive and predictable. With the wild swings of recent years, the Canadian exchange rate is not highly predictable. For the most part the variability has been a natural result of a floating exchange rate in an environment of wide cycles in commodity prices. As exchange rate policy is not in the provincial or territorial domain we will not address it here. Provincial inflation rates are heavily influenced by the national inflation rate which is in turn affected by the target the Bank of Canada sets in agreement with the Government of Canada. Over the past 10 years, as measured by the CPI, provincial and territorial inflation rates have averaged very close to the national pace of 2 per cent (Table 14). This leaves fiscal policy as the macro-economic instrument of provincial and territorial interest.

Budget deficits that are allowed to accumulate to a substantial debt burden reduce economic growth through depressing capital formation and productivity. Government indebtedness puts upward pressure on interest and inflation rates, creates an expectation of future tax increases, lowers governments' ability to apply counter-cyclical fiscal policy and restricts options to apply growth-enhancing spending or tax reductions. In a study of 20 OECD economies from 1970 to 2009, Salotti and Trecroci (2012) found that high public debts were followed by significant declines of both aggregate investment spending and productivity growth.

Table 14: Compound Annual Average Inflation Rate, Canadian Provinces and Territories, 2004-14, Per Cent

	2000-2014
Canada	1.80
Newfoundland and Labrador	1.73
Prince Edward Island	1.37
Nova Scotia	1.63
New Brunswick	3.68
Quebec	2.05
Ontario	1.43
Manitoba	1.76
Saskatchewan	3.95
Alberta	2.09
British Columbia	1.25
Whitehorse, Yukon	1.63
Yellowknife, Northwest Territories	5.06
Iqaluit, Nunavut	2.03

Source: Calculations based on CPI, all items, CANSIM Table, Statistics Canada 326-0021

An IMF study of advanced and emerging economies over a forty-year period found a direct negative relationship between government debt and growth with the impact largely reflecting a slowdown in labour productivity growth mainly due to reduced investment and slower growth of capital stock (Kumar and Woo, 2010). So over time provinces and territories should strive for balanced budgets and modest debt burdens. Canadian and international experience reveals that when economies are performing around their potential, it is futile to increase economic growth through increased public spending and/or tax reductions that cause large, persistent deficits. The focus must be on elevating the pace of potential growth and that requires structural reforms in an environment of macro-policy stability.

There is a case, however, for running budget deficits when the economy is performing beneath its potential. This should be done both passively through the automatic stabilizers (weaker revenues and higher social spending from a weaker economy) and as a result of demand-boosting policies. Recessions are extremely costly and the cost is not confined to the period of recession. Despite several years of economic recovery, the Canadian long-term unemployment rate has still not returned to its level prior to the 2009-2010 recession. Growth will be depressed for many years because of the capital stock lost during the recession. Macro-economic policy has a responsibility to counter economic cycles to return economic performance to its potential path. From there, it is the job of structural policies to lift that potential.

The considerable provincial and territorial deficits in the wake of the recession were warranted and even desirable. All jurisdictions are aiming to return to budget balance and this too is desirable and supportive of sustained economic growth. The jurisdictions will end up with very different public debt burdens, however. Economics does not yield a concise view on an optimal debt burden. At any rate, it would depend upon how the debt was generated. An economy, federal, provincial or territorial, could sustain a higher debt burden if it resulted from capital spending (infrastructure for example) than if the fiscal excesses were from activities that encouraged consumption and distorted economic activity. The more indebted provinces and territories will have to continue working on their macro-economic fiscal challenge and may require an extended period of budget surpluses. In turn, this would require a pace of revenue growth that exceeded increases in program spending.

Both the burden of debt and changes in this burden have varied significantly by province over time. Since the mid-1990s there has been very little change in the total level of provincial debt as measured as a proportion of national, nominal GDP. Although all but two provincial governments (Alberta and Saskatchewan) increased their net debt in nominal terms from the 1995-6 to the 2013-14 fiscal year (Table 15), five out of ten provinces decreased their net debt as a proportion of nominal GDP between the same period.

Alberta was able to achieve the most impressive fiscal turnaround, going from a 11.6 billion dollar net debt (12.4 per cent of nominal GDP) to 9.7 billion dollar net wealth (2.9 per cent of nominal GDP), representing the only province that has eliminated net debt in the given time frame (it should however be noted that the trend in Alberta in recent years has been towards slight deficits that are decreasing net wealth, and it may well slide back into net debt in the near future).

Table 15: Net Debt (Public Accounts Basis) amongst Federal and Provincial Governments, Canada, Millions of Dollars

	Net Debt 1995-6	Net Debt 2013-14	Change	Change (Percentage, 1995-6 base year)
Federal Government	554,162	611,881	+ 57,719	+ 10.4
British Columbia	12,162	38,777	+ 26,615	+ 218.8
Alberta	11,607	-9,677[34]	- 21,284	- 183.4
Saskatchewan	7,622	4,615	- 3,007	- 39.5
Manitoba	6,854	17,344	+ 10,490	+ 154.0
Ontario	101,864	267,200	+ 165,336	+ 162.3
Quebec	61,624	181,261	+ 119,636	+ 194.1
New Brunswick	5,850	11,641	+ 5,791	+ 99.0
Prince Edward Island	986	2,111	+ 1,125	+ 114.1
Nova Scotia	8,715	14,762	+ 6,047	+ 69.4
Newfoundland and Labrador	7,121	9,085	+ 1,964	+ 27.6
Total All Provinces	224,405	537,119	+ 312,714	+ 139,4

Source: CSLS calculations using RBC Report: Canadian Federal and Provincial Fiscal Tables, May 1, 2015. Accessed: http://www.rbc.com/economics/economic-reports/pdf/provincial-forecasts/prov_fiscal.pdf

Other provinces able to reduce net debt as a proportion of nominal GDP significantly include Saskatchewan and Newfoundland and Labrador (a 80.7 and a 61.2 per cent reduction of net debt respectively). Nova Scotia reduced net debt by 6.1 percentage points of nominal GDP, representing a net debt reduction of 13.9 per cent. Prince Edward Island kept its proportion relatively constant, decreasing it by 0.1 percentage points of nominal GDP and decreasing net debt by 0.3 per cent.

Of the provinces whose net debt as a proportion of nominal GDP increased, British Columbia posted the single largest percentage increase in the proportion of net debt to nominal GDP, 49.6 per cent, but maintained low levels of net debt overall, placing third amongst the 10 provinces in terms of the proportion of net debt to GDP (16.9 per cent). Manitoba and New Brunswick posted modest increases in their respective proportions of net debt to nominal GDP (3.3 and 1.8 per cent), that left their net debt levels largely in the same position.

[34] Negative figure indicates net wealth as opposed to net debt.

Table 16: Net Debt (Public Accounts Basis) in Federal and Provincial Governments as a Proportion of Nominal GDP, Canada, Per Cent

	Net Debt 1995-6 as a % of GDP[35]	Net Debt 2013-14 as a % of GDP[36]	Change (Percentage points)	Change (Percentage, 1995-6 base year)
Federal Government	67.1	32.3	- 34.8	- 51.9
British Columbia	11.3	16.9	+ 5.6	+ 49.6
Alberta	12.4	-2.9	- 15.3	- 123.4
Saskatchewan	28.5	5.5	- 23.0	- 80.7
Manitoba	25.0	28.3	+ 3.3	+ 13.2
Ontario	30.4	38.4	+ 8.0	+ 26.3
Quebec	34.0	50.0	+ 16.0	+ 47.1
New Brunswick	34.7	36.5	+ 1.8	+ 5.2
Prince Edward Island	36.6	36.5	- 0.1	- 0.3
Nova Scotia	43.8	37.7	- 6.1	- 13.9
Newfoundland and Labrador	65.5	25.4	- 40.1	- 61.2
Total All Provinces	27.2	28.4	+ 1.2	+ 4.4

Source: CSLS calculations using RBC Report: Canadian Federal and Provincial Fiscal Tables, May 1, 2015 and Statistics Canada Data. CANSIM Table 384-0038. RBC Report accessed: http://www.rbc.com/economics/economic-reports/pdf/provincial-forecasts/prov_fiscal.pdf

The largest increases to provincial debt, both in nominal and proportional terms, can be found in Ontario and Quebec. Ontario's net debt as a proportion of nominal GDP increased by 8 percentage points and 26.4 per cent, while Quebec's increased by 16 percentage points and 47.1 per cent, leading to those provinces having the highest debt levels, both in nominal and proportional terms, amongst the provinces.

When totaled together, total provincial net debt more than doubled in nominal terms but increased only slightly as a proportion of national, nominal GDP, registering a small 1.2 percentage point increase from 27.2 to 28.4 per cent and a 4.4 per cent increase in total net debt. When provincial net debt is combined with federal government net debt, which has decreased in the given time frame, total government debt is shown as decreasing as a percentage of nominal GDP substantially from 1995-6 to 2013-14.

[35] Figure for nominal GDP based on Data for 1995.
[36] Figure for nominal GDP based on Data for 2013.

F. Micro-economic environment

A number of structural or micro-economic policies are thought to influence economic growth. In this section we will address policies dealing with international and internal trade, competition, foreign investment, intellectual property (IP), telecom and electricity.

i. International Trade

The focus of trade policy is often on increasing access to foreign markets. Typically overlooked are the beneficial effects of lower tariffs and other barriers to imports. Lower cost imports provide cheaper goods and services to Canadians, effectively giving a welfare gain. They also give businesses better access at a lower cost to critical inputs such as machinery and equipment and technology. Lower-cost imports also provide a competitive boost to Canadian producers to raise their productivity. Ciuriak and Xiao (2014) estimate that unilateral elimination of all Canadian tariffs would generate a long-run increase of 1.05 per cent to Canada's Gross Domestic Product. To put that in context, the original Finance Canada estimate of the long-run GDP increase from the Free Trade Agreement was around 3 per cent (Jackson, 2003), the Canada-EU Joint Study estimates a 0.77 per cent increase from CETA and the Canada-India FTA and Canada-Korea FTA are, respectively, estimated to increase Canadian GDP 0.41 and 0.11 per cent (Ciuriak and Xiao, 2014).

The economic impacts of international trade agreements are typically estimated on an ex ante basis using general equilibrium models. It has proven difficult to measure the ex post impacts because so many things have changed in the Canadian and global economies that it is difficult to pinpoint the impact of one particular change. One of the most intensive studies of the Free Trade Agreement, that of Dan Trefler (2004*)* found that eight years after implementation, there had not been a significant change in Canadian real output attributable solely to the FTA. He did, however, find a 6 per cent increase in the level of Canadian manufacturing productivity. The explanation of course is that in the early years of the agreement the adjustment process inflicted significant job losses in Canada.

Regardless of the overall impact of trade agreements on Canadian output, it is clear that heightened global economic integration is here to stay and Canada and its businesses must do their utmost to take advantage of the opportunities offered. That means accelerating the diversification of our export base beyond our major markets of the United States and Europe and beyond concentration in a few products including largely unprocessed natural resources. The federal government and many of the provinces offer services to help companies tap into new markets. For small and medium size enterprises this can be challenging. As many of the recent trade agreements around the world have been bilateral or at most regional, exporters might face myriad rules of origin that are not easy for smaller companies to understand and abide by. The smaller firms may lack the scale to make the investment in understanding these rules worthwhile. Governments, federal and provincial, can do more to help these firms crack global markets through mentoring, opening doors in new markets and interpreting global trade rules.

ii. Internal Trade

We are far from the first to note the irony of Canadian efforts to establish free trade agreements with other countries yet do not have free trade within Canada. Some barriers to trade of goods, services and labour have been struck down. But it has been a long, slow process of reducing barriers. Instead the approach should be to establish a single domestic market where there are no internal barriers. The Canadian Chamber of Commerce estimates the remaining barriers lower Canadian GDP $50 billion a year (Beatty, The Globe and Mail, January 2, 2014). Trevor Tombe and Jennifer Winter estimate that eliminating inter-provincial trade barriers would lift Canadian productivity over 8 per cent, an impact that is even larger than eliminating remaining international barriers. They also find that interprovincial barriers account for over 40 per cent of the regional income inequality across provinces (Tombe and Winter, 2013).

Gasoline, beer and wine are among the products that face barriers due to lack of a common standard across the country. Provinces are responsible for jurisdictional accreditations for professionals and this can make mobility a challenge. Some provinces and municipalities still give preference to local or provincially based companies on government contracts. Differences in transportation rules hinder trade flows and raise prices. Marketing boards for agricultural products such as chickens and dairy act to push up consumer prices and lower industry productivity. Marketing boards are also an impediment to securing favourable international trade agreements. Many reports have called for their elimination with appropriate phase-out provisions. These internal restrictions on trade raise prices, protect inefficient producers and prevent the creation of scale that would lower costs, raise productivity and enhance Canada's international competitiveness.

The OECD has studied the influence of competition on economic growth across member countries and concludes that "because more competitive markets result in higher productivity growth, policies that lead to markets operating more competitively, such as enforcement of competition law and removal of regulations that hinder competition, will result in faster economic growth." (OECD, 2014e). Economic literature generally attributes three influences of competition on productivity gains – a "market selection effect" (reducing the market share of less productive firms), a "restructuring effect" (increasing the incentive to reduce costs) and an "entry effect" (lower cost firms entering the entering the market). In 2008 the federal government commissioned a review panel on competition (Competition Policy Review Panel, 2008). Among other things, the panel recommended lower internal and international trade barriers and liberalization of restrictions on foreign competitors in airlines, financial services and telecommunications and broadcasting. In a March 2015 report for the Canadian Council of Chief Executives, Paul Booth noted that many of the recommendations had not been acted upon, including liberalization of airlines, takeover rules for corporate directors, national securities regulation, cross-province regulatory harmonization and labour market flexibility. So in addition to any new ideas, it should be noted there are still outstanding policy issues, some squarely in provincial/territorial domain, from earlier reviews.

The federal announcement in the 2014 budget that retail price differentials between Canada and the United States would be regulated under the Competition Act provides an interesting perspective on competition and other facets of federal and provincial policy. The use

of regulation can be interpreted as a conclusion there is a market failure that requires government intervention. Yet the market failure, if there is one, seems to largely flow from government policies themselves. Li (2014) finds that the price differentials largely relate to Canadian regulatory barriers, tariffs and agriculture supply management, all issues addressed above on aspects of international and internal trade.

a. Internal Trade: New West Partnership

There are a number of internal trade barriers in Canada between Canadian provinces, which exist due to the fact that Canadian federalism "assigns economic and regulatory powers to federal, provincial and territorial jurisdictions" (Canadian Chamber of Commerce, 2004:2). Quite simply,

> *"Internal trade barriers increase the costs to both businesses and consumers and negatively impact the competitiveness of the Canadian economy. An earlier study of the Canadian Chamber of Commerce concluded that businesses receive no benefit from barriers to trade. By creating closed provincial economies, inter-provincial trade barriers foster business practices that hinder the competitiveness of the Canadian economy. Barriers to trade encourage businesses to make strategic decisions based on the shelter provided by these barriers, rather than growing their business to compete internationally, creating in effect artificially sheltered small economies. In an age of globalization, Canadian businesses need to operate in a domestic environment where they can grow to a point where they can compete internationally" (Canadian Chamber of Commerce, 2004:2).*

This quote makes abundantly clear that internal trade barriers could prevent innovative activity in a number of ways, but mainly through their inhibition of competition. Hence, dismantling internal trade barriers would foster greater competition within Canada's domestic market, which may encourage greater levels of innovation. Moreover, reducing barriers to internal trade would encourage the growth of Canadian companies. Larger Canadian companies would be promising for innovation activity because larger companies are known to undertake more R&D than smaller companies (although R&D represents a smaller share of revenues compared with smaller companies). Moreover, larger Canadian companies would be more able to compete internationally, further encouraging innovative activity.

Therefore, there are plenty of reasons to remove trade barriers. The New West Partnership, signed between Saskatchewan, Alberta and Manitoba, is one step in the right direction.

The New West Partnership, signed in 2010, contains four major components (Hanna et al., 2010):

- A comprehensive economic agreement, which will remove remaining barriers to trade, investment and labour mobility;

- An international cooperation agreement, that will see that the three provinces cooperate on trade and investment missions to international markets, and share foreign market intelligence;

- An innovation agreement, which will enable provincial innovation efforts to be coordinated to better attract investment and talent;

- A procurement agreement that will enable the provinces to capitalize on their combined buying power through the joint procurement of goods and services.

At the time of signing, British Columbia and Alberta were fully subject to the terms of the agreement, while only Saskatchewan's departments, ministries, agencies, boards, councils, committees, commissions, and similar agencies of government were fully subject to the agreement. In July 2012, Saskatchewan's Crown Corporations, municipal governments, school boards and publicly-funded academic, health and social service entities, as well as any corporation or entity owned or controlled by them, became subject to the agreement. Finally, in 2013, the last remaining transitional measure, Saskatchewan financial services, became subject to the agreement, and the New West Partnership Trade Agreement (NWPTA) was fully implemented. In January 2015, the first Protocol of Amendment to the NWPTA was signed. The amendments in this document clarified labour mobility language and dispute resolution provisions.

Essentially, the New West Partnership includes a Trade Agreement, covering workers, investors, businesses and consumers rights; an International Cooperation Agreement; an Innovation Agreement; and a Procurement Agreement, all serving to establish Canada's largest free-trade area.

Clearly, the New West Partnership has great intentions, but unfortunately, an investigation shows that there is no literature on the effects of the New West Partnership. Hence, it might be worthwhile to explore the impact that this agreement has had on trade barriers and procurement, as well as its impact on innovation and international cooperation.

In conclusion, as regards internal trade barriers, the following recommendations are put forth. The recommendations should be followed sequentially:

- Review the impacts and effects of the New West Partnership

- Conditional on net positive impacts of the New West Partnership, expand the geographical boundaries of the New West Partnership to include more provinces

iii. Foreign investment

Foreign investment brings together elements of trade and competition. Foreign investment can be a source of greater capital, technology and market expertise for the Canadian economy. But there are a number of obstacles from the Investment Canada Act that limit the

actual benefits. It is not just the proposed investments that have been rejected by the Canadian Government or the conditions attached to those accepted. After all, there have been few outright rejections. Rather, it is the uncertainty associated with the opaque regime that acts as a deterrent. Foreign firms may not attempt to invest in Canada. And such a barrier acts to reduce the competitiveness of Canadian firms because they do not need to worry about a foreign competitor buying them out.

The "default" setting in the foreign investment review process says a lot. The Minister must be satisfied that the deal is likely of net benefit to Canada. This seems to presume there is in general something negative about foreign investment. Yet an extensive survey of evidence by Statistics Canada (Baldwin and Gellatly, 2007) points to substantial benefits to the Canadian economy of foreign input of capital. Some of the findings of the survey are:

- Foreign-controlled firms are generally larger than domestic firms, have higher productivity, greater capital intensity and pay higher wages
- Foreign takeovers have contributed to a net gain in head offices in Canada
- Foreign-controlled firms are more likely to use advanced technologies
- Foreign-controlled firms have raised Canadian productivity by displacing less productive plants, diffusing new technology and restructuring

Grant Bishop (2014) puts forward an alternative regime that would increase the transparency of the foreign investment review process and encourage more capital investment in Canada. Two key components of this regime are a change in the default such that the Government would have to show "net detriment" in order not to approve an application and a decision concerning a transaction could be challenged by a specialized tribunal in a process that parallels that under the Competition Act.

Certain network industries – such as railways, airlines, telecommunications and electricity – have evolved under the presumption of natural monopoly conditions. This has meant government ownership and/or heavy regulation. However, in some markets, certainly telecommunications and broadcasting, technological disruptions are reducing barriers to entry. And it is becoming more apparent that the closed Canadian market is driving up costs and reducing productivity. Some advances in fostering market forces have been made but many more possibilities exist. As an example, Ben Dachis (2014) of the C.D. Howe Institute proposes a very different aviation policy framework whereby airports are privatized, domestic routes are opened to international carriers and federal and provincial fees imposed on airport operations are reformed. Vijay Gill (2012) of the Conference Board estimates that these fees are important elements of a 30 per cent cost advantage that U.S. airports enjoy over comparable Canadian counterparts.

The CRTC has deferred to market forces in many aspects of telecommunications. However, there still appear to be distortions through policy. For example, the C.D. Howe Institute's Competition Policy Council (2014) has argued that the ten per cent threshold for

foreign acquisitions of domestic carriers creates a distortion in favour of smaller, less efficient competitors. Jeffrey Church and Andrew Wilkins (2014) of the University of Calgary's School of Public Policy argue that the focus on the number of competitors in auctions for wireless spectrum is inappropriate as new entrants may not be viable or efficient and there is inadequate evidence that incumbents offer adequate competition.

Cost-saving, productivity-enhancing changes are also possible in electricity. The recent proposal of the Ontario Government to privatize much of Hydro One offers a perspective on the greater efficiency that can be introduced through the private sector, as well as the proceeds of the asset sale to the government. There have been many calls for interconnecting Canada's fragmented electricity grid. An example is the 2010 report of the Canadian Academy of Engineering which argues this would improve pricing and sustainability of the power supply as electricity could be distributed from excess supply to high-demand regions and time-dependent peak loads could be met. However, Jan Carr, former CEO of the Ontario Power Authority, argues that a precondition for such interconnection is a scheme for the interface of different provinces' market structures. In particular, she is concerned that a province might use its monopoly position in electricity to limit transmission access from outside that province (Carr, 2010).

The main conclusions from this section on micro-economic policies to bolster economic growth are that governments should:

- Enhance their mentoring processes for small and medium-size enterprises to take full advantage of trade agreements

- Establish a true economic union within Canada where there are no provincial/territorial barriers, mutual recognition of regulations and standards, mechanisms for standards harmonization and effective dispute resolution

- Phase-out agriculture marketing boards

- Move immediately to achieve the reduction in barriers between provinces that has been offered in the draft Canada-European Union Trade Agreement (CETA) and may be undertaken in the Trans-Pacific Partnership (TPP) trade agreement.

- Work with the federal government to complete the process of reforming the *Investment Canada Act* on foreign investment by changing the default to the Government needing to prove detriment in order to reject a proposal and the creation of a professional dispute resolution body

- Work to ease monopoly ownership and heavy regulation in key industries such as railways, airlines, telecommunications and electricity

- Create an interconnection of electricity power grids across provinces.

G. Linkage between Economic Growth and Inequality

Study of the relationship between inequality and economic growth, including productivity growth, has a long history in economics. There are many channels whereby faster output and productivity growth can affect, both positively and negatively, income inequality and whereby changes in income distribution can influence economic growth, again both positively and negatively. There is no consensus in the literature on the direction or magnitude of these effects, as they can vary by region and country, time period, and measure of inequality.

The relationship running from economic growth to inequality is largely determined by the nature of the economic growth process. If economic growth is driven by industries employing relatively small numbers of highly skilled workers, inequality can increase. On the other hand, if economic growth is broad-based, from the point of the demand for skills, inequality can fall. Economic growth boosts government revenues and these revenues can be used for income redistribution if there is the political will. From this perspective, faster economic growth can in principle lead to a fall in income inequality, measured on a post- tax and transfer basis.

The relationship running from income distribution to economic growth has traditionally been examined from the perspective of effects on saving and investment. High levels on income inequality have been believed to result in greater savings. Given the high propensity to save of the rich relative to the poor, and hence greater investment, spurring economic growth. More recent research has stressed channels where inequality is bad for growth. For example, high levels of income inequality may mean that the poor have insufficient resources to develop their human capital, with negative effects for growth. Equally, high levels of inequality can have political economy effects, leading to civil unrest and a negative environment for investment.

To conclude, the two-way relationship between inequality and growth is still an area of active research for economists, with no definitive story. However, the literature does find that economic growth is often pro-poor and that high levels of income inequality can constitute barriers to economic growth.

III. Policies to Boost Labour Supply

Economic growth is also driven by the supply of labour, which is determined by the working age population (i.e. persons aged 15 years and over), the labour force participation rate (i.e. the share of the working age population engaged in the labour market), and average number of hours worked per worker. The working age population in turn is affected by the rate of natural increase (i.e. births minus deaths) and net international and interprovincial immigration.

Fiscal sustainability poses a significant challenge to the Canadian provinces. If growth in per capita real government expenditure on healthcare is to be maintained without rising deficits over the coming decades, real GDP will need to grow faster than recent trends suggest that it will. We have noted that, broadly speaking, there are only two ways for a society to increase real GDP. Either the amount of output per hour worked (labour productivity) needs to increase or else the number of hours being worked (labour supply) must increase.

The previous section discussed various determinants of labour productivity and how policy can promote labour productivity growth. This section will discuss policy options to promote labour supply growth in the Canadian provinces.

Similarly to growth in real GDP, there are three broad ways to generate growth in labour supply:

1) Increase the size of the working age population

2) Increase the labour force participation rate of the working age population

3) Increase the average number of hours worked by those in the labour force

This section is divided into two parts which discuss policy options related to these approaches to boosting labour supply.

The first part will consider the relatively limited options available to increase the working age population (1). Two obvious sources of growth in the working age population are immigration and the natural rate of increase (births minus deaths). Increasing the size of the working age population in these ways could raise real GDP, but they will also raise government expenditures so that there is no improvement in terms of GDP growth relative to government expenditure. However, population growth could still offer a partial solution through compositional effects. This can occur if segments of the population which are growing relatively quickly are more productive or require lower levels of expenditure than the average. For example, if most immigrants are skilled prime age workers, immigration could have a positive compositional effect by increasing skilled prime age workers as a share of the Canadian population.

The second part discusses options to increase the amount of labour supplied by a given working age population (2 and 3). This can be done through increasing the labour force participation rates of the working aged population, lowering unemployment rates of those in the

labour force, or increasing the number of hours worked by those who are employed. Most of our discussion will focus on raising labour force participation rates, as many of the policies which increase hours worked per worker or employment rates are the same as those which will raise participation rates. After considering historical trends in labour force participation in Canada and comparing performance across provinces and internationally, we will consider two general approaches to raising labour force participation. The first approach is to adopt policies which will raise labour force participation rates of the population generally. The second approach is to adopt policies which specifically target subpopulations known to under-participate in the labour market – namely women, those with disabilities, older people, immigrants, and the Aboriginal population.

A. Policies to Increase the Working Age Population

Table 17: Sources of Total Population Growth, Medium Growth Scenario, Compound Annual Growth Rates, Per Cent, Canada and the Provinces and Territories, 2014-2038

	Total Growth	Natural Increase	Births	Deaths	Inter-national Migration	Immigration	Emigration	Net Inter-provincial	Net non-permanent
Canada	0.85	0.25	1.06	-0.82	0.59	0.76	-0.17	0.00	0.01
Newfoundland and Labrador	-0.59	-0.38	0.77	-1.15	0.07	0.11	-0.04	-0.28	0.00
Prince Edward Island	0.83	-0.01	0.95	-0.95	0.77	0.83	-0.06	0.06	0.01
Nova Scotia	-0.04	-0.22	0.85	-1.08	0.18	0.25	-0.07	0.00	0.01
New Brunswick	-0.02	-0.19	0.85	-1.04	0.19	0.23	-0.04	-0.03	0.01
Quebec	0.56	0.14	1.03	-0.89	0.53	0.61	-0.07	-0.12	0.01
Ontario	0.80	0.22	1.03	-0.81	0.60	0.83	-0.22	-0.04	0.01
Manitoba	1.00	0.46	1.24	-0.78	0.97	1.05	-0.08	-0.44	0.01
Saskatchewan	0.68	0.46	1.26	-0.80	0.65	0.68	-0.03	-0.44	0.01
Alberta	1.75	0.70	1.31	-0.61	0.72	0.84	-0.12	0.32	0.01
British Columbia	1.02	0.13	0.95	-0.82	0.59	0.96	-0.37	0.28	0.02
Yukon	0.70	0.58	1.24	-0.66	0.75	0.75	0.00	-0.62	0.00
Northwest Territories	-0.10	1.01	1.56	-0.54	0.00	0.23	-0.23	-1.11	0.00
Nunavut	1.04	2.00	2.49	-0.49	0.00	0.00	0.00	-0.95	0.00

Source: CSLS calculations based on Statistics Canada data.

Stagnant birth rates combined with rising mortality rates as the population ages suggest that most of the future population growth in Canada will be the result of immigration. Table 17 presents the sources of total population growth projected under Statistics Canada's medium (M1) growth scenario. One sees that the population is projected to grow at a rate of only 0.85 per cent between 2014 and 2038. The majority of this population growth will be due to net international migration, which is projected to contribute 0.59 percentage points (0.76 percentage points due to immigration, but -0.17 percentage points as the result of emigration). There is expected to be very little growth due to natural increases (0.25 percentage points) as growth due to births (1.06 percentage points) will be largely offset by deaths (-0.82 percentage points).

Population growth is projected to be strongest in Manitoba (1.06 per cent), Alberta (1.87 per cent), British Columbia (1.11) per cent, and Nunavut (1.09 per cent). The territories and the Prairie Provinces are notable in that they are all projected to have above average population growth due to natural increases. International migration is also generally projected to be stronger in the west. Only Alberta, British Columbia, and Prince Edward Island are expected to experience population growth from interprovincial migration over both subperiods.

How can the provinces increase working age population growth above the levels projected by Statistics Canada?

i. The Natural Rate of Increase

To raise the natural rate of increase, either the birth rate must rise or the death rate must fall.

a. Increasing Births

There are several ways in which a government could incentivize its population to have more children. The most common policies encouraging higher birth rates in Canada are to lower the cost of having children, typically through tax credits for those with children or for specific expenses related to children.[37]

From 1988 to 1997, Quebec offered an Allowance for Newborn Children which was specifically intended to raise birth rates and likely serves as the best example of a pro-natalist policy in Canada. In 1992, Quebec offered families $500 for their first child, $1,000 for their second, and 20 quarterly payments from birth of $400 ($8,000 in total) for each additional child. Evidence suggests that this policy was successful at raising the birth rate in Quebec, but at considerable cost. Milligan (2002) estimates that births between 1989 and 1996 increased by 14.5 per cent in Quebec as a result of the policy, but this increase cost the government about $15,000 per additional birth.[38]

Realistically, increasing birth rates is not a solution to provincial fiscal sustainability within the time frame we are considering. As we have noted above, raising the population also raises total expenditures. Raising birth rates could eventually help, as this would increase the population which is young (low expenditure) and of working age (high revenue). However, there is not enough time for children to reach working age between now and 2038 – in 2038, a child born in 2014 would only be about 23 years old. Most of the children born between 2014 and 2038 would not be able to work and would only serve to raise the dependency ratio and put further strain on government finances.

[37] Theoretically a government could also attempt to reduce the use of contraception through taxation, but this would undoubtedly prove extremely unpopular and may result in an increase in unwanted births.

[38] Recall that the government is making payments for births which would have happened in the absence of the policy. This figure of $15,000 reflects the amount of money paid for all children born under the policy divided by the number of births estimated to have occurred as a result of the policy.

b. Lowering Mortality Rates

While lower mortality rates are a desirable goal in and of themselves, they likely are not a means to improving fiscal balances. The most obvious approach to reducing mortality is to further increase government expenditures on healthcare. As mortality rates are already very low among the population of prime working age (those aged 25-54 accounted for 9 per cent of deaths in Canada in 2011[39]), reducing mortality rates generally may have a negative compositional effect on fiscal positions. Seniors, who are associated with higher per capita government expenditure and lower labour force participation, would likely become a larger segment of the population if mortality rates were generally reduced (those aged 65+ accounted for 79 per cent of deaths in Canada in 2011). This is not to say that such an outcome is undesirable, but it is unlikely to increase GDP growth more than government expenditures.

That being said, expenditures or regulations which would reduce mortality rates or lower morbidity rates specifically among the working population (reducing presenteeism, absenteeism, or disability) could have a positive impact on labour supply. Workplace mortality rates are unacceptably high in Canada. In 2005, the incidence of workplace fatalities in Canada was 6.8 per 100,000 workers, up from 5.9 per 100,000 in 1993 – about one in every 15,000 workers suffered a workplace fatality in 2005 (Sharpe and Hardt, 2006a). The Public Health Agency of Canada's 2014 report on the Economic Burden of Illness in Canada (EBIC) estimated that premature deaths due to illness and premature deaths due to injury cost the Canadian economy $463.5 million in lost output in 2008 (constant 2010 dollars).

Improvements in health may have a significantly larger impact on labour supply by reducing lost hours of work due to illness. The EBIC report estimated that absenteeism resulting from morbidity was estimated to have cost $16.7 billion in 2008.[40] As such, policymakers should keep in mind that health policy can have an effect on GDP. We will not consider health policy options in detail, although we will discuss policies to increase the labour supply of persons with disabilities later in this report.

ii. International Migration

a. Immigration Policy

Immigration is expected to be the major driver of Canadian population growth in the coming decades. In 2014, preliminary figures indicate that 260,308 individuals immigrated to Canada (0.73 per cent of the Canadian population) (CANSIM Table 051-0037). Between 2014 and 2026, (gross) immigration is expected to account for 80 per cent of the growth in Canada's population. This is expected to increase to 100 per cent over the 2026-2038 period (Drummond and Capeluck, 2015). The figures in Table 17 indicate that international immigration is expected

[39] Based on death counts in CANSIM Table 102-0503

[40] The estimated cost of mortality is based upon a "friction cost method" which only counts lost production over the time it takes to find and train a replacement. This produces a much lower cost of mortality than a "human capital method" which counts all output a deceased individual would have been expected to produce.

to account for over 90 per cent of the population growth between 2014 and 2038 in every province except for Alberta (48 per cent).

The Canadian government has considerable control over the extent of population growth due to immigration and there seems to be no shortage of people wishing to move to Canada. Increasing the number of immigrants is thus frequently advocated as a solution to Canada's demographic problems. While the federal government controls immigration, most provinces have some control over their number and type of immigrants through the Provincial Nominee Program.[41]

As is the case with changing the natural rate of increase, the direct gains to GDP arising from a greater number of immigrants would be more or less offset by growth in expenditures. However, Canada has considerable control over who is allowed to immigrate and could further target immigrants which will have positive compositional effects – specifically young skilled workers. As such, raising immigration may offer a viable approach to raising labour supply, but the impact is unlikely to be large enough in the timeframe under consideration. Given that immigrants underperform in the labour market compared to the Canadian born, they may not improve the situation without significant improvements in their performance. Dungan, Fang, and Gunderson (2013) estimate that immigration at its current level will likely slightly reduce Canada's GDP per capita in the long run. Any increase in the number of immigrants should be accompanied by reforms to attract and select immigrants who are likely to make a positive economic contribution and to improve their odds of success in the labour market upon arrival. Policies to improve the labour market performance of immigrants will be discussed at length later in this section. Even with such reforms, the age gap between immigrants and domestic workers is currently too small and the immigration rate too low to have a major impact on Canada's fiscal situation within the timeframe under consideration.

Section B.vii.a on immigration below analyzes the extent to which reasonable levels of immigration to Canada can be expected to mitigate the aging of the population in greater detail.

b. Emigration Policy

A second way to increase population growth due to net immigration is to reduce the number of people leaving Canada. Generally, policies attempting to retain Canadians beyond those which generally make Canada a desirable place to live and work are not recommended. Concerns are periodically raised about "brain drain" and the outflow of Canadian talent, but such problems are perhaps somewhat overstated. While some skilled Canadians do choose to leave the country to take advantage of opportunities elsewhere, workers should not be discouraged from moving if they will be more productive elsewhere and skilled Canadian emigrants can form valuable international connections and may eventually return to Canada bringing foreign skills, experience, and knowledge. As such, Canadians should be free to live wherever they want.

Emigration tends to be relatively small when compared to births, deaths, or immigration, and a large number of emigrants do eventually return to Canada. From July 1, 2013, to June 30, 2014, preliminary estimates are that Canada had 61,928 emigrants (CANSIM Table 051-0004),

[41] Quebec has greater control, as it has the right to select its own immigrants.

but there were also 36,811 returning emigrants over this period. Some of these emigrants also likely represent individuals who immigrated to Canada and opt to emigrate back to their country of origin upon retirement, which is fiscally beneficial.

iii.. Interprovincial Migration

Internal migration cannot change the total population at the national level, although it could offer a means for provinces to raise their populations at the expense of others. Just as with international migration, provincial changes in the population level would be expected to have offsetting effects on revenues and expenditures, but compositional effects could matter. In particular, provinces may compete to attract young and skilled workers. "Beggar thy neighbor" style policies by provincial governments could potentially be harmful if they reduce incentives for provincial investment in education and training. For example, some provinces have recently offered tuition rebates which attract graduates from other provinces. Saskatchewan offered a refund on tuition fees of up to $20,000 in the form of a refundable tax credit to recent graduates residing in the province between 2007 and 2012. New Brunswick, Nova Scotia, and Manitoba have all offered similar tuition repayments via taxation in recent years.[42] If successful, such policies may have benefited these provinces, but at the expense of provinces which did not offer similar rebates. The concern is that such policies may lead to inefficient provincial investments in education.[43]

Rather than actively attempting to free-ride on the investments of other jurisdictions, the provinces should focus on fostering economic opportunities which will attract workers through market forces. Barriers to interprovincial migration should be minimal so as to promote efficient reallocation of resources at the national level. This should naturally improve provincial finances, potentially even for provinces which are losing population. If one province is experiencing an expansion and has excess demand for labour and a second is struggling in terms of employment, unemployed workers from the second province should be encouraged to move to the first. This will lower expenditures in the province experiencing the downturn and raise GDP in the province which is booming. In this way, efficient reallocation of labour across the provinces can have positive compositional effects nationally and benefit provincial governments on both sides of the migration.

Between 1987 and 2014, the Centre for the Study of Living Standards (2015) estimated that 59,259 jobs were created in Canada as the result of interprovincial migration, which had a cumulative effect of raising GDP by an estimated 0.50 per cent. If one also factors in the positive reallocation effects in terms of labour productivity, the total gains to Canadian GDP due to migration over the entire period amounted to 1.25 per cent of GDP. The cumulative effect of these improvements was an increase in the output growth rate over the 1987-2012 period of about 2 per cent.

[42] Some of these programs have been modified or eliminated recently. As of the most recent provincial budget, Saskatchewan's graduate retention program is now offered as a non-refundable tax credit and is paid out over a longer period of time following graduation. Nova Scotia eliminated its Graduate Retention Rebate in 2014, citing ineffectiveness of the program.

[43] Provinces lacking such policies may be incentivized to underinvest in education if less human capital will be retained. Alternatively, other provinces may feel compelled to offer similar tuition rebates, which would eliminate the incentives to move and just result in greater expenditures supporting education.

There are very few impediments to interprovincial migration in Canada. Expanded (federal) tax credits for moving expenses or introduction of tax credits for job search expenses may promote additional interprovincial migration. The obvious problem with offering assistance with costs of interprovincial job search is that such benefits may be exploited to fund travel by those who were not seriously seeking employment. As such, any support for job search would likely require stringent eligibility requirements to minimize abuse. Improvements in the availability of labour market information could also facilitate interprovincial job searches.

iv. Conclusions

We conclude that there are limited opportunities to improve provincial finances by increasing the working age population. While raising the natural rate of increase or net migration could boost GDP, it will also increase expenditures. As a result, the benefits of policies in these areas do not occur directly through the size of the working age population, but through impacts on its composition.[44] Increased immigration seems to be the best option to achieve population growth. In summary:

- Raising birth rates is not a viable option. This would not have a significant positive impact on GDP in the timeframe under consideration and would raise the dependency ratio.

- Changes to health policy and safety regulation (particularly in the workplace) to reduce mortality rates of the prime working age population may help, but only to a limited degree given that mortality rates are already very low for this group.

- While often lauded as a solution, international immigration may actually lower Canada's growth rate of GDP per capita under the status quo. Reforms to better target young skilled workers and increase their odds of economic success upon arrival would help, but more immigration should not be expected to solve the problem.

- Governments should co-operate to facilitate interprovincial job search and migration by enhancing available labour market information. Provincial policies which promote interprovincial migration at the expense of other provinces should be avoided.

[44] One additional option to increase the size of the working age population is to relax rules surrounding minimum working ages. Unlike migration or the natural rate of increase, lowering the minimum working age can increase the working age population without significantly increasing government expenditures because it does not change the size of the total population. While lowering the minimum working age or relaxing age-related work restrictions could increase the available supply of labour, it may come at the cost of interfering with the development of human capital. As such, provinces should be very cautious in adopting this option. However, the young do represent a substantial pool of labour to draw upon and could potentially contribute to economic output through part-time jobs in safe occupations, at reasonable hours, with appropriate supervision.

B. Policies to Boost Labour Force Participation

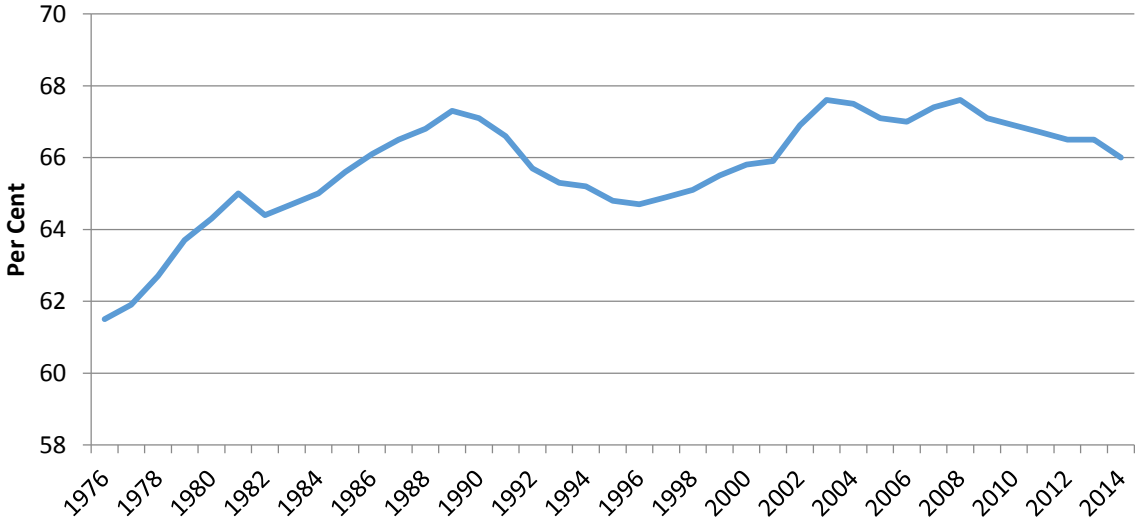
Besides increasing immigration rates or potentially expanding employment of children, there is not a lot of scope to raise GDP by increasing the working age population. The only other option to boost labour supply is to increase the average amount of work performed by each person of working age. Before discussing policy options to do this, it is useful to examine trends in labour force participation rates so as to gain a better understanding as to how much excess capacity Canada may have in this regard.

As we have noted above, we will focus our attention on labour force participation rates, as these tend to be indicative of employment rates and hours worked. The reader should keep in mind that, besides raising labour force participation rates, labour supply could also be increased by raising the number of hours worked by each person in the labour force. This could be done by increasing the percentage of workers who are full-time (about 81 percent of workers were full-time in 2014 according to CANSIM Table 282-0002) or by increasing the average number of hours worked by those of full- or part-time status.

i. An Overview of Labour Force Participation in Canada

Chart 31 presents the labour force participation rate of the Canadian working age population between 1976 and 2014. One sees that there was a significant increase in the participation rate from about 62 per cent in 1976 up to about 67 per cent in 1990. This increase was almost entirely the result of female entry into the workforce. Participation rates fell to about 65 per cent with the recession in the early 1990s and remained low for the remainder of the decade. The participation rate rose to a new high of slightly above 67 per cent in the 2000s, but has declined to about 66 per cent since the global recession. This recent decline can be linked to falling youth participation rates in response to high youth unemployment and the aging of the working age population.

Chart 31: Labour Force Participation Rate of Population Aged 15+, Canada, 1976-2014

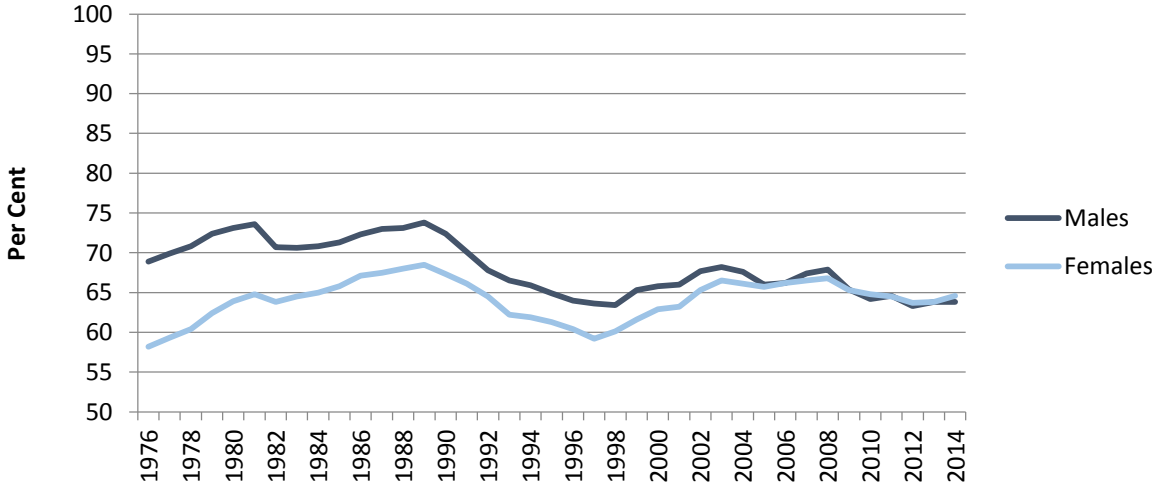


Source: Statistics Canada, CANSIM Table 282-0002 Labour force survey estimates (LFS), by sex and detailed age group, annual.

Chart 32, Chart 33, and Chart 34 plot movements in the labour force participation rates by gender for three respective age groups: 15-24, 25-54 (prime working age), and 55+. A few interesting trends emerge.

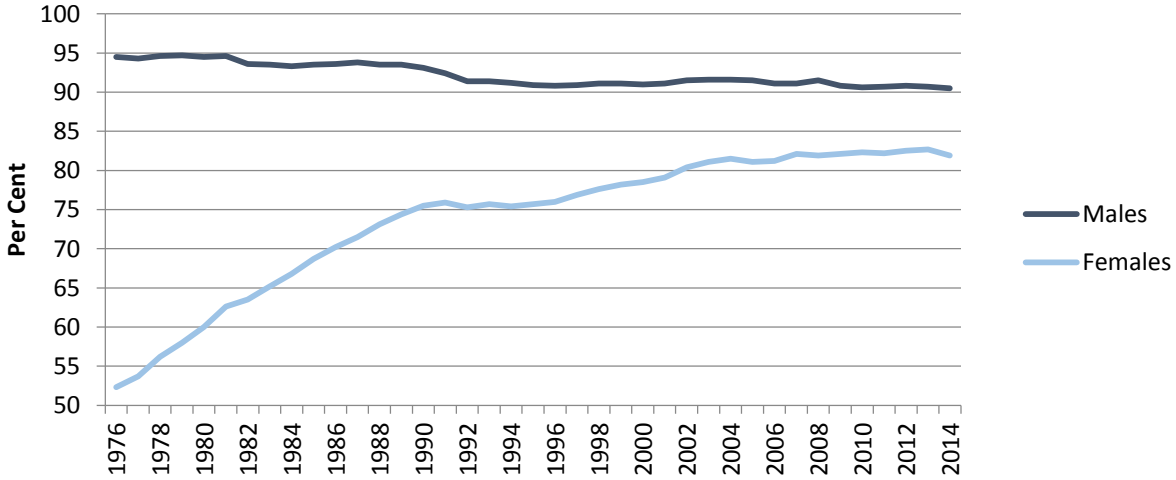
Chart 32 reveals that male and female participation rates of the young have converged at about 65 per cent. The male youth participation rate has fallen considerably compared to its pre-1990 levels. Participation rates in this age group are somewhat lower than those of the prime working age population as a large share of those aged 15-24 opt not to work while attending school. Keep in mind that about 49 per cent of those in this age group who are employed in Canada only worked part-time in 2014. Rising postsecondary enrolment has reduced the number of people in this age group available to work full-time.

Chart 32: Labour Force Participation Rate of Population Aged 15-24 by Sex, Canada, 1976-2014



Source: Statistics Canada, CANSIM Table 282-0002 Labour force survey estimates (LFS), by sex and detailed age group, annual.

Chart 33: Labour Force Participation Rate of Population Aged 25-54 by Sex, Canada, 1976-2014



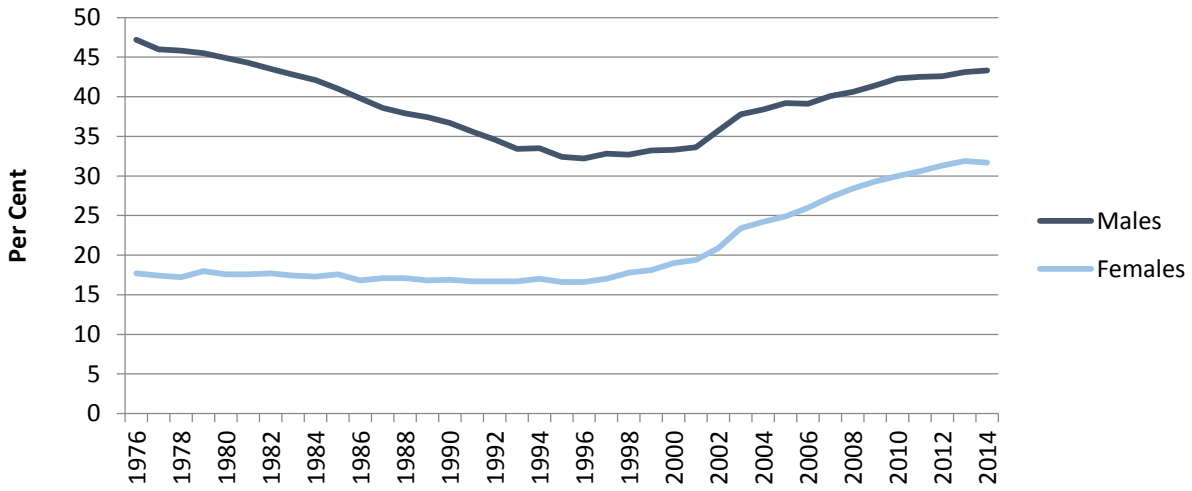
Source: Statistics Canada, CANSIM Table 282-0002 Labour force survey estimates (LFS), by sex and detailed age group, annual.

Chart 33 illustrates that many prime-age women chose to enter the labour force in the 1970s and 1980s. Most of the improvement in labour force participation rates over this period can be attributed to rising participation rates among this group. Female participation continued to rise between about 1990 and 2005, albeit at a slower pace, and has now more or less stabilized at slightly above 80 percent, about 10 percentage points below the corresponding male participation rate.

Interestingly, the gains in the female participation rate observed in those aged 25-54 in the 1970s and 1980s do not appear to have occurred for the female population aged 55+. One also notes that male participation rates in this age group steadily declined from 1976 until about 1995. This reflects compositional shifts in this age group (the share of this group aged 55-59 fell while the share aged 70+ rose over the period) and that individuals were choosing to retire sooner (most of the fall in participation rates occurred among those aged 60-64). Participation rates for both men and women in this age group have risen significantly since about 2002. This may suggest that some individuals are choosing to retire later, although much of this increase is likely the result of a compositional shift in the age distribution within this category as the first baby boomers reached age 55 at about this time.

From a historical perspective, we see that Canadian participation rates are currently quite high, but they have been higher in the past, particularly for men. With one-third of the Canadian working age population currently not participating in the labour force, there appears to be room for labour supply to increase. However, we must keep in mind that the aging population will naturally lower the aggregate participation rate (although Drummond and Capeluck (2015) estimates that about 58 per cent of the effect of aging on the participation rate already occurred between 2000 and 2014) and it is not immediately clear how high the participation rate could realistically be. International comparison can provide a clearer understanding of reasonable upper bounds on participation rates.

Chart 34: Labour Force Participation Rate of Population Aged 55+ by Sex, Canada, 1976-2014



Source: Statistics Canada, CANSIM Table 282-0002 Labour force survey estimates (LFS), by sex and detailed age group, annual.

Canada is already one of the strongest performers among developed countries in terms of labour force participation. Table 18 presents participation rates for the working age populations in 33 OECD countries. In order to make this comparison more meaningful, we have standardized the participation rates by applying the Canadian age and sex distribution to age-sex-specific[45] participation rates for each country. We find that Canada has the 7th highest standardized participation rate of the 34 OECD countries, 66.5 per cent, which is far above the OECD participation rate of 60.9 per cent.

Table 18: Labour Force Participation Rates of the Population Aged 15+, OECD Countries, 2013

Country	Participation Rate	Age-Sex-Standardized Part Rate
Iceland	81.4	77.4
Switzerland	68.3	70.0
Sweden	71.5	69.5
New Zealand	68.4	68.6
Norway	71.2	67.7
Netherlands	65.2	66.9
Canada	**66.5**	**66.5**
Denmark	62.4	65.7
Japan	59.3	65.0
Australia	64.9	64.9
United Kingdom	63.3	64.8
Estonia	68.3	64.7
Germany	60.3	64.1
Finland	65.4	63.8
Israel	63.7	63.6
United States	63.2	63.2
Austria	61.5	62.8
Portugal	59.3	61.7
Chile	59.6	60.7
OECD Countries	**60.1**	**60.9**
Czech Republic	59.3	60.0
Korea	61.5	59.7
Mexico	60.5	59.6
France	56.5	59.5
Spain	60.0	59.3
Ireland	60.5	58.6
Slovenia	57.2	57.8
Slovak Republic	59.3	57.4
Poland	55.9	56.0
Luxembourg	59.4	55.9
Belgium	53.6	55.8
Greece	52.8	54.7
Hungary	57.5	53.9
Italy	49.5	51.4
Turkey	50.8	46.2

Source: CSLS calculations using data from OECD.StatExtracts, Labour Force Statistics, LFS by Sex and Age. Standardization is performed by the CSLS based on the age and sex distribution of the Canadian working age

[45] 5-year age groups between 15 and 64 were used along with a 65+ category.

population in 2013 and 5-year age-sex-specific participation rates in each country for the population 15-64 plus a category for the population aged 65+.

The only countries with higher participation rates in the OECD are Iceland, Switzerland, Sweden, New Zealand, Norway, and the Netherlands. Iceland has a very high participation rate of 77.4 per cent which merits further investigation. Ignoring Iceland, it seems that the upper bound for participation rates in the OECD is about 70 per cent. This suggests that it may be possible for Canada to raise its participation rate by a few percentage points.

There is also significant variation in terms of participation rates within Canada (Table 19). The highest (age-standardized) participation rate of the working age population in Canada in 2014 was 70.6 per cent in Prince Edward Island. Saskatchewan, Alberta, and Manitoba also had above average participation rates. Ontario and Quebec have participation rates which are slightly below average, while the other Atlantic Provinces and British Columbia tend to have the weakest labour market performance. Similar trends are observed across the provinces for all three of the age groups considered above.

Table 19: Labour Force Participation Rates by Province, 2014

	Ages 15+ (age-standardized)	Ages 15 to 24	Ages 25 to 54	Ages 55 and over
Prince Edward Island	70.6	69.5	89.5	42.7
Saskatchewan	69.5	66.8	87.6	44.1
Alberta	69.2	67.4	87.4	46.4
Manitoba	67.8	67.6	87.4	38.8
Canada	**66.0**	**64.2**	**86.2**	**37.2**
Ontario	65.8	61.9	85.7	38.1
Quebec	65.7	67.4	87.0	33.6
New Brunswick	65.5	64.1	86.3	35.2
Nova Scotia	65.2	64.7	86.1	34.2
British Columbia	64.2	61.6	84.6	34.9
Newfoundland and Labrador	62.6	59.9	84.4	32.5

Source: Statistics Canada, CANSIM Table 282-0002 Labour force survey estimates (LFS), by sex and detailed age group, annual.

It is interesting to note that Quebec has a participation rate which is somewhat higher than the national average for the population aged 15-24 (67.4 per cent versus 64.2 per cent) but it has a much lower participation rate for the population aged 55 and over (33.6 per cent versus 37.2 per cent).

To the extent that policy differences underlie the gaps between some of the top and bottom performing provinces, it may be possible to raise provincial participation rates. Understanding the strong performance of Prince Edward Island compared to every other

province in terms of the participation rates of the prime aged population would be particularly interesting.[46]

Based upon historical trends, international comparisons, and interprovincial comparisons, it seems reasonable to suggest that some Canadian provinces could significantly increase their labour force participation rates.

A target in the realm of 70 per cent (age-standardized), which is about the highest observed anywhere outside Iceland and is approximately the upper bound within Canadian provinces, is probably a reasonable target as to what governments should hope to achieve.

It is also important to keep in mind that many individuals who are not in the labour force may still be performing productive activities in their own homes (care-giving, for example) or as volunteers. While these activities may not show up in GDP or in labour force statistics or increase government revenues, it is important to understand that increased labour force participation may come at the expense of reduced non-market production, leisure time, or investments in education.

ii. Opportunities to Increase Labour Force Participation

From our examination of aggregate figures, it seems that it should be possible to raise the labour force participation rate in Canada, but how can we do this? One approach is to identify policies which generally encourage everyone in the population to work more (either by participating at all or by working more hours). For example, lowering marginal tax rates could be one such approach. While such policies are certainly worth pursuing, there is likely only so much that can be done to raise the participation rates of Canadians across the board given that the aggregate participation rate in Canada is already very high. Alternatively, we could design policies to engage specific subsets of the population which we believe underparticipate, as these groups represent clear opportunities to raise participation rates. In particular, women, seniors, Aboriginal people, immigrants, and those with disabilities could all potentially provide additional labour. Improving the labour market performance of these groups would not only include them as beneficiaries of economic growth in Canada: inclusion could be a driver of economic growth.

Table 20, Panel A, compares the participation rates of prime aged males (ages 25-54) to those of prime aged females, older workers and prime age workers. Labour force participation rates of prime aged male immigrants were not readily available by province, so the table compares prime age landed immigrants of both sexes to those of all prime aged workers born in Canada.

[46] PEI had a participation rate which was below the national average in 1976. Its participation rate significantly improved relative to that of the other provinces between 1976 and 1990. It then remained relatively stabilized before significantly rising again between about 1997 and 2005. Since about 2000, it has had one of the highest participation rates in the country. One potential explanation for PEI's high participation rate may be a relatively high population share on employment insurance (and thus in the labour force) due to a relatively high employment share of cyclical industries such as agriculture and fishing.

Table 20, Panel B, presents the participation rates of these groups as a percentage of that of prime aged males.

Table 20: Labour Force Participation Rates, Select Groups, Canadian Provinces, 2014

Panel A: Labour Force Participation Rates

Province	Male Aged 25-54	Female Aged 25-54	Male Aged 55+	Aboriginal Male Aged 25-54 (off-reserve)	Born in Canada Aged 25-54 (Both Sexes)	Landed Immigrants* Aged 25-54 (both sexes)
Canada	90.5	81.9	43.3	81.3	87.7	82.6
Newfoundland and Labrador	88.5	80.4	38.7	89.4	84.3	85.9
Prince Edward Island	92.3	86.9	49.3	100.0	90.5	81.1
Nova Scotia	88.7	83.7	40.3	83.1	86.4	84.9
New Brunswick	89.4	83.3	41.0	100.0	86.6	82.9
Quebec	89.7	84.2	39.4	79.4	86.6	81.0
Ontario	90.3	81.2	44.0	78.5	87.6	82.4
Manitoba	92.2	82.6	45.7	81.3	87.5	87.7
Saskatchewan	92.5	82.4	52.8	80.4	88.4	85.3
Alberta	93.6	80.8	53.8	88.6	88.0	86.2
British Columbia	89.2	80.2	40.0	78.0	86.5	81.5
Panel B: Labour Force Participation Rates Relative to Baseline						
Canada	100.0	90.5	47.8	89.8	100.0	94.2
Newfoundland and Labrador	100.0	90.8	43.7	101.0	100.0	101.9
Prince Edward Island	100.0	94.1	53.4	108.3	100.0	89.6
Nova Scotia	100.0	94.4	45.4	93.7	100.0	98.3
New Brunswick	100.0	93.2	45.9	111.9	100.0	95.7
Quebec	100.0	93.9	43.9	88.5	100.0	93.5
Ontario	100.0	89.9	48.7	86.9	100.0	94.1
Manitoba	100.0	89.6	49.6	88.2	100.0	100.2
Saskatchewan	100.0	89.1	57.1	86.9	100.0	96.5
Alberta	100.0	86.3	57.5	94.7	100.0	98.0
British Columbia	100.0	89.9	44.8	87.4	100.0	94.2

* *Refers to people who are, or have been, landed immigrants in Canada. A landed immigrant is a person who has been granted the right to live in Canada permanently by immigration authorities. Canadian citizens by birth and non-permanent residents (persons from another country who live in Canada and have a work or study permit, or are claiming refugee status, as well as family members living here with them) are not landed immigrants.*

Source: CSLS calculations using data from Statistics Canada, Labour Force Survey, CANSIM Tables Table 282-0002 and 282-0102.

The labour force participation rate of prime aged men in Canada was 90.5 per cent in 2014, much higher than the overall participation rate. There are sizable gaps between the participation rates of prime aged males and those of other groups. These gaps represent opportunities to increase the overall supply of labour. For some groups, such as Aboriginal Canadians, fully closing the participation rate gaps (conditional on demographic differences)

may seem like a reasonable goal, although slightly narrowing it will be more reasonable for groups such as older workers as many in this group cannot participate in the workforce due to failing health.

While the gender gap has narrowed, it remains substantial. Prime aged women have a participation rate of 81.9 per cent, 8.6 percentage points below that of prime aged men.[47] Even a small improvement can have a significant impact on aggregate labour supply because women constitute half the population. The gender gap in participation rates tends to increase from east to west. Female participation rates range from 86.3 per cent of the provincial male rate in Alberta to 94.4 per cent of the provincial male rate in Nova Scotia.

Participation rates of men aged 55 and above tend to be about half those of prime aged men. Participation of older workers is relatively strong in Prince Edward Island, Saskatchewan, and Alberta compared to the national rate for this group, while it is relatively weak in British Columbia, Quebec, and Newfoundland and Labrador. However, the participation rates of this group should be viewed cautiously given that there may be significant differences across provinces in the age composition of the population above 55.

The population with disabilities is not included in the above tables because data is not available for the same age range, but Table 27 later in this report provides similar figures for persons with disabilities aged 15-64. Nationally, the participation rate of Canadians with disabilities is about 70 per cent that of non-disabled Canadians in the same age group. Participation rates of persons with disabilities vary considerably depending upon the nature and severity of disability.

Canada's Aboriginal population is also less likely to participate in the labour force. Prime age Aboriginal males living off-reserve have a participation rate of just 81.3 per cent, which is below that of women. This figure excludes nearly one quarter of the Aboriginal population living on-reserve, where economic performance is notoriously poor. Interestingly, Aboriginal participation rates for prime aged males (off-reserve) are actually higher than those of non-Aboriginal males in all Atlantic provinces except for Nova Scotia. The (off-reserve) Aboriginal participation rate ranges from about 87 to 89 per cent that of the non-Aboriginal population in all other provinces with the exception of Alberta (94.7 per cent).

Landed immigrants (anyone granted permission to live in Canada permanently by immigration authorities)[48] are also less likely to participate in the labour force, although the gap is not nearly as large as for the groups discussed thus far. The participation rate for landed immigrants in Canada was 82.6 per cent (both sexes) compared to 87.7 per cent for those born in Canada. However, this may be somewhat misleading because immigrants are relatively well-educated. This also hides the fact that immigrant participation rates increase significantly with the number of years since immigration. Immigrant participation rates are higher than those of

[47] Some readers may think that there should always be at least some gap given that women will always need to take some leave for maternity. While this is true, those on leave are counted as in the labour force by the Labour Force Survey, so the participation rate gaps reported here could be completely eliminated in principle.

[48] By this definition, landed immigrants do not include native born Canadians or non-permanent residents who work or study in Canada.

Canadian born residents in Newfoundland and Labrador and Manitoba. Quebec and Prince Edward Island are the provinces with the lowest immigrant participation rates compared to the native born population.

Some of these groups potentially offer greater opportunities for growth in labour supply than others in any given province depending upon the size of the group and its current level of participation. Table 21 presents women, those aged 55+, landed immigrants, and Aboriginal people (off-reserve only) as a percentage of the population for each province. Women make up slightly more than half the population for most provinces, making them an important group in all jurisdictions.

Those aged 55+ account for about 33 to 36 per cent of the working age population in most provinces, closer to 40 per cent in the Atlantic provinces, and 28 per cent in Alberta. This group will become increasingly important as populations continue to age.

Persons with disabilities represent between 6.7 per cent (Quebec) and 14.2 per cent (Nova Scotia) of the population aged 15-64 (see Table 27).

Table 21: Percentage of Working Age Population (15+) Exhibiting Select Characteristics, Canadian Provinces, 2014

Province	Female	Aged 55+	Landed Immigrant	Aboriginal
Canada	50.7	34.3	23.8	2.9
Newfoundland and Labrador	51.0	38.8	2.3	6.0
Prince Edward Island	51.6	38.1	6.0	1.4
Nova Scotia	51.7	38.9	5.9	2.9
New Brunswick	51.2	39.2	4.0	2.1
Quebec	50.5	36.5	14.8	1.3
Ontario	51.3	33.7	32.7	1.9
Manitoba	50.7	33.5	20.0	10.9
Saskatchewan	49.7	33.4	10.3	8.9
Alberta	49.3	28.0	20.8	4.4
British Columbia	50.7	35.8	30.4	3.9

Source: CSLS calculations using data from Statistics Canada, Labour Force Survey, CANSIM Tables Table 282-0002 and 282-0102.

Landed immigrants represent nearly one quarter of Canada's working age population, but this varies considerably across provinces. They represent less than 6 per cent of the population in the Atlantic Provinces, 10 per cent in Saskatchewan, 20 per cent in Alberta, and a bit more than 30 per cent in British Columbia and Ontario.

The Aboriginal population is relatively small nationally, representing only about 2.9 per cent of those aged 15 and above (off-reserve only). However, this group is very important for some provinces, particularly Manitoba (10.9 per cent) and Saskatchewan (8.9 per cent). Given the relative youth of the Aboriginal population, improving Aboriginal labour market outcomes could have a significant impact on several provinces.

Table 22: Labour Market Outcomes by Province/Territory, Population Aged 15+, 2014

	Employment Rate	Participation Rate	Unemployment Rate	Hours Worked	Average Hourly Wage
Canada	61.4	66.0	6.9	32.9	$24.5
Newfoundland and Labrador	53.8	61.0	11.9	34.6	$24.7
Prince Edward Island	61.4	68.7	10.6	34.4	$20.4
Nova Scotia	57.2	62.8	9.0	33.0	$21.9
New Brunswick	56.9	63.2	9.9	33.6	$20.8
Quebec	59.7	64.7	7.7	31.5	$23.1
Ontario	61.0	65.8	7.3	33.0	$24.8
Manitoba	64.2	67.8	5.4	33.4	$22.3
Saskatchewan	67.0	69.7	3.8	34.8	$25.3
Alberta	69.3	72.7	4.7	35.3	$28.1
British Columbia	59.5	63.3	6.1	32.0	$24.3
Yukon	71.5	74.7	4.3	..	..
Northwest Territories	68.4	74.3	7.9	..	..
Nunavut	53.1	61.5	13.8	..	..

Source: Statistics Canada. Employment rates, unemployment rates, and participation rates are from CANSIM Table 282-0123: Labour force survey estimates (LFS), by provinces, territories and economic regions based on 2011 census boundaries, annual; hours worked is from CANSIM Table 282-0069 Labour force survey estimates (LFS), wages of employees by type of work, National Occupational Classification for Statistics (NOC-S), sex and age group, unadjusted for seasonality, annual ; average hours worked is from CANSIM Table 282-0018 Labour force survey estimates (LFS), by actual hours worked, main or all jobs, sex and age group, annual .

The size of the gap (Table 20) and relative size of the subpopulation (Table 21) determine the potential impact of improving participation rates for a specific segment of the population. Table 23 provides some rough estimates of the potential impact of eliminating these disparities on overall labour force participation rates. While these figures have, to varying degrees, controlled for the age structure of the population, the reader must be cautious in interpretation. For example, while raising participation rates of persons aged 15-64 with disabilities to the participation rates of those aged 15-64 would raise Canada's participation rate by about 2 percentage points, this represents an upper bound because many of the individuals in this subpopulation are severely disabled and may not realistically be able to participate in the labour force. To some extent, these lower participation rates represent optimal decisions resulting from individual preferences – most workers want to retire eventually and some women would rather stay home and care for their children. Our goal is not to push everyone in these groups to work, but rather to remove impediments or barriers which limit their ability to make optimal decisions. Given overlap between many of the categories (for example, disability rates tend to rise with age), one must also be cautious about summing these values. These figures also do not provide any information about the cost of achieving higher participation rates.

One sees that the largest potential gains could typically be achieved by raising female participation rates or those of older workers. However, improvements among the other groups can still make significant contributions. While the impact of improving Aboriginal participation rates nationally is quite small, it could be very large in Manitoba or Saskatchewan.

Table 23: Potential Impact on Total Participation Rate (Ages 15+), Canada and Provinces, Percentage Points

Source	LFS (2014)	LFS (2014)	CSD (2012)	LFS (2014)	NHS (2011)
Subpopulation	Women (Ages 15+)	Older Population (Ages 55-69)	Persons with Disabilities (Ages 15-64)	Landed Immigrants (Ages 25-54)	Aboriginal Population (Ages 15+)
Target Participation Rate	Men of Comparable Age	Population in Next Youngest 5-Year Age Group	Population without Disabilities of Comparable Age	Canadian Born Population (Ages 25-54)	Non-Aboriginal Population of Comparable Age
Canada	3.83	4.13	2.06	0.63	0.36
Newfoundland and Labrador	3.94	5.08	2.30	-0.02	0.20
Prince Edward Island	3.32	4.77	2.40	0.29	0.12
Nova Scotia	3.18	4.90	2.56	0.04	0.23
New Brunswick	3.27	4.86	2.84	0.08	0.24
Quebec	2.95	4.94	1.66	0.66	0.12
Ontario	3.82	3.81	2.51	0.85	0.18
Manitoba	4.52	4.18	1.78	-0.02	2.39
Saskatchewan	5.12	3.39	1.50	0.21	2.72
Alberta	5.63	2.93	1.52	0.22	0.61
British Columbia	3.59	4.26	2.04	0.74	0.34

Source: CSLS calculations using data from Statistics Canada's 2011 National Household Survey, 2014 Labour Force Survey, and 2012 Canadian Survey on Disability. Female calculations use age groups 15-24, 25-54, 55-64, and 65+. Calculations for persons with disabilities use age groups 15-24, 25-34, 35-44, 45-54, and 55-64. Calculations for the Aboriginal population use the age groups 15-19, 20-24, 25-29, 30-34, 35-44, 45-54, 55-64, 65-74, and 75+. Calculations for those aged 55-69 are based upon the age groups 55-59, 60-64, and 65-69 if participation rates rose to those of previous age group (50-54, 55-59, and 60-64 respectively).

Before moving on to a discussion of policy options available to increase labour input per worker generally and for each of these subgroups, two additional points should be made.

First, the reader may be concerned that increased labour market participation rates for some of these groups may just crowd out participation by those already in the labour force, primarily prime aged males. Such concerns have been especially prevalent in discussions of immigration policy.

There is probably some truth to such concerns, although historically the declines in participation rates for some groups have tended to be modest compared to the gains for others. The obvious example is Canada's experience with rising female labour force participation. Male participation rates did fall somewhat, but the decline was nowhere as great as the increase in female participation. This was likely driven by young men choosing to spend more years in school (rising postsecondary enrolments) and by decisions to allocate more household work to men within some couples, rather than by employers forcing men out of the workforce to hire women. The effects of immigration on native born employment and productivity are still being debated, although some have suggested that positive externalities arising from the immigration of skilled foreign workers may result in increased employment and productivity domestically, which can offset direct negative effects on domestic employment and wages (for example, see Peri et al., 2014). Furthermore, in the unlikely event that there is no net increase in employment

from removing barriers to participation by these subpopulations, there may still be positive impacts on productivity as a result of having a larger pool of potential workers to draw upon, assuming employers will tend to hire the best available workers. However, under the more likely scenario where total employment would rise due to the removal of barriers, it is likely that marginalized groups who enter the labour force will have below average productivity and will therefore lower aggregate labour productivity.

Secondly, many of the trends with regards to underperformance in labour participation rates also hold in terms of unemployment rates, hours worked, and hourly wages. Many of the policies which improve participation rates will also lower unemployment rates, increase average hours worked, and raise average wages, amplifying the effects of increased participation.

a. General Policies to Raise Participation Rates

First, we summarize several broad approaches which could be taken to raise Canadian labour force participation (and hours worked). These can be thought of as approaches which would raise participation rates of our benchmark prime aged male population, although they would have a positive effect across all groups. Given Canada's generally strong performance in labour force participation, there is likely not a lot of potential for improvement from such approaches.

There are two major factors which determine each individual's choice to supply labour. The first is an individual's ability to actually find an employer who demands additional labour. This is partly captured by the unemployment rate. The second factor is the level of compensation an individual expects to receive for the labour supplied. This is closely related to productivity, which is a major determinant of wages. This relevant level of compensation should be thought of as being net of any costs an individual incurs by working including direct costs of performing a job (such as boredom or safety risks) but also an individual's opportunity cost of working – by working, an individual sacrifices leisure time, home production, or may lose access to social assistance. Most policies aiming to raise labour force participation target one or both of these factors.

Note that the problem of slowing growth in the supply of labour due to the aging population will most likely be partly offset by market forces even in the absence of any changes to policy. At prevailing market wage rates, a decreased supply of labour will lead to excess demand for workers (assuming no change in demand). This will lead to rising real wage rates (and lower unemployment rates) which will draw additional workers into the labour force. Our projections of future labour supply are only based upon past trends and fail to capture the likely equilibrating effects in the labour market. This means that labour supply growth will likely not be quite as weak as we have projected.

b. Increasing the Likelihood of Finding Work

One option to increase a worker's chances of finding employment is to stimulate labour demand, which can be done in a wide variety of ways, but we will focus our discussion on better matching the skills of workers to those demanded by employers. There are two major ways to do

this. The first is to improve access to education and training, particularly in areas which are valued by employers. The second is to improve the quality and availability of labour market information.

The previous section discussed the importance of human capital formation for raising labour productivity. Greater individual productivity generally translates into higher wages. Skilled workers are also sought after by employers, so it is not surprising that labour supply rises significantly with education. Increased subsidization of postsecondary education (or lowering tuition more directly), assisting students in financing higher education and improving the quality of early education are critical for fostering human capital development. In addition to assisting students in accessing post-secondary education generally, governments may wish to consider subsidizing programs which are expected to remain in high demand in the future.[49]

While Canada's education system is reasonably effective at training individuals to an advanced level by the time they reach prime working age, there may be considerable room to improve access to retraining for prime aged workers who are relatively young (25-34) who find that their skills do not align with those desired by employment. Even if such individuals are able to find and retain work, they may be underemployed compared to what they are capable of. Halliwell (2013) advocates the adoption of policies to provide a "second chance" to such individuals. Assistance for retraining should be available not only for individuals who are unemployed, but also for those who are underemployed. Such individuals may be somewhat older than typical students, but could still benefit significantly from further formal training. Such individuals may be prevented from acquiring such training because of financial obligations to creditors or families. Temporary assistance for such individuals could result in significantly improved labour market outcomes.

A better match between labour supply and labour demand will improve employment prospects and raise output. Optimal education and employment decisions require accurate and detailed information on labour markets, but all provinces fall short of the goal.

The Forum of Labour Market Ministers charged an Advisory Panel in 2008 to make recommendations to address the inadequacies of Canada's labour market information system. The panel made 69 recommendations in 2009 at a modest ongoing annual cost, spread across all governments in Canada, of $49 million per annum (Advisory Panel on Labour Market Information, 2009). Some of the recommendations have been acted upon, such as the creation of a sub-group to co-ordinate labour market information (although it has not yet received any funding) and the addition of a Statistics Canada job vacancy survey (although it is more aggregated than the Panel envisioned), but most of the recommendations have yet to be implemented.

[49] In principle, students should directly be able to make sound educational choices (taking into account personal abilities and preferences) based on existing labour market information, but directly influencing decisions may help overcome difficulties in communicating labour market information or behavioural biases which result in sub-optimal education decisions. Implementing such a policy assumes that projections of future labour market conditions by field of study are at least somewhat informative which may not be the case.

Statistics Canada released the new Job Vacancy and Workers Survey in August, which marks a significant improvement in Canadian labour market data. It provides the number of job vacancies, by occupation, in an economic region on a quarterly basis, as well as information by occupation, such as the proportion of job vacancies in full- and part-time positions, the distribution of vacancies by level of education and experience, the proportion of vacancies per occupation that are difficult to fill, and the average pay or hourly wage for new vacancies. As this is a new survey, it will take some time before researchers can use it to identify labour market trends.

The continuing weaknesses in the labour market information system compromise federal, provincial and territorial policy-making capacity in areas such as education, training and immigration, make it needlessly difficult for workers to find new or better jobs or determine the kinds of skill upgrades they need, hamper the ability of employers to find the right workers, generate uncertainty for students as to the best education options for economic and social success and makes it difficult for colleges, universities and training institutes to best meet the economy's labour demands. As an illustration of the macro-economic effects, the Advisory Panel estimated that if better information lowered the national unemployment rate a mere 0.1 percentage points that would translate into a permanent increase of $800 million of output at the national level (Advisory Panel on Labour Market Information, 2009).

The state of labour market information varies considerably across provinces and territories. While all jurisdictions fall short of the labour market information systems in some of the more advanced European countries such as Germany and Sweden, there are promising practices in some jurisdictions that should be studied by others. Only a few will be noted here.

All provinces and territories could improve their information systems simply by doing a scan across the country and moving to "best-in-class" within Canada for key components such as data, analysis, dissemination and governance. For example, provinces lacking coherent co-ordination of labour market information should look at the agency model in Quebec; Alberta contains some rich information and analysis on its public site; and Alberta and British Columbia have made strides in disseminating labour market data.

Adopting best practices from the Canadian provinces would still leave weak connections of information across provinces and territories, the provinces would still lag behind the best-in-class globally, and all systems would still suffer from the same lack of available data. To cite just a few examples, no province or territory has detailed information on labour markets at the sub-provincial level,[50] occupational and skill details lag the rapid shifts in labour markets, and at best there are only snap-shots of how college and university graduates, differentiated by field of study, are faring in the economy. The National Graduate Survey is performed by Statistics Canada only every 5 years and looks only at the second year after graduation (for 2010 the focus was the third year, making it difficult to compare the results to previous surveys) and the few provinces that do their own surveys also only look at a particular year. Further, there is weak dissemination of the information so that prospective post-secondary education students and their counselors remain largely in the dark as to the likely employment and income prospects of

[50] Of course, there is information available at the sub-provincial level, but the level of detail is limited. For example, the Labour Force Survey provides timely labour market information at the CMA and Economic Region levels

pursuing various fields of study. Of course past and even present economic and social outcomes of graduates may not be good predictors of future returns by field of study, but at least such information would provide a base for students to contemplate their options.

The cost of poor labour market information is evident in the debate over the past few years of labour shortages in Canada. Many analysts and employer groups have claimed there are severe shortages. Yet the telltale signs of a severe imbalance between labour demand and supply, such as rapidly rising wages, are not evident. The answer must be that the shortages described by employers are only in specific occupations or skills and regions.[51] However, incomplete and sketchy data make it difficult to pin down these shortages and, in turn, that makes it difficult for workers to shift to the areas of demand and for colleges, universities and training institutes to gear their resources to producing workers with the skills being sought. So the debate regarding skills shortages, if it can be called that, essentially runs on anecdotes. To the extent that there are shortages, this should be expected to occur in boom times in a well-functioning economy. Training should not aim to avoid any shortages in narrow fields at the peak of the business cycle, but should aim to develop skills which are generally in line with those sought by employers.

The Advisory Panel on Labour Market Information recommended the Forum of Labour Market Information Ministers (FLMM) take the lead in addressing the deficiencies in data, analysis and information dissemination. The FLMM consists of all federal, provincial and territorial Ministers responsible for labour matters. In theory, it is the appropriate body to drive the pan-Canadian improvement in labour market information. However, it has failed to fully seize the responsibility and opportunity to date. It has established a sub-group to co-ordinate labour market information, which is a positive step, but this sub-group has not yet received any funding. Statistics Canada and Employment and Social Development Canada have made some improvements in their areas but both agencies have been hit with budget cutbacks and, with many aspects of labour policy a provincial responsibility, there are limits on how far they can or should go without effective provincial input.

Each jurisdiction can make improvements to its own labour market information systems. However, to fully exploit the potential of good information, co-ordinated action is required from all jurisdictions, including the federal government. In order for this to happen, a radical change in governance will be required. The Chair of the Advisory Panel recently concluded that, given the inaction by the Forum of Labour Market Ministers, it is perhaps time for all governments to assign much more of the responsibility to Statistics Canada, with Employment and Social Development Canada filling in more of the gaps (Drummond, 2014). But as much as labour market policy is a provincial responsibility, this could not possibly be successful without thorough input from the provinces and territories. So again the question arises as to how the provinces should best co-ordinate such input. The present structure of the Forum of Labour Market Ministers, with the provincial co-Chair position revolving every 2 years and no permanent support resources, compromises its ability to act as co-ordinator, never mind play the much more active role envisioned by the Advisory Panel in 2009.

[51] Another possibility is that employers are simply not being flexible enough and are reluctant or unwilling to hire and train those with less than ideal qualifications.

In conclusion, several lines of action on labour market information are in order which would result in permanent gains to output and lower unemployment across all provinces and territories. These include:

- At a minimum each province and territory should bring its labour market information systems (data, analysis and dissemination) up to the best-in-class provincial standard within Canada

- Statistics Canada should be charged with collecting more and better labour market information and Employment and Services Canada could fill in more of the data gaps and co-ordinate pan-Canadian information

- The provinces and territories must examine the governance structure of the Forum of Labour Market Ministers, or transfer the labour market information responsibilities to a new or different agency, to more effectively co-ordinate provincial and territorial information needs

c. Increasing the Returns to Work

The policy environment can have a significant impact on the amount of labour individuals choose to supply. One obvious way to encourage workers to supply more labour is to lower marginal effective income tax rates.[52] The quantitative effect of changes to wages and tax rates on labour supply remains a subject of debate in the literature (see Keane (2011) for a review of the economic literature on taxes and labour supply), although most economists believe that the effect is fairly small and positive, at least for males. In practice, reductions in taxation will likely not have much effect on many working individuals because, once working full-time, many individuals do not have much control over the number of additional hours they work. Lowering marginal tax rates is more likely to increase labour supply among those not already in the labour force, those only working part-time (or who would consider working a second job), and those who have the option to work over-time.

Rather than reducing taxation, one could also subsidize employment income[53]. One approach which may be sensible is to increase the amount of social assistance which is contingent upon working to encourage participation by low income Canadians. The federal government introduced the Working Income Tax Benefit (WITB) in 2007, a refundable tax credit available to low income Canadians earning at least $3,000 annually. Once earning income, the value of the WITB increases at a rate of 25 cents per dollar earned above the $3,000 minimum until some threshold is reached, effectively subsidizing low income wages. This

[52] While this may seem intuitively obvious, it may not actually be true. Economists have long noted that labour supply curves may be "backward bending" for individuals with very high or very low wage rates (or initial wealth), (see, for example, Barzel and McDonald, 1973). Reducing the income tax rate can reduce hours worked if the income effect of the tax reduction (raises after-tax income, so can afford more leisure time) outweights the substitution effect (leisure time becomes relatively expensive in terms of income). This is most likely to be a concern for those segments of the population which are already working long hours (Blundell, 1995). As such, any plan to increase labour supply by reducing income taxation must be evaluated carefully.

[53] The approach discussed here is to directly increase an employee's wage, but wage subsidies could also be provided to employers.

incentive is eliminated once a maximum value of the WITB is reached. The WITB is gradually reduced once an individual is above another income threshold, at a rate of 15 cents per dollar. Theoretical evaluations (and simulations (Scarth and Tang, 2008; Annabi et al. 2013) suggest that the WITB has had a positive impact on labour supply in Canada, although strong empirical evidence of its effects is currently lacking. However, evidence suggests that a similar policy in the United States, the Earned Income Tax Credit, has had a positive effect on the supply of labour, particularly that of single mothers (Eissa and Liebman, 1996; Meyer, 2002).

Note that the WITB will significantly improve the returns to work for those with very low incomes, but it also raises the marginal effective tax rate for these individuals once they earn enough that the benefit is clawed back.[54] It is important that the benefit is clawed back very gradually to avoid high disincentives to work at the margin. Additionally social assistance as a means to coax low income individuals into the workforce can be a powerful tool, but such an approach to social assistance will likely harm those who were not on social assistance by choice but because they genuinely could not find work.

Of course, any reduction in taxation would have consequences for government revenues and nothing guarantees that revenues generated by the additional labour supplied would exceed the revenues lost from lowering income tax rates. The standard policy prescription is not to reduce the overall level of taxation, but to offset reductions in taxes on labour income with increases in taxes levied on consumption or greenhouse gas emissions.

In addition to taxation or subsidization, the other major approach to increasing the returns to work is to adopt policies which raise labour productivity (see previous section).

d. Summary of Recommendations to Increase Labour Supply Generally

- Reduce high marginal effective taxes on labour income or offer income assistance which encourages individuals to work, offsetting any reductions in tax revenue with increased taxation of consumption or carbon.

- Raise labour productivity (and wages) by following the recommendations outlined in the previous section.

- Further invest in education and provide incentives for the development of skills which are expected to be in high demand.

- Improve quality of and access to labour market information.

iii. Increasing Labour Force Participation of Women

Female participation in the labour force rapidly expanded between the 1960s and the early 1990s. The Organization of Economic Co-operation and Development (OECD) analyzed

[54] Note that, under the alternative of providing a lump sum welfare benefit independent of income, there would also typically need to be a gradual clawing back of the benefit past some range.

female labour force participation rates in 17 of its member countries (Jaumotte, 2004). They found a general upward trend in female labour force participation rates over the period but a wide variance in the levels of participation across countries. As of 2013, Canada had the seventh highest female labour force participation rate for the total working age population (age standardized) of 34 OECD countries. Canada's rank in female participation is higher than its rank in terms of male participation (11th). When differences in age compositions across the two

Table 24: Labour Force Participation Rates of the Population Aged 15+ by Gender, OECD Countries, 2013

Country	Female Participation Rate (Age Standardized)	Male Participation Rate (Age Standardized)	Female Participation Rate As a Percentage of Male
Finland	61.5	64.8	94.9
Sweden	66.2	71.5	92.6
Norway	64.4	69.8	92.3
Denmark	62.3	67.5	92.2
Iceland	73.6	80.2	91.8
Estonia	61.3	67.0	91.5
Canada	**62.1**	**69.5**	**89.4**
Slovenia	53.8	60.2	89.4
France	55.1	62.4	88.3
Portugal	57.2	65.2	87.6
Germany	58.9	67.7	87.0
Switzerland	64.3	74.1	86.7
Austria	57.5	66.3	86.7
Netherlands	61.2	70.9	86.4
Spain	53.9	63.0	85.6
United Kingdom	58.9	69.2	85.1
Belgium	50.6	59.5	85.0
New Zealand	62.5	73.5	85.0
Israel	57.6	68.6	84.0
United States	57.1	68.2	83.8
Hungary	48.5	58.0	83.6
Australia	58.4	70.0	83.4
Slovak Republic	51.0	62.3	81.9
Poland	49.8	60.9	81.8
Czech Republic	53.3	65.3	81.6
Luxembourg	49.3	61.1	80.8
Ireland	51.1	64.8	78.8
OECD	52.4	68.1	77.0
Greece	46.5	61.5	75.7
Japan	55.6	73.6	75.6
Italy	42.5	59.2	71.9
Korea	49.3	69.9	70.5
Chile	47.9	73.1	65.6
Mexico	41.8	76.9	54.4
Turkey	27.4	64.2	42.8

Source: CSLS calculations using data from OECD.StatExtracts, Labour Force Statistics, LFS by Sex and Age. Standardization is performed by the authors based on the age distribution of the Canadian female working age population in 2013 and 5-year age-sex-specific participation rates in each country.

genders are controlled for, Canada's women have the seventh strongest participation rates relative to men. Women have stronger performance relative to men in the Nordic countries and Estonia.

Female participation rates do not exceed those of men in any of the OECD countries. Women are naturally predisposed to have a slightly lower participation rate than men given their biological requirement to temporarily leave the workforce for childbirth, even if policies minimize the impact on a woman's career and earnings. Nonetheless, it is clear from the experiences of the Nordic countries the gender gap in labour force participation can be quite a bit smaller than that observed in Canada.

Jaumotte (2004) attempted to identify specific policy parameters that influenced trends in participation rates within countries and differences across countries. Before delving into the specific policy measures, the OECD noted the positive impact of three general factors on female labour force participation rates – better educated females, well-functioning labour markets, and positive cultural attitudes towards women working. Based on these three general factors, the OECD identified five specific policy parameters which have a significant impact on raising female labour force participation rates: neutral taxation of second-earners in families; subsidized childcare; available childcare spaces; parental leave and; the availability of part-time work.

a. Neutral Taxation of Second Earners

In many OECD countries, the second income-earner in a family faces a much higher marginal income tax rate than the "primary" earner. This arises due to the loss of tax benefits such as the spousal allowance when the second person, who often happens to be female, earns income. The higher marginal tax rate acts as a work disincentive. Jaumotte (2004) found that Canada was one of the worst countries in the study in this regard. As an indication of the sensitivity of female participation rates to taxation policy, the OECD calculated that introducing a neutral taxation system between primary and secondary earners,[55] would raise the participation rate of women nine percentage points for a typical OECD country. While the analysis was not directly applied to Canada, an impact of that general order may be applicable.

b. Assisting Families with Childcare

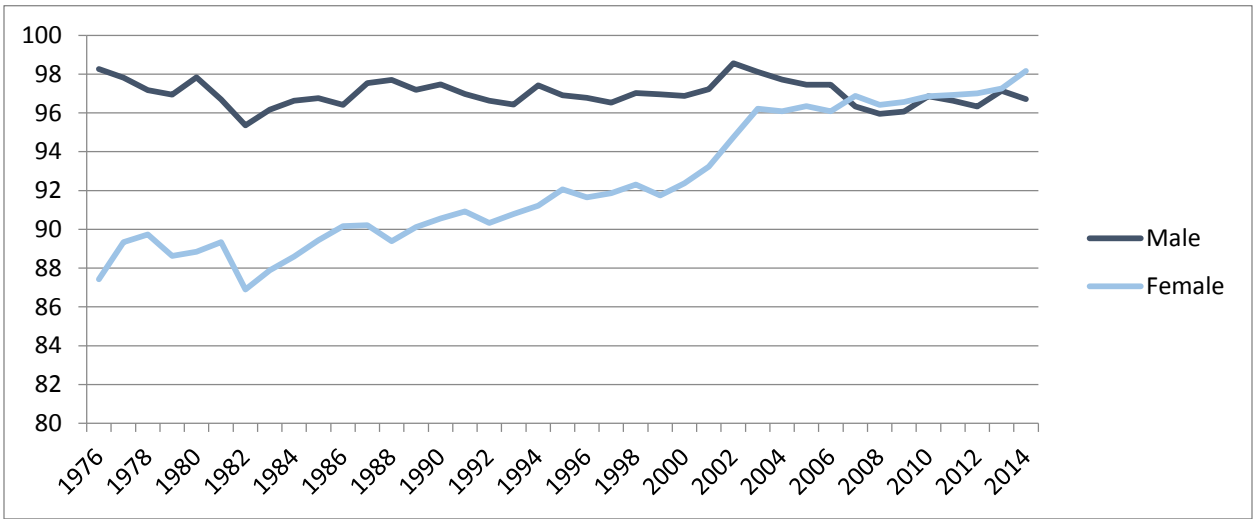
Many women leave the workforce upon having children and not all return. Lack of available childcare spaces at a reasonable price can serve as a barrier for women to return to the workforce. Subsidized childcare raises the net return from work for a parent and hence increases labour force participation. In contrast, flat benefits related to children were found to lower participation because they increase family income without any increased work (Jaumotte, 2004).

Quebec's daycare program offers a Canadian case study for the OECD's observation that subsidized daycare increases female labour force participation rates. Just prior to introduction of its heavily subsidized childcare program in 1997, Quebec's female labour force participation rate for the working age population (15+) was 5 percentage points lower than that in the rest of the

[55] Using parameters similar to Denmark's in the calculation.

country. In September of 1997, Quebec began offering full-day kindergarten to children aged 5, after-school daycare to those aged 5-12 for $5 a day, and $5 a day daycare to children aged 4. By 2000, $5 a day daycare was extended to all children below the age of 5 (Fortin, 2015). By 2007 the gap had largely closed, indicating that Quebec's female participation rate increased much faster than the national average. Such improvement was not observed in the participation rate of the total male population over this period (Chart 35).

Chart 35: Quebec's Labour Force Participation Rate as Percentage of that of All Other Provinces by Sex, Ages 15+, 1976-2014



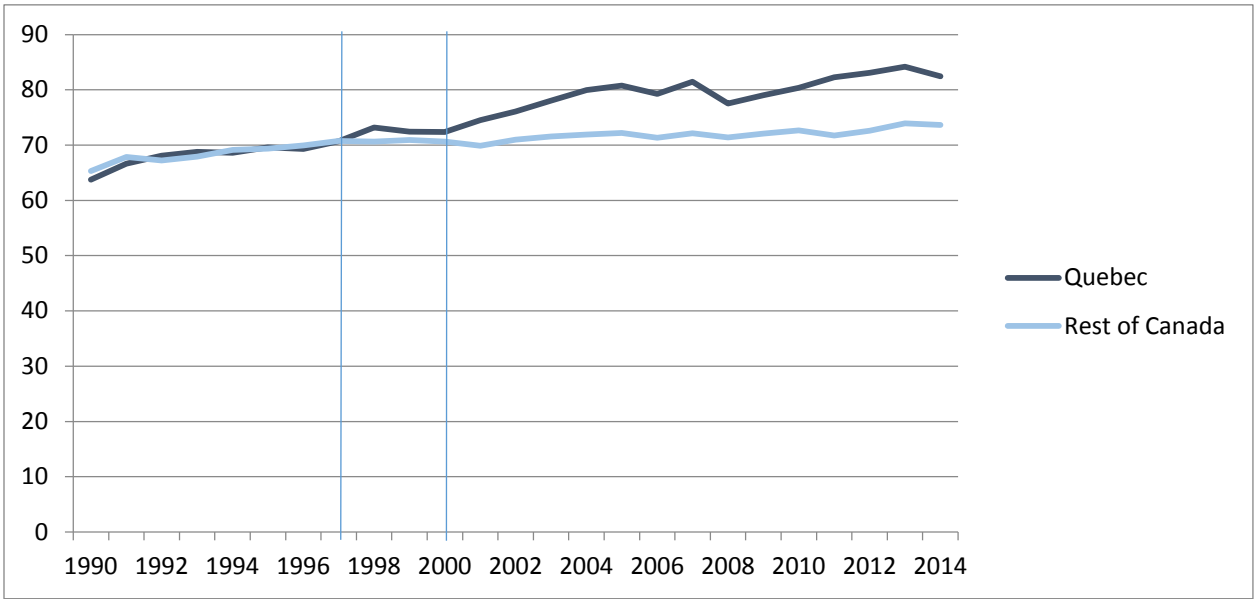
Source: CSLS calculations using data from Statistics Canada, CANSIM Table 282-0002 Labour force survey estimates (LFS), by sex and detailed age group, annual.

More specifically, Quebec experienced a significant improvement in the participation rates of those in families with a female reference person or spouse, an employed husband, and children aged 5 or younger compared to the rest of Canada (Chart 36). In 1996, the rate had been about 70 per cent in both Quebec and the rest of Canada, but after 2000 the participation rate for families with children in Quebec rose about 10 per cent above that observed in the rest of the country. There are other important differences in Quebec family policy as well, such as more generous tax support for families and better parental leave, so careful analysis is required to isolate the impact of the daycare program. Several studies have performed this analysis and all find that the daycare program had a very significant, positive impact on female labour force participation rates.

For example, Baker et al. (2008) found that the daycare program resulted in a 7.7 percentage point increase in the employment rate for mothers of children between 0 and 4 years of age relative to the rest of Canada. Fortin et al. (2012) analyzed some of the previous empirical studies and concluded that the daycare program had resulted in a 3.8 per cent increase in female employment in Quebec and an increase in total employment, female and male, of 1.7 per cent. Further, they found that if dynamic economic effects were included, then the economic gains from the program were sufficiently large to induce enough incremental revenue to the Quebec Government to cover the cost of the subsidies. Fortin (2015) estimates that, in 2008, each

additional dollar spent on Quebec's low-fee childcare system generated a net benefit of 20 cents for Quebec and 55 cent for the federal government.

Chart 36: Participation rates, Families with Female reference person/spouse with employed husband, youngest child below 6



Source: Table 282-0211 Labour force survey estimates (LFS), by family type and family age composition, annual (persons x 1,000)

While Quebec's low-fee universal childcare program seems to have had a positive impact on participation rates and government fiscal balances, it is not without critics. The high quantity of childcare services demanded at low prices can lead to a shortage of daycare services or a reduction in quality. In order to meet demand, Quebec has relied more on home-based childcare services, which are subject to less regulation and employ workers with less training than non-profit publicly funded daycare centres.[56] There are concerns that the wealthy or politically connected are better able to access quality childcare under the system. There is also some debate about the impact on the education of children and on the impact on the parenting of parents who are tired from working all day. Recent analysis by Kottelenberg and Lehrer (2013) supports claims that universal childcare in Quebec has resulted in a number of undesirable outcomes in terms of child development and health. These concerns should be taken seriously by policymakers considering similar programs to increase labour supply in other jurisdictions.

c. Parental Leave

Women often find it difficult to re-enter the workforce after leaving work for a prolonged period to care for children. Extended parental leave can help maintain attachment to the labour force and ease the transition back into work as some women would quit their jobs if not granted a sufficiently long leave. The OECD found paid parental leave to have a positive impact, but only

[56] Anderssen, Erin, and Mackrael, Kim. "Better daycare for $7/day: One province's solution for Canada," *The Globe and Mail*, Published Friday October 18, 2013. http://www.theglobeandmail.com/life/parenting/the-one-province-that-gets-daycare-right-in-canada-think-7-a-day/article14933862/?page=all

if the duration fell into a sweet spot of being around, but generally not exceeding, 20 weeks (Jaumotte, 2004). Longer absences tend to cause depreciation of skills and other barriers to returning to the workplace. Canada has more generous maternity leave provisions than the average of OECD countries, but is far behind many European countries, especially in the Nordic area. Canada's relative position on parental leave is even worse.

In line with our comments on taxation above, any transfers to parents should be designed so as to minimize financial disincentives to return to work earlier. The Nordic schemes are also notable for allowing considerable flexibility in how parents use paid parental leave. For example, some provide an option to take part-time leave over a longer period of time or allowing parents to save part of their parental leave for when the child is older (Datta et al., 2006). Such flexibility may encourage parents to return to the workforce sooner, reducing disruption to careers following childbirth.

d. Education and Occupations

Before leaving the issue of female labour force participation, we will briefly re-visit the OECD's point that a basic underlying condition for strong female participation is good education for females, both in terms of quantity and quality. In general, this would not seem to be a problem in Canada. Females scored below males in mathematics in the OECD's Programme for International Student Assessment (PISA) in 2012 testing, but they have similar results in science and superior scores in reading. While the females in Canada are generally well-educated, there may be some concerns about what females are choosing to study. While field selection may partly reflect naturally occurring differences in preferences between men and women, it could be a problem in terms of labour supply (or productivity) if cultural barriers or relatively poor performance in mathematics is preventing women from entering fields which will be in high demand.

Females now dominate university enrolment such that, of Canadians 25 to 35 years old with university degrees, 59 per cent were female in 2011 (Hango, 2013). Yet this university participation is quite skewed towards certain fields. Females are 80 per cent of the 25 to 34 year-old graduates in health and education fields. The labour market in health is quite tight, as evidenced by the low ratio of unemployed people to job vacancies in the sector (the latest Job Vacancy Survey shows 0.8 unemployed people in the health and social assistance sector for every job vacancy), but education is one of the most over-supplied areas of the labour market (the latest result is 3.8 unemployed people in education for every job vacancy; a year prior to that it was almost double that ratio). This being said, unemployment rates overall tend to be very low for those who have studied education or health compared to other fields among women aged 25-34 (Table 25).

Employers have increasingly been complaining they cannot find enough workers in the STEM (Science, Technology, Engineering, and Mathematics) fields. Here we find that only 39 per cent of the graduates aged 25 to 34 are female (Hango, 2013). At least that is more favorable than the female share of 23 per cent of 55 to 64 year-olds, indicating that female participation in these disciplines has increased substantially over the past 30 years. In particular areas of STEM

female participation is particularly low among 25 to 34 year-olds, such as 23 per cent in engineering and 30 per cent in mathematics and computer science.

Table 25: Field of Study of those with a Postsecondary Certificate, Diploma, or Degree by Sex, Ages 25-34, Canada, 2011

	Distribution		Unemployment Rates	
	Male	Female	Male	Female
All Fields of Study*	100.0	100.0	5.9	6.3
Education	2.60	9.40	3.5	4.1
Visual and performing arts, and communications technologies	4.78	4.92	6.8	6.9
Humanities	4.52	6.21	7.2	7.8
Social and behavioural sciences and law	8.09	16.27	6.5	6.6
Business, management and public administration	17.14	23.68	5.1	6.5
Physical and life sciences and technologies	3.83	4.39	6.2	6.9
Mathematics, computer and information sciences	8.27	2.79	4.8	8.9
Architecture, engineering, and related technologies	35.22	4.23	6.1	7.7
Agriculture, natural resources and conservation	2.84	1.83	7.7	7.2
Health and related fields	5.57	20.40	5.1	5.4
Personal, protective and transportation services	7.14	5.84	6.8	6.6
Other	0.01	0.04	16.2	6.4

Source: Statistics Canada, 2011 National Household Survey Data Tables: Labour Force Status (8), Highest Certificate, Diploma or Degree (15), Major Field of Study - Classification of Instructional Programs (CIP) 2011 (82), Location of Study Compared with Province or Territory of Residence (6), Age Groups (13B) and Sex (3) for the Population Aged 15 Years and Over, in Private Households of Canada, Provinces, Territories, Census Metropolitan Areas and Census Agglomerations

Employers are also complaining of difficulty hiring skilled trades people and project this will become worse due to the older age of current workers. Women only represent 5 per cent of the skilled trades workers in Canada (Status of Women Canada, 2015). Table 26 presents the distribution across major occupational groups by gender in 2014. One sees that only about two per cent of female workers aged 15+ work in occupations related to trades, transport, and equipment occupations compared to 27 per cent of men. Women are also less likely to be in management positions (6.0 per cent versus 9.8 per cent) and occupations related to the natural and applied sciences (3.5 per cent versus 11.3 per cent). Women are overrepresented in sales and services (30 per cent versus 21 per cent), business, finance, and administration (25 per cent versus 10 per cent), and health occupations. A simple exercise suggests that this may negatively impact female labour supply. If we calculate average hours worked for women and then compare this to a calculation of actual hours worked if women had the male occupational distribution (but retained female hours worked within each occupation), we find that female average hours worked would be expected to increase by 5.7 per cent (or 1.6 hours).[57]

The OECD (and others) has studied the gender gaps in mathematics and other STEM disciples in order to see how female scores and participation in non-traditional fields might be

[57] For robustness, one could perform a similar exercise to estimate the reduction in male hours which would occur if men had the female occupational distribution. In this case, average hours worked would be 5.9 per cent lower under the female occupational distribution.

enhanced.[58] The objective is worthy and one in which Canadian jurisdictions should devote considerable effort. In order to maximize female participation and success in the Canadian labour market, they should be well represented across the diversity of occupations and especially in areas where labour demand is likely to be strong. The reasons for lower female scores and participation are many and some are deeply ingrained such as cultural stereotypes, parents' expectations, differing ways of spending leisure time, lack of self-confidence et cetera. Indeed Table 25 suggests that women may be avoiding math and engineering for good reason, as those women with credentials in these fields tend to have high unemployment rates compared to men in these fields and women who studied almost any other field. For example, the female unemployment rate for those aged 25-34 with a postsecondary credential who studied math, computers, or information services was 8.9 per cent compared to a male rate of 4.8 per cent in this field and an average rate of 6.3 per cent for all women aged 25-34 with a postsecondary credential.[59]

Table 26: Occupation Distribution of those Employed by Sex, Ages 15+, Canada, 2014

	Distribution		Average Actual Hours Worked	
	Female	Male	Female	Male
Total employed, all occupations	100.0	100.0	28.6	35.7
Management occupations	6.0	9.8	35.8	39.4
Business, finance and administrative occupations	25.4	10.1	29.5	34.2
Natural and applied sciences and related occupations	3.5	11.3	32.9	36.0
Health occupations	11.6	2.6	28.0	34.4
Occupations in social science, education, government service and religion	13.9	5.0	28.9	32.5
Occupations in art, culture, recreation and sport	4.1	2.7	25.1	30.6
Sales and service occupations	29.6	20.6	25.6	31.3
Trades, transport and equipment operators and related occupations	2.0	26.8	30.6	37.9
Occupations unique to primary industry	1.3	4.8	32.2	42.3
Occupations unique to processing, manufacturing and utilities	2.7	6.3	33.5	37.4

Source: Statistics Canada, Labour Force Survey, CANSIM Table 282-0026 Labour force survey estimates (LFS), by actual hours worked, class of worker, National Occupational Classification for Statistics (NOC-S) and sex, annual

But these factors which push women out of STEM can likely be modified over time and offset by other approaches. For example, it has been found that females respond well when left to solve mathematics and science problems on their own as opposed to being restricted to using standard algorithms. Some of the same deep-rooted issues as cultural stereotypes and parents' expectations restrict female participation in the skilled trades. The lack of female role models and weak labour market information are also important and intertwined. Without knowing

[58] For example, see "PISA 2012 Results: The ABC of Gender Equality in Education: Aptitude, Behaviour, Confidence, OECD 2015

[59] Keep in mind that these figures are for a highly aggregated level of field of study. Differences in specific fields within this category may explain why female unemployment rates are so high.

women who work in the trades, young females do not tend to know much about the employment and income opportunities in the sector.

In conclusion, four policy considerations for raising the female labour force participation rate based upon the international and domestic literature are:

- Lower the marginal effective personal income tax rates that females face when they enter the labour force or increase their earnings (by working more hours or being paid more per hour).

- Enhance the generosity of statutory maternity and parental leaves.

- Improve access to and affordability of childcare.

- Beginning in the early years of schooling, encourage individuals to pursue any occupation regardless of traditional gender roles. In particular, female participation in STEM fields and the trades should be promoted.

iv. Increasing Labour Force Participation of Older Workers

As the oldest members of the baby boom generation (defined as those born during the 1946-1964 period) reach retirement age, the gradual impact of Canada's ageing population on labour supply is poised to accelerate. Chart 37 shows the age distribution of the Canadian population as of 2014 by single year. Notice that a large share of the population is concentrated towards the upper end of the distribution. In particular, the current ratio of those 65 + to those aged 15-64 stands at 0.23 in Canada,[60] below that in most OECD countries. By 2030 the Canadian ratio will have almost doubled to 37 per cent when it will stand above the OECD average of 35 per cent (Department of Finance Canada, 2012). Changes in fertility can do very little to alter this course and extreme increases in immigration would be required to do so.

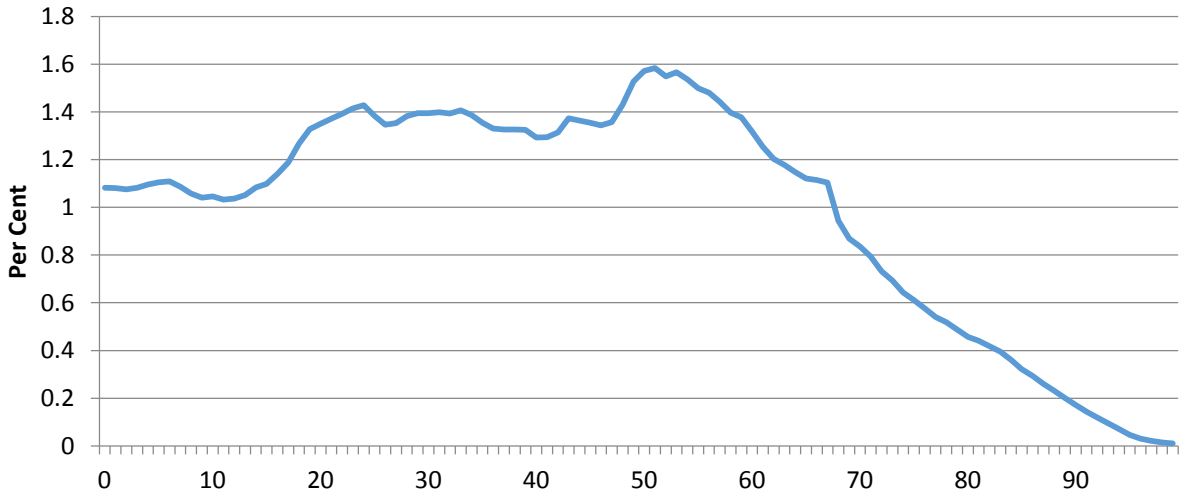
The impact of this ageing on Canadian growth rates will largely depend upon the labour force participation patterns of older Canadians. From about age 50 onward, participation in the labour force begins to decline significantly (Chart 38). Developments over the past 15 years suggest there is considerable flexibility in the labour attachment of older workers, so the right set of measures could ease the otherwise severe drag on growth from ageing. For example, between 2000 and 2011, the Canadian participation among those aged 65-69 (both sexes) rose from 11 to 26 per cent. As people remain healthier and have greater life expectancies, they are increasingly willing and able to postpone retirement.

As we noted earlier, one option to expand Canada's labour supply would be to have Canada's youth enter the workforce earlier. This is not a desirable option because such individuals lack work and life experience (posing safety risks and making them less productive) and would sacrifice human capital development by entering the workforce. In contrast, Canada's

[60] Based on 2014 estimates in CANSIM Table 051-0001.

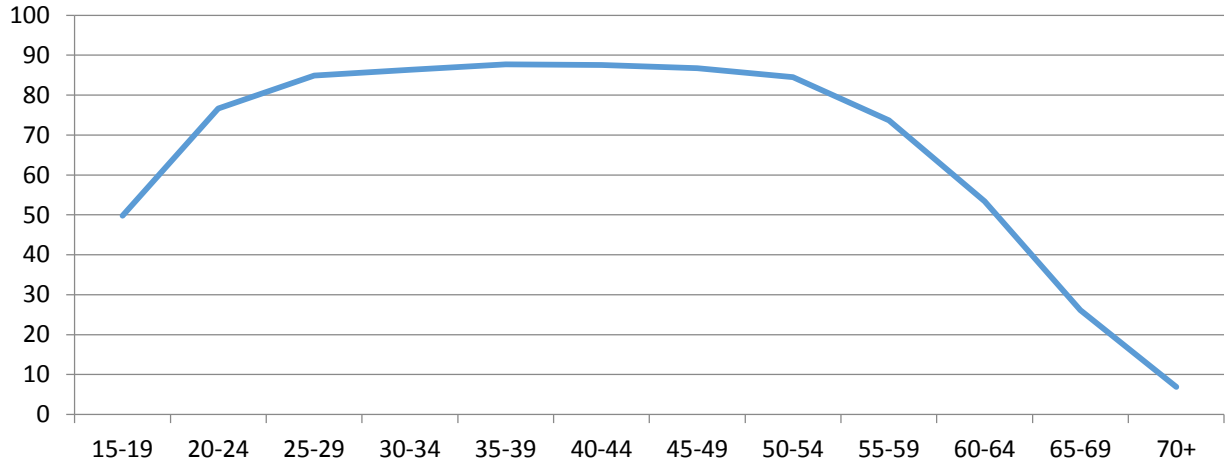
seniors already possess significant knowledge and expertise from decades of experience and would not be sacrificing human capital development to continue working.

Chart 37: Age Distribution of Canadian Population, 2014



Source: Statistics Canada, CANSIM Table 051-0001: Estimates of population, by age group and sex for July 1, Canada, provinces and territories

Chart 38: Labour Force Participation Rate by Age Group, Canada, 2014



Source: Statistics Canada, CANSIM Table 282-0002: Labour force survey estimates (LFS), by sex and detailed age group

In 2011, Canada had a higher participation rate of people 55 + than the OECD average (Department of Finance Canada, 2012). But, whereas Canada had the 6th highest participation rate within the OECD for all ages at the time, for the population 55 + Canada stood 12th and well below Norway, Sweden, New Zealand, Japan and the United States. So there is scope to do better. Interjurisdictional differences within Canada also suggest flexibility in the older workers' labour market. The average age of retirement in Canada in 2012 was 62.9. In Alberta, where jobs were relatively plentiful, the average was 64 (Mei et al., 2013). This national average retirement age is up significantly from a low of 60.9 in 1998, but it remains below historical

levels. In 1976, Canada's average retirement age was 64.9 per cent (Labour Force Survey, CANSIM Table 282-0051).

Fougere et al. (2005) provide a sense of the potential macro-economic impact of extending seniors' participation in the labour market. They estimate that an increase in the effective age of retirement to 65 would raise real GDP per capita by nearly 12 per cent in 2050.

There are many factors which reduce labour supply of Canada's elder population. While some of these individuals have accumulated significant wealth for retirement and would prefer to have more leisure time, many would prefer to continue working but face barriers which prevent them from doing so. The natural impediment is deterioration in health which makes participation painful or significantly reduces productivity. Some exit the workforce to care for an ailing partner. Advances in health have relaxed such health related constraints, but older workers face several other barriers to remaining in the workforce. Any remaining legal barriers to employment should be removed, except in cases where safety is shown to be a serious concern. Until recently, federally or provincially mandated retirement ages were a major obstacle – an employer could force a worker to retire at age 65 regardless of the worker's desire or ability to continue to work. Such institutional barriers have largely been removed in recent years. However, many older workers may face significant financial disincentives to continue working which arise due to the design of public and private pension plans. Negative attitudes towards older workers (ageism), poorly adapted physical work environments, and inflexible human resources practices are also commonly cited barriers.[61]

Public sector pensions, including the Canada Pension Plan, created disincentives to continue working. Many of these have been addressed, such as increasing the penalty to accessing CPP at age 60 rather than waiting until 65. Starting in 2020, the age of eligibility for the Guaranteed Income Supplement (GIS) and Old Age Security (OAS) is being increased from 65 to 67 by 2029. As of 2013, individuals could choose to defer receipt of the OAS by up to 60 months in exchange for higher future payments. Despite these modifications, there remain disincentives to work which should be eliminated. The high clawback rate on GIS benefits still acts as an incentive for lower-income Canadians to work. Similarly, the OAS Recovery Tax of 15 per cent on income above $70,954 (as of 2013) may also discourage work for some people (Clemens et al., 2013). Companies may still have mandatory retirement practices and features of their pension systems which reduce the returns from working longer. For example, some private pensions base payments in retirement on the last 5 years of work which introduces a huge penalty for working part-time toward the end of a career. Governments should engage with employers and private sector pension providers to encourage restructuring of pensions to reduce such disincentives.

Gomez and Gunderson (2006) found the most important barrier that inhibited retirees from continuing in employment concerned their desire to reduce work-time through arrangements such as part-time work, fewer days per week, shorter days and longer vacations.

[61] For example, some older physicians have raised concerns about how medical colleges pressure older doctors to leave their jobs in a recent article in the Ottawa Citizen. While increased scrutiny of older doctors is intended to ensure that they remain competent to provide medical services, some complain that efforts to remove older doctors from the workforce reflect an age bias (Blackwell, 2015).

Too often, the employment choices facing an older worker are to continue exactly as before or quit. Employers have been responding, but perhaps not quickly enough.

Work arrangements may not seem an obvious area of provincial and territorial responsibility. But first, it should be recognized that the public sector is a large employer – the provinces, the health sector, universities and colleges and provincial Crowns employ almost 2 million people - and its internal human resources practices could generate externalities by setting models for the private sector. Provinces and territories could expand flexible work arrangements within their operations. They could also lead discussions with employers in their jurisdictions regarding how to best retain and utilize aging workers.

Additionally, the federal, provincial and territorial governments could assist employers by ensuring there are not government-imposed barriers to the creation of part-time work. For example, ceilings on payroll contributions, such as CPP, EI and Workers' Compensation, can act as an impediment: a company could have to contribute more for two part-time workers who together worked the same hours at the same total compensation as it would for one full-time worker who exceeded the income ceiling.

A particularly difficult problem facing older workers occurs when someone is laid off from a job in an area they have worked for a long time. Gray and Finnie (2011) found that one-quarter of workers with long-term stable employment histories who are laid off between 45 and 59 leave the work force within five years. These workers cease to make meaningful contributions to government revenues but require social assistance. Training programs have not proven successful in re-employing these people in the same or a similar occupation. Gray and Finnie found that those who did find employment typically experienced an earnings loss of around 40 per cent relative to their previous job. Many workers may choose to exit the labour force rather than accept such a pay cut. It may be best in these circumstances to offer the laid-off older worker a time-limited wage subsidy to accept work in a different field.

Some individuals are compelled to retire in order to care for an ill family member. In 2009, 7 per cent of those who were fully retired and 6 per cent of those who were "partially retired" cited care giving as a reason for retirement (Park, 2011). Subsidizing the costs of hiring someone to provide care may be an option to keep some of these individuals in the workforce. The rationale for this is very similar to that behind subsidizing childcare.

In summary, there are a number of options governments could pursue to encourage higher labour force participation rates of older workers:

- Ensure there are no legal impediments to working beyond a certain age unless required for legitimate reasons.

- Reduce or eliminate remaining disincentives to work present in public pension schemes.

- Lead discussions with the private sector on more flexible work arrangements and the removal of biases in private pension plans that discourage work beyond a certain age or number of years of service.

- Reduce barriers to the creation of more flexible work arrangements such as addressing the incentive effects of ceilings on payroll contributions to hire full-time rather than part-time.

- Make more flexible work arrangements available to older workers employed in public sector jobs.

- Consider a time-limited wage subsidy for older, long-term workers who get laid off and accept a lower paying job.

- Consider subsidized care giving in order to encourage spouses of those in ill health to remain in the workforce.

v. Increasing Labour Force Participation of People with Disabilities

Table 27: Population with Disabilities and Participation Rates, Ages 15-64, Canada, Provinces, and Territories, 2012

	Population with Disabilities	Total Population	People with Disabilities as a Share of Provincial Population (%)	Participation Rate of People without Disabilities (Age Standardized*) (%)	Participation Rate of People with Disabilities (Age Standardized*) (%)	Participation Rate of People with Disabilities Relative to Participation Rate of People without Disabilities (%)
Canada	2,338,240	23,187,350	10.1	79.2	55.6	70.2
Newfoundland and Labrador	40,060	350,090	11.4	75.1	50.0	66.6
Prince Edward Island	11,500	97,620	11.8	84.9	61.8	72.8
Nova Scotia	89,410	628,310	14.2	79.5	59.2	74.5
New Brunswick	61,650	499,670	12.3	79.8	52.1	65.3
Quebec	361,250	5,355,580	6.7	78.0	49.6	63.6
Ontario	1,035,090	9,065,910	11.4	79.0	53.5	67.7
Manitoba	87,120	782,650	11.1	81.6	62.2	76.2
Saskatchewan	68,790	649,350	10.6	83.4	66.0	79.1
Alberta	242,540	2,590,550	9.4	83.0	64.7	78.0
British Columbia	334,800	3,089,460	10.8	78.2	57.8	73.9
Yukon	2,920	25,610	11.4	84.0	78.4	93.3
Northwest Territories	1,910	31,180	6.1	81.0	59.2	73.1
Nunavut	1,210	21,390	5.7	70.7	63.2	89.4

* *In the Canadian Survey on Disability (CSD), age standardization is usually used by adjusting the age distribution in order to match to the age composition of the Canadian population, using the following age groups: ages 15-24, 25-34, 35-44, 45-54, and 55-64.*

Source: Statistics Canada, Canadian Survey on Disability, CANSIM Tables 115-0002 and 115-0005.

According to the 2012 Canadian Survey on Disability (CSD), 2.3 million Canadians between the ages of 15 and 64 had a disability – about 10 per cent of the total population in the age group.[62]

Many of the individuals in the CSD were unable to participate in the labour force as a result of their disability. The participation rate of the population with disabilities was only 55.6 per cent in 2012 compared to a rate of 79.2 per cent for the population without disabilities (age-standardized rates). Thus, disability represents a significant loss of labour supply in Canada – about 550,000 workers.[63] In addition, many of those people with disabilities who are working will be working reduced hours or part-time.

Table 28: Participation Rates (Age-Standardized[*]) by Type and Severity of Disability, Ages 15-64, Canada, 2012

Nature of Disability	All Severities	Mild	Moderate	Severe	Very Severe
Unknown	70.8	65.6	79.3	F[a]	F[a]
Hearing	56.4	84.9	69.0	54.6	37.2
All disabilities	**53.6**	**72.0**	**60.2**	**47.1**	**32.5**
Pain	52.7	76.1	64.0	47.4	34.1
Flexibility	45.1	70.9	60.4	46.3	32.3
Seeing	44.8	65.9	70.2	48.3	29.3
Mental and or Psychological	44.7	68.2	60.9	41.2	34.5
Mobility	41.6	69.4	58.1	45.1	28.6
Memory	37.9	60.5	52.8	47.3	30.9
Dexterity	37.6	72.5	51.6	41.0	32.9
Learning	36.5	59.9	59.3	40.5	27.8
Developmental	28.2	48.8	34.9	34.4	19.3

[*] *In the Canadian Survey on Disability (CSD), age standardization is usually used by adjusting the age distribution in order to match to the age composition of the Canadian population, using the following five ten-year age groups: ages 15-24, 25-34, 35-44, 45-54, and 55-64.*
[a] *F denotes data which Statistic's Canada deemed too unreliable to publish.*
Source: Statistics Canada, Canadian Survey on Disability, CANSIM Table 115-0006.

Disability seems to be more prevalent in some jurisdictions than others. The populations of Nunavut and the Northwest Territories seem to have relatively low rates of disability, but this may just be the result of their relative youth or different perceptions of what constitutes disability in these regions. Quebec is also notable for having a very low rate of disability, as only 6.7 per cent of those aged 15-64 reported having a disability, two-thirds of the national average. Disability rates for this age group are highest in Nova Scotia (14.2 per cent), New Brunswick (12.3 per cent), and Prince Edward Island (11.8 per cent).

[62] The CSD definition of disability includes anyone who reported being "sometimes", "often" or "always" limited in their daily activities due to a long-term condition or health problem, as well as anyone who reported being "rarely" limited if they were also unable to do certain tasks or could only do them with a lot of difficulty.
[63] This is estimated by applying the difference between the participation rates of the populations without disabilities and with disabilities respectively: (0.792-0.556)*2,388,240 = 551,825. Ignoring differences between persons with disabilities and the non-disabled populations in terms of age, adding these workers to total labour supply would raise the participation rate of all Canadians aged 15-64 by about 2.4 percentage points.

Perhaps more interesting than variation in the prevalence of disability across provinces is the variation in the impact of disability on participation rates. After controlling for age structure, participation rates of people with disabilities are not all that much worse than those of the population without disabilities in some provinces and territories, such as the Yukon Territory (93.3 per cent), Nunavut (89.4 per cent), Alberta (78.0 per cent), and Saskatchewan (79.1 per cent). In contrast, participation rates of the population with disabilities are only 63.6 per cent those of the population without disabilities in Quebec, 66.6 per cent in Newfoundland and Labrador, and 67.7 per cent in Ontario. This large variation in labour force participation of the people with disabilities suggests that there may be significant opportunity for improvement in these provinces.

Disability is a very broad term which incorporates a wide range of physical limitations which can vary significantly in terms of severity. Table 28 presents (age-standardized) participation rates in Canada for the population with disabilities aged 15-64 by type and severity of disability. Recall that the age standardized participation rate for the population without disabilities was 79.2 per cent. One sees that almost all types of disabilities negatively impact participation rates, even if they are only mild.[64] Not surprisingly, participation rates decline as disabilities become more severe. For example, the participation rate for those with mild disabilities is 72.0 per cent, but it falls to 60.2 per cent for those with moderate disabilities, 47.1 per cent for those with severe disabilities, and 32.5 per cent for those with very severe disabilities.

Some types of disabilities hinder participation more than others. Considering all levels of severity, those with disabilities related to hearing (participation rate of 56.4 per cent), pain (52.7 per cent), and flexibility (45.1 per cent) are as likely to be out of the workforce as those with learning (36.5 per cent) or developmental (28.2 per cent) disabilities. However, these differences should be viewed somewhat cautiously as they will be driven in part by the severity distribution within each class of disability.

Providing individuals with disabilities an incentive to work can be a difficult problem because of the continuum of severity of disability. Many people who are disabled are simply unable to work. Others find work difficult or painful and thus have strong disincentive to work or may not be able to work many hours. Others may be willing and able to work, but struggle to find an employer who can accommodate them. Providing generous benefits to those who cannot work due to misfortune is desirable. The difficulty is that such benefits can create strong disincentives to work if clawed back with income. Ideally, social assistance for people with disabilities would be tied to working for those who are able, but in many cases it can be very difficult to determine exactly how much work an individual with a disability is capable of performing. Thus, there tends to be a negative relationship between the level of benefits and the labour supply of people with disabilities (see Jones, 2008, for a short review of empirical evidence).

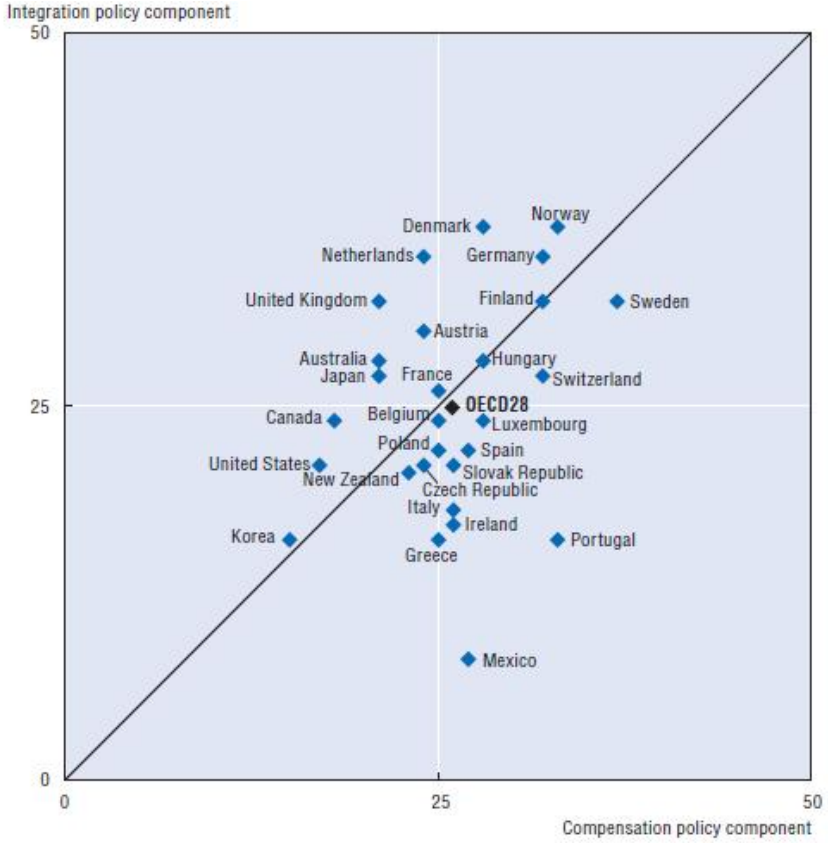
[64] The notable exception is hearing, as those with mild hearing impairment seem to have higher participation rates than the general population. Reverse causality may be at play. Exposure to noise in the workplace may result in those participating in the labour force developing mild hearing disabilities which are not severe enough to force them out of the workforce.

Let us consider several options to encourage and assist Canadians with disabilities to work. This discussion will draw heavily upon a recent study by the OECD (2010b) on disability and work in Canada.

a. Policies Targeting Individuals with Disabilities

An international comparison of disability benefit programs performed by the OECD (2010a) assessed disability policies along two dimensions: compensation policy (generosity of assistance) and integration policy (policies designed to bring the people with disabilities into the labour force). Canada was found to be one of the lowest ranking countries in terms of compensation but had about average performance in terms of integration (Chart 39). This may suggest that Canada should consider increasing the generosity of its social assistance for people with disabilities, but that is another issue. There has been a general trend across the OECD of reforming disability policies to be stronger along the integration dimension and this shall be our focus.

Chart 39: Components of OECD Disability Policy Orientation Index, 2007



Source: Chart taken from OECD (2010a), Figure 3.1. The maximum value of the index along either dimension is 50, A higher integration policy component indicates policies which are more developed in terms of rehabilitation and employment while a higher compensation policy component indicates policies which are more generous in terms of the amount accessibility of benefits.

One very important component of disability policy is the ease with which an individual can gain access to benefits. If benefits are too easy to access, some individuals may opt to go on disability benefits even if they could continue to work. The requirements for many disability benefits in Canada are quite high. For example, CPP disability benefits are reserved for individual with severe and prolonged disabilities.[65] Such stringent requirements likely ensure that most of those receiving benefits would not be able to work much anyway, but this may result in excluding many individuals who do face strong barriers to working. It may be prudent to consider offering more of a tiered system in which individuals who have less severe disabilities are eligible for partial benefits which are tied to work requirements.

Arduous requirements to receive benefits may serve to screen out those who do not truly need them, but they can also have a negative impact on labour force participation. In particular, long wait times to process benefit applications can have a negative impact on the participation of those who are rejected, as they cannot work while the application is being processed. While Service Canada's website indicates that it takes about 4 months for an application for CPP disability benefits to be approved for an initial claim, many wait longer, particularly those who appeal a rejection. About 60 per cent of applications for CPP disability (CPP-D) benefits are rejected on the first application (Prince, 2014). A long period of detachment from the labour force can make a return difficult, particularly for those with disabilities which employers may need to accommodate.[66] For example, a recent study in the United States (Autor et al. 2015) found that a 2.4 month increase in processing times for Social Security Disability Insurance reduced annual participation rates by 1 percentage point one year after the decision. As such, efforts to speed up processing times of benefit applications may be beneficial.

A major problem with many disability benefit schemes is that they focus too much on labeling individuals as disabled (or not) rather than focusing on what individuals are capable of doing. Greater efforts need to be made to assess the extent of an individual's disability and develop a plan to retrain or accommodate the individual so that he or she can continue to work. Canada has programs in place to do this, but they occur too late, typically only after an individual has filed for long-term disability benefits (CPP-D). Under both the CPP-D and QPP-D, there are no measures to help those with disabilities return to work while awaiting benefits (OECD 2010b). Individual cases should be evaluated as soon as individuals apply for short-term disability benefits through EI (EI-S), as this is a relatively early stage where efforts to keep an individual in the workforce may be more effective. There is currently a two-week unpaid waiting period under EI-S during which no interventions are taken by employers or government (OECD 2010b).

Once individuals are receiving benefits, they must be structured sensibly so as to eliminate disincentives to work. Marginal tax rates must be considered carefully in all policies related to taxation to ensure that they remain reasonable. The CPP has some very good mechanisms which support individual attempts to return to the workforce. For example, workers have the option to undergo a "trial period" of work during which they will be fast-tracked back onto disability benefits if the disability proves too great a barrier to continue in the position.

[65] Not necessarily corresponding to the definition from the CDS above.

[66] This detachment from the labour could reduce the labour supply of those denied benefits, but it could also negatively impact some of those who do receive benefits and then attempt to re-enter the workforce.

Similarly, increasing the level of earnings before disability benefits are clawed back will encourage more people with disabilities to enter the workforce. Campolieti and Riddell (2012) found that increasing the level of allowable earnings increased labour force participation of people with disabilities in Canada without raising the number of people on disability benefits, although they did not find any evidence of a positive effect from automatic reinstatement of benefits.

b. Policies Targeting Employers

Employers play an important role in ensuring that people with disabilities can participate in the workplace. Employers should be incentivized to hire and accommodate workers with disabilities. One way to do this is to legislate quotas or anti-discrimination laws, but such solutions have generally been found to be fairly ineffective in the long-term (OECD, 2010a) because they can be difficult to enforce effectively. Such policies can be useful for helping workers retain their jobs – legislation can force an employer to make reasonable accommodations because if they do not the employee can file a complaint. However, such policies can have a negative impact on the hiring of new workers with disabilities (or greater likelihood of developing disabilities) because employers know that they will be difficult to end an employment relationship with. Employers may just use existing employees who develop relatively minor disabilities to fill quotas.

A better approach may be to facilitate better matching between potential employers and workers with disabilities. Subsidizing costs associated with accommodating a worker with a disability and more directly assisting employers in screening workers with disabilities for their capabilities may make it easier for employers to hire people who are disabled.

Employers should also play a prominent role in identifying disabilities at an early stage and providing accommodation or retraining for alternative tasks before these become serious health issues. One way to incentivize employers to intervene is to make employer CPP and EI contributions experience rated so that employers with a relatively high rate of workers who end up seeking disability benefits through these programs must pay for it. This feature is already common in Workers' Compensation schemes and private disability insurance in Canada OECD (2010b).

c. Policies Targeting Administration of Benefits

The disability benefits system in Canada is very complicated. The OECD (2010b) notes that Canadians may draw upon as many as six different public or private, provincial or federal disability benefit programs. These schemes often have quite different designs and objectives. They vary considerably in the extent to which they allow "benefit stacking". Greater consolidation and co-ordination of these programs would simplify the process for Canadian workers and may make it easier to ensure that all Canadians with disabilities who are still able to work have incentives to do so and have access to the necessary assistance. Navigating such a complicated benefits system may lead to individuals with disabilities not receiving the benefits to which they are entitled or not accessing valuable programs which could help them with retraining or employment. Ideally, there would be a "one-stop-shop" where all Canadians could

go to apply for benefits, find information, and access available services. Service Canada seems to be the natural body to provide such a role.

Many services which assist Canadians with disabilities are provided through the private not-for-profit sector. These organizations provide valuable expertise and form valuable linkages between the population with disabilities and the wider community using private and public funds. The natural concern with such organizations is accountability. Ideally, funding should be linked to results, but this can be difficult in practice. Further efforts need to be made to shift funding from "output-based" to "outcome-based" (OECD 2010b). The distinction is largely that an "output-based" approach focuses on the immediate consequences of spending by an organization while an "outcome-based" approach focuses on the long-term or final impact of the spending. While the latter objective is more important, it can also be much more difficult to link to the specific actions of an organization. The complexity of funding of many non-profit disability service providers in Canada can make accountability challenging.

The role of medical professionals in determining eligibility for disability benefits in Canada may offer another opportunity for improvement. One's doctor will often be the first person an individual consults regarding his or her ability to continue working. Medical evaluation serves as the primary means to determine eligibility for sickness leave (OECD 2010a). As such, it is important to ensure that medical professionals have clear incentives and guidelines to make optimal recommendations regarding how long an individual should be absent from work.

There also needs to be a co-ordinated effort to collect comparable data on workers with disabilities and their participation in benefit programs across the provinces. Given the diversity of specific disability schemes from one province to another, there should be considerable opportunity to learn about what works and what does not. Co-operation in terms of policy evaluation could improve disability policy in all provinces.

In summary, the labour supply of Canadians with disabilities could be increased in the following ways:

- Identify and eliminate (or reduce) disincentives to work which remain in some disability benefit policies.

- Speed up wait times for benefit applications and appeals to reduce the amount of time individuals with disabilities must remain out of the workforce.

- Disability benefits should not be applied on an all-or-nothing basis. Partial benefits should be available to those with less severe disabilities, ideally with a requirement to participate in the labour market (perhaps similar in structure to the WITB).

- Information and administration should be consolidated to make accessing benefits as simple as possible for people with disabilities.

- Earlier diagnosis and intervention would keep more individuals in the workforce. Assistance with retraining and workplace accommodation should begin when individuals are on short-term disability before problems become more severe.

vi. Increasing Labour Force Participation of the Aboriginal Population

While Canada's Aboriginal population is relatively small (about 4.3 per cent), its youth and fast growth[67] relative to the general Canadian population mean that it will account for a significant portion of future labour force growth. This is especially true for the provinces where the Aboriginal population makes up a large share of the population, most notably the Territories, Manitoba, and Saskatchewan (Table 29).

Chart 40 presents the age distribution of the Aboriginal and non-Aboriginal populations in Canada as of 2011. It is easy to see that a much larger share of the Aboriginal population is below the age of 25 while the non-Aboriginal population is more concentrated above the age of 45. The median age of the Aboriginal population was only 28 in the 2011 National Household Survey, while it was 41 for the non-Aboriginal population

Table 29: Total Aboriginal Population, Canada, Provinces, and Territories, 2011

	Total Population by Aboriginal Identity	Aboriginal Identity	Aboriginal Share of Provincial Population	Provincial Share of Aboriginal Population
Canada	32,852,320	1,400,685	4.3	100.0
Newfoundland and Labrador	507,270	35,800	7.1	2.6
Prince Edward Island	137,375	2,230	1.6	0.2
Nova Scotia	906,170	33,845	3.7	2.4
New Brunswick	735,835	22,620	3.1	1.6
Quebec	7,732,520	141,915	1.8	10.1
Ontario	12,651,790	301,430	2.4	21.5
Manitoba	1,174,345	195,895	16.7	14.0
Saskatchewan	1,008,760	157,740	15.6	11.3
Alberta	3,567,975	220,695	6.2	15.8
British Columbia	4,324,455	232,290	5.4	16.6
Yukon	33,320	7,710	23.1	0.6
Northwest Territories	40,795	21,160	51.9	1.5
Nunavut	31,700	27,360	86.3	2.0

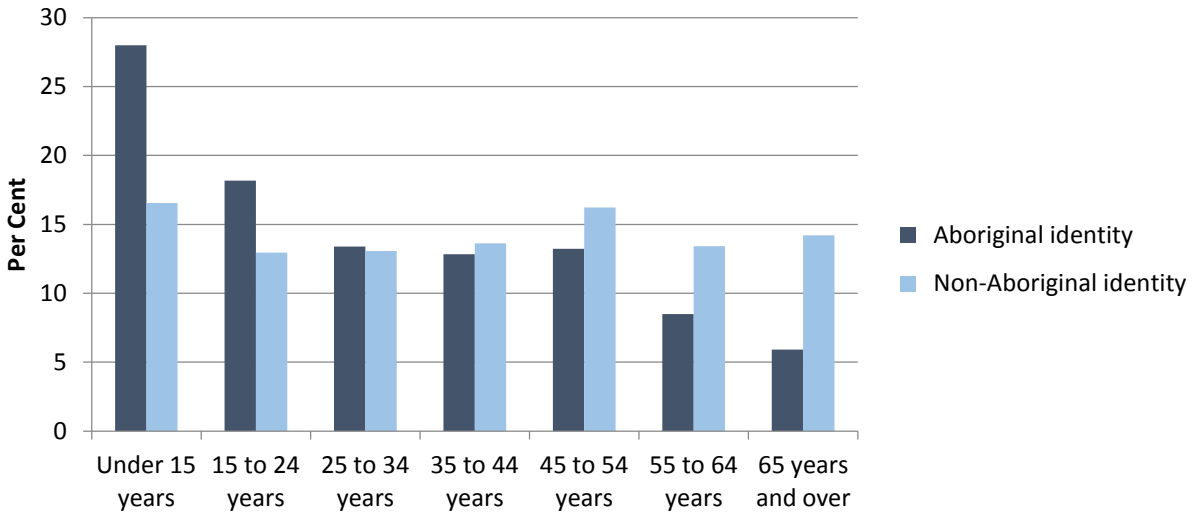
Source: Statistics Canada, 2011 National Household Survey Data Tables, Aboriginal Identity (8), Age Groups (20), Registered or Treaty Indian Status (3), Area of Residence: On Reserve (3) and Sex (3) for the Population in Private Households of Canada, Provinces and Territories

As is well-known, Aboriginal labour market performance lags behind that of the general population (Table 30). The labour force participation rate of the Aboriginal population aged 25-64 in 2011 was 71.7 per cent, much lower than that of the non-Aboriginal population (80.6 per cent). The Aboriginal employment rate (62.5 per cent versus 75.8 per cent) gap is even larger

[67] This fast growth is due to its higher natural growth rate, but it is also related to an increasing number of individuals reporting an Aboriginal identity in surveys (ethnic mobility).

than the participation rate gap because Aboriginal unemployment rates are more than double those of the non-Aboriginal population (12.8 per cent versus 6.0 per cent).

Chart 40: Age Distributions of Aboriginal and Non-Aboriginal Populations, Canada, 2011



Source: Statistics Canada, 2011 National Household Survey Data Tables, Aboriginal Identity (8), Age Groups (20), Registered or Treaty Indian Status (3), Area of Residence: On Reserve (3) and Sex (3) for the Population in Private Households of Canada, Provinces and Territories

There is significant variation in labour market performance across Aboriginal identity or heritage groups. The Métis tend to perform much better than other Aboriginal identity groups in the labour market with a participation rate of 78.0 per cent, not far below that of the non-Aboriginal population of 80.6 per cent. The Inuit (participation rate of 70.9 per cent) and First Nations living off reserve (71.9 per cent) perform much worse, but First Nations living on reserve have by far the worst labour market outcomes (60.0 per cent)

Table 30: Aboriginal Labour Market Outcomes by Aboriginal Identity, Ages 25-64, 2011

Aboriginal Identity	Area of Residence	Total Population	Labour Force Participation Rate	Employment Rate	Unemployment Rate
Non-Aboriginal	Total	17,712,540	80.6	75.8	6.0
Aboriginal	Total	671,380	71.7	62.5	12.8
Métis	Total	237,710	78.0	71.2	8.6
Inuit	Total	24,910	70.9	58.6	17.3
First Nations	Total	389,210	67.7	57.1	15.6
	On-reserve	137,565	60.0	46.8	22.0
	Off-reserve	251,650	71.9	62.7	12.7

Source: Statistics Canada, 2011 National Household Survey Data Tables, Secondary (High) School Diploma or Equivalent (14), Labour Force Status (8), Aboriginal Identity (8), Area of Residence: On Reserve (3), Registered or Treaty Indian Status (3), Age Groups (13B) and Sex (3) for the Population Aged 15 Years and Over, in Private Households of Canada, Provinces and Territories

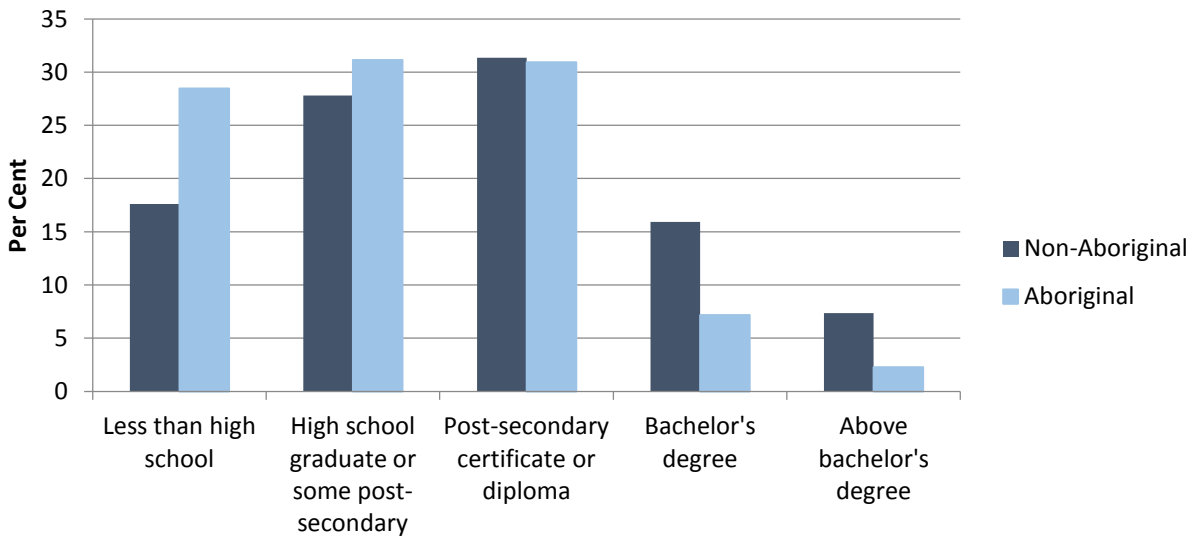
Why is the Aboriginal population so disengaged from the Canadian labour market? There are many reasons. Many Aboriginal people remain trapped in a cycle of poverty which originated from centuries of mistreatment following European colonization of North America.

Social problems such as high rates of crime and substance abuse and substandard housing and health make it difficult for Aboriginal people to succeed. A significant portion of the Aboriginal population lives in remote areas where economic opportunities are relatively scarce. Those who do try to participate in the Canadian economy face serious barriers to doing so. Some of this is the result of discrimination which is often justified by pointing at Aboriginal social problems in the aggregate or based on poor understanding of Aboriginal people. Cultural differences can also impede relationships between non-Aboriginal employers and Aboriginal employees.

Aboriginal education levels, which are also very low, are often singled out as a major channel through which improvements could potentially occur.

Chart 41 compares the highest levels of educational attainment of the Aboriginal and non-Aboriginal working age populations (15+) in 2014. Similar to age, the differences are mostly at the extremes of the distribution. A far greater number of Aboriginal students have less than a high school diploma (about 28 per cent versus 17 per cent) while far fewer Aboriginal people hold a university degree. Note that Chart 41 uses data from the Labour Force Survey and thus excludes those living on reserve, where education levels are especially low.

Chart 41: Educational Attainment Distribution (Highest Level), Aboriginal and Non-Aboriginal Populations Aged 15+, Canada, 2014



Source: Labour Force Survey. Note that this data source excludes Aboriginal people living on reserve.

Table 31 provides a detailed comparison of First Nations and non-First Nations education levels of the young (aged 25-34) on and off reserve according to the 2011 National Household Survey. While only 8.4 per cent of non-Aboriginal people in this group held no educational credential, nearly one quarter of First Nations living off-reserve fell into this category, and almost half of First Nations living on reserve. A similar trend (but opposite in direction) occurs for the share of the population with university education. While Aboriginal education has been improving off reserve in recent times, this has only occurred at a comparable rate to improvements in non-Aboriginal education. Furthermore, education levels on reserve barely improved in absolute terms between 2001 and 2011 (Calver, 2015b).

The impact of low Aboriginal education on labour market performance is significant. Lamb (2013) found that education is a major explanatory factor in earnings disparity between Aboriginal and non-Aboriginal populations. While considering the likely impact of Aboriginal education levels on future labour force participation rates, Spielaeur (2014) found that Aboriginal educational attainment accounts for about half of the labour force participation gap.

Similarly, Calver (2015b) estimates the potential impact of closing the Aboriginal educational attainment gap on the Canadian economy between the years 2011 and 2031. He estimates that closing the educational attainment gap could raise the growth rate of employment by 0.022 percentage points (2.86 per cent), the growth rate of labour productivity by 0.032 percentage points (2.32 per cent), and the growth rate of real GDP by 0.055 percentage points (2.53 per cent). If these improvements coincided with elimination of employment rate and income gaps for a given level of education, the total impact on growth rates is estimated at 0.036 percentage points (4.61 per cent) for employment, 0.034 percentage points for labour productivity (2.43 per cent), and 0.070 percentage points (3.24 per cent) for real GDP.

Table 31: First Nations Education On- and Off-Reserve, Ages 25-34, Canada, 2011

	Non-Aboriginal	First Nations On Reserve	First Nations Off Reserve
Total - Secondary (high) school diploma or equivalent	100.00	100.00	100.00
No high school diploma, no postsecondary certificate, diploma or degree	8.42	49.45	24.85
No high school diploma, with postsecondary certificate or diploma	1.75	6.68	4.32
With high school diploma, no postsecondary certificate, diploma or degree	21.23	23.80	28.27
With high school diploma, with apprenticeship or trades certificate or diploma	9.38	5.66	8.78
With high school diploma, with college, CEGEP or other non-university certificate or diploma	21.77	10.04	19.43
With high school diploma, with university certificate or diploma below bachelor level	4.58	2.08	3.10
With high school diploma, with Bachelor's degree	22.52	1.87	8.40
With high school diploma, with university certificate, diploma or degree above bachelor level	10.34	0.40	2.84

Source: 2011 National Household Survey Data Tables: Secondary (High) School Diploma or Equivalent (14), Labour Force Status (8), Aboriginal Identity (8), Area of Residence: On Reserve (3), Registered or Treaty Indian Status (3), Age Groups (13B) and Sex (3) for the Population Aged 15 Years and Over, in Private Households of Canada, Provinces and Territories, 2011 National Household Survey

It seems that there would be significant benefits if Aboriginal education could be improved to non-Aboriginal levels, but it is far less clear how this could be achieved. First, it is probably important to have some understanding of why Aboriginal education levels are so low. Frenette (2011) is able to attribute significant parts of the Aboriginal education gap to specific factors. The most important explanatory factor he identifies is academic performance – low overall grades and poor reading scores can explain roughly 25 per cent of the gap in high school completion rates and 45 per cent of the gap in university attendance upon completion of high

school.[68] Other significant factors which he identifies include home environment (particularly parental presence and maternal education), effort (as measured by time spent on homework), and having a dependent child before the age of 19. While Frenette (2011) is only able to explain 53 per cent of the high school completion gap, he can explain 90 per cent of the university attendance gap (of those who completed high school). Factors such as racial discrimination at school or cultural attitudes towards education may also be significant, but cannot be controlled for in Frenette's exercise.

As First Nations persons living on-reserve and the Inuit are under federal jurisdiction, policies to improve their labour market performance fall more in the federal domain than in the provincial domain. Nevertheless, many Aboriginal Canadians actually live off reserve, and their education and social supports often fall to provincial or territorial governments. Consequently, federal and provincial/territorial governments, as well as First Nations governments, have a stake in Aboriginal education, social policy and integration into the labour force. Intergovernmental cooperation will be required if progress is to be made.

The most obvious approach to improve Aboriginal education is to spend more money on it. While this may be part of the solution, other changes will also likely need to occur. There has been considerable disagreement as to whether or not there is an Aboriginal funding gap. Drummond and Rosenbluth (2013) explain the complexity of determining if Aboriginal children receive the same amount of education funding as non-Aboriginal children and conclude that a single measure of an Aboriginal funding gap would not be very useful, although funding of many Aboriginal schools does seem to be below that of comparable provincial schools. Given the poor academic performance of Aboriginal children, it seems reasonable to think that a necessary condition to close the educational attainment gap will be to fund Aboriginal education at least as well as non-Aboriginal education, but this is unlikely to be sufficient.

Other changes may be necessary to engage Aboriginal children at school and to obtain the necessary support from parents. Such changes require a co-ordinated effort by federal and provincial governments, Aboriginal governing bodies, and parents. Redesigns of curricula geared specifically towards Aboriginal children may be one option. Providing support for external tutoring for Aboriginal children who cannot obtain the academic assistance they need at home may be another. Additional support to help address underlying social problems which may impede student success at school will also likely be part of the solution.

Given the legacy of the residential school system,[69] part of the problem may be a lingering mistrust of government efforts to provide education. Granting further control over Aboriginal education to the Aboriginal people may help to improve Aboriginal attitudes towards education. Of course, assistance would need to be made available to Aboriginal operated school

[68] While academic performance can explain much of the gap in Aboriginal education, the specific reasons for this poor academic performance are not entirely clear.

[69] Feir (2015) finds evidence that the children of Aboriginal women who attended residential schools perform worse at school. Her estimates suggest that nearly 20 percent of the gap in suspensions and expulsions between Registered Indian children and other children in Ontario can be explained by the mother's residential school attendance. These worse schooling outcomes are accompanied by worse attitudes towards school: children whose mothers attended residential school are 14 percentage points less likely to get along with their teachers and 12 percentage points less likely to report enjoying school almost all of the time.

boards to ensure that they have sufficient administrative capacity. Encouraging reserves to form consolidated school boards could help to achieve economies of scale. Careful monitoring may be necessary to ensure accountability of spending of funds allocated for education spending.

Besides improving primary and secondary education, it will also be important to ensure that Aboriginal students (and their parents) have access to high quality labour market information and that any Aboriginal student who wants to pursue post-secondary education is not impeded by an inability to obtain financing.

While improving Aboriginal education is perhaps the best way to raise Aboriginal labour market participation, it is not the only option. Howard et al. (2012) identified barriers employers face in hiring Aboriginal workers based on a survey conducted by the Conference Board of Canada. The most cited challenges to hiring Aboriginal workers were related to education (57 per cent cited a lack of qualifications and 49 per cent a low level of skills). Many firms (40 per cent) identified a lack of experience as a barrier. Providing additional support for Aboriginal internships may help to overcome this barrier. Twenty-eight per cent of businesses in the survey claimed that differences in employer and employee expectations were an issue. Facilitating further engagement between the Aboriginal and non-Aboriginal communities may allow for better understanding on both sides. Encouraging more Aboriginal entrepreneurship may help if Aboriginal business owners have a better understanding of Aboriginal workers. Promoting further Aboriginal education and employment in human resources or management may also help firms overcome cultural barriers.

While the exceptionally low employment levels on-reserve are linked to low levels of educational attainment, the geographic isolation of many reserves may be a significant source of the problem. Unless willing to make long commutes, many First Nations people are limited by the opportunities available on reserve. This is not necessarily a problem for everyone – many Aboriginal people prefer to live an independent and traditional lifestyle, and it is their right to do so. However, many First Nations people may feel compelled to choose between two less than ideal options. On the one hand, they can choose to live on reserve with family and friends but with poor economic prospects. On the other, they can choose to move off reserve for greater economic opportunities but risk feeling socially and culturally isolated. Howard (2012) found that 27 per cent of employers cited a reluctance to move for work as a barrier to Aboriginal hiring.

Efforts to improve outcomes and education on-reserve are important, but offering additional assistance to relocate off reserve for work may improve Aboriginal participation rates and living standards. Generous support should be available to facilitate a transition to working (or living) off reserve. Recent success stories of urban reserves, which have offered employment opportunities for many Aboriginal people living in major urban centres, may suggest potential benefits from offering support to municipalities and bands which are interested in developing additional urban reserves.

Summary of recommendations to increase labour supply of Aboriginal people:

- Further investments in facilities and educators are necessary to ensure that all Aboriginal children have access to a high quality education, especially on-reserve.

- Greater control over Aboriginal education should be placed in the hands of the Aboriginal peoples, along with assistance in assuring administrative capacity and accountability.

- Currricula should be re-evaluated in order to better engage Aboriginal children who struggle under the current system

- Ensure sufficient financial support for all Aboriginal people seeking postsecondary education

- Offer additional support to address social problems plaguing Aboriginal communities which interfere with education

- Assist employers in overcoming barriers to hiring and training Aboriginal workers

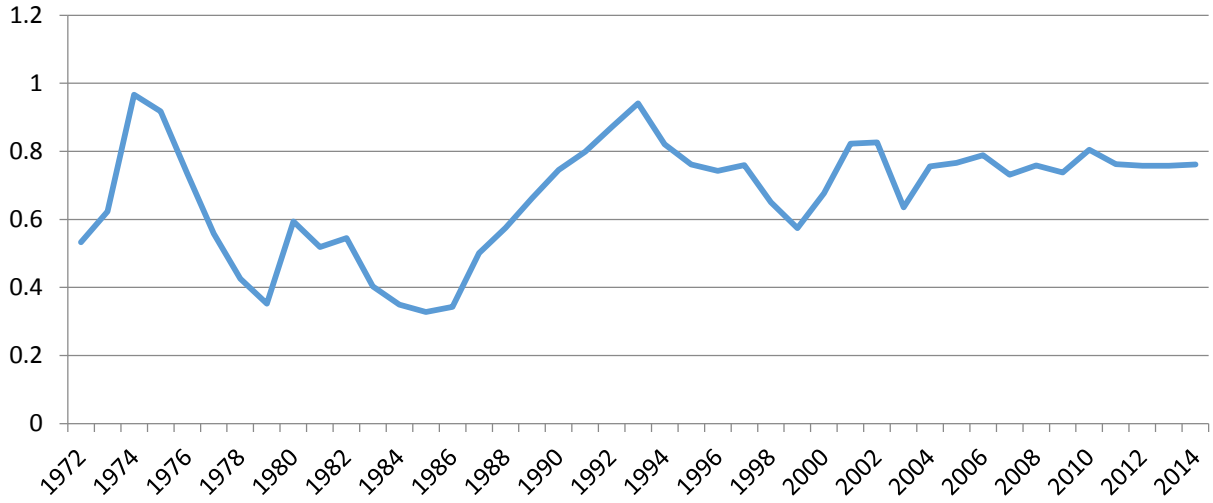
- Facilitate movement off reserve for any Aboriginal wishing to take advantage of opportunities in cities

vii. Increasing Labour Force Participation of Immigrants

Between July 1, 2013, and June 30, 2014, about 268 thousand individuals immigrated to Canada, or about 0.76 per cent of the Canadian population. As Chart 42 shows, this level of immigration has been fairly steady over the past decade. The number of new immigrants to Canada between 1971 and 2000 was somewhat more varied, but the number of immigrants has been between 0.3 and 1.0 per cent of the total population. While this is not an enormous amount of immigration in any given year, over time it accumulates so that immigrants represent a large share of the total population. According to the National Household Survey, 23.8 per cent of Canadians were (or had been) landed immigrants in 2014.

Immigrants have tended to concentrate in some regions of Canada more than others. Recall from Table 21 that the share of immigrants in the working age population (15+) was below 6 per cent in the Atlantic Provinces in 2014, 15 per cent in Quebec, between 10 and 20 per cent on the Prairies, and slightly above 30 per cent in Ontario and British Columbia. In recent times (2013-2014), there has been a greater regional balance of new immigrants with proportionately fewer moving to Ontario and British Columbia. Immigrants have been settling at the highest rates (relative to provincial population) in Prince Edward Island, Manitoba, Saskatchewan, Alberta, and the Yukon Territories. Immigration rates have remained relatively low in the other Atlantic Provinces and territories.

Chart 42: Flow of Landed Immigrants as a Percentage of the Canadian Population, 1971/72-2012/13



Source: CSLS calculation using data from Statistics Canada, CANSIM Table 051-0004 (number of immigrants between July 1 and June 30) and CANSIM Table 051-0001 (estimate of Canadian population on July 1).

Table 32: Flow of Immigrants by Province, 2013/2014

	Number of Immigrants (2013/2014)	Population (2013)	Immigrants Relative to Population (%)
Canada	267,716	35,154,279	0.76
Newfoundland and Labrador	1,019	528,194	0.19
Prince Edward Island	1,399	145,505	0.96
Nova Scotia	2,772	942,930	0.29
New Brunswick	2,298	755,635	0.30
Quebec	51,654	8,153,971	0.63
Ontario	101,841	13,550,929	0.75
Manitoba	15,419	1,265,405	1.22
Saskatchewan	12,300	1,106,247	1.11
Alberta	41,016	4,007,199	1.02
British Columbia	37,451	4,582,625	0.82
Yukon	360	36,364	0.99
Northwest Territories	163	43,841	0.37
Nunavut	24	35,434	0.07

Source: CSLS calculation using data from Statistics Canada, CANSIM Table 051-0004 (number of immigrants between July 1 and June 30) and CANSIM Table 051-0001 (estimate of Canadian population on July 1).

There are several different classes of immigrants entering Canada. In 2013, 57.8 per cent of new permanent residents of Canada were classified by Citizenship and Immigration Canada (CIC) as economic immigrants. These are individuals who are chosen because they are expected to have a positive economic impact. Thirty-eight per cent of new non-permanent residents entered Canada to be reunited with family. Refugees made up 9.3 per cent of the total. The target of 265,000 to 280,000 immigrants set for 2015 aims for about 65.5 to 66.2 per cent of immigrants to fall into the economic category (CIC, 2015).

Table 33: Permanent Residents Immigrating to Canada by Category, 2013

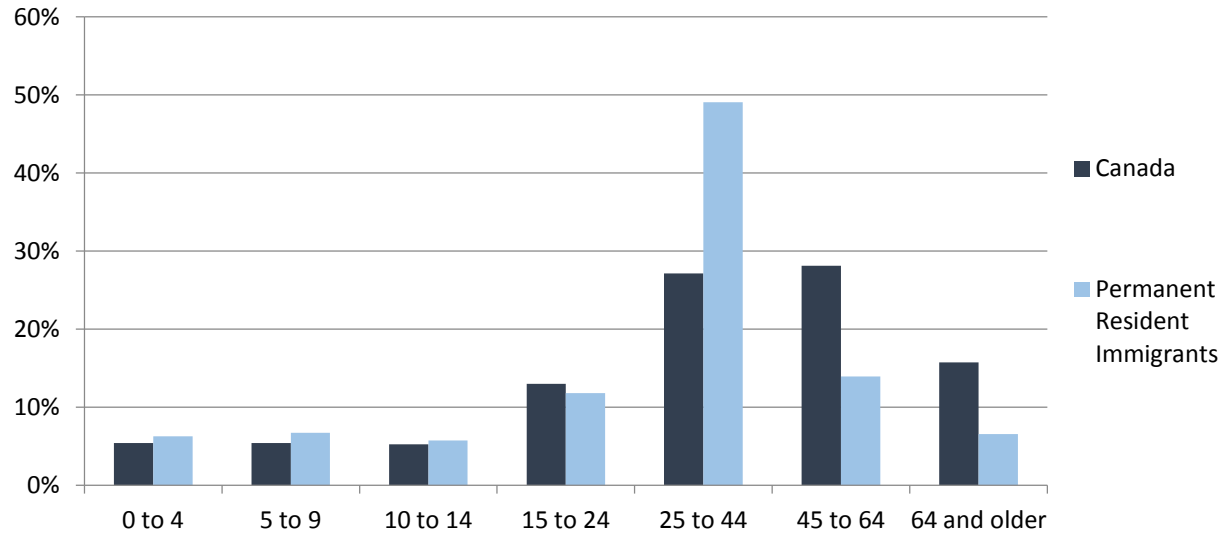
Category	Number of Immigrants	Percentage of Total
Family	79,684	30.8
Economic	148,181	57.2
Refugee	24,049	9.3
Other	7,039	2.7
Total	258,953	100.0

Source: Citizenship and Immigration Canada, Facts and figures 2013 – Immigration overview: Permanent residents, Canada – Permanent residents by category

a. Immigration and the Ageing Population

Much has been made of the potential of immigration to Canada to offset the ageing of the Canadian population and the subsequent challenges that arise from it. It is thought that a steady flow of younger immigrants to Canada can help balance the demographic scales. These are at the moment rapidly tipping towards an increasingly elderly population, where the proportion of those aged 65 and above, and therefore more likely to be not working full time and increasingly making use of public resources such as healthcare and public pensions, is increasing. Chart 43 presents a recent snapshot of the age profile of the Canadian population as a whole versus that of 2013's flow of permanent resident immigrants.

Chart 43: Age Structure of Canadian Population versus Permanent Resident Immigrant Flow, per cent, 2013



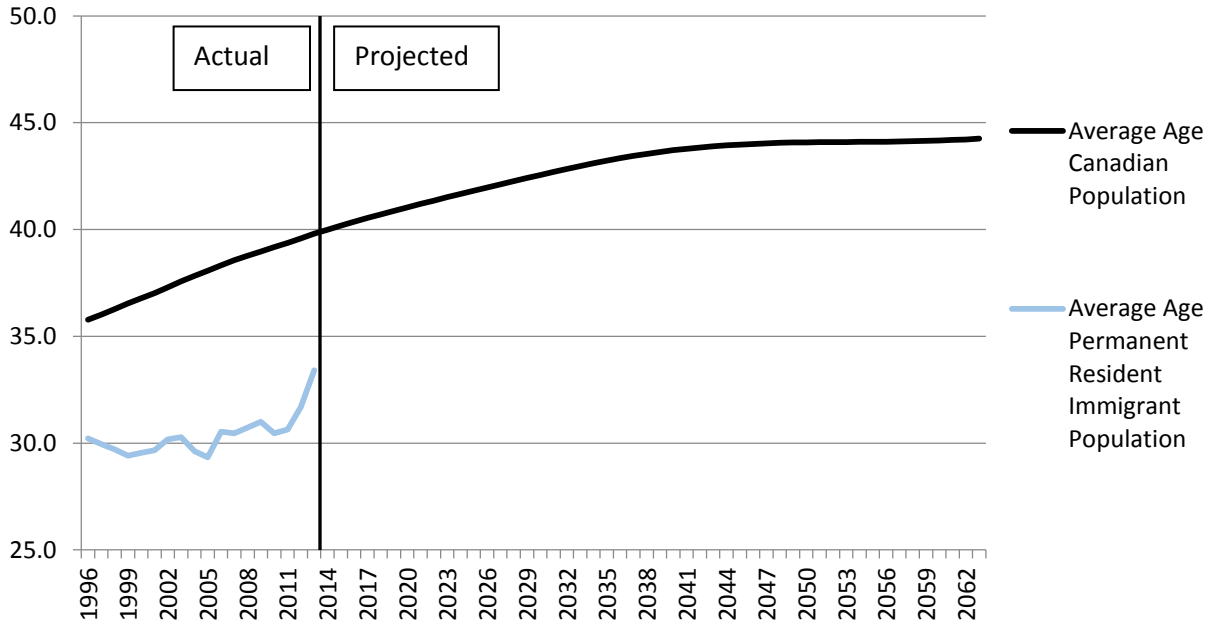
Source: CSLS calculations using Statistics Canada Data (CANSIM table 051-0001) and Citizenship and Immigration Canada Facts and Figures: http://www.cic.gc.ca/english/resources/statistics/facts2013/index.asp

This snapshot confirms the view that the newly arrived immigrant population is indeed younger than the Canadian population as a whole. The proportions of permanent resident immigrants arriving in 2013 aged 45 to 64 and 65 and older are approximately half that of the

Canadian population's, while the proportion of those 25 to 44 is approximately double. The proportion of those 15 to 24 is slightly less among the immigrant population, while the proportion of children under the age of 15 is slightly higher than that of the Canadian population as a whole.

Another way to compare the Canadian population's age to that of the annual immigrant population is to look at average ages. Chart 44 shows the average age of the Canadian population compared to the average age of the immigrant population since 1996.

Chart 44: Average Age (Years) of Canadian Population[70] and Permanent Resident Immigrant Flows[71], 1996-2063



Source: CSLS calculations based on Statistics Canada Data (CANSIM Table 051-0001, 052-0005 [Medium Growth Scenario using 1991/1992-2010/2011population growth trends]) and Citizenship and Immigration Canada Facts and Figures, 1998-2013: http://publications.gc.ca/site/eng/9.505817/publication.html.

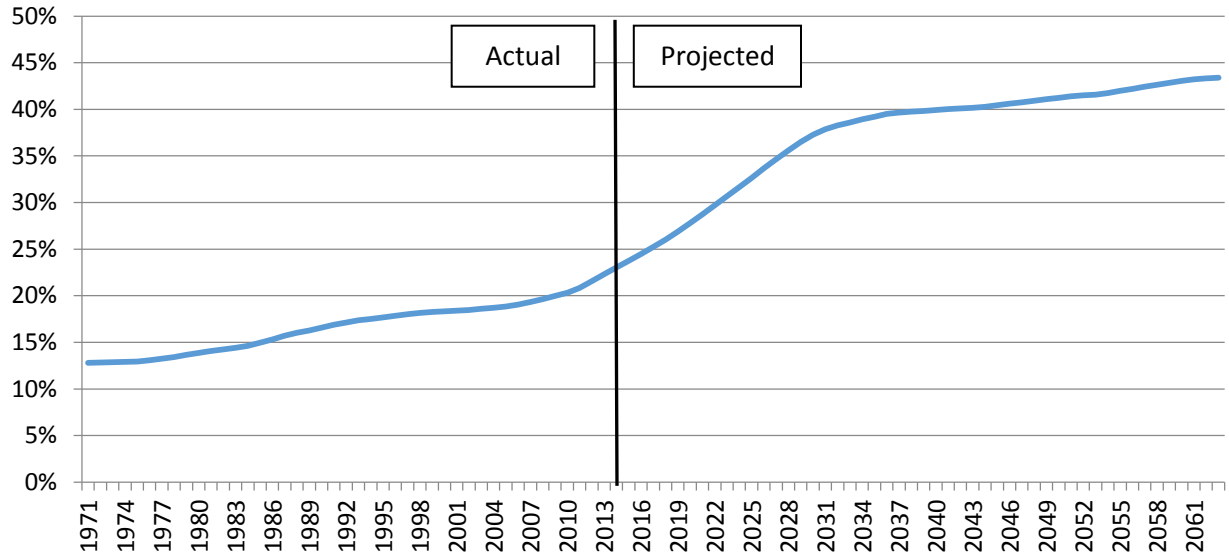
Using the average age measurement one can also clearly see that the average age among the annual immigrant flows has been significantly lower than that of the Canadian population as a whole. As can be seen, the average age of the Canadian population has been trending upwards, going from 35.8 years in 1996 to 39.8 years in 2013. It is projected to continue increasing until about 2041, reaching 43.8 years, the level at which it remains relatively constant, inching up to 44.2 years in 1963. The average age of the annual immigrant flows, which held steady at around 30 years until 2011 has since increased to 33.4 in 2013, driven mainly by a higher proportion of permanent resident immigrants over the age of 45, particularly those above the age of 65 (Chart 45).

[70] Calculated using individual ages and a figure of 95 for the 90 and above category.
[71] Calculated using the midpoint ages of 0-14, 15-24, 25-44, 45-64 age brackets and a an average value of 75 for 65

However, the mere fact of permanent residents' relative youth compared to the Canadian population as a whole does not in itself say very much about immigration's ability to help dampen Canada's population ageing. The nature of problems arising from this ageing can best be understood as an increasing ratio of people making increasing use of public resources such as public pensions and healthcare and are less likely to be working, to people who are in prime working age and are likely playing a greater role in financing these systems. Large liabilities arise from continuing down the current demographic trajectory and the notion that such public resources will at least be maintained in their current level (Robson, 2010).

In order to examine immigration's effect on population ageing one must take a closer look at the dependency ratio. The dependency ratio is the ratio of people considered to be in the prime working age range of 15-64 to those who are not, and is a general indicator of the level of difficulty in financing public services – the higher the ratio of dependents to contributors, the higher the burden on each contributor to maintain the level of services. The dependency ratio can be broken down into two components: The old-age dependency ratio, which represents the population over 65 years of age, and the youth dependency ratio, which represents the population under 15. The old-age dependency rate is the more problematic component of the overall dependency ratio in the long-run, given that those who have reached this age bracket, unlike youth dependents, will likely not again be entering the labour force. Therefore we will focus on Canada's old-age dependency ratio, as shown in Chart 45.

Chart 45: Old-age (65 +) Dependency ratio (% of working-age population, 15-64 years of age), 1971-2062, Canada, per cent



Source: CSLS Calculations based on Statistics Canada Data. CANSIM tables 051-0001, 052-0005 (Medium Growth Scenario using 1991/1992-2010/2011population growth trends).

As can be seen, Canada's old-age dependency ratio has been increasing steadily since 1971, from 12.8 per cent of working age population in 1971 to 23.0 per cent in 2014. The old-age dependency ratio is projected to further increase sharply in the next decades as the large proportion of Canadians in the 45 to 64 age group (Chart 43) retire and are not replaced, given

the far lower proportion of young Canadians projected to enter into the labour force in that time frame. This increase is projected to come in two phases: the first being a rapid increase in the rate up to 39.2 per cent in 2035, after which the rate is projected to increase at a more moderate pace, hitting 43.4 per cent by 2062.

It is important to note that the average age of a population and the share of the population over 65 are two related, but not identical measures. The average age of the Canadian population can, and has, been increasing since the 1970s, driven largely by the ageing of people in the middle of the demographic pyramid (people in their 20s to 40s). An increase in the average age therefore can be, but is not necessarily, an indicator that reflects demographic challenges. The share of the population above 65 provides a better picture of demographic problems, as this tends to be a better indicator reflecting the share of the population making greatest use of public resources. There are however several limitations to the use of the old-age dependency ratio as well. Many people above the age of 65 are increasingly working, accessing private incomes such as private pensions or investment returns, paying taxes on these incomes, and generally getting healthier, therefore incurring less public healthcare costs.

According to the demographics literature, immigration's ability to influence the dependency ratio is limited in two main ways. The first is the scale of immigration as compared to the population as a whole – a younger immigrant stream will have little effect on the age composition of the population as a whole if the absolute numbers of immigrants coming in is small compared to the existing population. The second is the age structure of the immigrant streams – the extent to which the incoming immigrants are younger than the Canadian population is also important, as an only slightly younger immigrant workers will not stay young forever, but will themselves eventually retire and exit the labour force. An annual immigrant flow that closely resembles the existing Canadian age structure would therefore have very little if no effect on the dependency ratio and average age.

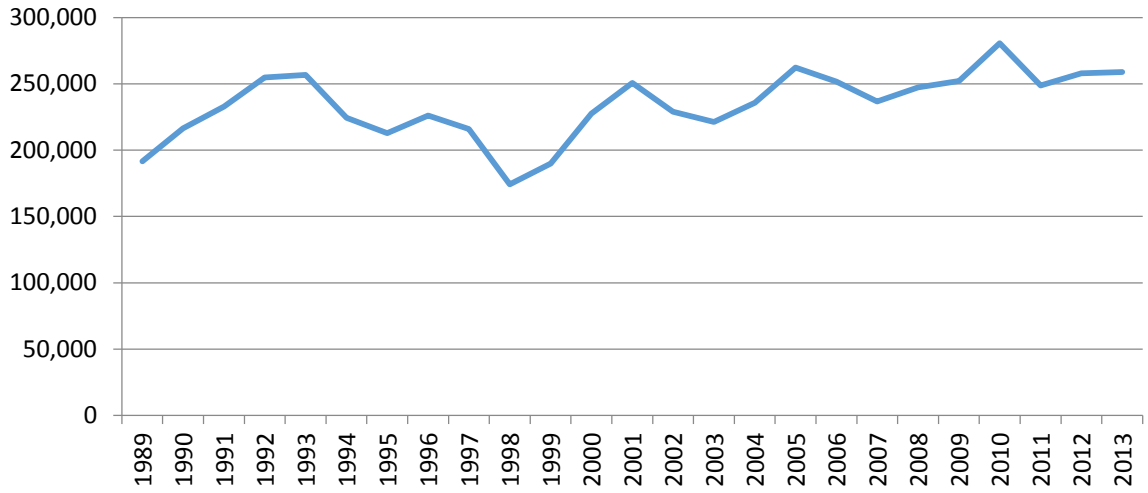
Within the Canadian context, both factors speak towards an, at best, mitigatory role for immigration in keeping the dependency ratio from rising. Guillemette and Robson (2006) project that at continuous 2006 immigration levels (approximately 230,000 immigrants a year, representing about 0.7 per cent of the population as a whole, a level which has since increased slightly to about 260,000 a year[72]) and a constant age structure, the old-age dependency ratio will continue to rise dramatically through 2050. Denton and Spencer (2005) undertake similar calculations and find that, at current immigration levels and structure, the dependency ratio would double by 2050. These findings broadly reflect the projections calculated in Chart 3.

There are two ways in which one might seek to change the structure of current immigration policies so as to attempt to increase their effect on the dependency ratio. One could increase the annual number of immigrants, change the age structure of the annual number of immigrants so as to make it even younger, or some combination of the two. Guillemette and Robson (2006) estimate that to prevent the long-term dependency ratio from rising, even assuming all immigrants coming in are in the 20-24 age group, the annual proportion of immigrants to the Canadian population would have to skyrocket in coming years, more than tripling from its current 0.7 per cent to approximately 2.5 per cent (these figures being based on

[72] CIC Facts and Figures.

2006, since which we have experienced neither massively higher immigration nor a younger age structure of immigrants, meaning current figures would be even higher). Denton and Spencer (2005), investigating the same issue, came to similar conclusions, namely a need for an increase of immigration to an annual 2.6 – 3.5 per cent of the Canadian population to prevent further increases to the dependency ratio. Chart 46 shows why this is an unlikely proposition – although immigration has been rising somewhat in recent years, its absolute levels have changed very little in the past 30 years, save a dip from 1993 to 1998.

Chart 46: Absolute Flow of Permanent Resident Immigrants to Canada, 1989-2013



Source: Citizenship and Immigration Canada, Facts and Figures: http://www.cic.gc.ca/english/resources/statistics/facts2013/permanent/01.asp#figure2

An increase in immigration to 2.5 per cent of population would necessitate increases in absolute immigration totally unprecedented in recent Canadian history – 2.5 per cent of the 2014 population would be 888,510 immigrants (CANSIM table 051-0001), which would represent an increase of 243 per cent on the 2013 figure. This seems politically and practically infeasible.

To understand why such a dramatic increase in immigration would be necessary to make a significant change in Canadian demographics one can examine the effect that a year's immigration has on the average age of the population. Table 34 shows the average age of Canadian population in two scenarios. The first, Scenario 1, utilizes actual immigration figures and age structures from 2009 to 2013 and Statistics Canada projections for future immigration figures, which assumes somewhat lower immigration in future years. Scenario 1 derives future immigration stream age structures by utilizing the average of age average structures found from 2009 to 2013. Scenario 2 is an alternate scenario in which all immigration ceased beginning in 2009.

What is clearly apparent is that at current annual levels of immigration, representing approximately 0.75 per cent of the population (2009 figure[73]), despite having a significantly younger average age than the Canadian population as a whole, annual immigration flows have only a small effect on the average age of the Canadian population. A whole year's worth of

[73] Citizenship and Immigration Facts and Figures, 2009: http://publications.gc.ca/site/eng/9.505817/publication.html

immigration leads to a difference in average age of only 0.072 years, and cumulatively over 59 years a difference of 3.695 years.

Table 34: Average Age of Canadian Population[74] under Actual Immigration and No Immigration Scenarios

Year	Average Age of Permanent Resident Immigrant Flows[75] (Years)	Scenario 1: Actual/Projected Immigration	Scenario 2: No Immigration	Difference (Cumulative)
		Average Age of Canadian Population (Years)	*Average Age of Canadian Population (Years)*	
Actual				
2009	31.005	39.473	39.537	0.064
2010	30.465	39.689	39.832	0.143
2011	30.642	39.887	40.101	0.214
2012	31.694	40.089	40.371	0.282
2013	33.411	40.284	40.623	0.339
Projected				
2015	31.44	40.624	41.102	0.478
2020	31.44	41.366	42.183	0.817
2030	31.44	42.751	44.245	1.494
2040	31.44	43.561	45.761	2.200
2050	31.44	43.722	46.556	2.834
2060	31.44	43.840	47.276	3.436

Source: CSLS calculations based on Statistics Canada Data (CANSIM Tables 051-0001, 052-0006 [Medium Growth Scenario using 1991/1992-2010/2011population growth trends]) and Citizenship and Immigration Facts and Figures, 2009-2013: http://publications.gc.ca/site/eng/9.505817/publication.html

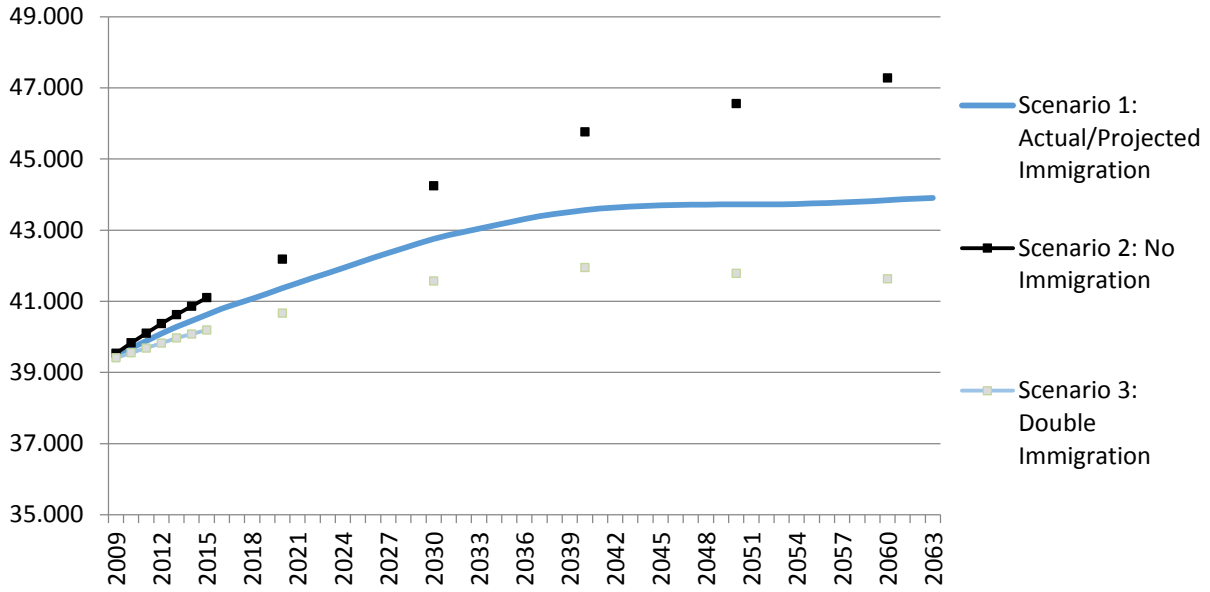
Chart 47 further demonstrates the effect of increasing immigration flows by comparing the average age developments in the Canadian populations under Scenarios 1 and 2 as presented in Table 34, with a Scenario 3, which features a doubling of the projected immigration flows under the same 2009-2013 average age structures. It should however be noted that this features a doubling assuming constant age structures: if one were to double the annual immigrant flows exclusively by admitting more economic immigrants (See Chart 49 and corresponding explanation), with an overall younger age structure, there would be a greater downwards effect on average age in Canada.

Chart 47 shows the extreme scenarios in which immigration is either eliminated or doubled compared to the current projections. The underlying trends towards an ageing

[74] Calculated using the midpoint ages of the 0-14, 15-24, 25-44, 45-64 age brackets and a an average value of 75 for the 65 and older category.
[75] Calculated using the same procedure as for Canadian population.

population would be dampened somewhat by a doubling of immigration, limiting the rise of the average age to 41.9 years in 2040 compared to 43.6 in Scenario 1 and even leading to a slight drop to 41.6 years by 2060 compared to a slight rise under Scenario 1. On the other hand, eliminating immigration entirely leads to unabated rises in average age all the way through 2060, topping out at 47.3 years, indicating that current immigration levels are already contributing a significant amount to holding back population ageing.

Chart 47: Average Age (Years) of Canadian Population under 3 Scenarios, 2009-2063



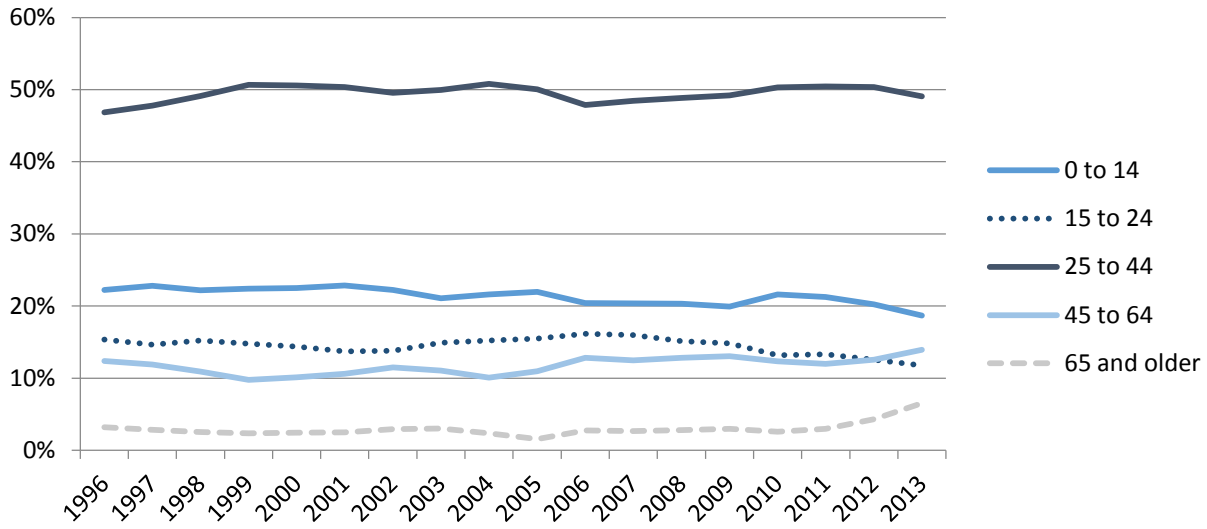
Source: CSLS calculations based on Statistics Canada Data (CANSIM Tables 051-0001, 052-0006 [Medium Growth Scenario using 1991/1992-2010/2011 population growth trends]) and Citizenship and Immigration Facts and Figures, 2009-2013: http://publications.gc.ca/site/eng/9.505817/publication.html

The second option to affect population demographics using immigration, namely attempting to increase the share of younger immigrants within the annual immigrant population, seems on the surface more feasible, but also comes up against limitations. Wu and Li (2003) and Schmertman (1992) find that in order to have a significant effect on decreasing the dependency ratio, the annual immigrant population must be composed of a vast majority, if not entirely, of workers who are of a very young age (around 25-30). Chart 43 shows the age breakdown of the 2013 flow of permanent resident immigrants.

A plurality of 2013 permanent resident immigrants do in fact fall within the desired category encompassing the 25-30 age group, though there are no further breakdowns of this age category, so it is unclear how many in this group are actually close to this ideal age and therefore exerting maximum downward influence on Canada's long-term dependency rate. There are also a substantial percentage of immigrants, namely 39.2 per cent of the total, who fall clearly outside of this age range. In fact, 25.2 per cent of total 2013 permanent resident immigrants were themselves dependents, who would initially increase the dependency ratio, of whom 6.6 per cent of the total permanent resident immigrant population were in the 65 and older age group.

Chart 48 shows the remarkable stability of the annual permanent resident immigrant flow's age structure for the past two decades.

Chart 48: Age Structure of Permanent Resident Immigrant Flows, Canada, per cent, 1996-2013



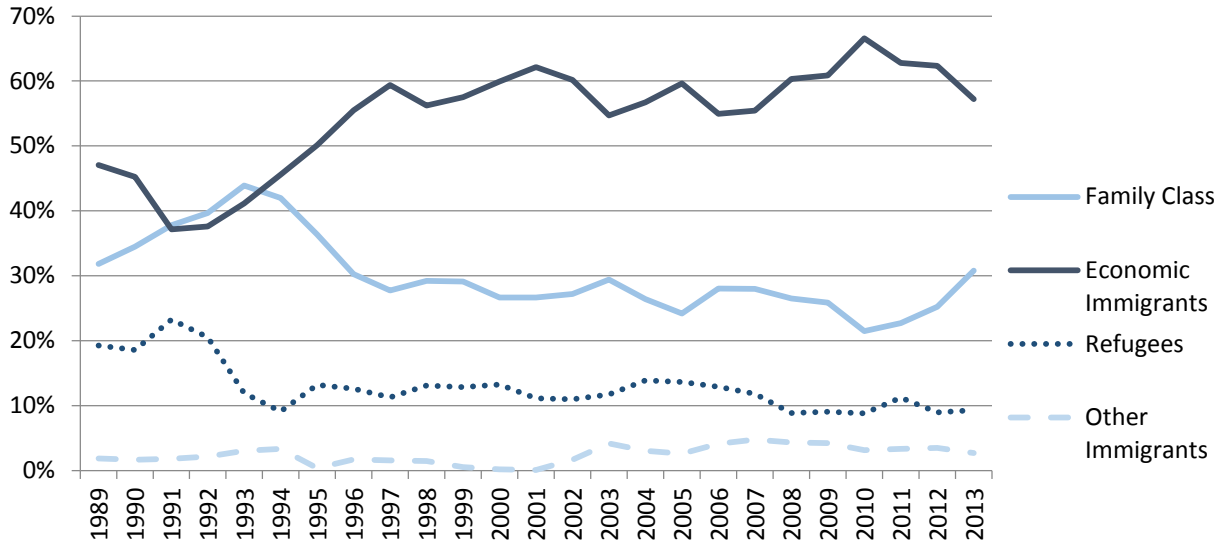
The age breakdown of Canadian immigrants however limits the scope for further age targeting of young immigrants beyond the status quo necessary to keep the long-term dependency ratio from increasing. Partially this is due to the relatively young age structure already present in Canada's annual immigrant populations, as can be seen in Chart 48. It appears that immigrants in the relatively older age groups of 45 and over are actually increasing somewhat as a proportion of total permanent resident immigrants since 2011, and that the proportions of age groups within the range of 0 to 44 have all slightly decreased.

The lack of potential further age targeting in Canada's annual immigrant flow is also partially due to the categories assigned to immigrants by Citizenship and Immigration Canada (CIC) through which they gain entry to the country. The category that grants CIC the greatest ability to target specific young age groups is that of economic immigrants, people (and their accompanying spouses and dependents) who move to Canada because they are able and willing to work and have been deemed desirable via the points system. Categories that enable the government to be less selective about age brackets, due to the fact that other criteria take precedent, are family class[76], refugees and other immigrants[77]. Chart 49 presents a historical look at the proportion of these different categories of immigrants.

[76] Family class refers to foreign nationals sponsored for immigration by close relatives or family members in Canada, that includes spouses and partners, dependent children, parents and grandparents.

[77] Other immigrants refers to anyone granted permanent resident status who would not otherwise qualify in any category – this occurs in cases where there are strong humanitarian and compassionate considerations or other public policy reasons. Discretion over awarding this status is held by CIC.

Chart 49: Permanent Resident Immigrant Flows by CIC Category, Canada, 1989-2013, per cent



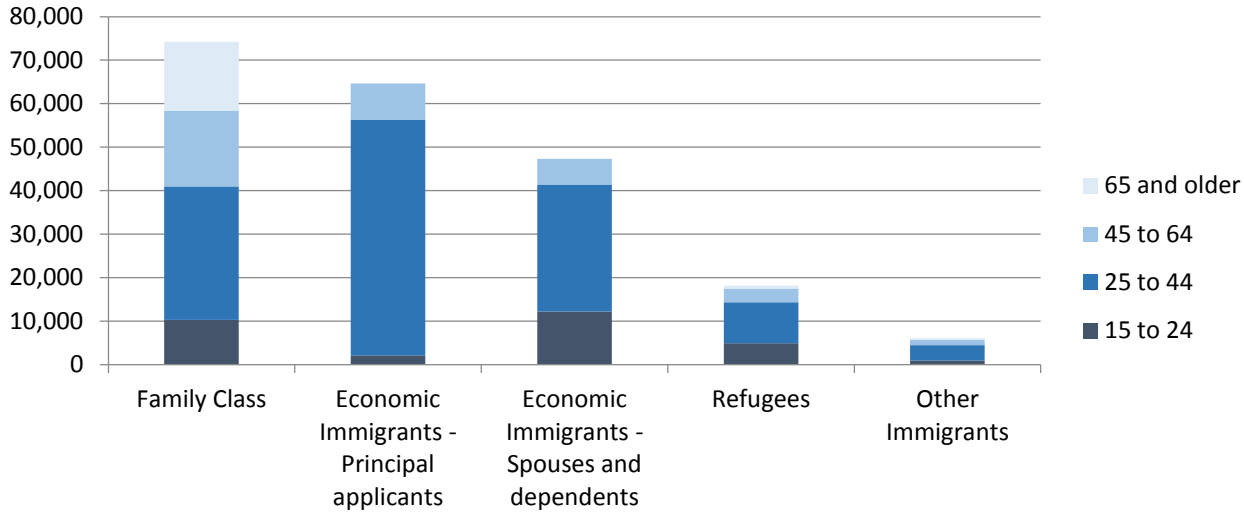
Source: Citizenship and Immigration Canada, Facts and Figures 2013: http://www.cic.gc.ca/english/resources/statistics/facts2013/permanent/01.asp

As can be seen, family class, refugees and other immigrants, categories in which the government can be less selective in regards to age, make up a combined 42.8 per cent of total immigration in 2013, a figure roughly comparable to the historical norm since 1996. This represents a proportion of more than four tenths of the total immigrant population of 2013 for which little or no age targeting can be achieved. Although this leaves 57.2 per cent of annual immigration theoretically available for greater age targeting, this is tempered by the fact that this group is quite young, supplying the lion's share of immigrants in the desired age groups already.

Chart 50 shows the distribution of ages amongst the different CIC categories. The economic immigrants category is split up into two sub-groups: the principal applicants and the spouses and dependents assigned as economic immigrants due to their tie to a principal applicant.

Although 25 to 44 year olds make up the majority of every CIC category, it is fairly clear that the bulk of people outside of the age categories 25-44 immigrate to Canada outside of the category of economic immigrant principal applicant. There is very little potential for additional age screening in the economic immigrants category due to the fact that this category already has a very young structure. In order to significantly alter the age composition of future flows of immigrants towards Wu and Li's ideal 25-30 age group one would need to change or restrict the criteria used to evaluate primarily the family class, but also refugees, other immigrants and economic migrants who are spouses or dependents – all of which would entail significant revisions to current immigration policy. Table 35 further demonstrates this by showing the average ages of each category of immigrants aged 15+ in 2013. In order to attract a younger immigrant stream one would not only have to dramatically begin age targeting amongst the economic immigrant principal applicants, but would need to do so in other categories as well, most heavily amongst family class immigrants.

Chart 50: Permanent Resident Immigrants (ages 15 and over) Flow by CIC Categories, Age, Canada, 2013



Source: Citizenship and Immigration Canada, Facts and Figures 2013: http://www.cic.gc.ca/english/resources/statistics/facts2013/permanent/05.asp

Table 35: Average Age[78] (Years) of Permanent Resident Immigrants (15+) by CIC Category, 2013

CIC Category	Average Age (Years) 2013
Family Class	46.1
Economic Immigrants – Principal applicants	37.1
Economic Immigrants – Spouses and dependents	33.6
Refugees	35.9
Other Immigrants	39.2

Source: Citizenship and Immigration Canada, Facts and Figures 2013: http://www.cic.gc.ca/english/resources/statistics/facts2013/permanent/05.asp

Overall, we find that although current immigration levels are playing a role in slowing the increase of Canada's average age and the proportion of Canadians over 65, its viability in slowing it further is quite limited. Although increasing the number of immigrants and/or attempting to target a younger immigrant structure would probably help stall or reduce the rate of increases slated to occur in the next decades, neither are likely to be pursued at the scope necessary to significantly alter Canada's current demographic trajectory. This would involve either radically increasing the number of annual immigration or excluding hard to age target

[78] Calculated using the midpoint ages of the 0-14, 15-24, 25-44, 45-64 age brackets and a an average value of 75 for the 65 and older category.

immigrant categories such as refugees or elderly family immigrants, both of which would be radical departures from historical norms and would likely therefore be politically and practically infeasible. Though current immigration levels are certainly contributing to blunting Canada's population ageing already, immigration policy as a tool to further change the current demographic trajectory appears, at best, very limited.

b. Immigrant labour market outcomes

While immigration will likely raise total GDP, it may not increase GDP per capita which is the more appropriate measure of Canadian living standards. Dungan, Fang, and Gunderson (2013) found that immigration at its current level will likely slightly reduce Canada's GDP per capita in the long run. This is because immigrants have not performed as well in the labour market on average as those born in Canada in recent history. Prior to 1980 immigrants initially earned around 80 per cent of Canadian born earnings upon arrival and closed the gap or went beyond within 10-20 years (Grady, 2009), but since 1980 immigrants have struggled in the labour market in every respect.

Table 36: Years since Immigration and Labour Market Outcomes, Ages 25-54, Canada, 2014

	Born in Canada	Landed Immigrants*			
		Total	5 or Less Years	Between 5 and 10 Years	More than 10 Years
Unemployment rate	5.2	7.4	11.5	7.4	6.3
Participation rate	87.7	82.6	74.7	81.5	85.3
Employment rate	83.1	76.5	66.1	75.5	79.9

* *Refers to people who are, or have been, landed immigrants in Canada. A landed immigrant is a person who has been granted the right to live in Canada permanently by immigration authorities. Canadian citizens by birth and non-permanent residents (persons from another country who live in Canada and have a work or study permit, or are claiming refugee status, as well as family members living here with them) are not landed immigrants.*
Source: Statistics Canada, Labour Force Survey, CANSIM Table 282-0102: Labour force survey estimates (LFS), by immigrant status, age group, Canada, regions, provinces and Montreal, Toronto, Vancouver census metropolitan areas.

In 2014, the labour force participation rate of all landed immigrants aged 25-54 in Canada was 82.6 per cent compared to an average of 87.7 per cent for those born in Canada (Table 36). Similarly, the immigrant unemployment rate was 7.4 per cent compared to 5.2 per cent for those born in Canada. While the gap does improve for those who have lived in Canada for 10 year or longer, it no longer fully closes. The participation rate for those who have been in Canada for less than 5 years was only 74.7 per cent, while it was 81.5 per cent for those who have been in Canada for 5-10 years, and 85.3 per cent for those who have been here more than 10 years.

While education does improve the odds of finding work for immigrants, those with more education tend to have slightly lower participation rates relative to their Canadian peers when compared to those with very little education (Table 37). For example, immigrants aged 25-54 with no certificate, diploma, or degree have a participation rate which is only 95.5 per cent that of those born in Canada with the same education, while those with a university degree have a participation rate which is 91.2 per cent as high. The exception to this trend of a slightly

increased participation rate gap with education is those with a post-secondary certificate or diploma, as they have the strongest participation rate relative to those born in Canada (96.0 per cent). While these participation rate gaps may seem fairly small, the gaps can be much larger in terms of total earnings. Average earnings of new immigrant men with a university degree is less than half that of Canadian born men (40 per cent for women) (Grady, 2009).

According to Dungan et al. (2013), if immigrants had the same earnings as the Canadian born, then immigration would increase real GDP per capita over 10 years by about $200 a year (or about $800 for a family of four). Thus, while the impact of immigration on GDP per capita may be negative under current conditions, there is the potential for it to have a positive impact, although perhaps not as large as some would hope. Dungan et al. (2013) also found that immigration likely will not have a major impact on budget balances.

Table 37: Participation Rates by Education and Immigrant Status, Ages 25-54, Canada, 2014

	Born in Canada	Landed Immigrants*	Landed Immigrants* as Percentage of those Born in Canada	Recent Immigrants (< 5 years)	Recent Immigrants as Percentage of those Born in Canada
Total, all education levels	87.7	82.6	94.2	74.7	85.2
No degree, certificate or diploma	68.3	65.2	95.5	57.8	84.6
High school graduate	84.1	77.9	92.6	72.0	85.6
High school graduate, some post-secondary	83.5	76.3	91.4	66.5	79.6
Post-secondary certificate or diploma	90.9	87.3	96.0	81.0	89.1
University degree	93.4	85.2	91.2	74.9	80.2

* *Refers to people who are, or have been, landed immigrants in Canada. A landed immigrant is a person who has been granted the right to live in Canada permanently by immigration authorities. Canadian citizens by birth and non-permanent residents (persons from another country who live in Canada and have a work or study permit, or are claiming refugee status, as well as family members living here with them) are not landed immigrants.*
Source: Statistics Canada, Labour Force Survey, CANSIM Table 282-0106: Labour force survey estimates (LFS), by immigrant status, educational attainment, sex and age group, Canada, annual

c. What Explains Immigrant Labour Market Performance?

Many studies have attempted to explain the substandard labour market outcomes of Canadian immigrants. They typically find the most important causes to be, in order of importance: a lack of arranged employment on arrival; official-language skills; and work experience in Canada.

A good part of the deterioration of immigrants' economic performance in the second half of the 2000s was the downturn in information technology (IT) and the concentration of entering immigrants in IT or engineering occupations (Picot, 2008). A study by Picot and Hou (2009) found that this could explain as much as two thirds of the decline in earnings among entering immigrants.

While the relatively high education of immigrants have positive effects on earnings (Begin et al., 2010; Ferrer, Picot and Riddell, 2014; Picot and Sweetman, 2012), education

interacts with language skills. Green and Riddell (2001) found that official-language skills and numeracy skills explain much of the earnings gap between immigrants and Canadian born.

Age (ie youth) and education have positive effects on earnings (Begin, Goyette and Riddell 2010, Ferrer, Picot and Riddell 2014, and Picot and Sweetman 2012) although education is found to interact with language skills. Bonikoska, Green and Riddell found that official-language literacy and numeracy skills explain a good part of the earnings gap between immigrants and Canadian born workers. While education attainment of immigrants has been rising, their economic outcomes have progressively worsened (Picot and Sweetman 2012).

Picot and Sweetman (2012) found that Canadian employers do not attach much value to foreign work experience and heavily discount foreign education. Related to this observation, Coulombe, Grenier and Nadeau (2014) offer a very simple explanation for worsening immigrant outcomes. They used GDP per capita in an immigrant's country of birth as a proxy for the quality of schooling and work experience acquired in that country. They found this to be a good explanation as to why immigrant outcomes have worsened, as those from countries with higher GDP per capita performed better.

Coulombe et al.'s (2014) results suggest that the explanation for worsening immigrant labour market performance since about 1980 is a bit more subtle than economic performance of immigrants suffering because of a change in source countries away from the United States and United Kingdom. Rather, it is that the sources moved away from wealthier to poorer countries and, implicitly, countries that offered poorer education and work experience – or at least experiences that Canadians are less familiar with (see Table 38). Between 1971 and 1980, 35.1 per cent of immigrants entering Canada were born in Europe. This figure fell to 13.7 per cent by the 2006-11 period. While Europe's share of Canadian immigrants declined, the shares of immigrants born in Asia and Africa greatly increased. Nearly 60 per cent of immigrants over the 2001-2011 period were born in Asia.

Table 38: Region of Birth of Immigrants by Period of Immigration, Canada, 2011

	Before 1971	1971 to 1980	1981 to 1990	1991 to 2000	2001 to 2005	2006 to 2011
United States	5.0	6.5	3.4	2.2	3.2	3.9
Caribbean, Central and South America	5.4	17.3	16.7	10.9	10.5	12.3
Africa	1.9	5.8	6.0	7.3	10.3	12.5
Europe	78.3	35.1	24.2	19.0	15.4	13.7
Asia (including the Middle East)	8.5	33.8	48.8	59.8	60.0	56.9
Oceania and other	0.8	1.4	0.9	0.8	0.7	0.6

Source: Statistics Canada (2013), Figure 2

Coulombe et al. (2014) find that the share of the immigrant wage gap explained by differences in human capital quality (using their crude proxy of GDP per capita) is more than 35 times that explained by language skills for males and about nine times for females. Countries with lower incomes per capita likely also produce immigrants with worse English and French

language skills, so the total impact of changes in source countries likely occurs through a combination of its impact on education quality, credentials and experience which Canadian employers are comfortable with, and skills in Canada's official languages.

d. Policy Responses

There has been an impressive array of changes to Canadian immigration policy since 2008 which will have had positive effects on labour supply. Language requirements have been enhanced and greater priority has been given to admitting those of young working age, those with Canadian work experience (e.g. students and temporary foreign workers), and those with a background in skills which are in demand in Canada. Immigrants with prior job offers have accelerated pathways through provincial nominee programs and the Canadian Experience Class.

While these are all useful improvements for increasing the likely contribution of immigrants to the Canadian economy, Canada still does not factor economic needs into immigrant selection heavily enough. Principal applicants under the economic class are still only one quarter of total immigration (Halliwell, 2013).

Despite improvements in selection criteria for new immigrants, the provinces must accept that there will be an ongoing need for settlement assistance and language and skills upgrading for immigrants in the foreseeable future. The era of immigrants catching up to Canadian born labour market performance is long over (more than 30 years in the past) and no province seems completely prepared for the training needs of Canada's immigrant population. Despite the greater need, immigrants are less likely than the Canadian born to participate in employer-sponsored training (Boudarbat and Boulet, 2010) and there is increasing pressure on governments to address this issue.

Selection criteria have to be rooted in a better assessment of Canada's (and each provinces' and territories') future economic needs. Permanent immigrants should not be chosen to solve short-term labour market shortages but should be selected based upon long-term needs. Of course, this assumes that governments know what their long term occupational needs will be. Improvements in labour market information are critical in developing more effective economic selection criteria.

Excessive focus on short-term needs resulted in the explosion of the temporary foreign worker program. As of December 31st, 2013, there were 104,160 Temporary Foreign Worker Program work permit holders with a valid permit in Canada according to Citizenship and Immigration Canada.[79] Such a program is useful to fill short-term gaps, but when the needs becomes permanent this reflects either a failure of the general immigration program to select those with the skills Canadian employers require, a failure of employers and educational institutions to develop these skills domestically, or an attempt by employers to skirt wage and working condition requirements. Some provinces need to reconsider the role of temporary foreign workers in the economy. These workers are not adding to long-run capacity. The underlying sources of shortages in the labour market need to be addressed. Problems with the Temporary Foreign Workers Program are currently recognized by the federal government. On

[79] http://www.cic.gc.ca/english/resources/statistics/facts2013/temporary/1-1.asp#fig1

May 8, 2015, while hosting a visit of the President of the Philippines, Prime Minister Harper stated (Blanchfield, 2015): "This country is not going to have a policy, as long as I am prime minister, where there will be a permanent underclass of temporary people […] here forever with no rights of citizenship and no rights of mobility."

Table 39: Permanent Residents Admitted through the Provincial Nominee Program by Destination, 2013

Province / Territory	Provincial Nominee Program	Provincial Nominees as a Share of Permanent Residents Admitted to Province/Territory (%)	Provincial/Territorial Share of Permanent Residents Admitted as Provincial Nominees (%)
NL	440	53.3	1.1
PE	775	77.7	1.9
NS	1,202	47.5	3.0
NB	1,330	65.9	3.3
QC	13	0.0	0.0
ON	2,516	2.4	6.3
MB	8,854	67.6	22.2
SK	8,182	76.6	20.5
AB	9,144	25.0	22.9
BC	7,155	19.8	17.9
YT	249	78.8	0.6
NT	54	36.0	0.1
NU	1	9.1	0.0
Canada	39,915	15.4	100.0

Source: 2014 Annual Report to Parliament on Immigration (CIC, 2014), Table 7: Permanent Residents Admitted in 2013, by Destination and Immigration Category

In the early 1990s, several provinces expressed concern about their low levels of immigration. In 1995, 88 per cent of new immigrants settled in British Columbia, Quebec, and Ontario (mostly in Vancouver, Montreal, and Toronto) (Seidle, 2013). Beginning in 1998, each province signed a bilateral agreement with Ottawa allowing the province to nominate individuals for immigration based on its own selection criteria. These arrangements, known as Provincial Nominee Programs (PNPs), aimed to select immigrants who were best suited to local economic conditions and were likely to choose to stay in the province upon arrival. Applicants typically must demonstrate that they intend to remain in the province upon immigration through family connections, an offer of long-term full-time employment, or a pre-existing relationship with the province through work or study. Once nominated, a potential immigrant can submit an application to CIC as a provincial nominee, but must still obtain federal approval.

In 2013, provincial nominees represented 15.4 per cent of permanent residents admitted to Canada (Table 39). In 2015, the target is for provincial nominees to represent about 26 to 27 per cent of economic immigrants (46,000-48,000 provincial nominees) (CIC, 2015).

The PNPs have become quite complex, with more than 50 categories with differing selection criteria and processes as of 2009. The provinces are able to create additional streams of

nominees without permission from CIC, although CIC must be informed. (Auditor General of Canada, 2009). According to a 2010 study, in addition to the general or employer recruitment streams that all provinces administered, six provinces had business investment programs, six had family reunification streams and four had a stream for international students (Carter, Pandey and Townsend, 2010)

Provincial nominees now account for the majority of permanent residents immigrating to many provinces (Table 39). In 2013, the majority of new permanent residents admitted to Prince Edward Island, New Brunswick, Manitoba, Saskatchewan, and the Yukon Territories immigrated as provincial nominees. Most of the provincial nominees (over 80 per cent) admitted to Canada have been settling in the four westernmost provinces. As such, the program seems to have been successful in diversifying the destinations of new immigrants. A program evaluation by CIC (2011) found that, in 2008, more than three-quarters of provincial nominees who became permanent residents between 2000 and 2008 remained in the province (or territory) that nominated them. Provincial nominees who leave their nominating province tend to do so within the first five years after landing (CIC, 2011).

The program has also proven effective at improving immigrant outcomes in the short-term. Immigrants have superior earnings initially under provincial nominee programs than the federal skilled worker class (probably because the nominees have a job offer in hand), but that difference disappears over time (Pandey and Townsend, 2011). A better balance needs to be struck by the provincial nominee programs between short term and longer-term economic issues.

The federal government has allowed a shift to immigration through the temporary foreign worker program (although this is changing) and provincial nominee programs at the expense of the foreign skilled worker program, despite evidence suggesting that people from the latter category have had better long-term economic results (Alboim and Cohl, 2012).

Despite the vast number of changes in immigration policy of late, there has not been a comprehensive reform that looks at the interactions between the various programs (Alboim and Cohl, 2012). There should be a serious federal-provincial study of immigration and how it is or is not working in Canada.

Most recent changes have been unilateral federal decisions despite immigration being a shared responsibility and the fact that immigrants become largely the responsibility of the provincial and territorial governments upon arriving. There is great variation across provinces in terms of their quotas under the provincial nominee system. Quebec has control over selection of immigrants to the province,[80] while some other provinces, such as Ontario, only receive a relatively small allocation of nominations. The federal government should respect the interests of all provinces and territories when setting immigration policy.

[80] In particular, under the 1991 Canada–Québec Accord relating to Immigration and Temporary Admission of Aliens**:** (a) Québec has sole responsibility for the selection of immigrants destined to that province and Canada has sole responsibility for the admission of immigrants to that province; (b) Canada shall admit any immigrant destined to Québec who meets Québec's selection criteria, if the immigrant is not in an inadmissible class under the law of Canada; and (c) Canada shall not admit any immigrant into Québec who does not meet Québec's selection criteria.

In summary, our recommendations related to increasing immigrant labour supply are:

- Reconsider support of the temporary foreign worker program and focus on finding long term solutions to shortages.

- A comprehensive federal-provincial study of how to improve Canada's immigration system should be undertaken.

- Provinces must strike a better balance in their nominee programs between short term and long term concerns. Enhanced labour market information is needed to understand what long term needs are likely to be.

- Additional assistance with language training and skills upgrading may be necessary for many immigrants currently in Canada.

- Economic needs should become an even larger factor in the selection of immigrants.

IV. Summary and Conclusion

Fostering economic growth should be a high priority for policymakers at all levels of government in Canada. Rising aggregate output is essential to raising the material standard of living, both directly by raising individual incomes, but also indirectly by facilitating a higher level of government expenditures.

Motivated by recent concerns over the long term sustainability of public expenditures in Canada, we have constructed projections of revenues and expenditures between 2014 and 2038 for governments at the provincial/territorial level. We found that the expected level of GDP growth based on recent economic and demographic trends would be sufficient to cover spending which remained constant in real per capita terms.

However, health spending per capita has risen considerably in recent years. As health expenses rise with age, Canada's aging population will require real spending to rise on a per capita basis in order to maintain the same level of care. Real enrichment in terms of healthcare will require expenditures to rise even more. Therefore, we developed a more realistic set of projections in which nominal health expenditures rose in each province at the average rates observed between 2000 and 2014. We found that expenditures would grow faster than revenues in almost every province under this more realistic scenario, suggesting that long-term fiscal stability will be a problem if something does not change.

While searching for ways to rein in health spending through more efficient spending is critical, we suggest that there remains much that all levels of government in Canada could do to raise government revenues by promoting economic growth. Even governments which face less daunting fiscal challenges would benefit from pursuing economic growth to the extent that it improves economic well-being.

This report has considered most of the major sources of economic growth and proposed a series of policies which would increase real GDP either by raising productivity or expanding the supply of labour. Our evaluation is based on the notion that, while there are many different approaches to achieving growth, not all are equal. We would prefer policies which would generate the necessary growth in GDP while also having other positive impacts on well-being while minimizing environmental degradation and reducing inequality.

Raising GDP is not a new idea. There are many market-oriented policies which most economists agree will generate economic growth. To their credit, governments in Canada have adopted many of these policies over the last few decades. Unfortunately, Canada has not experienced the boom in productivity which many had hoped these policies would bring. This is not to say that the reforms were not useful, as productivity growth likely would have been worse without them. Indeed, we recommend a number of additional market oriented policies which economists have advocated for a long time. However, a new approach may be needed to drive economic growth in the future.

The market oriented policies which our governments have adopted have focused on eliminating barriers to competition and then passively allowing the market to function, hoping

that growth will happen. We generally advocate a more active role for government within the competitive market. A recurring theme throughout this report is that government can improve market performance through carefully constructed policies which offer mentorship, information, and support for Canadian businesses and individuals.

A key message of this report is that governments need to more effectively address the issues of shared growth and efficient provision of services, including infrastructure. It is interesting to note that this theme has been highlighted by Francois Fukuyama (2014:546) in his magistral book Political Order and Political Decay: From the Industrial Revolution to the Globalization of Democracy when he writes: "If there is a single problem facing contemporary democracies, either aspiring or well established, it has been centered in their failure to provide the substance of what people want from government: personal security, shared economic growth, and quality basic public services like education, health and infrastructure that are needed to achieve individual opportunity."

The policies which we recommend emphasize the need for growth to be both green and inclusive. The goals of environmental sustainability and equity do not necessarily conflict with that of economic growth. To the limited extent which they do, we note that economic well-being – not economic growth or fiscal balance – is the ultimate aim of public policy. With this in mind, governments in Canada must seek ways to protect our environment while simultaneously enhancing long-term economic performance. Similarly, we note that helping underperforming businesses and individuals reach their potential not only reduces inequality, it also eases the burden on government spending on these individuals and offers a way to expand the economy.

Many of the policies recommended in this report are complement each other and existing market-oriented policies. We offer a broad set of policy options which will be most effective if viewed in terms of the broader principles or philosophies which underlie them.

We close this report with a summary of the policy recommendations.

V. List of Policy Recommendations to Promote Economic Growth in Canada

A. Private Investment

- Reduce rates of taxation on capital where they are relatively high.

- Extend mentoring services to assist businesses in determining if they are under-investing and choosing an optimal level of investment.

- Shift the burden of taxation from capital (directly and through sales taxes), corporate income taxes and personal income taxes onto consumption taxes. This is especially relevant for the provinces with retail sales taxes (which tax business inputs including machinery and equipment).

- Broaden tax bases by eliminating preferential taxes and subsidies that distort markets;

- Put a price on carbon to address economic concerns while reducing other forms of more economically-damaging taxes

B. Public Investment

- Governments should take a holistic approach when evaluating the desirability of individual projects that looks beyond a project's impact on GDP and employment at its impact on health, safety and environmental outcomes, ensuring that their public investment strategy fits within a framework for green and inclusive growth.

- Consider the introduction of road pricing (tolls) on public roads and encourage investment in highways like the 407 ETR in the GTHA to lower GHG emissions and provide low-congestion alternatives to commuters. This would generate revenues, relieve congestion and encourage the use of public transit.

- Increase investment in public transit in an attempt to make it a more viable alternative for commuters. Take steps to shorten the average commute by public transit relative to driving.

- Extend the use of high-occupancy vehicle (HOV), high-occupancy toll (HOT) and express lanes to reduce both congestion and GHG emissions.

- Increase the availability of bicycle lanes in metropolitan areas to reduce congestion and GHG emissions and improve public health.

- Governments should take advantage of low interest rates and the current output gap to increase public investment which will support future growth. Given the lower interest

rate at which the federal government can borrow, provincial governments should negotiate agreements with the federal government to finance projects at these lower rates.

- Dedicate adequate funds to infrastructure maintenance and investment to increase the lifespan of infrastructure and reduce costs in the long-run.

- Conduct regular, comprehensive audits of the state of public infrastructure to identify infrastructure gaps and prioritize investment spending.

- Consider P3s and other non-traditional forms of investment to leverage private investment as these leveraged funds mean higher levels of investment in infrastructure can be achieved. These alternate forms of investment should be done while seeking more opportunities to levy user fees.

- All infrastructure projects should be subject to rigorous cost-benefit analysis and only be approved if they pass such tests.

- Public investment should focus on trade gateways and other "strategic investments" such as investment in pipeline and rail infrastructure to prevent bottlenecks for grain, oil, ore, and other products being shipped to market, as well as trade gateways like the Detroit River International Crossing.

- Promote the dissemination of best practices related to infrastructure management and investment across provinces and cities.

- Public investment policies should aim to meet multiple societal objectives, including the improvements of economic growth and well-being, as well as the reduction of GHG emissions. Well-designed public investment policies must be at the heart of any green and inclusive growth strategy.

- Remove remaining barriers to infrastructure investment, particularly for private investment and foreign direct investment.

C. Technological Change and Innovation

- Undertake rigorous evaluations of R&D tax credit programs to ascertain whether these programs are leading to additional business R&D, and assess the cost effectiveness of these programs.

- Rebalance support for business R&D spending from tax credits toward direct grants and subsidies.

- Adopt policies that will foster greater competition in the Canadian landscape and thereby encourage innovation.

- Increase the number of baccalaureate graduates and doctoral graduates in fields linked to science and technology.

- Increased targeting of immigrants who are likely to participate in innovation.

- Introduce tax policies, or other incentive-based policies, that lessen the extent of the "brain drain".

- Encourage the collaboration between business, higher educational institutions and governments.

- Consider demand-side innovation policies.

- Foster innovation in the services sector in Canada, engineering solutions for new innovations, and the use of innovation in new designs.

- Support the pricing, marketing and delivery of new innovations.

- Increase public funding of R&D, especially in areas which can create a competitive advantage, such as resources and green technologies.

- Develop successful models of clean technology in partnership with businesses, universities/colleges, and other levels of government.

- Balance the number and complexity of innovation policies.

- Perform an evaluation of the innovation policy system in Canada.

- Review of current programs that promote the diffusion of technologies and assist firms in adopting best practices, benchmarking these programs against the international state of the art in the area.

- Allocate additional resources to programs that have been found effective in promoting the diffusion of technologies to both SMEs and larger firms that would likely not have adopted such technologies.

- Simplify the system of tax credits which promote innovation.

- Create an Industrial Research and Innovation Council (IRIC) to deliver and evaluate the federal and provincial governments' business innovation programs.

- Simplify the tax credit system used to support SMEs.

- Develop procurement strategies with the objective of business innovation.

- Transform the institutes of the National Research Council into a series of large-scale, collaborative centres involving businesses, universities and the provinces.

- Provide access to risk capital for high-growth innovation firms through the Business Development Bank of Canada.

- The provinces should speak with a clear, unified federal voice that will guide coordination between the provinces and the federal government concerning innovation policies and programs.

D. Education and Human Capital

- Ensure that post-secondary institutions have adequate funding to continue the upward trend in the proportion of the population with post-secondary education, maintaining Canada's position as the OECD country with the highest proportion of post-secondary graduates.

- Target the improvement of PISA scores. Particular attention should be paid to lifting underperformers.

- Provide students with greater exposure to fundamental science, technology, engineering, and math (STEM) skills.

- Address cultural as well as financial issues that act as impediments to participation in higher education for groups such as low-income and Aboriginal students.

- Improve the collection and dissemination of information on employment and income prospects through better surveys of graduates.

- Broaden the focus of colleges and universities from number of graduates and subject-particular knowledge to outcomes on broader cognitive and personality skills; this should be done in the context of establishing competency criteria across fields and in each field of study.

- Reform funding of post-secondary institutions from being mainly determined by enrolment to providing incentives for quality of outcomes.

- Create a body or task an existing one with collecting, analyzing and disseminating data on higher learning outcomes.

E. Micro-Economic Environment

- Enhance mentoring processes for small and medium-size enterprises to take full advantage of trade agreements.

- Establish a true economic union within Canada where there are no provincial/territorial barriers, mutual recognition of regulations and standards, mechanisms for standards harmonization and effective dispute resolution processes.

- Gradually eliminate agriculture marketing boards.

- Take immediate action to reduce barriers between provinces as has been offered in the draft Canada-European Union Trade Agreement (CETA) and may be undertaken in the Trans-Pacific Partnership (TPP) trade agreement.

- Reform the *Investment Canada Act* on foreign investment by changing the default to the Government needing to prove detriment in order to reject a proposal and the creation of a professional dispute resolution body.

- Work to ease monopoly ownership and heavy regulation in key industries such as railways, airlines, telecommunications and electricity.

- Interconnect the electrical power grids across provinces.

F. General Policies to Increase Labour Supply

- Reduce high marginal effective taxes on labour income or offer income assistance which encourages individuals to work. Offset any reductions in tax revenue with a carbon tax or increased consumption taxes.

- Make further investments in education and provide incentives for the development of skills which are expected to be in high demand.

- Improve the quality and dissemination of labour market information.

- At a minimum, each province and territory should bring its labour market information systems (data, analysis and dissemination) up to the best-in-class provincial standard within Canada.

- Statistics Canada should be charged with collecting more and better labour market information and Employment and Services Canada could fill in more of the data gaps and co-ordinate pan-Canadian information.

- The provinces and territories must examine the governance structure of the Forum of Labour Market Ministers, or transfer the labour market information responsibilities to a new or different agency, to more effectively co-ordinate provincial and territorial information needs.

G. Increasing Female Labour Supply

- Lower the marginal effective personal income tax rates that females face when they enter the labour force, work more hours or receive a higher rate of pay.

- Increase the generosity of statutory maternity and parental leaves.

- Improve access to and affordability of childcare throughout Canada.

- Beginning in the early years of schooling, encourage women to pursue any occupation regardless of traditional gender roles. In particular, female participation in STEM fields and the trades should be promoted.

H. Increasing Labour Supply of Older Workers

- Ensure there are no legal impediments to working beyond a certain age unless required for legitimate reasons (such as health or safety).

- Reduce or eliminate any disincentives to work which remain in public pension schemes.

- Lead discussions with the private sector on more flexible work arrangements and the removal of biases in private pension plans that discourage work beyond a certain age or number of years of service.

- Reduce barriers to the creation of more flexible work arrangements. For example, address ceilings on payroll contributions which incentivize employers to hire full-time rather than part-time workers.

- The public sector should take the lead by offering more flexible work arrangements to older workers employed in public sector jobs.

- Consider a time-limited wage subsidy for older, long-term workers who get laid off and accept a lower paying job.

- Consider subsidized care giving in order to encourage spouses of those in ill health to remain in the workforce.

I. Increasing Labour Supply of People with Disabilities

- Identify and eliminate (or reduce) disincentives to work which remain in some disability benefit policies.

- Speed up wait times for benefit applications and appeals to reduce the amount of time individuals with disabilities must remain out of the workforce.

- Disability benefits should not be applied on an all-or-nothing basis. Partial benefits should be an option for those with less severe disabilities, ideally tied to a requirement to participate in the labour market (perhaps similar in structure to the WITB).

- Information and administration should be consolidated to make accessing benefits as simple as possible for people with disabilities.

- Assistance with retraining and workplace accommodation should begin when individuals are on short-term disability before problems become more severe. Earlier intervention may prevent some workers from becoming disabled to the point where working is no longer an option.

J. Increasing Labour Supply of Aboriginal People

- Further investments in facilities and educators are necessary to ensure that all Aboriginal children have access to a high quality education, especially on-reserve. It seems reasonable that Aboriginal children on reserve will require at least the same level of education resources as non-Aboriginal children living in comparable rural communities.

- Greater control over Aboriginal education should be placed in the hands of the Aboriginal peoples, along with assistance in assuring administrative capacity and accountability.

- Currricula should be re-evaluated in order to better engage Aboriginal children who struggle under the current system.

- Ensure sufficient financial support for all Aboriginal people seeking postsecondary education.

- Take further action to address social problems plaguing Aboriginal communities, particularly those which are likely to interfere with education.

- Assist employers in overcoming barriers to hiring and training Aboriginal workers.

- Facilitate movement off reserve for any Aboriginal wishing to take advantage of employment opportunities in cities.

K. Increasing Labour Supply of Immigrants

- Reconsider support of the temporary foreign worker program and focus on finding long term solutions to shortages.

- A comprehensive federal-provincial study of how to improve Canada’s immigration system should be undertaken.

- Provincial nominee programs must strike a better balance between short-term and long-term concerns. Enhanced labour market information is needed to understand what long-term immigration needs are likely to be.

- Additional assistance with language training and skills upgrading may be necessary for many immigrants already in Canada.

- Economic concerns should become an even larger factor in the selection of immigrants.

Bibliography

Advisory Panel on Labour Market Information (2009). "Working Together to Build a Better Labour Market Information System for Canada."

Agence de la santé et des services sociaux de Montréal (2006) "Urban Transportation, A Question of Health." Retrieved from: http://c.ymcdn.com/sites/www.alphaweb.org/resource/resmgr/comoh_section/montreal_2-89494-501-9.pdf.

Agnosteva, D. and Anderson, J.E. (2013). *Internal Trade Costs in Canada*. Public Policy Forum Canada.

Alberta (n.d.). *New West Partnership*. Retrieved at http://www.international.alberta.ca/985.cfm.

Alboim, N., & Cohl, K. A. (2012). "Shaping the Future: Canada's Rapidly Changing Immigration policies." Maytree Foundation.

Albrizio, S., T. Koźluk and V. Zipperer (2014). "Empirical Evidence on the Effects of Environmental Policy Stringency on Productivity Growth", *OECD Economics Department Working Papers*, No. 1179, OECD Publishing, Paris.

Almon, Michael John and Tang, Jianmin (2011) "Industrial Structural Change and the Post-2000 Output and Productivity Growth Slowdown: A Canada-U.S. Comparison", International Productivity Monitor No. 22, Fall 2011.

Ambec, S., Cohen, M. A., Elgie, S., and Lanoie, P. (2013). "The Porter Hypothesis at 20: can Environmental Regulation Enhance Innovation and Competitiveness?" *Review of Environmental Economics and Policy*, Volume 7, Issue 1, pp. 2-22.

Ambec, S. and Lanoie, P. (2008). "Does it Pay to be Green? A Systematic Overview." *The Academy of Management Perspectives*, Volume 22, Issue 4, pp. 45-62.

Annabi, N., Y. Boudribila, and S. Harvey (2013). Labour supply and income distribution effects of the working income tax benefit: a general equilibrium microsimulation analysis. *IZA Journal of Labor Policy*, *2*(1), 1-33.

Anderson, M. L. (2014). "Subways, Strikes, and Slowdowns: The Impacts Of Public Transit On Traffic Congestion," *American Economic Review*. 104(9): pp. 2763–2796.

Arnold, Jens (2008). "Do Tax Structures Affect Aggregate Economic Growth? Empirical Evidence from a Panel of OECD Countries" OECD Working Paper.

Arsenault, Jean-Francois and Sharpe, Andrew (2008) "An Analysis of the Causes of Weak Labour Productivity Growth in Canada since 2000", International Productivity Monitor No. 16, Spring 2008.

Aschauer, D. A. (1989) “Is Public Expenditure Productive?” *Journal of Monetary Economics*. 23: pp. 177-200.

Atkinson, Robert, Michael McTernan and Alastair Reed, eds. (2015) *Sharing in the Success of the Digital Economy* (London: Policy Network) http://www.policy-network.net/publications/4876/Sharing-in-the-Success-of-the-Digital-Economy

Auditor General of Canada (2009). “2009 Fall Report of the Auditor General of Canada.” Chapter 2.

Autor, David H., N, Maestas, K. J. Mullen, and A. Strand (2015). “Does Delay Cause Decay? The Effect of Administrative Decision Time on the Labor Force Participation and Earnings of Disability Applicants.” National Bureau of Economic Research, No. w20840.

Baker, M., J. Gruber, J., and K. Milligan (2008). “Universal Child Care, Maternal Labor Supply, and Family Well-Being.” *Journal of Political Economy*, *116*(4), 709-745.

Baldwin, John R. and Gellatly, Guy (2007). "Global Links: Multinationals in Canada: An Overview of Research at Statistics Canada" November 2007, Statistics Canada Research Paper, Catalogue no 11-622-MIE, no 14.

Bartlett, R., J. Bendiner, and A. Kolaj (2015). “From a Longer-Term Growth Perspective, West is Still Best.” TD Economics.

Barzel, Y., & McDonald, R. J. (1973). Assets, Subsistence, and the Supply Curve of Labor. *The American Economic Review*, 621-633.

Bassanini, A. and Venn, D. (2008) “The Impact of Labour Market Policies on Productivity in OECD Countries” International Productivity Monitor, 17, pp. 3-15.

Baylor, Maximilian and Beuasejour, Louis (2004). "Taxation and Economic Efficiency: Results from a Canadian GE Model." Working paper; 2004-2010, Finance Canada.

Beatty, Perrin (2014) Canada’s next free-trade agreement? How about a deal between provinces? The Globe and Mail.

Beckman, K., D. Fields, and M. Stewart (2014). *A Difficult Road Ahead: Canada’s Economic and Fiscal Prospects*. Ottawa, The Conference Board of Canada.

Beaudry, Paul; Collard, Fabrice and Green, David A. (2005) “Explaining Productivity Growth: The Role of Demographics”, International Productivity Monitor No. 10, Spring 2005.

Begin, Karine, Chantal Goyette and W. Craig Riddell (2010). “Revising Canada’s Immigrant Selection System: An Assessment of Recent Changes” Background paper prepared for Citizenship and Immigration Canada.

Bernstein, Jeffrey I.; Harris, Richard G.; Sharpe, Andrew (2002) "Explaining the Widening Canada-US Productivity Gap in Manufacturing", International Productivity Monitor No. 5, Fall 2002.

Bhide, A. (2008). *The Venturesome Economy: How Innovation Sustains Prosperity in a More Connected World*. Princeton University Press.

Bishop, Grant (2014) "A Rule of Reason for Inward FDI: Integrating Canadian foreign investment review and competition policy." Unpublished paper.

Bivens, J. (2012) "Public Investment: The next 'new thing' for powering economic growth," EPI Briefing Paper No. 338. Retrieved from: http://s4.epi.org/files/2012/bp338-public-investments.pdf.

Blackwell, Richard (2015). "Going green: Does Ontario's energy shift have the power to sustain itself?" *The Globe and Mail*, Published July 10, 2015. Retrieved July 17, 2015, http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/going-green-ontarios-energy-transformation/article25421677/

Blackwell, Tom (2015). "No Country for Old Doctors." Ottawa Citizen, D3, Saturday, May 9, 2013.

Blanchfield, Mike (2015) "Tories 'a pro-immigration government' Harper says," *Ottawa Citizen*, May 9, page A11.

Blundell, R. W. (1995). The Impact of Taxation on Labour Force Participation and Labour Supply. OECD Jobs Study Working Papers.

Boothe, Paul and Roy, Richard (2008) "Business Sector Productivity in Canada: What Do We Know?", International Productivity Monitor No. 16, Spring 2008.

Boothe, Paul (2015a) "Compete to Win: the Wilson panel report six years later," Council of Canadian Chief Executives, March http://www.ceocouncil.ca/wp-content/uploads/2015/02/Boothe-paper-March-2015-FINAL.pdf

Boothe, Paul. (2015b). Report for the Canadian Council of Chief Executives

Boulet, M., & Boudarbat, B. (2010). *Un diplôme post-secondaire canadien: un tremplin vers des emplois de qualité pour les immigrants?* Institut de Recherche en Politiques Publiques.

Brydon, Robbie, Nicholas Chesterly, Benjamin Dachis and Aaron Jacobs (2014) "Measuring Innovation in Canada: The Tale Told by Patent Applications," C.D. Howe E-Brief.

Brochu, Pierre, Marie-Anne Deussing, Koffi Houme, Maria Chuy. (2013). "Measuring Up: Canadian Results of the OECD PISA Study," Council of Ministers of Education, Canada (CMEC).

Bussière, Patrick, Fernando Cartwright, Robert Crocker, Xin Ma, Jillian Oderkirk, Yanhong Zhang. (2001). "Measuring up: The Performance of Canada's Youth in Reading, Mathematics and Science," Ottawa: Statistics Canada.

Bussière, Patrick, Fernando Cartwright, Tamara Knighton. (2004). "Measuring Up: Canadian Results of the OECD PISA Study," Ottawa: Statistics Canada.

Bussière, Patrick, Tamara Knighton, Dianne Pennock. (2007). "Measuring Up: Canadian Results of the OECD PISA Study," Ottawa: Statistics Canada.

Calver, Matthew (2015b). "Closing the Aboriginal Education Gap in Canada: Assessing Progress and Estimating the Economic Benefits," CSLS Research Report 2015-03, http://www.csls.ca/reports/csls2015-03.pdf.

Calver, M. (2015a) "Measuring the Appropriate Outcomes for Better Decision-Making: A Framework to Guide the Analysis of Health Policy," Forthcoming CSLS Report.

Cameron, S., H. Lao, and T. Shaw (2014). *Fiscal Sustainability Report 2014*. Office of the Parliamentary Budget Officer, Ottawa.

Campolieti, M., & Riddell, C. (2012). Disability policy and the labor market: Evidence from a natural experiment in Canada, 1998–2006. *Journal of Public Economics*, *96*(3), 306-316.

Canada Revenue Agency. (2015). *Summary of Provincial and Territorial Research and Development (R&D) Tax Credits*. Retrieved at http://www.cra-arc.gc.ca/txcrdt/sred-rsde/prv-crdts-eng.html.

Canadian Academy of Engineering (2010) "Power Grid Task Force Report, Electricity Interconnecting Canada: A Strategic Advantage."

Canadian Council of Chief Executives (2014). Preliminary survey report: the skills needs of major Canadian employers.

Canadian Chamber of Commerce (2004). *Obstacles to Free Trade in Canada: A Study on Internal Trade Barriers*. Retrieved at: http://www.chamber.ca/download.aspx?t=0&pid=65cd767a-e905-e411-b0ed-000c29c04ade.

Canadian Institute for Health Information (2014). "National Health Expenditure Trends, 1975 to 2014. Spending and Health Workforce."

Canning, D. and P. Pedroni (2008) "Infrastructure, Long-run Economic Growth and Causality Tests for Integrated Panels," *The Manchester School*, 76(5), 504-527.

Capeluck, Evan (2014) "Convergence across Provincial Economies in Canada: Trends, Drivers and Implications," report prepared by the Centre for the Study of Living Standards for the Privy Council Office, CSLS Research Report 2014-03, May. http://www.csls.ca/reports/csls2014-03.pdf

Capeluck, Evan (2015) "The Labour Market Performance of Immigrants in Canada, 2006-2014," CSLS Research Report, forthcoming.

Capeluck, Evan (2015) "Canadian Changes in Manufacturing Employment Shares," CSLS Research Report, forthcoming.

Cappon, Paul (2014) "Think Nationally, Act Locally: A Pan-Canadian Strategy for Education and Training." Canadian Council of Chief Executives.

Carr, Jan (2010) "Power Sharing: Developing Inter-Provincial Electricity Trade." C.D. Howe Institute).

Carter, T., M. Pandey, and J. Townsend (2010). "The Manitoba Provincial Nominee Program: Attraction, Integration and Retention of Immigrants." IRPP Study 10. Montreal: Institute for Research on Public Policy.

C.D. Howe Institute (2014). Reforming Telecommunications and Broadcast policy for the New Technological Age: Report of the C.D. Howe Institute Competition Policy Council, Eighth Meeting.

Centennial Group (2009) "Public Investment: Vital for Growth and Renewal, but should it be a Countercyclical Instrument?" Background Paper for the UNCTAD Seminar on the Role of Public Investment in Social and Economic Development, 13-14 July 2009 in Rio de Janeiro, Brazil. Retrieved from: http://unctad.org/en/Docs/webdiae20091_en.pdf.

Centre for the Study of Living Standards (2001) "Productivity Trends in the Construction Sector in Canada: A Case of Lagging Technical Progress"

Centre for the Study of Living Standards. (2005). *The Diffusion and Adoption of Advanced Technologies in Canada: An Overview of the Issues*. Ottawa, ON: CSLS Research Report 2005-05.

Centre for the Study of Living Standards (2011) "A Detailed Analysis of the Productivity Performance of the Canadian Primary Agriculture Sector" CSLS Research Report 2011-06, http://www.csls.ca/reports/csls2011-06.pdf

Centre for the Study of Living Standards (2012) "The Impact of Information and Communication Technology on the Productivity of the Canadian Transportation System: A

Macroeconomic Approach for the Air and Rail Sectors", CSLS Research Report 2012-07, http://www.csls.ca/reports/csls2012-07.pdf

Centre for the Study of Living Standards (2015). *Interprovincial Migration in Canada: Implications for Output and Productivity Growth*, forthcoming.

Chen, Duanjie and Mintz, Jack M. "The 2014 Global Tax Competitiveness Report: A Proposed Business Tax Reform Agenda." University of Calgary, School of Public Policy. SPP Research Papers, Volume 8, Issue 4. February 2015.

Church, Jeffrey and Wilkins, Andrew (2014). "Wireless Competition in Canada: Damn the Torpedoes! The Triumph of Politics Over Economics." University of Calgary, the School of Public Policy, SPP Research Papers, Volume 7, Issue 20.

Citizenship and Immigration Canada (2011). "Evaluation of the Provincial Nominee Program." Evaluation Division.

Citizenship and Immigration Canada (2014). "2014 Annual Report to Parliament on Immigration."

Citizenship and Immigration Canada (2015). "Report on Plans and Priorities 2015–2016." http://www.cic.gc.ca/english/resources/publications/rpp/2015-2016/index.asp.

Ciuriak, Dan and Jingliang, Xiao (2014). Should Canada unilaterally adopt global free trade? Canadian Council of Chief Executives.

Clemens, Jason, Milagros Palacios, and Niels Veldhuis (2013). "Reforming Old Age Secuirty: A Good Start but Incomplete." Fraser Institute.

Collin, Chantal, Isabelle Lafontaine-Émond, and Melissa Pang (2013). "Persons with Disabilities in the Canadian Labour Market: An Overlooked Talent Pool." Social Affairs Division, Parliamentary Information and Research Service.

Commission on the Reform of Ontario's Public Services (2012) *Public Services for Ontarians: A Path to Sustainability and Excellence* (Drummond Report)

Competition Policy Review Panel (2008). *Compete to Win: Final Report – June 2008*. Ottawa, ON: Public Works and Government Services Canada.

Conference Board of Canada (2011). "Investment and Productivity, Why is M&E Investment Important to Labour Productivity"

Conway, Paul and Nicoletti, Guiseppe (2007) "Product Market Regulation and productivity Convergence: OECD Evidence and Implications for Canada", International Productivity Monitor No. 15, Fall 2007.

Cote, M. and Miller, R. (2012) "Stimulating Innovation: Is Canada Pursuing the Right Policies?" International Productivity Monitor, 23, pp. 3-24.

Cotis, Jean-Philippe (2006) "Benchmarking Canada's Economic Performance", International Productivity Monitor No. 13, Fall 2006.

Coulombe, Serge, Gilles Grenier, and Serge Nadeau (2014). "Human Capital Quality and the Immigrant Wage Gap," *IZA Journal of Migration*, 3:14

Coulombe, S. and Tremblay, J.-F. (2009) "Education, Productivity and Economic Growth: A Selective Review of the Evidence" International Productivity Monitor, 18, pp. 3-24.

Council of Canadian Academies, (2009) *Innovation and Business Strategy: Why Canada Falls Short*. Ottawa, ON: The Expert Panel on Business Innovation, Council of Canadian Academies.

Council of Canadian Academies, 2013. *The State of Industrial R&D in Canada.* Ottawa, ON: The Expert Panel on Industrial R&D in Canada, Council of Canadian Academies.

Council of Canadian Academies (2015) "Some Assembly Required: STEM Skills and Canada's Economic Productivity, Council of Canadian Academies.

Coyne, A. (2011). "Stuck in Traffic," *Maclean's*. Retrieved from: http://www.macleans.ca/ news/canada/stuck-in-traffic/.

Dachis, Ben. (2014) "Full Throttle: Reforming Canada's Aviation Policy" C.D. Howe Institute.

Dachis, Ben, and Lester, John (2015) "Small Business Preferences as a Barrier to Growth: Not so Tall After All," C.D. Howe Institute, Commentary No. 426.

Datta, N. Gupta, N. Smith, and M. Verner (2006). "Child Care and Parental Leave in the Nordic Countries: A Model to Aspire to?" IZA Discussion Paper No. 2014.

De Avillez, Ricardo and Ross, Christopher (2011) "A Portrait of the Productivity Performance of the Canadian Provinces, 1997-2007", International Productivity Monitor No. 21, Spring 2011.

De Avillez, Ricardo (2011) "A Half-Century of Productivity Growth and Structural Change in Canadian Agriculture: An Overview", International Productivity Monitor No. 22, Fall 2011.

De Avillez, R. (2014a), "A Detailed Analysis of Productivity Trends in the Canadian Forest Products Sector", CSLS Research Report 2014-01, http://www.csls.ca/reports/csls2014-01.pdf.

De Avillez, R. (2014b), "An Analysis of Productivity Trends in the Canadian Forest Products Sector, 2000-2012" International Productivity Monitor No. 27, 79-100, Fall 2014, http://www.csls.ca/ipm/27/27-rda.pdf.

Deloitte (2013) "The Future of Productivity: A wake-up call for Canadian companies,"

Denton, Frank and Spencer, Byron, (2005). *Population Aging and the Macroeconomy: Explorations in the Use of Immigration as an Instrument of Control.* SEDAP Research Paper No. 135

Department of Finance Canada (2012). "Economic and Fiscal Implication of Canada's Aging Population."

Desjardins, L. and King, D. (2011). *Expectations and Labour Market Outcomes of Doctoral Graduates from Canadian Universities.* Research Paper: Culture, Tourism and the Centre for Education Statistics. Ottawa, ON: Statistics Canada and Human Resources and Skills Development Canada.

De Serres, Alain, Fabrice Murtin, and Giuseppe Nicoletti (2010). "A Framework for Assessing Green Growth Policies," OECD.

Diewert, W. Erwin and Yu, Emily (2012) "New Estimates of Real Income and Multifactor Productivity Growth for the Canadian Business Sector, 1961-2011", International Productivity Monitor No. 24, Fall 2012.

Drummond, Don (2006) "The Economists' Manifesto for Curing Ailing Canadian Productivity", International Productivity Monitor No. 13, Fall 2006.

Drummond, Don (2011) "Confessions of a Serial Productivity Researcher", International Productivity Monitor No. 22, Fall 2011.

Drummond, Don (2014). "Wanted: Good Canadian Labour Market Information." Institute for Research on Public Policy.

Drummond, Don, and Capeluck, Evan (2015) "Long-term Fiscal and Economic Projections for Canada and the Provinces and Territories, 2014-2038," CSLS Research Report 2015-08.

Drummond, D., Ryan, A., Veall, M. R. (2013) "Improving Canada's Productivity Performance: The Potential Contribution of Firm-level Productivity Research" International Productivity Monitor, Fall 2013, No. 26.

Drummond, Don, and Ellen Rosenbluth (2013). "The Debate on First Nations Education Funding: Mind the Gap," Working Paper, School of Policy Studies, Queen's University. http://www.queensu.ca/sps/publications/workingpapers/49-Drummond-Rosenbluth.pdf

Dungan, P., T. Fang, and M. Gunderson (2013). Macroeconomic Impacts of Canadian Immigration: Results from a Macro Model. *British Journal of Industrial Relations, 51*(1), 174-195.

Duranton, G. and M. A. Turner (2011). "The Fundamental Law of Road Congestion: Evidence from US Cities," *American Economic Review*. 101(6): pp. 2616–2652.

Ecofiscal Commission (2014) "Smart Practical Possible: Canadian Options for Greater Economic and Environmental Prosperity." Retrieved from: http://ecofiscal.ca/wp-content/uploads/2014/11/Ecofiscal-Report-November-2014.pdf.

Ecofiscal Commission (2015). "The Way Forward: A Practical Approach to Reducing Canada's Greenhouse Gas Emissions," April.

Eissa, N., and J.B. Liebman (1996). "Labor supply response to the earned income Tax credit." *Quarterly Journal of Economics*, 112(2):605–637.

ESDC (2012). *Indicators of Well-Being in Canada: Learning – Educational Attainment*. http://well-being.esdc.gc.ca/misme-iowb/.3ndic.1t.4r@-eng.jsp?iid=29.

Estevao, Marcello and Tsounta, Evridiki (2010) "Canada's Potential Productivity and Output Growth: A Post-Crisis Assessment", International Productivity Monitor No. 20, Fall 2010.

Farhadi, M. (2015) "Transport infrastructure and long-run economic growth in OECD countries," *Transportation Research Part A*, 74, 73-90.

Federation of Canadian Municipalities (2012a). "Canadian Infrastructure Report Card," Volume 1: Municipal Roads and Water System.

Federation of Canadian Municipalities (2012b). "The Road to Jobs and Growth: Solving Canada's Municipal Infrastructure Challenge," Submission to the Government of Canada's Long-term Infrastructure Plan Consultation.

Feir, Donna (2015). "The Intergenerational Effect of Forcible Assimilation Policy on Education and Health." Working Paper.

Ferrer, A. M., G. Picot, and W. C. Riddell (2014). "New Directions in Immigration Policy: Canada's Evolving Approach to the Selection of Economic Immigrants." *International Migration Review, 48*(3), 846-867.

Finnie, Ross (2009). Post-Secondary Education in Canada: Meeting Our Needs, Canadian Council on Learning, "Does culture affect post-secondary education choices? OECDiLibrary.

Finnie, R. (2014). "Does culture affect post-secondary education choices?" *Higher Education Management and Policy, 24*(3), 57-85.

Fortin, Pierre (2005). "From Productivity to Well-Being: Keep the Focus on Basic Skills", International Productivity Monitor No. 11, Fall 2005.

Fortin, Pierre, Luc Godbout, Suzie St-Cerny (2012). "Impact of Quebec's Universal Low Fee Childcare Program on Female Labour Force Participation, Domestic Income, and Government Balances", University of Sherbrooke, Working paper 2012/02.

Fortin, Pierre (2015). "Quebec's Childcare Win-Win," Presented at the Conference *The Millenials' Challenge,* Queen's International Institute on Social Policv. http://www.queensu.ca/sps/events/conferencesandworkshops/qiisp/2015/presentations/PierreFortin.pdf

Fougere, Maxime, Simon Harvey, Jean Mercenier and Marcel Merette (2005). "Population Ageing and the Effective Age of Retirement in Canada", SRI Working Paper Series, No. 2005 A-03

Frenette, Marc (2011). "What Explains the Educational Attainment Gap between Aboriginal and Non-Aboriginal Youth?" Canadian Labour Market and Skills Researcher Network (CSLRN), Working Paper No. 78.

Gill, Vijay (2012) Driven Away: Why More Canadians are Choosing Cross Border Airports, Conference Board of Canada.

Global Commission on the Economy and Climate (2015). "Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate. http://2015.newclimateeconomy.report

Gomez, Rafael, and Morley Gunderson (2006). "Costs and Benefits of Workforce Aging and Retirement to Firms", SRI Working Paper Series, No 2006 A-11

Goodfellow, A., M. Stergiou-Kita, B. Kirsh, and D. Lero (2013). Improving the Participation of Under-utilized Talent of People with Physical Disabilities in the Canadian Labour Market: A Scoping Review.

Grady, Patrick (2009). "The Impact of Immigration on Canada's Labour Market." Fraser Forum.

Gramlich, E. M. (1994) "Infrastructure Investment: A Review Essay," *Journal of Economic Literatrure,* 32(3), 1176-1196.

Gray, David and Ross Finnie, "Labour Force Participation of Older Displaced Workers in Canada: Should I Stay or Should I Go?", Institute for Research on Public Policy, February 24, 2011

Green, D. A., & Riddell, W. C. (2001). *Literacy, numeracy and labour market outcomes in Canada*. Statistics Canada.

Groupe de travail surl'investissement des entreprises (2008) *L'investissement au Quebec: on est pour* (Gouvernement du Quebec). (Fortin Report)

Gu, W. and R. Macdonald (2009). "The Impact of Public Infrastructure on Canadian Multifactor Productivity Estimates," *Canadian Productivity Review*. Catalogue no. 15-206-X, no. 21.

Gu, Wulong and Lafrance, Amelie (2010) "Productivity Growth in Canadian and U.S. Regulated Industries", International Productivity Monitor No. 19, Spring 2010.

Guillemette, Yvan and Robson, William B.P., (2006). *No Elixir of Youth: Immigration Cannot Keep Canada Young.* C.D. Howe Institute, Backgrounder: No. 96.

Hall, Bronwyn and Harhoff, Dietmar (2011) "Recent Research on the Economics of Patents," NBER Working Paper No. 17773, National Bureau of Economic Research.

Hall, Bronwyn, Christian Helmers, Mark Rogers and Vania Sena (2012) "The Choice Between Formal and Informal Intellectual Property: A Literature Review," National Bureau of Economic Research: Working Paper No. 17983, National Bureau of Economic Research.

Halliwell, Cliff (2013). "No Shortage of Opportunity: Policy Ideas to Strengthen Canada's Labour Market in the Coming Decade." *Institute for Research on Pulbic Policy (IRPP) Study*.

Hango, Darcy "Gender differences in science, technology, engineering, mathematics and computer science (STEM) programs at university", Statistics Canada 2013, 75-006-x

Hanna, I., Rogoschewsky, R., Hantik, C. and Anderson, B. (2010). *Saskatchewan, Alberta and B.C. Launch New West Partnership*. April 30. Retrieved at http://www.saskatchewan.ca/government/news-and-media/2010/april/30/saskatchewan-alberta-and-bc-launch-new-west-partnership.

Harchaoui, T. M. (1997) "Le capital public au Canada: évolution historique et externalités," *L'Actualité économique*, 73, 395-421.

Harchaoui, T. M. and F. Tarkhani (2003) "Public Capital and its Contribution to the Productivity Performance of the Canadian Business Sector," Economic Analysis Research Paper Series. Catalogue no. 11F0027MIE. Retrieved from: http://publications.gc.ca/ Collection/Statcan/11F0027M/11F0027MIE2003017.pdf.

Harrison, P. (2007) "Can Measurement Error Explain the Weakness of Productivity Growth in the Canadian Construction Industry?" CSLS Research Report 2007-01, http://www.csls.ca/reports/csls2007-01.PDF

Harrison, P., Sharpe, A. and Arsenault, J.-F. (2008) "The Relationship Between Productivity and Real Wage Growth in Canada and OECD Countries, 1961-2006, CSLS Research Report 2008-8, http://www.csls.ca/reports/csls2008-8.pdf

Harrison, P., and Sharpe, A. (2009) "The Productivity Performance of Atlantic Canada" CSLS Research Report 2009-14, http://www.csls.ca/reports/csls2009-14.pdf

HDR (2008) "Costs of Road Congestion in the Greater Toronto and Hamilton Area: Impact and Cost Benefit Analysis of the Metrolinx Draft Regional Transportation Plan." Retrieved from: http://www.metrolinx.com/en/regionalplanning/costsofcongestion/ISP_08-015_Cost_of_Congestion_report_1128081.pdf.

Helpman, Elhanan (2004). T*he Mystery of Economic Growth* (Cambridge: Harvard University Press).

Howard, Alison, Jessica Edge, and Douglas Watt (2012). "Understanding the Value, Challenges, and Opportunities of Engaging Métis, Inuit, and First Nations Workers." The Conference Board of Canada.

Human Resources and Skills Development Canada (2011). "Summative Evaluation of the Canada Pension Plan Disability Program."

International Energy Agency (2011). "World Energy Outlook 2011." http://www.iea.org/publications/freepublications/publication/weo2011_web.pdf

Jackson, Andrew. (2003). From Leaps of Faith to Hard Landings: Fifteen Years of "Free Trade", www.yorku.ca/cerlac/deep_papers/Andrew_Jackson

Jackson, Andrew (2005) "Productivity and Building Human Capital for the "Bottom Third"", International Productivity Monitor No. 11, Fall 2005.

Jarrett, Peter (2012) "The Long-Term Outlook for Productivity and Per Capita Income Growth for Canada: A Comparison with Selected G-20 Countries", International Productivity Monitor No. 24, Fall 2012.

Jaumotte, Florence (2004). "Labour Force Participation of Women: Empirical Evidence on the Role of Policy and Other Determinants in OECD Countries," Economic Studies, OECD, No.37, 2003/2.

Jenkins, T. (2011). *Innovation Canada: A Call to Action*. Ottawa, ON: Review of Federal Support to Research and Development, Expert Panel Report. Retrieved at http://rd-review.ca/eic/site/033.nsf/vwapj/R-D_InnovationCanada_Final-eng.pdf/$FILE/R-D_InnovationCanada_Final-eng.pdf.

Jones, M. K. (2008). "Disability and the "Labour Market: a Review of the Empirical Evidence." *Journal of Economic Studies*, *35*(5), 405-424.

Keane, M. P. (2011). "Labor Supply and Taxes: A Survey." *Journal of Economic Literature*, *49*(4), 961-1075.

Khan, M., Serafeim, G., and Yoon, A. (2015). "Corporate Sustainability: First Evidence on Materiality." Working Paper. http://papers.ssrn.com/sol3/Papers.cfm?abstract_id=2575912

Kohli, Ulrich (2006) "Real GDP, Real GDI and Trading Gains: Canada, 1981-2005", International Productivity Monitor No. 13, Fall 2006.

Kottelenberg, M. J., & Lehrer, S. F. (2013). New evidence on the impacts of access to and attending universal child-care in Canada. *Canadian Public Policy*, *39*(2), 263-286.

Kukucha, C. (2013). *Internal Trade Agreements in Canada: Best Practices Related to Negotiated Technical Language.*

Kumar, Manmohan, and Jaejoon Woo (2010). "Public Debt and Growth," IMF Working Paper.

Lamb, D. (2013). Earnings Inequality Among Aboriginal Groups in Canada.*Journal of Labor Research*, *34*(2), 224-240.

Lester, J. (2012). "Benefit-cost analysis of R&D support programs," *Canadian Tax Journal*, *60*(4).

Lester, John and Bev Dahlby (2014) "Evaluation of Business Subsidy Programs."

Li, Nicholas (2014) "Sticker shock: the causes of the Canada-U.S. price differential." C.D. Howe Institute,

Lindsey, R. (2009) "Introduction to the Special Issue on Road Pricing and Infrastructure Financing," *International Journal of Sustainable Transportation*, 3, 285-292.

Lindsey, R., A. Zhang, and J. A. Gómez-Ibáñez (2008) "Prospects for Urban Road Pricing in Canada," *Brookings-Wharton Papers on Urban Affairs*, 235-293.

Macdonald, R. (2008) "An Examination of Public Capital's Role in Production," Economic Analysis Research Paper Series. Catalogue no. 11F0027MIE. Retrieved from: http://www.statcan.gc.ca/pub/11f0027m/11f0027m2008050-eng.pdf.

Mackenzie, H. (2013) "Canada's Infrastructure Gap: Where It Came from and Why It Will Cost So Much To Close," Canadian Centre for Policy Alternatives. Retrieved from: https://www.policyalternatives.ca/sites/default/files/uploads/publications/National%20Office/2013/01/Canada's%20Infrastructure%20Gap_0.pdf.

Macklen, Tiff (2003) "Future Productivity Growth in Canada: Comparing to the United States", International Productivity Monitor No. 7, Fall 2003.

Macmillan, K.E. and Grady, P. (2007). "A New Prescription: Can the B.C.-Alberta TILMA Resuscitate Internal Trade in Canada?" *C.D. Howe Institute Backgrounder, No. 106, October*.

Maestas, N., Mullen, K. J., & Strand, A. (2013). "Does Disability Insurance Receipt Discourage Work? Using Examiner Assignment to Estimate Causal Effects Of SSDI Receipt." *The American Economic Review*, *103*(5), 1797-1829.

Manmohan S. Kimar and Jaejoon Woo. (2010) Public Debt and Growth, IMF Working Paper

McKenzie, K. J. (2005). "Tax Subsidies for R&D in Canadian Provinces*"*. *Canadian Public Policy, 16*(1).

McKenzie, K. J. (2012). "The Big and the Small of Tax Support for R&D in Canada". *The School of Public Policy Research Papers, 5*(22).

McKinsey and Company (2012). "Opportunities for Canadian Energy Technologies in Global Markets." http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/files/pdf/2013/McK-Report-eng.pdf

Mei, Zhaowen, Jacquie Eales and Janet Fast (2013). "Gifts of a Lifetime: The Contributions of Older Canadians."

Metrolinx (2008). "Costs of Road Congestion in the Greater Toronto and Hamilton Area: Impact and Cost Benefit Analysis of the Metrolinx Draft Regional Transportation Plan." Accessed from: http://www.metrolinx.com/en/regionalplanning/costsofcongestion/ ISP_08-015_Cost_of_Congestion_report_1128081.pdf.

Meyer, B.D. (2002). "Labor supply at the extensive and intensive margins: the EITC, welfare, and hours worked." *American Economic Review* 2, 92:373–379.

Milligan, K. (2002). "Quebec's baby bonus: can public policy raise fertility," *Backgrounder-CD Howe Institute*.

Montreal Health and Social Service Agency. 2006. Urban Transportation, A Question of Health. (63 pp)

Montani and Perry (2013). "Child Labour is No Accident: The Experience of BC's Working Children." First Call: BC Child and Youth Advocacy Coalition.

Moussaly-Sergieh, Karim, and François Vaillancourt (2009). "Extra Earning Power: The Financial Returns to University Education in Canada." C.D. Howe Institute, e-brief, http://www.cdhowe.org/pdf/ebrief_79.pdf.

Muntean, T. (2014) "Intangible Assets and their Contribution to Productivity Growth in Ontario" International Productivity Monitor No. 27, 22-39, Fall 2014. http://www.csls.ca/ipm/27/27-tm.pdf

National Post (2015). *National Post View: Couillard touts the force of Central Canada*. May 12. Retrieved at http://news.nationalpost.com/full-comment/national-post-view-couillard-touts-the-force-of-central-canada.

National Roundtable on the Environment and the Economy (2012). "Framing the Future: Embracing the Low-Carbon Economy." http://nrt-trn.ca/wp-content/uploads/2012/10/framing-the-future-report-eng.pdf

Nelson, Richard D. and Roberto Mazzoleni (1997) "Economic Theories About the Costs and Benefits of Patents," *Journal of Economic Issues*, Vol.32, No. 4, pp. 1031-1052.

Nicholson, Peter J. (2003) "The Growth Story: Canada's Long-run Economic Performance and Prospects", International Productivity Monitor No. 7, Fall 2003.

Nicholson, Peter (2009) "Innovation and Business Strategy: Why Canada Falls Short", International Productivity Monitor No. 19, Spring 2009.

OECD. (2006). *OECD Reviews of Innovation Policy: Switzerland 2006*. OECD Publishing.

OECD. (2007a). *OECD Reviews of Innovation Policy: Luxembourg 2007*. OECD Publishing.

OECD. (2007b). *OECD Reviews of Innovation Policy: New Zealand 2007*. OECD Publishing.

OECD. (2008a). *OECD Reviews of Innovation Policy: Hungary 2008*. OECD Publishing.

OECD. (2008b). *OECD Reviews of Innovation Policy: Norway 2008*. OECD Publishing.

OECD. (2009a). *OECD Reviews of Innovation Policy: Korea 2009*. OECD Publishing.

OECD. (2009b). *OECD Reviews of Innovation Policy: Mexico 2009*. OECD Publishing.

OECD (2010a). "Sickness, Disability, and Work: Breaking the Barriers. A Synthesis of Findings Across OECD Countries."

OECD (2010b). "Sickness, Disability, and Work: Breaking the Barriers. Canada: Opportunities for Collaboration."

OECD (2010c) Tax Policy and Economic Growth, Tax Policy Studies.

OECD (2010d). Interim Report of the Green Growth Strategy: Implementing our commitment for a sustainable future." Meeting of the OECD Council at Ministerial Level, 27-28 May, 2010. http://www.oecd.org/greengrowth/45312720.pdf

OECD (2010e). "The High Cost of Low Education Performance: the Long-Run Economic Impact of Improving PISA Outcomes."

OECD. (2011). *Business Innovation Policies: Selected Country Comparisons*. OECD Publishing. Retrieved from http://dx.doi.org/10.1787/9789264115668-en.

OECD. (2012). *Reviews of Innovation Policy: Slovenia 2012*. OECD Publishing. Retrieved from http://dx.doi.org/10.1787/9789264167407-en.

OECD. (2013). *Reviews of Innovation Policy: Sweden 2012*. OECD Publishing. Retrieved from http://dx.doi.org/10.1787/9789264184893-en.

OECD (2014a). *Education at a Glance 2014: OECD Indicators.* OECD Publishing.

OECD. (2014b). *Industry and Technology Policies in Korea.* OECD Publishing. Retrieved at http://dx.doi.org/10.1787/9789264213227-en.

OECD. (2014c). *OECD Reviews of Innovation Policy: France 2014*. OECD Publishing. Retrieved at http://dx.doi.org/10.1787/9789264214026-en.

OECD. (2014d). *OECD Reviews of Innovation Policy: Netherlands 2014*. OECD Publishing. Retrieved at http://dx.doi.org/10.1787/9789264213159-en.

OECD. (2014e). Factsheet on how competition policy affects macro-economic outcomes.

OECD (2015). *In It Together: Why Less Inequality Benefits All.* OECD Publishing.

OECD (2015). "PISA 2012 Results: The ABC of Gender Equality in Education: Aptitude, Behaviour, Confidence."

Pandey, M., & Townsend, J. (2011). "Quantifying the Effects of the Provincial Nominee Programs." *Canadian Public Policy*, *37*(4), 495-512.

Parham, Dean (2002) "Productivity and Policy Reform in Australia", International Productivity Monitor No. 5, Fall 2002.

Park, Jungwee (2011). "Retirement, Health, and Employment among those 55 Plus." Statistics Canada.

Peri, G., and K. Y. Shih (2013). "Foreign scientists and engineers and economic growth in Canadian labor markets." IZA Discussion Paper No. 7367.

Peri, Giovanni, Kevin Shih and Chad Sparber (2014) "Foreign Stem Workers and Native Wages and Employment in U.S. Cities," NBER Working Paper 20093, May 2014.

Picot, Garnett (2008). "Immigrant Economic and Social Outcomes in Canada: Research and Data Development at Statistics Canada." Statistics Canada, Business and Labour Market Analysis. http://www.statcan.gc.ca/pub/11f0019m/11f0019m2008319-eng.pdf

Picot, Garnett, and Feng, Hou (2009). "Immigrant Characteristics, the IT Bust, and Their Effect on Entry Earnings of Immigrants." Statistics Canada, Social Analysis Division.

Picot, G., & Sweetman, A. (2012). Making it in Canada: Immigration Outcomes and Policies. *IRPP study*, (29), 1.

Pilat, Dirk (2005) "Canada's Productivity Performance in International Perspective", International Productivity Monitor No. 10, Spring 2005.

Porter, M., and C. van der Linde (1995). "Toward a New Conception of the Environment Competitiveness Relationship." *Journal of Economic Perspectives*, Volume 9, Issue 4, pp. 97–118.

Prince, M. J. (2014). "Seven reasons why disabled Canadians are losing CPP benefits." The Globe and Mail, July 16, 2014. http://www.theglobeandmail.com/globe-debate/seven-reasons-why-disabled-canadians-are-losing-cpp-benefits/article19630200/

Public Health Agency of Canada (2014). *Economic Burden of Illness in Canada, 2005-2008*.

PWC (2015). *SR&ED Tax Clip: Provincial and Territorial R&D Tax Credits – 2014*. January, 15. Retrieved at http://www.pwc.com/ca/en/sred/tax-clips/2014-provincial-territorial-r-d-tax-credits.jhtml.

Quebec Taxation Review Committee (2015). "Focusing on Quebec's Future".

Ragan and F. St-Hilaire (eds.), *A Canadian Priorities Agenda: Policy Choices to Improve Economic and Social Well-Being*, (Montreal: Institute for Research on Public Policy), November 2007, pp. 353-388.

Rai, V. and Sharpe, A. (2013) "Can the Canada-US ICT Investment Gap be a Measurement Issue?" International Productivity Monitor No. 26, 63-85, Fall 2013.

Rao, Someshwar; Tang, Jianmin and Wang, Weimin (2002) "The Importance of Skills for Innovation and Productivity", International Productivity Monitor No. 4, Spring 2002.

Rao, Someshwar; Sharpe, Andrew and Smith, Jeremy (2005) "An Analysis of the Labour Productivity Growth Slowdown in Canada since 2000", International Productivity Monitor No. 10, Spring 2005.

Rao, S. and Li, J. (2013) “Explaining Slower Productivity Growth: The Role of Weak Demand Growth” International Productivity Monitor No. 26, Fall 2013, 3-19. http://www.csls.ca/ipm/26/IPM-26-Rao-Li.pdf

RBC (2015) Report: Canadian Federal and Provincial Fiscal Tables. Accessed: http://www.rbc.com/economics/economic-reports/pdf/provincial-forecasts/prov_fiscal.pdf

Remillard, Richard (2015). "Government Intervention in Venture Capital in Canada: Characteristics, Causes, Consequences ad Conclusions." Draft paper.

Richards, John. (2014). *"What Policies Work? Addressing the Concerns Raised by Canada's PISA Result,"* C.D Howe Institute.

Riddell, W. C. (2006). “The impact of education on economic and social outcomes: An overview of recent advances in economics.“ Canadian Policy Research Networks.

Robert, M. (2011). *Federal R&D Panel reports with six major recommendations*. Ottawa, ON. October 17. Retrieved at http://rd-review.ca/eic/site/033.nsf/eng/00294.html.

Robidoux, Benoit (2003) “Future Productivity Growth in Canada: The Role of the Service Sector”, International Productivity Monitor No. 7, Fall 2003.

Robson, William B.P, (2010). *The Glacier Grinds Closer: How Demographics Will Change Canada’s Fiscal Landscape.* C.D. Howe Institute e-brief.

Rodrigues, Erika (2015). “Trends in Canadian Innovative Activity: Evidence from Patents,” Centre for the Study of Living Standards, forthcoming.

Roland-Hurst, D. (2006) “Infrastructure as a Catalyst for Regional Integration Growth and Economic Convergence: Scenario Analysis for Asia,” Asian Development Bank. Retrieved from: http://www.adb.org/sites/default/files/publication/28207/wp091.pdf.

Romp, W. and J. De Haan (2007) “Public Capital and Economic Growth: A Critical Survey,” *Perspektiven der Wirtschaftspolitik*, 8(S1), 6-52.

Ross, Chris and Murray, Alexander (2010) “Aggregate Measures of Income and Output in Canada and the United States: Implications for Productivity and Living Standards”, International Productivity Monitor No. 19, Spring 2010.

Salotti, Simone and Trecroci, Carmine. (2012) Even worse than you thought:The impact of government debt on aggregate investment and productivity. National University of Ireland Galway, University of Brescia.

Satya, P., B. S. Sahni, and B. P. Biswal (2004) "Public Infrastructure and the Productive Performance of Canadian Manufacturing Industries," *Southern Economic Journal*, 70(4), 998-1011.

Scandizzo, S. and P. Sanguinetti (2009) "Infrastructure in Latin America: Achieving High Impact Management," Discussion Draft of the 2009 Latin America Emerging Markets Forum. Retrieved from: http://www.emergingmarketsforum.org/papers/pdf/2009% 20EMF%20LatAm%20Scandizzo%20Sanguinetti%20Infrastructure.pdf.

Scarth, William (2005) "Fiscal Policy Can Raise Both Employment and Productivity", International Productivity Monitor No. 13, Fall 2005.

Scarth, W., and L. Tang, L. (2008). An Evaluation of the Working Income Tax Benefit. *Canadian Public Policy*, *34*(1), 25-36.

Schmertman, Carl, (1992). *Immigrants' Ages and the Structure of Stationary Populations with Below-Replacement Fertility.* Demography, Springer, vol. 29(4): 595-612.

Seidle, F. L. (2013). "Canada's Provincial Nominee Immigration Programs: Securing Greater Policy Alignment." Institute for Research on Public Policy (IRPP) No. 43, December 2013.

Sharpe, Andrew (1998) "Productivity: Key to Economic Success," report prepared for the Atlantic Canada Opportunities Agency, http://www.csls.ca/reports/productivity.pdf

Sharpe, Andrew (2001) "Productivity Trends in the Construction Sector in Canada: A Case of Lagging Technical Progress", International Productivity Monitor No. 3, Fall 2001.

Sharpe, Andrew (2002) "The Contribution of Productivity to Economic Well-Being in Canada," *Productivity Issues in Canada*, 843-74.

Sharpe, Andrew (2005) "What Explains the Canada-US ICT Investment Gap?", International Productivity Monitor No. 13, Fall 2005.

Sharpe, Andrew, and Jill Hardt (2006a). *Five Deaths a Day: Workplace Fatalities in Canada, 1993-2005.* The Centre for the Study of Living Standards, December 2006.

Sharpe, Andrew (2006b) "Lessons for Canada from International Productivity Experience," CSLS Research Report 2006-02, October http://www.csls.ca/reports/csls2006-02.pdf

Sharpe, Andrew (2007) "Three Policies to Improve Productivity in Canada," in J. Leonard, C.

Sharpe, A., Arsenault, J.-F., and Lapointe, S. (2007) "The Potential Contribution of Aboriginal Canadians to Labour Force Employment, Productivity and Output Growth in Canada, 2001-2017" CSLS Research Report 2007-04, http://www.csls.ca/reports/csls2007-04.PDF.

Sharpe, A., Bradley, C. and Messinger, H. (2007) "The Measurement of Output and Productivity in the Health Care Sector in Canada: An Overview" CSLS Research Report 2007-06, http://www.csls.ca/reports/csls2007-06.PDF

Sharpe, Andrew; Arsenault, Jean-Francois and Ershov, Daniel (2007) "The Impact of Interprovincial Migration on Aggregate Output and Labour Productivity in Canada, 1987-2006", International Productivity Monitor No. 15, Fall 2007.

Sharpe, A. and Arsenault, J.-F. (2008) "Productivity Drivers in British Columbia: Strategic Areas for Improvement," CSLS Research Report 2008-9, http://www.csls.ca/reports/csls2008-9.pdf.

Sharpe, A. Harrison, P., and Arsenault, J.-F. (2008) "Investment in British Columbia: Current Realities and the Way Forward," CSLS Research Report 2008-10, http://www.csls.ca/reports/csls2008-10.pdf.

Sharpe, Andrew, Arsenault, Jean-Francois and Harrison, Peter (2008) "Why Have Real Wages Lagged Labour Productivity Growth in Canada? ", International Productivity Monitor No. 17, Fall 2008.

Sharpe, A. and Currie, I. (2008) "Competitive Intensity as Driver of Innovation and Productivity Growth: A Synthesis of the Literature" CSLS Research Report 2008-03, http://www.csls.ca/reports/csls2008-3.pdf.

Sharpe, A. and Bradley, C. (2009) "A Detailed Analysis of the Productivity Performance of Mining in Canada" CSLS Research Report 2009-07, http://www.csls.ca/reports/csls2009-7.pdf

Sharpe, Andrew, Jean-Francois Arsenault, Simon Lapointe, and Fraser Cowan (2009). *The Effect of Increasing Aboriginal Educational Attainment on the Labor Force, Output, and the Fiscal Balance*, The Centre for the Study of Living Standards, May 2009. http://www.csls.ca/reports/csls2009-3.pdf

Sharpe, Andrew and Thomson, Eric (2010) "Insights into Canada's Abysmal Post-2000 Productivity Performance from Decompositions of Labour Productivity Growth by industry and Province", International Productivity Monitor No. 20, Fall 2010.

Sharpe, Andrew (2010) "Can Sectoral Reallocations of Labour Explain Canada's Abysmal Productivity Performance? ", International Productivity Monitor No. 19, Spring 2010.

Sharpe, A. and Murray, A. (2011) "State of the Evidence on health as a Determinant of Productivity" CSLS Research Report 2011-04, http://www.csls.ca/reports/csls2011-04.pdf

Sharpe, A. and Osberg, L. (2011) "Beyond GDP: Measuring Economic Well-Being in Canada and the Provinces, 1981-2010" CSLS Research Report 2011-11, http://www.csls.ca/reports/csls2011-11.pdf

Sharpe, Andrew (2011) "Is Ageing a Drag on Productivity Growth? A Review Article on Ageing, Health and Productivity: The Economics of Increased Life Expectancy", International Productivity Monitor No. 21, Spring 2011.

Sharpe, A. and De Avillez, R. (2012) "A Detailed Analysis of Nova Scotia's Productivity Performance, 1997-2010", CSLS Research Report 2012-05, http://www.csls.ca/reports/csls2012-05.pdf

Sharpe, A. and Long, B. (2012) "Innovation in Canadian Natural Resource Industries: A Systems-Based Analysis of Performance, Policy and Emerging Challenges" CSLS Research Report 2012-06, http://www.csls.ca/reports/csls2012-06.pdf

Sharpe, A. and Grand'Maison, E. (2013) "A Detailed Analysis of Newfoundland and Labrador's Productivity Performance, 1997-2010: The Impact of the Oil Boom," CSLS Research Report 2008-9, http://www.csls.ca/reports/csls2013-05.pdf.

Sharpe, A. and Waslander, B. (2014) "The Impact of the Oil Boom on Canada's Labour Productivity Performance, 2000-2012" CSLS Research Report 2014-05, http://www.csls.ca/reports/csls2014-05.pdf

Sharpe A. and Waslander, B. (2014) " The Impact of the Oil Boom on Canada's Labour Productivity Performance, 2000-2012" International Productivity Monitor No. 27, 40-63, Fall 2014, http://www.csls.ca/ipm/27/27-csls.pdf

Sharpe, Andrew (2014)" Interprovincial; Migration in Canada: Implications for Productivity and Output Growth, " report prepared by the Centre for the Study of Living Standards for the Privy Council Office. March

Sharpe, Andrew (2015) 'Lessons for Canada from Australia's Productivity Policy", report prepared by the Centre for the Study of Living Standards for the Industry Canada forthcoming

Sharpe, Andrew (2015) "A Detailed Analysis of Ontario's Productivity Performance," report prepared by the Centre for the Study of Living Standards for the Ontario Ministry of Finance, forthcoming.

Shields, Margot (2006). "Unhappy on the Job." *Health Reports*, Statistics Canada, 17(4).

Smith, Jeremy (2004) "Assessing Aggregate Productivity Trends in Canada and the United States: Total Economy versus Business Sector", International Productivity Monitor No. 8, Spring 2004.

Spielauer, M. (2014). "The Relation between Education and Labour Force Participation of Aboriginal Peoples: A Simulation Analysis Using the Demosim Population Projection Model." *Canadian Studies in Population*, *41*(1-2), 144-164.

Statistics Canada (2008). "Age of Public Infrastructure: A Provincial Perspective," Catalogue No. 11-621-MIE — No. 067. Retrieved from: http://www.statcan.gc.ca/pub/11-621-m/11-621-m2008067-eng.pdf.

Status of Women Canada (2015). Fact Sheet: Economic Security. http://www.swc-cfc.gc.ca/initiatives/wesp-sepf/fs-fi/es-se-eng.html.

Stoneman, P. (2002). *The Economics of Technology Diffusion* Oxford: Blackwell Publishers Ltd.

Sturm, J. E. (1998) "Public Capital Expenditure in OECD Countries: The Causes and Impact of the Decline in Public Capital Spending," (UK: Edward Elgar Publishing).

Therrien, Pierre and Hanel, Petr (2011) "Innovation and Productivity: Summary Results for Canadian Manufacturing Establishments", International Productivity Monitor No. 22, Fall 2011.

Thomas, Jasmin (2015) "An Analysis of the Canada-U.S. ICT Investment Gap: An Update to 2013," report prepared by the Centre for the Study of Living Standards for Industry Canada, CSLS Research Report 2015-01http://www.csls.ca/reports/csls2015-01.pdf

Tombe and Winter. (2013) Internal Trade and Aggregate Productivity: Evidence from Canada,

Toronto City Summit Alliance (2010). "Time to Get Serious: Reliable Funding For GTHA Transit / Transportation Infrastructure," Transportation & Other Infrastructure Working Group Discussion Paper. Retrieved from: http://civicaction.ca/wp-content/uploads/2012/06/AllianceReliableFundingPaper.pdf.

Toronto Public Health (2006). "The Impacts of Traffic on Health."

Toronto Public Health (2007). "Air Pollution Burden of Illness from Traffic in Toronto."

Transport Canada (2006). "The Cost of Urban Congestion in Canada" Accessed from: http://www.adec-inc.ca/pdf/02-rapport/cong-canada-ang.pdf.

Trefler, Dan. (2004). The Long and Short of the Canada-U.S. Free Trade Agreement, *homes.chass.utoronto.ca/~**trefler**/**fta**.pdf)*

Turcotte, M. (2011). "Commuting to Work: Results of the 2010 General Social Survey," *Canadian Social Trends.* Statistics Canada Catalogue No. 11-008-X.

Vander Ploeg, C. G., and M. Holden (2013) "At the Intersection: The Case for Sustained and Strategic Public Infrastructure Investment," Canada West Foundation. Retrieved from: http://cwf.ca/pdf-docs/publications/AtTheIntersection_Feb2013.pdf.

Victoria Transport Policy Institute (2014) "TDM Encyclopedia." Retrieved from: http://www.vtpi.org/tdm/index.php.

Warner, A. M. (2014) "Public Investment as an Engine of Growth," IMF Working Paper. Retrieved from: http://www.imf.org/external/pubs/ft/wp/2014/wp14148.pdf.

Weingarten, Harvey, Martin Hicks, Linda Jonker, Carrie Smith and Hillary Arnold, (2015) Canadian Postsecondary Performance: Impact, Higher Education Quality Council of Ontario.

Wilson, Thomas A. (2003) "A Perspective on Future Productivity Growth in Canada", International Productivity Monitor No. 7, Fall 2003.

Wilson, "Red", Chair. (2008) Compete to Win, Competition Policy Review Panel.

Wood, Alexander (2015). "Ontario Climate Change Discussion Paper: Sustainable Prosperity Submission."

World Health Organization (2000) "Transportation, Environment and Health." Retrieved from: http://www.euro.who.int/__data/assets/pdf_file/0003/87573/E72015.pdf.

Wu, Zheng and Li, Nan, (2003). *Immigration and the Dependency Ratio of a Host Population*. Mathematical Population Studies, 10: 21-39.

Wylie, P. J. (1996) "Infrastructure and Canadian Economic Growth 1946-1991," *The Canadian Journal of Economics*, 29, S350-355.

Appendix A: An Overview of the Economic and Fiscal Projections

This appendix presents long-term economic and fiscal growth projections for Canada, the provinces and the territories for the 2014-2038 period. The purpose of the projections is to determine whether the baseline projections for nominal GDP growth exceed the nominal GDP growth rates required for revenues to keep pace with expected growth in public expenditures.

It is important to note that we are not making forecasts but only conditional projections based on various assumptions. Since these assumptions are subject to uncertainty, the results of various sensitivity analyses are also presented. In particular, we present six alternative scenarios for the economic projections and two alternative scenarios for the fiscal projections.

A. Description of the Economic Projections

There are seven scenarios for projected nominal GDP growth: the baseline projections and six alternative scenarios. All of the projections for nominal GDP growth are based on assumptions related to labour productivity growth, GDP deflator growth, growth in average hours worked, working age population growth, and growth in labour force participation rates. In order to account for the effect of compositional changes on average hours worked and the overall participation rate, the population is broken down into three age groups: 15-24 years, 25-54 years, and 55+ years.

The baseline projections are based on the following assumptions:

- **Labour productivity:** We assume that total economy labour productivity growth will be the same as the historical growth rates by province observed over the 2000-2014 period.

- **GDP deflator:** We assume that all of the provinces will experience GDP deflator growth of 2.0 per cent per annum.

- **Working age population:** We employ the M1 scenario from Statistics Canada's official population projections. This scenario predicts annual working age population growth of 0.9 per cent at the national level between 2014 and 2038.

- **Average hours worked:** We assume that average hours worked in every province will decline at the same pace as at the national level in 1976-2014 (that is, -0.56 per cent for the 15-24 age group, -0.14 per cent for the 25-54 age group, and -0.25 per cent for the 55+ age group).

- **Participation rates:** We assume that, in every province, the participation rate for the 15-24 age group will decline at the same pace as at the national level in 2000-2014 (-0.02 per cent); that the participation rate for the 25-54 age group will remain at its 2014 level; and that the participation rate for the 55+ age group will increase over time, but at a diminishing rate, based on trends observed at the national level in 2000-2014.

We present six alternative scenarios to show the sensitivity of the baseline projections to changes in its underlying assumptions. These scenarios are briefly described below.

- **Alternative scenario 1:** Instead of applying the same GDP deflator growth rate to every province, we use historical GDP deflator growth rates by province from the 2000-2014 period.

- **Alternative scenario 2:** Instead of using the national growth rates in average hours worked by age group from the 1976-2014 period, we use the national growth rates in average hours worked by age group from the 2000-2014 period.

- **Alternative scenario 3:** Rather than applying the historical labour productivity growth rates by province from the 2000-2014 period, we use the national labour productivity growth rate from the 2000-2014 period (0.99 per cent) for every province.

- **Alternative scenario 4:** Instead of applying the M1 growth scenario, we use the high-growth scenario from Statistics Canada's official population projections.

- **Alternative scenario 5:** In place of the M1 growth scenario, we use the low-growth scenario from Statistics Canada's official population projections.

- **Alternative scenario 6:** Rather than using the national growth rates in average hours worked by age group from 1976-2014, we use the provincial growth rates in average hours worked by age group from 1976-2014.

B. Description of the Fiscal Projections

There are three scenarios for public spending growth: the base case, alternative scenario A, and alternative scenario B. These scenarios are briefly described below.

- **Base case:** We assume that public spending will be constant in real per capita terms, with growth in nominal per capita expenditure at the assumed inflation rate (2.0 per cent).

- **Alternative scenario A:** We assume that public spending – divided into health and non-health spending – will be constant in real per capita terms, with growth in nominal per capita non-health spending at the assumed inflation rate (2.0 per cent) and nominal per capita health spending at the historical growth rates by province in the deflator for health spending from the 2000-2014 period (which range from 2.2 to 3.6 per cent).

- **Alternative scenario B:** We assume that non-health spending will be constant in real per capita terms, with growth in nominal per capita non-health spending at the assumed inflation rate (2.0 per cent). However, it is assumed that health spending will be positive in real per capita terms, with growth in nominal per capita health spending at the historical growth rates by province from the 2000-2014 period (which range from 3.6 to 6.1 per cent).

C. Results

Appendix Table A1: Nominal GDP Growth Required for Revenues to Grow in Line with Government Expenditures, Base case, Compound Annual Growth Rates, Per Cent, Canada and the Provinces and Territories, 2014-2026 and 2026-2038

	2014-2026				2026-2038			
	Nominal Per Capita Expenditure	Total Population	Required Nominal GDP (Base Case)	Projected Nominal GDP (Baseline)	Nominal Per Capita Expenditure	Total Population	Required Nominal GDP (Base Case)	Projected Nominal GDP (Baseline)
Canada	2.00	0.94	2.96	3.58	2.00	0.76	2.77	3.60
Newfoundland and Labrador	2.00	-0.42	1.57	2.56	2.00	-0.76	1.23	2.56
Prince Edward Island	2.00	0.92	2.94	3.66	2.00	0.71	2.72	3.59
Nova Scotia	2.00	0.09	2.09	2.70	2.00	-0.17	1.83	2.73
New Brunswick	2.00	0.11	2.11	2.79	2.00	-0.16	1.83	2.77
Quebec	2.00	0.68	2.69	3.20	2.00	0.45	2.46	3.25
Ontario	2.00	0.89	2.91	3.45	2.00	0.71	2.72	3.44
Manitoba	2.00	1.06	3.08	4.37	2.00	0.94	2.96	4.39
Saskatchewan	2.00	0.77	2.78	3.87	2.00	0.60	2.61	3.94
Alberta	2.00	1.87	3.91	4.37	2.00	1.63	3.66	4.32
British Columbia	2.00	1.11	3.13	4.18	2.00	0.93	2.95	4.19
Yukon	2.00	0.82	2.83	3.48	2.00	0.46	2.47	3.57
Northwest Territories	2.00	0.23	2.23	1.30	2.00	-0.11	1.89	1.20
Nunavut	2.00	1.15	3.17	3.85	2.00	0.99	3.01	3.67

Note: The base case assumes that public spending will be constant in real per capita terms, with growth in nominal per capita expenditure at the assumed inflation rate (2.0 per cent in every province and territory).
Source: CSLS calculations based on Statistics Canada data.

Appendix Table A2: Nominal GDP Growth Required for Revenues to Grow in Line with Government Expenditures, using Historical Deflator Growth for Health Spending, Compound Annual Growth Rates, Alternate Scenario A, Per Cent, Canada and the Provinces and Territories, 2014-2026 and 2026-2038

	2014-2026						2026-2038					
	Nominal Per Capita Expenditure			Total Population	Required Nominal GDP (Scen. A)	Projected Nominal GDP (Baseline)	Nominal Per Capita Expenditure			Total Population	Required Nominal GDP (Scen. A)	Projected Nominal GDP (Baseline)
	Health	Non-health	Total				Health	Non-health	Total			
Canada	2.81	2.00	2.29	0.94	3.25	3.58	2.81	2.00	2.31	0.76	3.08	3.60
Newfoundland and Labrador	3.14	2.00	2.43	-0.42	1.99	2.56	3.14	2.00	2.46	-0.76	1.69	2.56
Prince Edward Island	2.90	2.00	2.34	0.92	3.28	3.66	2.90	2.00	2.36	0.71	3.08	3.59
Nova Scotia	2.75	2.00	2.33	0.09	2.42	2.70	2.75	2.00	2.34	-0.17	2.17	2.73
New Brunswick	2.99	2.00	2.36	0.11	2.47	2.79	2.99	2.00	2.39	-0.16	2.22	2.77
Quebec	2.54	2.00	2.15	0.68	2.84	3.20	2.54	2.00	2.15	0.45	2.61	3.25
Ontario	2.82	2.00	2.32	0.89	3.23	3.45	2.82	2.00	2.33	0.71	3.06	3.44
Manitoba	3.01	2.00	2.41	1.06	3.50	4.37	3.01	2.00	2.44	0.94	3.41	4.39
Saskatchewan	3.32	2.00	2.51	0.77	3.29	3.87	3.32	2.00	2.55	0.60	3.17	3.94
Alberta	3.55	2.00	2.61	1.87	4.53	4.37	3.55	2.00	2.68	1.63	4.35	4.32
British Columbia	2.23	2.00	2.09	1.11	3.23	4.18	2.23	2.00	2.10	0.93	3.05	4.19
Yukon	3.41	2.00	2.31	0.82	3.14	3.48	3.41	2.00	2.35	0.46	2.82	3.57
Northwest Territories	3.00	2.00	2.22	0.23	2.45	1.30	3.00	2.00	2.24	-0.11	2.13	1.20
Nunavut	3.39	2.00	2.44	1.15	3.62	3.85	3.39	2.00	2.49	0.99	3.50	3.67

Note: Alternative scenario A assumes that public spending – divided into health and non-health spending – will be constant in real per capita terms, with growth in nominal per capita non-health spending at the assumed inflation rate (2.0 per cent) and nominal per capita health spending at the historical growth rates in the deflator for health spending in 2000-2014 (which range from 2.2 to 3.6 per cent).

Source: CSLS calculations based on Statistics Canada and Canadian Institute of Health Information data.

Appendix Table A3: Nominal GDP Growth Required for Revenues to Grow in Line with Government Expenditures, using Historical Nominal Per Capita Spending Growth for Health Spending, Compound Annual Growth Rates, Alternative Scenario B, Per Cent, Canada and the Provinces and Territories, 2014-2026 and 2026-2038

	2014-2026						2026-2038					
	Nominal Per Capita Expenditure			Total Population	Required Nominal GDP (Scen. B)	Projected Nominal GDP (Baseline)	Nominal Per Capita Expenditure			Total Population	Required Nominal GDP (Scen. B)	Projected Nominal GDP (Baseline)
	Health	Non-health	Total				Health	Non-health	Total			
Canada	4.56	2.00	2.98	0.94	3.94	3.58	4.56	2.00	3.16	0.76	3.94	3.60
Newfoundland and Labrador	5.64	2.00	3.50	-0.42	3.06	2.56	5.64	2.00	3.88	-0.76	3.09	2.56
Prince Edward Island	5.88	2.00	3.61	0.92	4.57	3.66	5.88	2.00	4.04	0.71	4.78	3.59
Nova Scotia	6.07	2.00	3.97	0.09	4.07	2.70	6.07	2.00	4.44	-0.17	4.26	2.73
New Brunswick	5.34	2.00	3.34	0.11	3.45	2.79	5.34	2.00	3.66	-0.16	3.49	2.77
Quebec	4.35	2.00	2.69	0.68	3.39	3.20	4.35	2.00	2.83	0.45	3.30	3.25
Ontario	4.26	2.00	2.92	0.89	3.83	3.45	4.26	2.00	3.06	0.71	3.79	3.44
Manitoba	4.66	2.00	3.16	1.06	4.25	4.37	4.66	2.00	3.36	0.94	4.34	4.39
Saskatchewan	5.46	2.00	3.44	0.77	4.23	3.87	5.46	2.00	3.78	0.60	4.40	3.94
Alberta	5.90	2.00	3.68	1.87	5.62	4.37	5.90	2.00	4.12	1.63	5.81	4.32
British Columbia	3.56	2.00	2.66	1.11	3.81	4.18	3.56	2.00	2.73	0.93	3.69	4.19
Yukon	5.77	2.00	2.92	0.82	3.77	3.48	5.77	2.00	3.26	0.46	3.73	3.57
Northwest Territories	5.37	2.00	2.85	0.23	3.08	1.30	5.37	2.00	3.11	-0.11	3.00	1.20
Nunavut	5.32	2.00	3.14	1.15	4.33	3.85	5.32	2.00	3.44	0.99	4.47	3.67

Note: Alternative scenario B assumes that non-health spending will be constant in real per capita terms, with growth in nominal per capita non-health spending at the assumed inflation rate (2.0 per cent). However, it assumes that health will be positive in real per capita terms, with growth in nominal per capita health spending at the historical growth rates in nominal per capita health spending in 2000-2014 (which range from 3.6 to 6.1 per cent).

Source: CSLS calculations based on Statistics Canada and Canadian Institute of Health Information data.

Appendix Table A4: List of Jurisdictions where Required Nominal GDP Growth is Above Projected Nominal GDP Growth by Scenario for Public Spending Growth and by Scenario for Projected Nominal GDP Growth, Canada and the Provinces and Territories, 2014-2026 and 2026-2038

Scenario for Nominal GDP Growth	2014-2026			2026-2038		
	Scenario for Public Spending Growth			Scenario for Public Spending Growth		
	Base Case	Alternative Scenario A	Alternative Scenario B	Base Case	Alternative Scenario A	Alternative Scenario B
Baseline Projections	NT	AB, NT	All jurisdictions except for MB and BC	NT	AB, NT	All jurisdictions except for MB and BC
Alternative Scenario 1	NT	NT	PE, NS, NB, QC, ON, YT, NT	NT	NT	PE, NS, NB, QC, ON, AB, YT, NT
Alternative Scenario 2	NT	ON, AB, NT	All jurisdictions except for BC	NT	AB, NT, NU	All jurisdictions except for BC
Alternative Scenario 3	None	NL	All jurisdictions	None	None	All jurisdictions except for BC
Alternative Scenario 4	NT	NT	NL, PE, NS, NB, ON, SK, AB, NT, NU	NT	NT	NL, PE, NS, NB, SK, AB, NT, NU
Alternative Scenario 5	NT	ON, AB, NT	All jurisdictions	NT	ON, AB, NT, NU	All jurisdictions
Alternative Scenario 6[a]	None	AB	All provinces except for MB and BC	None	None	All provinces except for MB and BC

Note: This table shows the jurisdictions for which required nominal GDP growth is expected to be greater than projected nominal GDP growth. There are three scenarios for required nominal GDP growth (the base case, alternative scenario A and alternative scenario B), which are described in Appendix Table 4. There are seven scenarios for projected nominal GDP growth: the baseline projections and six alternative scenarios. The different alternative scenarios for projected nominal GDP growth are described below:
1) Alternative scenario 1 uses historical GDP deflator growth rates by province and territory for 2000-2014.
2) Alternative scenario 2 uses the (typically lower) national growth rates in average hours worked by age group for 2000-2014.
3) Alternative scenario 3 uses the historical national labour productivity growth rate of 0.99 per cent per year for each province and territory.
4) Alternative scenario 4 uses the high population growth scenario from Statistics Canada's official population projections.
5) Alternative scenario 5 uses the low population growth scenario from Statistics Canada's official population projections.
6) Alternative scenario 6 uses the provincial growth rates in average hours worked by age group for 1976-2014.
[a] The territories are excluded from alternative scenario 6.
Source: CSLS calculations based on Statistics Canada and Canadian Institute of Health Information data.

Appendix B: Investment

i. Private Investment

This appendix outlines the historical and current role of business investment in Canada. First it looks at Canadian business investment as a whole, examining annual investment levels, overall capital stock as well as gross and depreciation. Secondly, it examines the breakdown of investment levels and capital stock amongst the provinces, and thirdly Canada's business investment is examined within the context of the international community. Business investment is examined through the lens of its proportion of nominal GDP and per hours worked.

Canada-wide trends in Business Investment

Canada-wide annual Business Investment Intensity

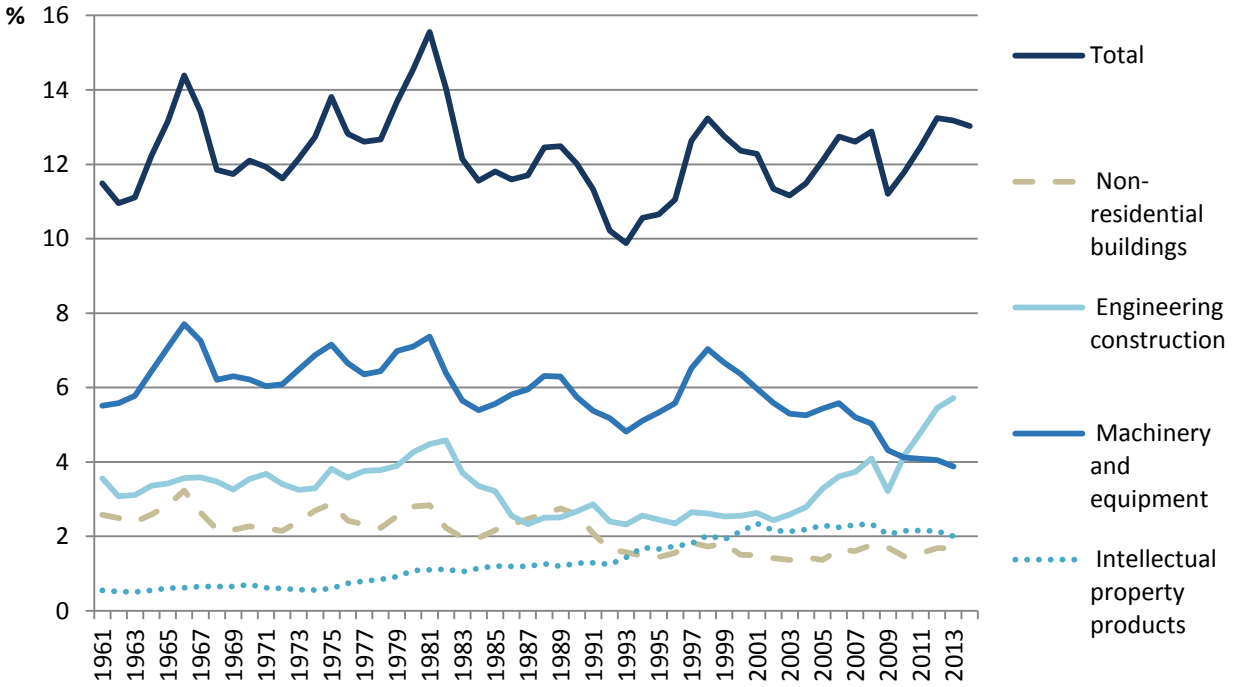
Canada's intensity of annual total gross business investment, defined as gross, business fixed, non-residential investment as a share of nominal GDP, has fluctuated within different ranges in several distinct periods (Appendix Chart B1). From 1961 to 1981 the annual percentage of nominal GDP invested by businesses increased in cycles from a low of 11.49 per cent in 1961 to a high of 15.56 per cent in 1981. From 1981 to 1993 business investment plunged to an all-time low of 9.88 per cent of nominal GDP, after which it recovered to 13.23 per cent in 1998, since then fluctuating within a range of 11.15 per cent to 13.23 per cent.

The individual component parts of the total gross business investment, namely non-residential buildings, engineering construction, machinery and equipment and intellectual property products (IPPs), each have evolved in a distinct manner. IPPs, which as a category are made up of software, research and development, as well as mineral exploration and evaluation, have seen a steady increase in their share of GDP, from 0.55 per cent in 1961 to 2.35 per cent in 2001, after which it has remained approximately steady at a little above 2 per cent. Business investment in non-residential buildings has gone through two distinct phases: from 1961 to 1991 there was regular fluctuation between approximately 2 and 3 per cent per annum, while between 1991 and 2014 the range of fluctuation was narrower and at a lower level, namely between 1.35 and 1.75 per cent. Business investment in engineering construction rose from 3.56 per cent in 1961 to 4.58 per cent in 1982, after which it fell to 2.32 per cent in 1987, where it approximately remained until 2002, at which point it began rising again, more than doubling to a share of 5.71 per cent of nominal GDP in 2013. The recent increases in business engineering construction investment as a percentage of nominal GDP can be mostly explained through business resource development investment, which has seen a boom in specific provinces, most heavily in Alberta and Newfoundland and Labrador.

Machinery and equipment, which has historically been the largest component of business investment, has seen its share of nominal GDP rise and fall between a range of 5.50 per cent and 7.70 per cent from 1961 to 1990, after which the share decreased to a low of 4.81 per cent by 1993. Following a temporary recovery to 7.03 per cent in 1998 there has been a steady decrease in business investment in machinery and equipment, falling to 3.87 per cent in 2013, a decrease

representing almost half of the proportion achieved in 1998. 2010 saw annual business investment in engineering construction overtake machinery and equipment as the largest single component of total fixed, non-residential investment in Canada for the first time in the recorded data, and the gap between the two has widened ever since to the benefit of machinery and equipment.

Appendix Chart B1: Nominal Total Gross Business, Fixed, Non-Residential Investment by Component, Share of Nominal GDP, Per Cent, Canada, 1961-2013



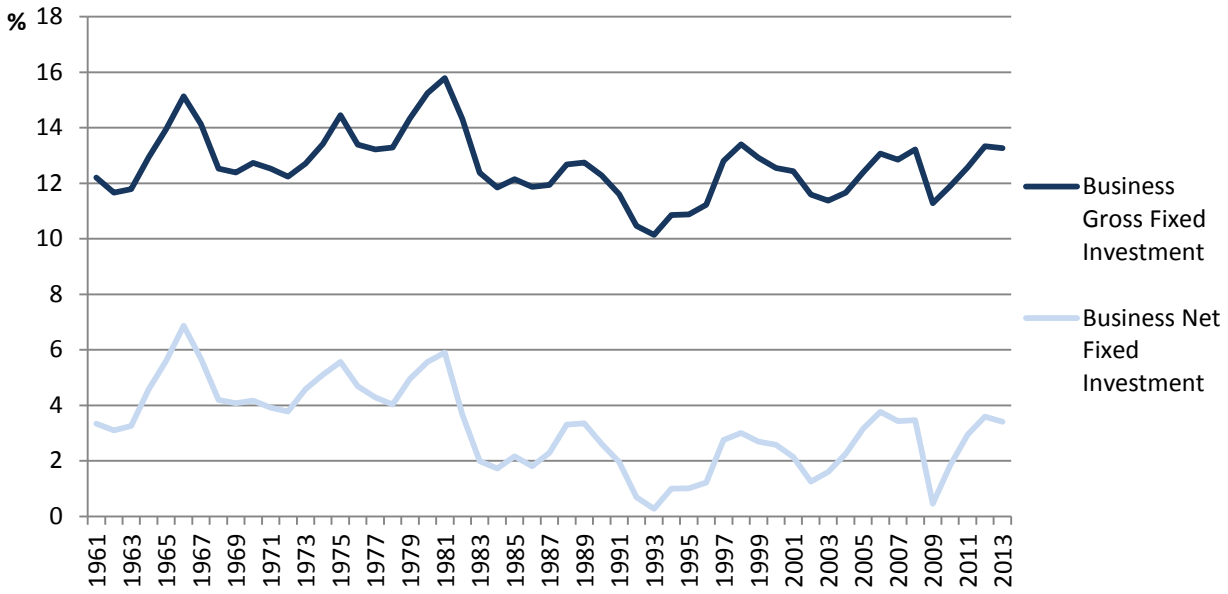
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 031-0005, 380-0064, 384-0038, and 380-0017.

Canada-wide Gross and Net investment

Appendix Chart B2 shows the gross and net business investment across Canada from 1961 to 2013. As can be seen, depreciation (the difference between gross and net business investment) as a share of GDP remains fairly constant, ranging from approximately 8.10 to 9.00 per cent from 1961 to 1977, after which the range broadens slightly and becomes greater, with depreciation fluctuating between approximately 9.00 and 11.00 per cent. This slight increase can be partially attributed to the increasing tendency of investments to have shorter life spans – computers and other ICT investments for example have a far shorter life span than do traditional business investments, such as buildings.

Both gross and net business investment go through two phases: from 1961 to 1981 and from 1981 to 2013. In the first phase both net and gross business investment fluctuate at higher levels (around 14 and 5 per cent respectively), while in the second both fluctuate at lower levels, around 12 and 2 per cent respectively.

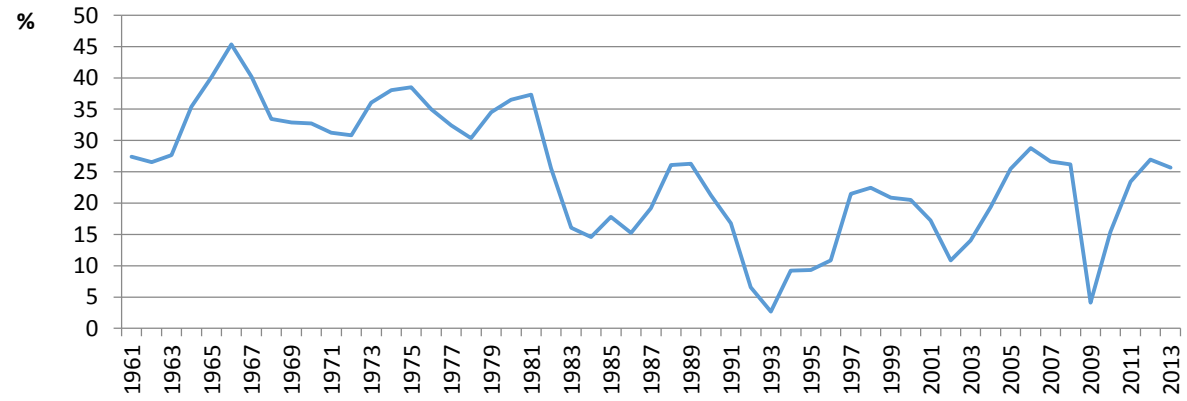
Appendix Chart B2: Business Sector (All industries – Government Sector) Gross and Net Fixed, Non-Residential Investment, Share of Nominal GDP, Per Cent, Canada, 1961-2013



Note: Business Net Fixed Investment calculated using Linear Depreciation.
Source: CSLS Calculations based on Statistics Canada Data. CANSIM tables 031-0005, 380-0017, 384-0064.

The same two phases can be observed when measuring business net investment as a proportion of business gross investment. From 1961 to 1981 the proportion fluctuates around approximately 35 per cent, while between 1981 and 2013 the proportion fluctuates within a broader range of approximately 5 and 28 per cent. Since depreciation remains relatively fixed over time, drops in gross business investment can lead to incredibly low net business investment figures, such as that recorded in 1993, where net business investment made up only 0.27 per cent of nominal GDP and only 2.68 per cent of gross business investment.

Appendix Chart B3: Share of Business (Total Industries – Government Sector) Net Investment in Gross Business Investment, Business Sector Fixed, Non-Residential Investment, Per Cent, Canada, 1961-2013



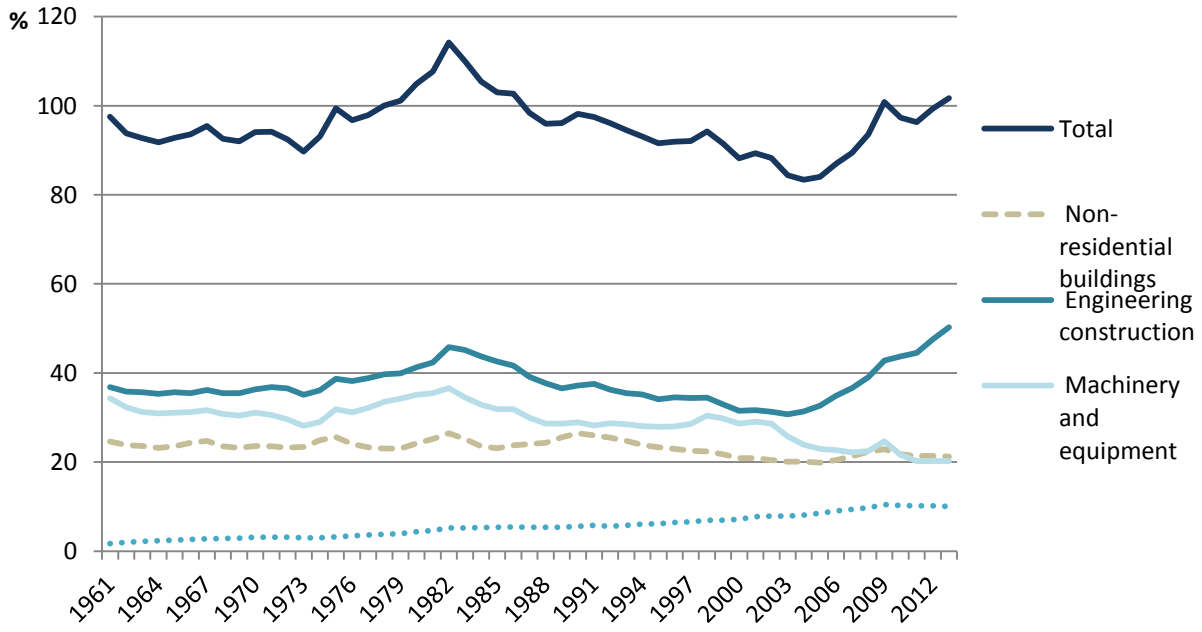
Note: Business Net Fixed Investment calculated using Linear Depreciation.
Source: CSLS Calculations based on Statistics Canada Data. CANSIM tables 031-0005, 380-0017, 384-0064.

Canada-wide Business Capital Stock

Canada's total business capital stock has gone through four phases since 1961 (Appendix Chart B4). From 1961 to 1973 the capital stock slowly decreased from 97.52 per cent of nominal GDP to 89.72 per cent. From 1973 to 1982 there was a sharp recovery and increase to an all-time peak of 114.18 per cent, after which a slow, steady decline occurred, reducing the total business capital stock to 83.42 per cent by 2004. Since then there have been yearly increases, however dipping slightly in 2010 and 2011, ultimately coming to 101.71 per cent of nominal GDP in 2013.

The business IPP capital stock has steadily risen from a share of 1.70 per cent in 1961 to approximately 10.00 per cent in 2013. The stock of non-residential buildings held constant between 1961 and 1992 in an approximate range of 23 and 26 per cent, after which it has held steady in a lower range of 20 to 23 per cent. The developments in the engineering construction and machinery and equipment capital stocks of both largely reflected the trends seen in total business capital stock up until 2001. From 1961 to 1973 both experienced a slight decrease from 36.85 to 35.13 per cent and 34.35 to 28.15 per cent respectively, engineering construction increased to 45.83 and machinery and equipment rebounded to 36.64 per cent by 1982. Both stocks saw long-term declines to 30.70 and 25.78 per cent respectively by 2003. From there on the paths diverge – engineering construction business capital stocks have since grown to an all-time high of 50.28 per cent of nominal GDP while machinery and equipment stocks have fallen to an all-time low of 20.21 per cent, falling for the first time below the share of nominal GDP represented by the non-residential business capital stock.

Appendix Chart B4: Business (All industries – Government Sector) Net Fixed, Non-Residential Capital Stock by Component, Share of Nominal GDP, Per Cent, Canada, 1961-2013

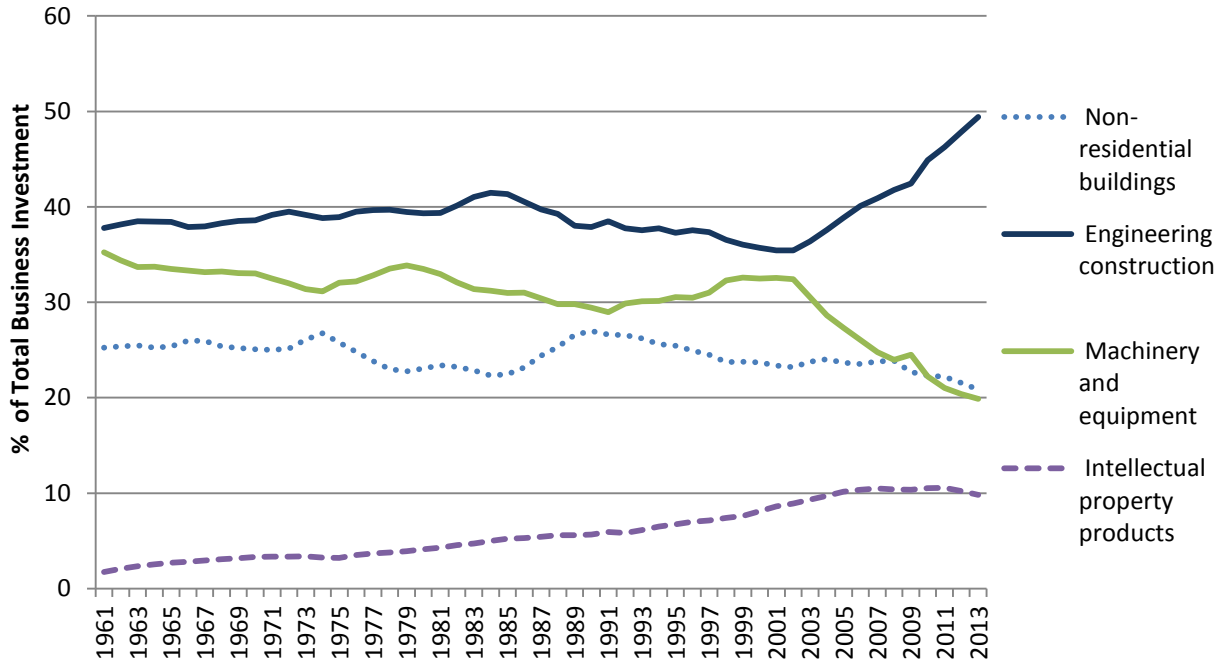


Linear end of year net fixed, Non-Residential capital stock used to represent net Non-Residential Capital Stock

Source: CSLS Calculations based on Statistics Canada Data. CANSIM tables 031-0005, 380-0017, 384-0064.

The share of each component of the business capital stock in the total business capital stock reflects largely the same story as is told by each component's share of nominal GDP (Appendix Chart B5). IPP business capital stock's share of the total business capital stock has increased from 1.74 per cent to 10.54 per cent in 2011, after which it has declined slightly to 9.83 per cent. Non-residential building's share of the total business capital stock has remained steady in a range of 22 to 27 per cent, though since 2011 there has been an additional decrease outside of this range, reaching a low of 20.87 per cent in 2013, yet at the same time reaching a higher proportion of overall share of the business capital stock than the non-residential business capital stock. Machinery and equipment business capital stock has seen its share of total business capital stock fall dramatically since 2001 from its historical norm of approximately 32 per cent to a low of 19.87 per cent in 2013. Conversely, the engineering construction capital stock has surged since 2002 to represent approximately 50 per cent of the total business capital stock, up from an average of 40 per cent from 1961 to 1983 and a share between 35 and 40 per cent from 1983 to 2002.

Appendix Chart B5: Share of Fixed, Non-residential Business Capital Stock Components (All industries-Government Sector) of Total Fixed, Non-residential Business Capital Stock, Per Cent, Canada, 1961-2013



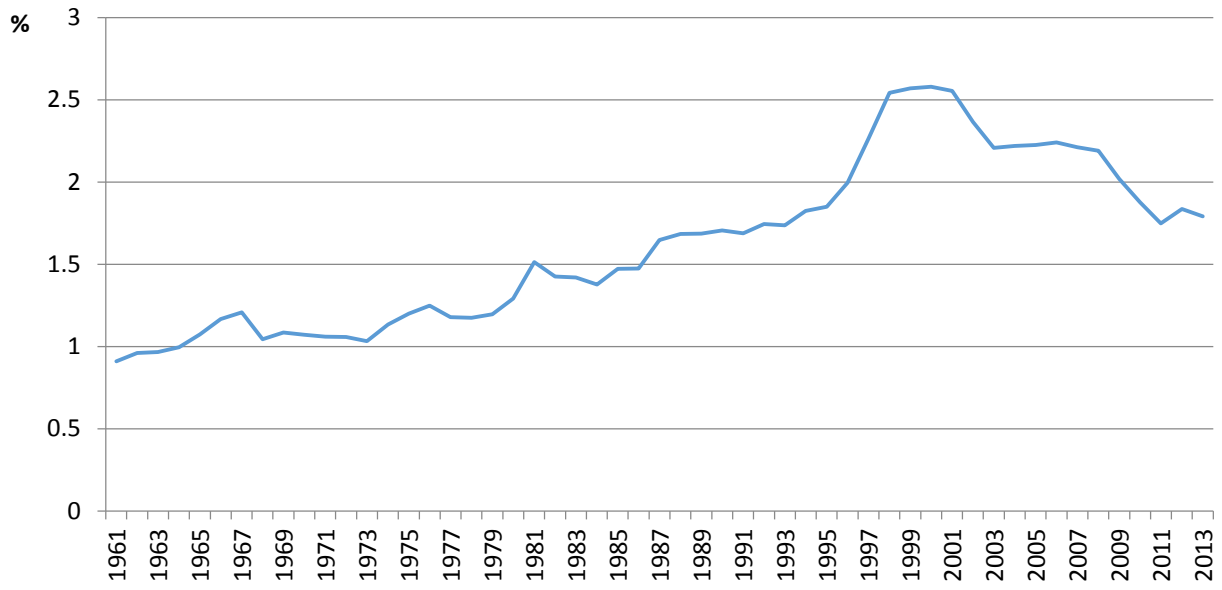
Linear end of year net fixed, Non-Residential capital stock used to represent net Non-Residential Capital Stock
Source: CSLS calculations based on Statistics Canada Data. CANSIM table 031-0005.

Canada-wide ICT Business Investment

Appendix Chart B6 shows the development of ICT business investment in Canada since 1961. Beginning in the 1960s and lasting well into the early 90s, ICT investment as a share of nominal GDP increased fairly steadily, increasing from 0.90 per cent in 1961 to 1.85 per cent in 1995. At that point there was a steep increase all the way up to 2.58 per cent in 2000. Having

reached this high point, business ICT investment went on to steadily decrease over the course of the next 13 years to a figure still well above the historical range, namely 1.97 per cent of nominal GDP.

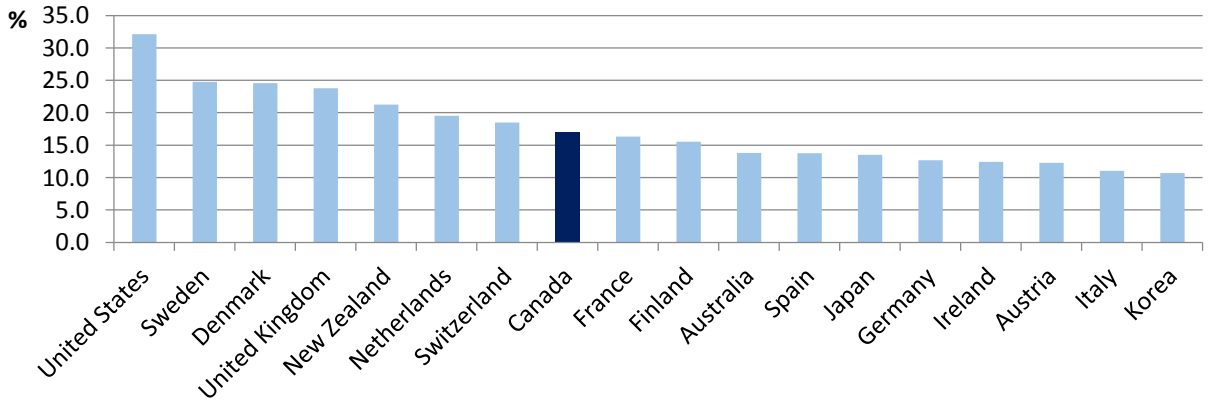
Appendix Chart B6: Business Sector (All industries – Government Sector) Gross Fixed, ICT (Computers and Electronics, Software) Investment, Share of Nominal GDP, Per Cent, Canada, 1961-2013



Note: 1961-1976 figures do not include business software investment, Data not available.
Source: CSLS calculations based on Statistics Canada Data. CANSIM tables 0031-0006, 380-0017 and, 384-0064

Compared to other nations, Canada's investment in ICTs as a proportion to total investment (no specific data for business ICT investment available) is middling, placing far behind the progress of the United States, Sweden and Denmark, while at the same time being significantly ahead of nations like Korea and Italy.

Appendix Chart B7: Total Gross Fixed, ICT Investment, Share of Gross Fixed Investment, Per Cent, 2010



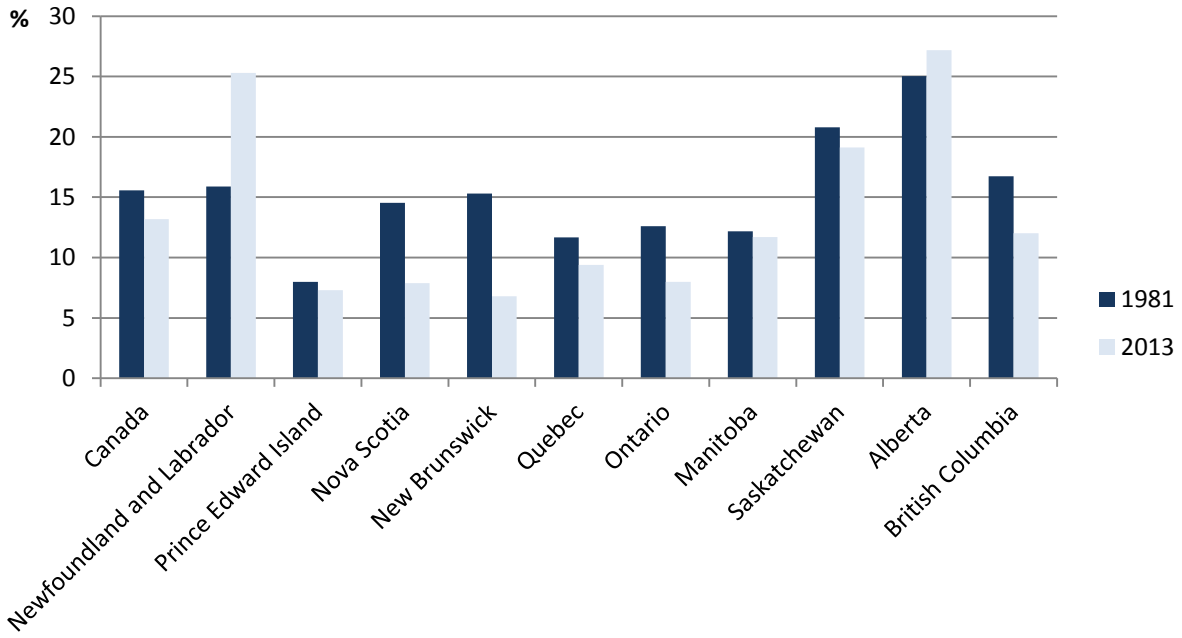
NOTE: Data for Australia, Denmark, the Netherlands and the United Kingdom are for 2007. Data for Australia and Japan are for 2008. Data for France and Sweden are for 2009.
Source: OECD Data

Trends in Canada-wide and provincial Business Investment

Canada-wide and provincial annual Business Investment Intensity

The modest decrease in annual business investment intensity measured across Canada, 15.56 to 13.18 per cent from 1981 to 2013 is reflected in Prince Edward Island (7.98 to 7.29 per cent), Quebec (11.66 to 9.39 per cent), Manitoba (12.18 to 11.70 per cent) and Saskatchewan (20.78 to 19.12 per cent). Larger decreases were measured in Nova Scotia (14.53 to 7.89 per cent), New Brunswick (15.30 to 6.80 per cent), Ontario (12.59 to 8.00 per cent), and British Columbia (16.72 to 12.01 per cent). Provinces that have experienced more resource development since 1981 have on the other hand seen increases in business investment intensity, with Alberta posting a slight increase of 25.02 to 26.19 per cent, while Newfoundland and Labrador experienced a dramatic increase from 15.89 to 25.30 per cent.

Appendix Chart B8: Business Sector (Total industries – Government Sector) Gross Fixed, Non-residential Investment, Share of Nominal GDP, Per Cent, Canada and the Provinces, 1981 and 2013



Note: 2013 PEI Total Business Gross Fixed Investment figure does not include IPP figures.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables, 380-0017, 384-0038, and 380-0064.

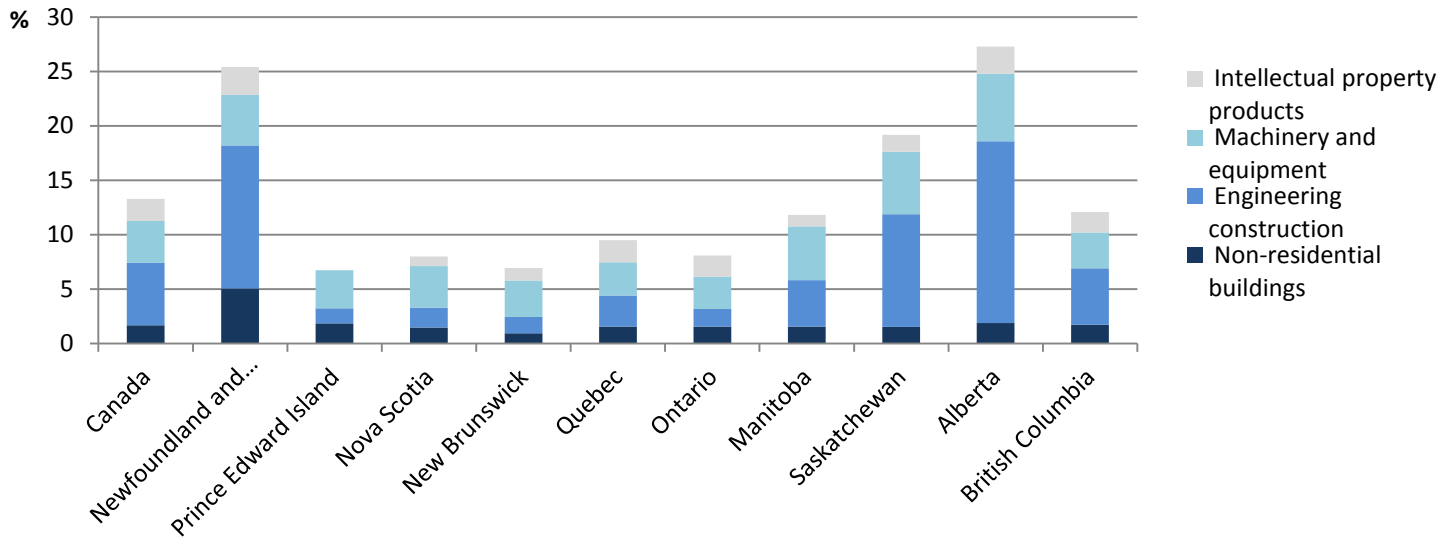
Breaking down annual provincial business investment intensity by component shows that the greatest variation amongst provinces is the proportion of engineering construction investment undertaken. Provinces that experienced increases in business investment intensity from 1981 to 2013, namely Alberta and Newfoundland and Labrador, have a dramatically larger proportion of business investment in engineering construction, 16.7 and 13.15 per cent respectively, than Canada overall (5.71 per cent) or any of the other provinces. Saskatchewan, which held its total business investment relatively steady from 1981 to 2013, also has a larger share of engineering construction investment, 10.45 per cent. Other provinces can be grouped into two categories on engineering construction – those whose proportion is between 1 and 2 per cent (PEI, Nova

Scotia, New Brunswick, Ontario, and those whose proportion is somewhat higher, namely Quebec (2.84 per cent), Manitoba (4.26 per cent) and British Columbia (5.14 per cent.)

There is far less variation amongst the provinces in the shares of other components of business investment. Non-residential business investment operates within a very narrow band, within most provinces, falling within the range of 1.45 to 1.87 per cent. The exceptions are Newfoundland and Labrador, which saw a far greater proportion of 5.04 per cent and New Brunswick, in which businesses invested only 0.94 per cent of GDP in non-residential capital.

IPP business investment ranges from 0.87 per cent in Nova Scotia to 2.54 in Newfoundland and Labrador, with no data available for PEI. Provincial business investment in machinery and equipment falls within a range of 2.98 per cent in Ontario to 6.22 per cent in Alberta.

Appendix Chart B9: Business Sector (All industries – Government Sector) Gross Fixed, Non-Residential Investment by Component, Share of Nominal GDP, Per Cent, Canada and the Provinces, 2013

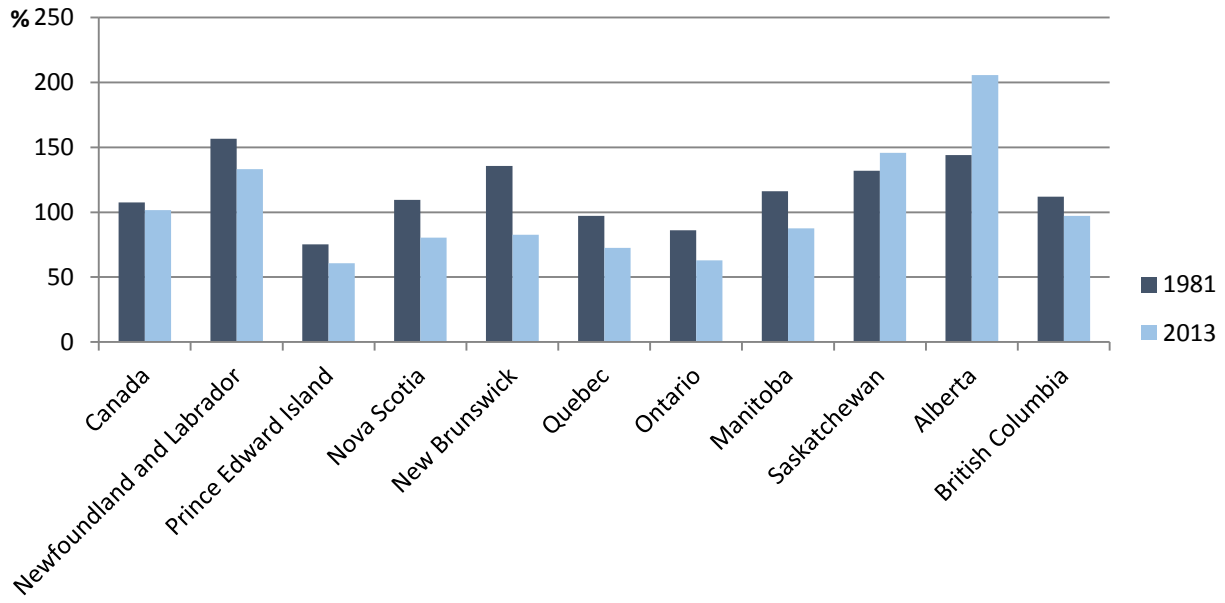


Note: 2013 PEI IPP figures not available
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 031-0005, 380-0017, 380-0064, 384-0038

Canada-wide and provincial annual Business Capital Stock

The business capital stock decline by 5.93 percentage points of nominal GDP is reflected in all but two of its provinces. Alberta (+ 61.66 percentage points) and Saskatchewan (+ 13.65 percentage points) were the only two provinces to see an increase in the business capital stock between 1981 and 2013. British Columbia experienced a 14.76 percentage point decline in the capital stock, while Manitoba, Newfoundland and Labrador, Quebec and Ontario all posted roughly 23-28 percentage point declines. The greatest decline was seen in New Brunswick, with a decline of 54.01 percentage of nominal GDP.

Appendix Chart B10: Business Sector (All industries – Government Sector) Gross Fixed, Non-Residential Capital Stock by Component, Share of Nominal GDP, Per Cent, Canada and the Provinces, 2013



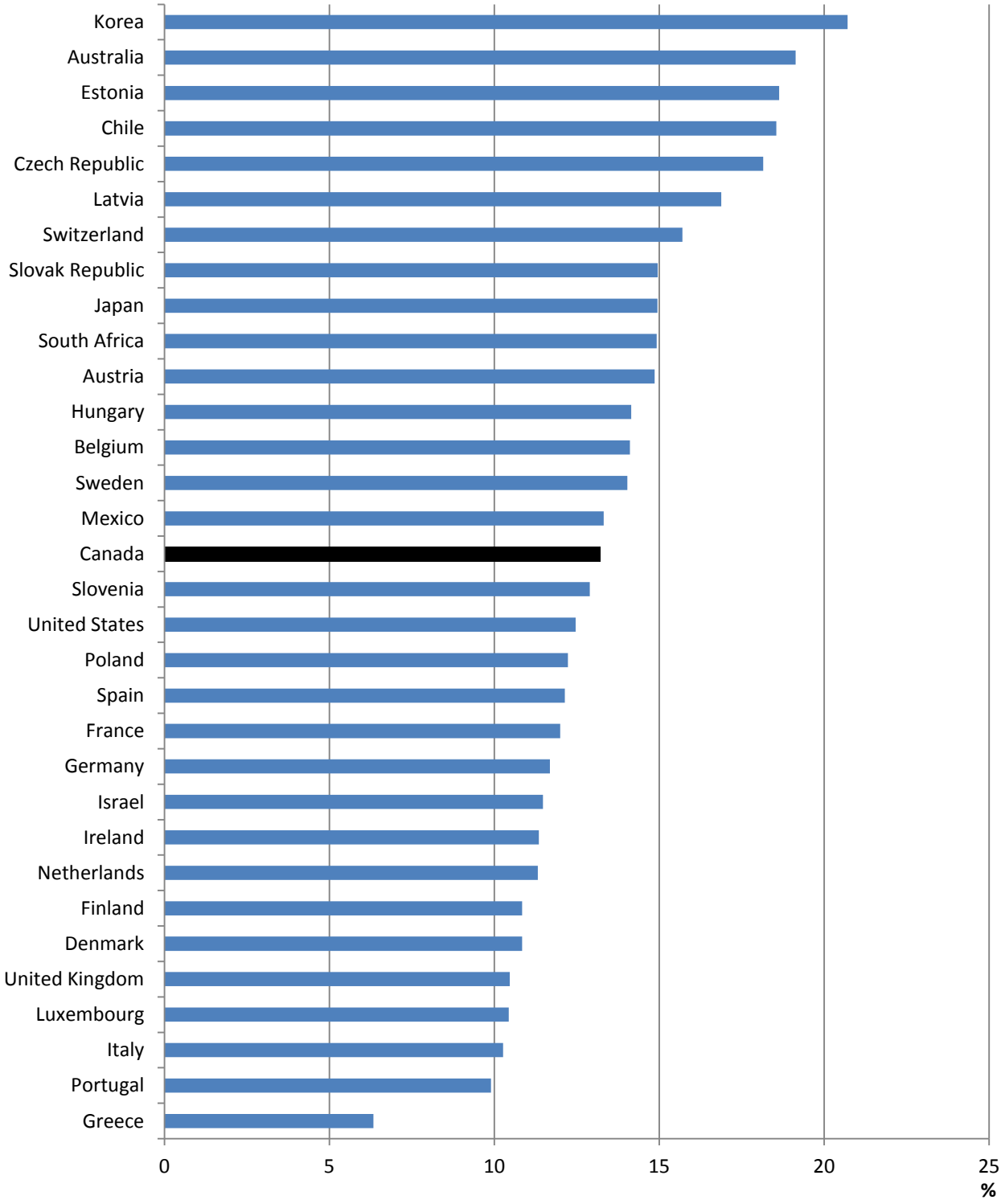
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 031-0005, 380-0017, and 384-0064.

International Comparison of Canada's Business Investment Intensity

Appendix Chart B11 shows Canada's business investment intensity in 2013 compared to a subsection of other OECD members. Of the 32 countries for which data were available, Canada's business investment intensity fell largely in the middle of the pack. It ranked higher than most of the Western and Southern European countries ranked (Greece, Portugal, Italy, Belgium, Poland, Spain, France, Germany, the United Kingdom, Denmark, Finland, the Netherlands, Ireland and Slovenia) as well as Israel and the United States.

Canada was however ranked below a variety of Eastern and Central European countries (Estonia, Czech Republic, Latvia, Slovak Republic, Austria and Hungary) as well as Mexico, Japan, Australia, Korea.

Appendix Chart B11: International Comparison of Business, Gross Fixed, Non-Residential Investment, Share of Nominal GDP, Per Cent, 2013



Source: CSLS calculations based on OECD Data. Dataset 1: Gross Domestic Product and Dataset 12: Government deficit/surplus, revenue, expenditure and main aggregates

The key findings from the previous parts are briefly outlined below.

- The intensity of Canada-wide business investment has been recovering since the 1981-1993 decline, reaching a low of 9.88 per cent in 1993 and climbing back up to 13.02 per cent since then. The recent increases in business investment intensity were driven mostly by increased private investment in engineering construction and a slow increase of IPP investment that has been ongoing since 1961.

- The intensity of private investment Canada-wide is still lower than its peak in 1981 (13.02 versus 15.56 per cent), but is still broadly in line with historical averages. A dramatic increase in engineering construction investment intensity since 2001 has been offset by a decrease in machinery and equipment investment intensity, the steady increases of IPP investment intensity have been somewhat offset by slightly lower investment intensity in non-residential housing.

- Fixed gross business investment has, since 1981, fluctuated around approximately 12 per cent of nominal GDP, approximately 2 percentage points below the 1961-1981 average of approximately 14 per cent. This shift downwards has been reflected in the fixed net business investment, which similarly has been fluctuating 2 percentage points lower since 1981 than its 1961-1981 average of approximately 5 per cent.

- The net business capital stock, driven mostly by shifts in engineering construction investment and machinery and equipment investment reached a high of 114.18 per cent in 1982, decreased until it hit 88.21 per cent in 2000, after which it began increasing again, ultimately reaching 101.71 per cent in 2013. The increase in the net business capital stock since 2000 can almost exclusively be attributed to a large increase in the net business engineering construction capital stock, which has seen large investments since 2000, particularly in Alberta, Saskatchewan and Newfoundland and Labrador.

- Canada-wide trends in business investment intensity and net business capital stock have been mostly replicated on the provincial levels, the major exceptions being the provinces that have seen large amounts of resource development since 2000, Alberta and Newfoundland and Labrador, and to a lesser extent Saskatchewan.

- Among thirty-two countries, Canada ranked sixteenth in terms of the intensity of private investment. It ranked higher than most of the Western and Southern European countries ranked, as well as Israel and the United States, while being ranked below most of the Central and Eastern European countries measured, as well as Chile, Korea, Mexico, Australia and Japan.

Trends in Investment and Capital Intensity

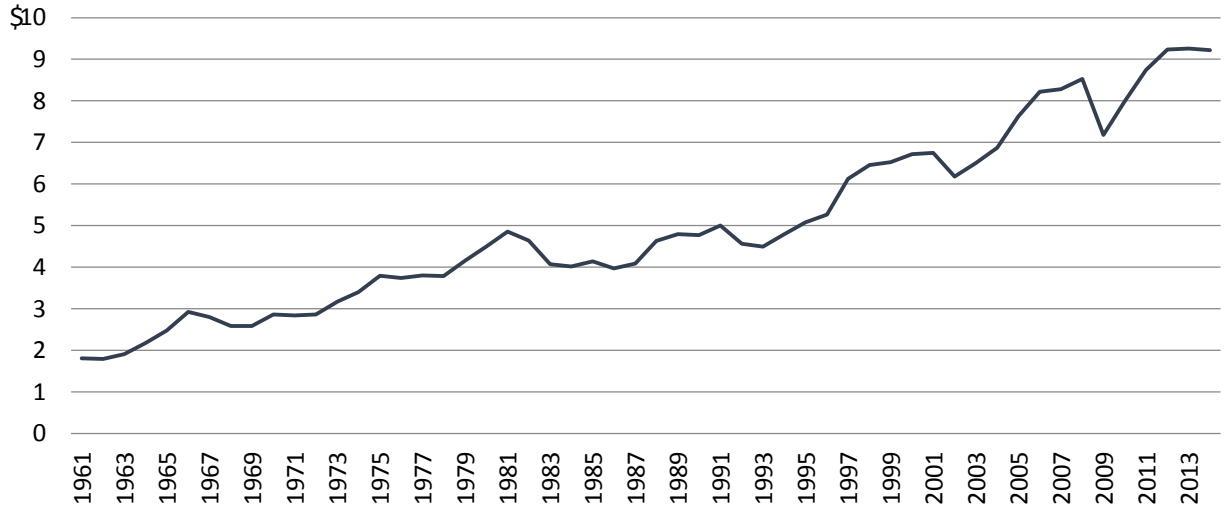
Appendix Table B1 provides a breakdown of gross business investment by component for 2013. At the national level, gross business investment accounted for 13.27 per cent of nominal GDP in 2013. Of this total, business investment in engineering construction was the largest component at 5.71 per cent of nominal GDP in 2013, followed by business investment in machinery and equipment (3.87 per cent), business investment in IPP (2.00 per cent) and business investment in non-residential buildings (1.68 per cent). Of the total for IPP, business investment in software accounted for the largest share of nominal GDP at 0.92 per cent, followed by business investment in R&D at 0.62 per cent of nominal GDP.

Appendix Table B1: Business Sector Gross Investment per Hour Worked by Component, Current Prices, Canada, 2013

	Share of Nominal GDP (Per Cent)	**Share of Total Investment (Per Cent)**	**Per Hour Worked (Current Dollars)**
Total non-residential	13.27	100	10.28
Non-residential buildings	1.68	12.65	1.30
Engineering construction	5.71	43.07	4.43
Machinery and equipment	3.87	29.2	3.00
Textile products, clothing and products of leather and similar materials	0.00	0.01	0.00
Wood products	0.01	0.06	0.01
Plastic and rubber products	0.00	0.01	0.00
Non-metallic mineral products	0.00	0.01	0.00
Fabricated metallic products	0.01	0.04	0.0
Industrial machinery	1.54	11.6	1.19
Computer and electronic products	0.87	6.55	0.67
Electrical equipment, appliances and components	0.11	0.84	0.09
Transportation equipment	0.96	7.27	0.75
Furniture and related products	0.31	2.31	0.24
Other manufactured products and custom work	0.01	0.09	0.01
Intellectual property products	2.00	15.09	1.55
Mineral exploration and evaluation	0.46	3.49	0.36
Research and development	0.62	4.64	0.48
Software	0.92	6.94	0.71
ICT	1.79	13.49	1.38

CANSIM tables 031-0006, 383-0021 and 383-0012.

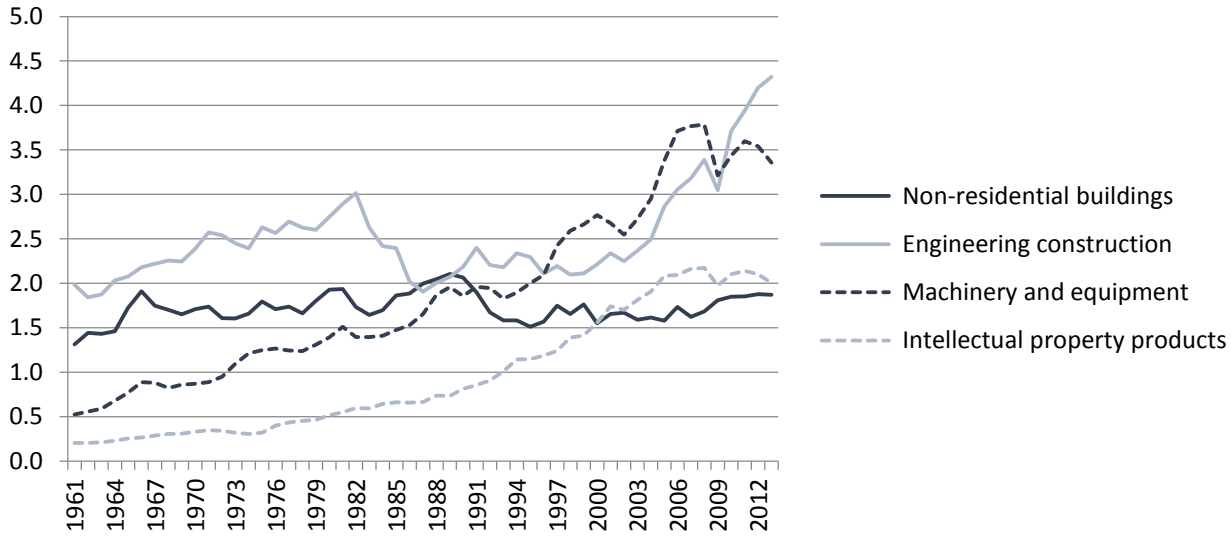
Appendix Chart B12: Business Sector Gross Investment per Hour Worked, Chained (2007) Dollars, Canada, 1961-2013



Source: CANSIM tables 031-0006, 383-0021 and 383-0012.

Appendix Chart B12 shows gross business investment on a real per hour worked basis. At the national level, real per hour worked business investment increased from 1961-2013 at a rate of 3.19 per cent. Notable fluctuations can be seen between 1961 and 1981 in which real per hour worked business investment experienced the largest growth at 5.06 per cent. In contrast, between 2002 and 2008, real per hour worked business investment increased steadily until declining sharply in 2009. From 2009 to 2012, there has been an increase in real per hour worked business investment.

Appendix Chart B13: Gross Business Investment per Hour Worked by Component, Chained (2007) Dollars, Canada, 1961-2013



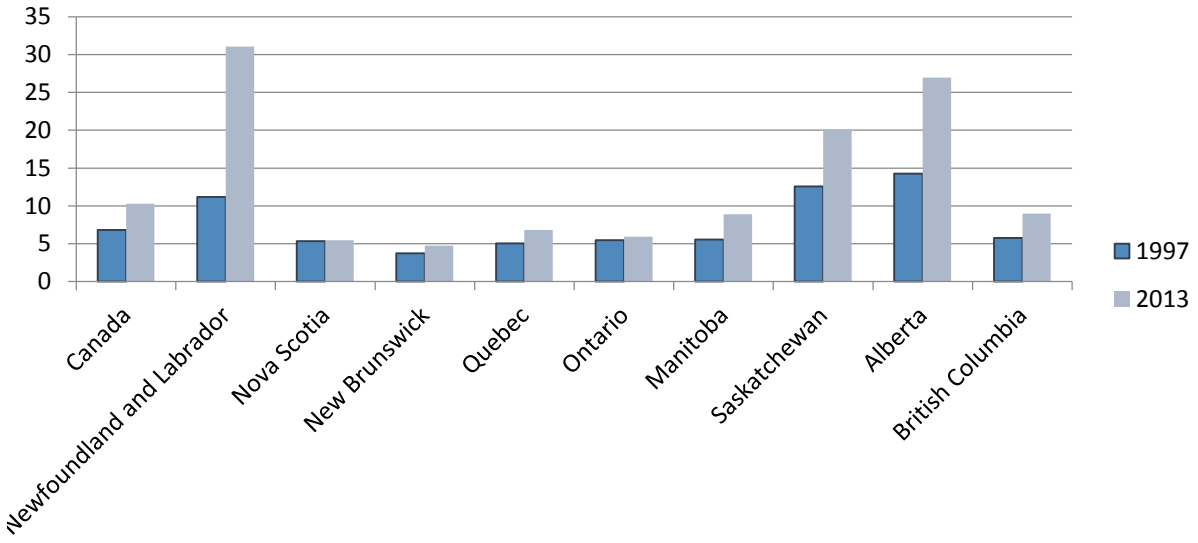
Source: CANSIM 031-006, 383-0021 and 383-0012.

Appendix Table B2: Annual Growth Rates of Gross Business Investment per Hour Worked, by Component

	1961-2013	1961-1981	1981-2000	2000-2013
Non- residential buildings	0.68	1.96	-1.16	1.45
Engineering and Construction	1.51	1.91	-1.39	5.28
Machinery and Equipment	3.63	5.43	3.23	1.5
Intellectual Property Products	4.48	5.05	5.63	1.96
Total	3.19	5.06	1.73	2.49

Appendix Table B2 provides a breakdown of real per hour worked gross business investment by type of investment. It shows that over the years of 1961-2013, growth in real non-residential building investment was quite weak as it stayed around $1.75 per hour worked. Meanwhile, M&E experienced the largest and steadiest growth in real per hour gross business investment between 1961 and 2007. Since 2007, real per hour gross business investment in M&E has been declining. Likewise, real per hour gross business investment in IPP has been increasing steadily from 1961 to 2013. In contrast, real per hour gross business investment in engineering and construction experienced increased growth from 1961 to 1981 at 5.43 per cent and after experiencing a dramatic decline between 1981 and 1987, has been increasing rapidly as it has the highest real per hour business investment.

Appendix Chart B14: Gross Business Investment per Hour Worked, Chained (2013) Dollars, Canada and the Provinces, 1997 and 2013



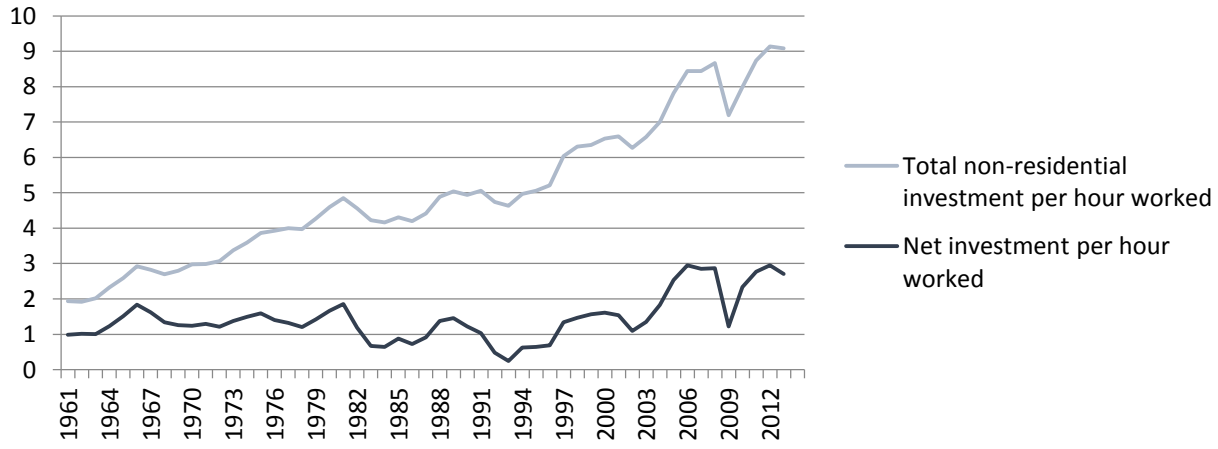
Note: No information available for PEI.
Source CANSIM 031-005, 383-0021 and 383-0012.

Appendix Table B3: Annual Growth Rates of Gross Business Investment per Hour Worked, Canada and the Provinces

	1997-2013	1997-2008	2008-2013
Canada	2.59	3.35	0.93
Newfoundland and Labrador	6.59	1.28	19.30
Nova Scotia	0.17	-0.06	0.67
New Brunswick	1.52	7.87	-11.17
Quebec	1.91	3.09	-0.63
Ontario	7.80	1.95	-2.70
Manitoba	2.98	3.05	2.82
Saskatchewan	2.97	13.10	4.08
Alberta	4.05	4.61	2.82
British Columbia	2.81	3.96	0.33

Appendix Chart B14 illustrates that gross per hour real business investment varied across provinces in 1997 and 2013. Between 1997 and 2013, Nova Scotia, New Brunswick, Quebec and Ontario experienced the least amount growth in business investment per hour worked whereas Saskatchewan, Alberta and Newfoundland and Labrador experienced the greatest amount of growth. Canada's growth in business investment per our worked has been relatively modest between 1997 and 2013 at 2.59 per cent (Appendix Table B3).

Appendix Chart B15: Business Sector Gross and Net Fixed, Non-Residential Investment per Hour Worked, Chained (2007) Dollars, Canada 1961-2013 (Linear Depreciation)



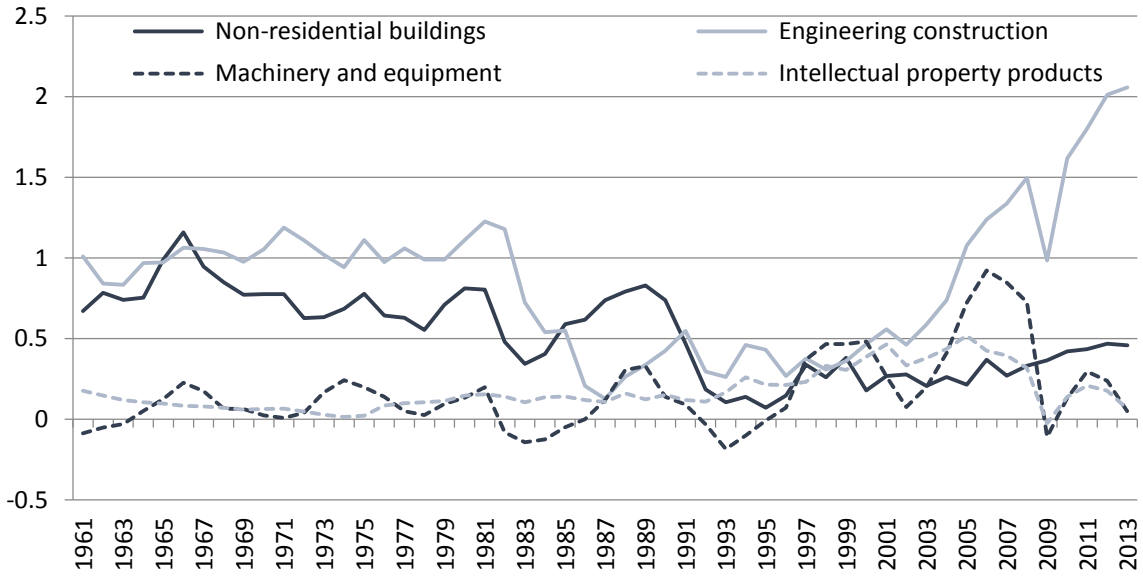
Note: Linear depreciation was used to calculate net fixed, non-residential investment 0
Source: CANSIM 031-0006, 383-0021 and 383-0012

Appendix Table B4: Annual Growth Rates of Gross and Net Fixed, Non-Residential Investment per Hour Worked, 1961-2013

Time Period	Gross Investment	Linear Depreciation	Net Investment
1961- 2013	3.01	3.73	1.95
1961-1981	4.68	5.89	3.20
1981-2000	1.59	2.66	2.60
2000-2013	2.56	2.01	4.06

Appendix Chart B16 provides an examination of business gross non-residential real investment per hour worked and business net non-residential real investment. It illustrates that while gross non-residential real investment has been increasing steadily over the 52 years examined, net non-residential real investment has remained relatively constant from 1961-1983 and has fluctuated from 1984-2013 while remaining, on average, around $1.50/ hour worked. After declining sharply between 2008 and 2009, net non-residential real investment has increased steadily.

Appendix Chart B16: Business Sector Net Fixed, Non-Residential Investment per Hour Worked by Component, Chained (2007) Dollars, Canada, 1961-2013



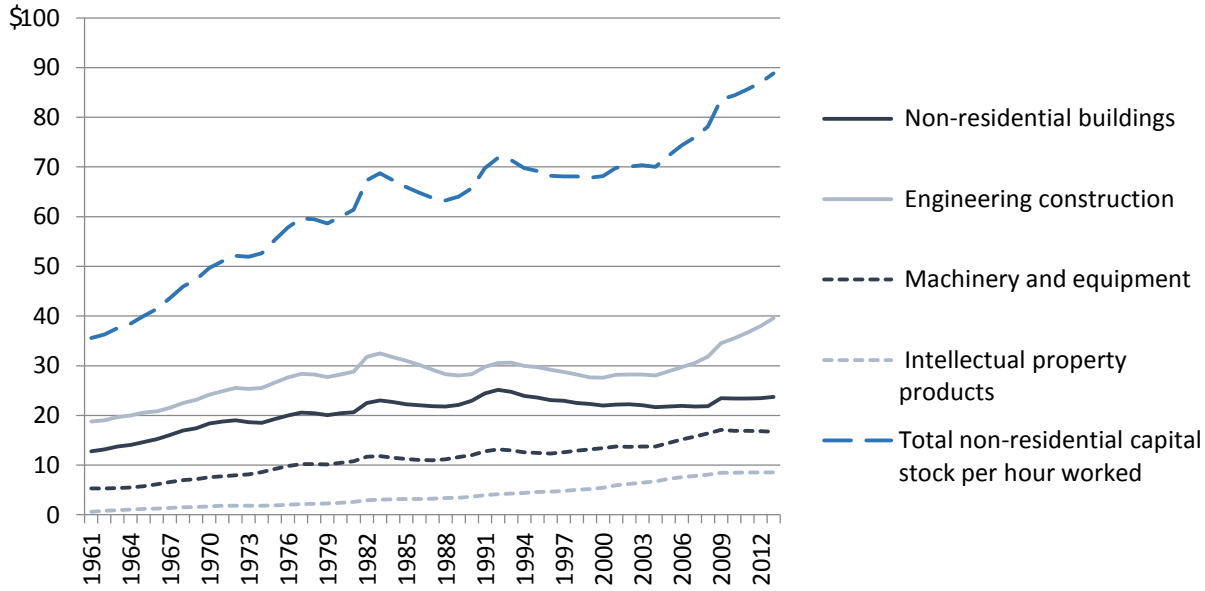
Note: Linear depreciation was used to calculate net fixed, non-residential investment.
Source: CANSIM 031-0006, 383-0021 and 383-0012.

Appendix Table B5: Annual Growth Rates of Business Investment per Hour Worked by Component, 1961-2013

	1961-2013	1961-1981	1981-2000	2000-2013
Non-residential buildings	-7.29	0.91	-6.73	7.53
Engineering construction	1.38	0.98	-4.95	12.09
Machinery and equipment	-1.05	4.64	4.80	-16.49
Intellectual property products	-1.96	-0.65	4.92	-13.01

Appendix Table B5 provides real per capita net business investment by type of investment. Fluctuations in real business investment can be seen in all components of total investment across 1961-2013. Engineering and construction experienced decline in real business net investment between 1981 and 2000, decreasing by 4.95 per cent. However, after 2000, engineering and construction experienced the largest growth out of all components at 12.09 per cent. In contrast, real business net investment in M&E decreased the most between 2000 and 2013, decreasing by 16.49 per cent.

Appendix Chart B17: Business Sector Net Fixed, Non-Residential Capital Stock Per Hour Worked, Total and by Component, Chained (2007) Dollars, Canada, 1961-2013



Note: Linear end-year net stock was used to calculate net fixed, non-residential capital stock.
Source: CANSIM tables 031-0006, 383-0021 and 383-0012.

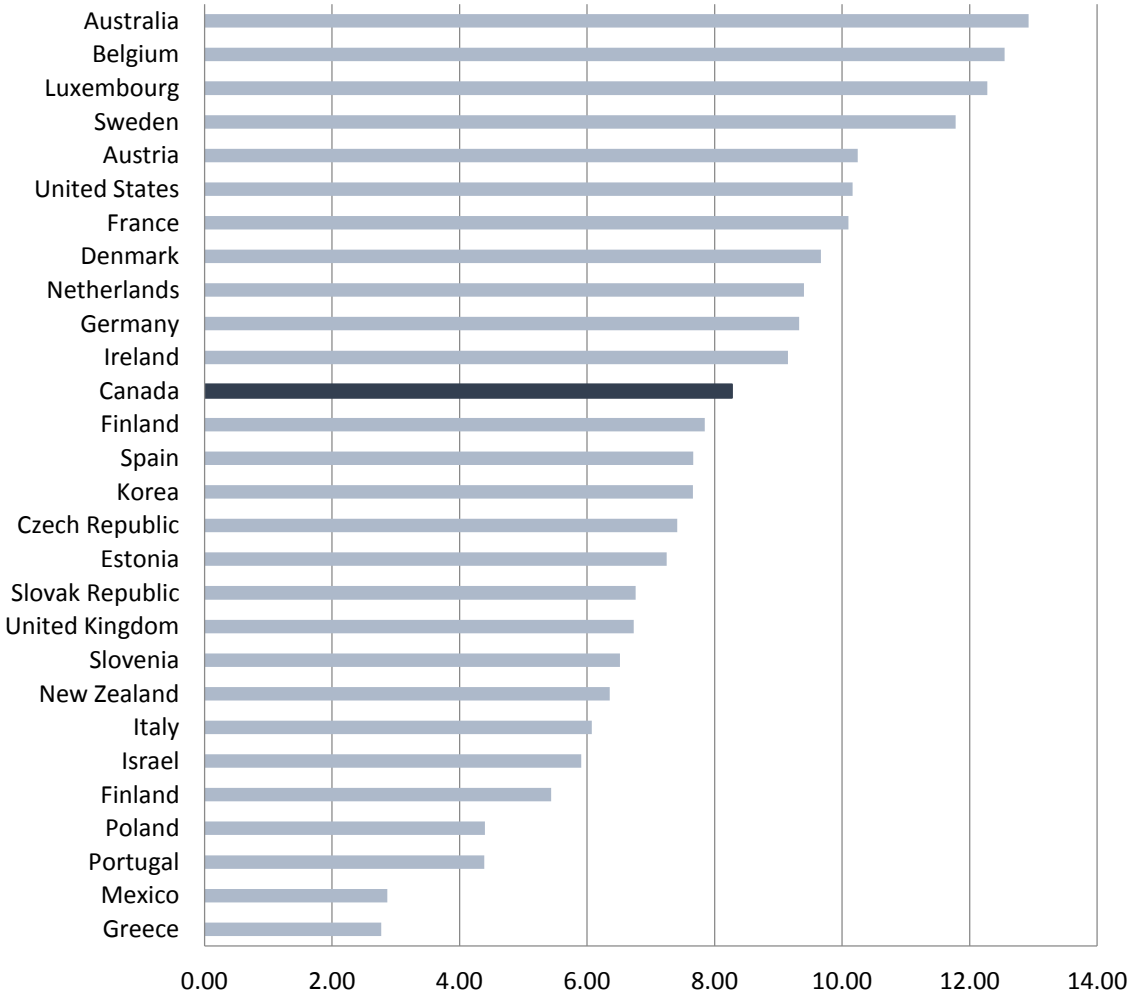
Appendix Chart B17 illustrates both total net business capital stock per hour worked and business capital stock per hour worked by component. Between 1961 and 2013, total net business capital stock per hour worked has been increasing with a few fluctuations, most notably from 1982 to 1988 when it experienced a decline. In contrast, net business capital stock per hour worked for IPP and M&E has experienced little growth in the 52 years examined and appear to be relatively constant from 2009 to 2013. Additionally, net business capital stock per hour

worked in engineering and construction has been increasing since 2003 after remaining relatively stagnant from 1990 to 2002.

Appendix Table B6: Annual Growth Rates of Net Non-Residential Capital Stock per Hour Worked by Component

	1961-2013	1961-1981	1981-2000	2000-2013
Non-residential buildings	1.20	2.44	0.33	0.58
Engineering construction	1.45	2.17	-0.22	2.82
Machinery and equipment	2.22	3.58	1.16	1.71
Intellectual property products	5.33	7.79	4.05	3.49
Total	1.78	2.76	0.55	2.06

Appendix Chart B18: International Comparison of Business Gross Fixed Investment Per Hour Worked, PPP-adjusted U.S. Dollars, 2013



Note: The data for Australia are for 2011.
Source: OECD data and Bureau of Labor Statistics, Current Employment Statistics.

Appendix Chart B18 displays and international comparison of per hour worked gross business investment (in PPP-adjusted US 2013 dollars) for 2013. Australia experienced the highest level of per hour worked gross business investment at $12.92 while Greece experienced the lowest level of per hour worked gross business investment at $2.77. Canada ranked 12th out of 28 countries with a per hour worked gross business investment $8.28 compared to the United States which ranked 6th out of 28 countries, with a per hour worked gross business investment of $10.16.

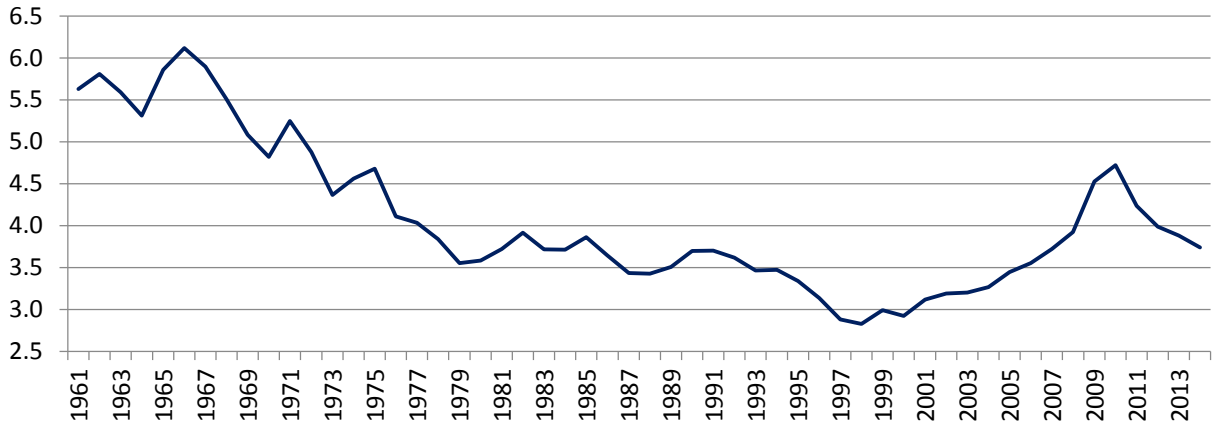
ii. Public Investment

This sub-section discusses the potential role of public investment in improving productivity performance. It is organized into three parts. The first part looks at historical trends in gross public investment, net public investment, and the net stock of public capital. The second part summarizes the key findings from the data presented in the first part. The third part reviews the literature on the state of Canada's public infrastructure as well as the effect of public investment on productivity growth.

a. Trends in Public Investment

General Government Gross Investment

Appendix Chart B19: General Government Gross Fixed Investment, Share of Nominal GDP, Per Cent, Canada, 1961-2014



Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017 and 380-0064.

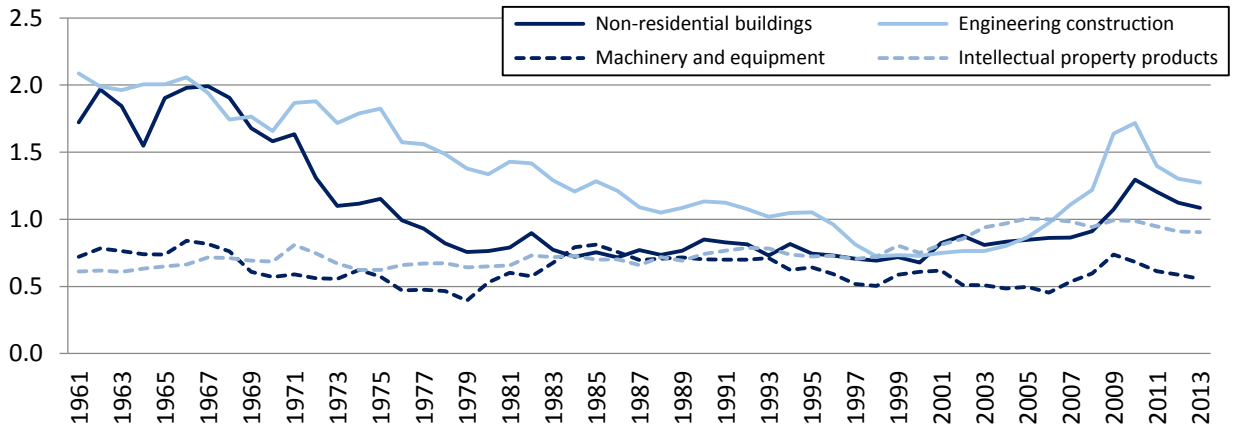
At the national level, the intensity of gross public investment, defined as the share of gross public investment in nominal GDP, was 3.7 per cent in 2014 (Appendix Chart B19).[81] This represents an increase from the historical low of 2.8 per cent in 1998, but remains well below the range observed in the 1960s (5.1 to 6.1 per cent). Between 1966 and 1998, the intensity of gross public investment fell steadily from 6.1 to 2.8 per cent. The intensity of gross public investment

[81] General government gross public investment includes investment by all resident government units (*i.e.*, federal, provincial, territorial, local, and Aboriginal governments) and all resident non-market, non-profit institutions that are controlled and mainly financed by resident government units (*e.g.*, hospitals, colleges, and universities). It is important to note that government business enterprises are not classified within general government.

recovered from 1998 to 2008, increasing 1.1 percentage points to 3.9 per cent. Between 2008 and 2010, the intensity of gross public investment increased by another 0.8 percentage point to 4.7 per cent due to weakness in economy related to the 2008-09 recession and the adoption of stimulative fiscal policy measures at all levels of government. The intensity of gross public investment fell 1.0 percentage point from 4.7 per cent in 2010 to 3.7 per cent in 2014, as the economy recovered and governments began to implement fiscal tightening.

Appendix Chart B20 breaks down the intensity of gross public investment by type of investment for the 1961-2013 period.[82] It shows that the dramatic decline in gross public investment intensity from 1966 to 1998 was primarily due to falling public investment in non-residential buildings and engineering structures.[83] In particular, non-residential buildings accounted for 1.3 percentage points (or 44.4 per cent) of the 2.9 percentage-point decline in gross public investment intensity, while engineering construction accounted for 1.3 percentage points (or 46.1 per cent). Declining public investment in machinery and equipment (M&E) accounted for only 0.3 percentage point (or 11.6 per cent) of the decline in gross public investment intensity from 1966 to 1998. In contrast, the intensity of gross public investment in intellectual property products (IPP) increased 0.06 percentage point between 1966 and 1998.[84]

Appendix Chart B20: Government Sector Gross Fixed, Non-Residential Investment by Component, Share of Nominal GDP, Per Cent, Canada, 1961-2013



Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017, 380-0064 and 031-0006.

[82] Appendix Chart B19 is based on general government fixed investment data from the expenditure accounts. In contrast, Appendix Chart B20 was created using gross fixed, non-residential investment data for the government sector from the flows and stocks tables. There are two important differences between the *general government* figures presented in Appendix Chart B19 and the *government sector* figures presented in Appendix Chart B20. First, general government and the government sector are different concepts. In contrast to general government, the government sector is an industry concept which is composed of establishments in the following industries: educational services (NAICS code 61), health care and social assistance (NAICS code 62), and public administration (NAICS code 91). Second, the government sector figures exclude gross public investment in residential structures, while the general government figures do not.

[83] Engineering structures is more or less equivalent to public infrastructure. Non-residential buildings include: hospitals, universities, colleges, elementary schools, warehouses, manufacturing plants, offices buildings, etc.

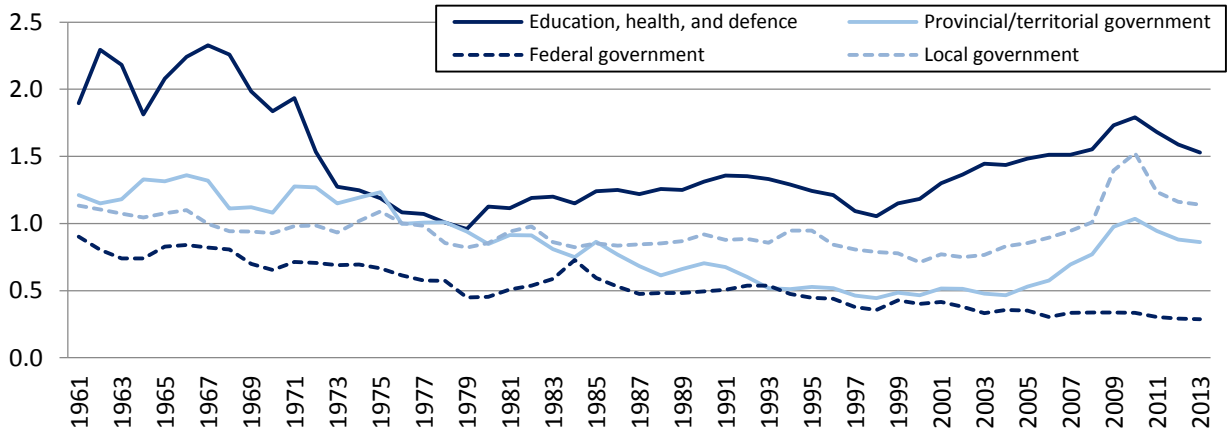
[84] Appendix Table B7 provides information on the sub-components of M&E and IPP.

Between 1998 and 2013, the intensity of gross public investment increased 1.2 percentage points. An increase in public investment in engineering construction contributed 0.6 percentage point (or 47.0 per cent) to the overall increase, while non-residential building contributed 0.4 percentage point (or 33.4 per cent). Public investment in M&E and IPP contributed much less to the increase in gross public investment intensity from 1998 to 2013, at 0.05 percentage point (or 4.4 per cent) and 0.09 percentage point (or 7.5 per cent), respectively.

Overall, the intensity of gross public investment was 1.3 percentage points lower in 2013 compared to 1961 at the national level. This decline was driven by lower public investment intensities for engineering construction (0.8 percentage point or 61.4 per cent of the total decline), non-residential buildings (0.6 percentage point or 48.1 per cent of the total decline), and to a lesser extent M&E (0.2 percentage point or 12.5 per cent of the total decline).

Between 1961 and 2013, trends in gross public investment intensity were quite dissimilar across the different levels of government (Appendix Chart B21).[85] The federal government exhibited the largest decline from 1961 to 2013 (0.62 percentage point or 46.5 per cent of the total decline), followed by education, health and defence (0.37 percentage point or 27.7 per cent) and provincial governments (0.35 percentage point or 26.5 per cent).[86] It is also interesting to note that the massive falloff in gross public investment intensity in the 1960s and 1970s was largely attributable to decreases in education, health and defence, which declined from a high of 2.3 per cent in 1967 to a low of 1.0 per cent in 1979.

Appendix Chart B21: Government Sector Gross Fixed, Non-Residential Investment by Level of Government, Share of Nominal GDP, Per Cent, Canada, 1961-2013



Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017, 380-0064 and 031-0005.

Appendix Table B7 provides a more detailed breakdown of gross public investment by type of investment for 2014. At the national level, gross public investment accounted for 3.7 per cent of nominal GDP in 2014. Of this total, public investment in engineering structures was the

[85] It is important to note that Appendix Chart B21 provides information on the levels of government that are spending on public investment, not the levels of government that are actually funding public investment.
[86] The education, health and defence category includes the investment activities of multiple levels of government; however, the vast majority of this category is attributable to provincial governments.

largest component at 1.3 per cent of nominal GDP, followed by public investment in non-residential building (1.0 per cent), public investment in IPP (0.9 per cent), public investment in M&E (0.5 per cent), public investment in residential structures (0.06 per cent), and public investment in weapons systems (0.04 per cent). Of the total for IPP, public investment in research and development (R&D) accounted for the largest share of nominal GDP (0.6 per cent), followed by public investment in software (0.3 per cent).

Appendix Table B7: General Government Gross Fixed Investment by Component, Canada, 2014

	Share of Total Investment (Per Cent)	**Share of Nominal GDP (Per Cent)**	**Per Capita (Current Dollars)**
Total general government gross fixed capital formation	100.00	3.74	2,083.74
Construction	62.04	2.32	1,292.66
Residential structures	1.62	0.06	33.84
Non-residential structures	60.41	2.26	1,258.82
Non-residential buildings	26.05	0.97	542.86
Engineering structures	34.36	1.29	715.97
Machinery and equipment	13.41	0.50	279.33
Industrial machinery and equipment	3.08	0.12	64.10
Computers and computer peripheral equipment	2.64	0.10	54.97
Communications and audio and video equipment	1.67	0.06	34.74
Other electrical and electronic machinery and equipment	1.48	0.06	30.80
Other machinery and equipment	1.58	0.06	32.99
Furniture, fixtures and prefabricated structures	1.78	0.07	36.99
Passenger cars	0.15	0.01	3.10
Trucks, buses and other motor vehicles	0.62	0.02	12.82
Aircraft and other transportation equipment	0.42	0.02	8.82
Weapons systems	0.96	0.04	19.92
Intellectual property products	23.60	0.88	491.83
Research and development	15.75	0.59	328.13
Software	7.86	0.29	163.70

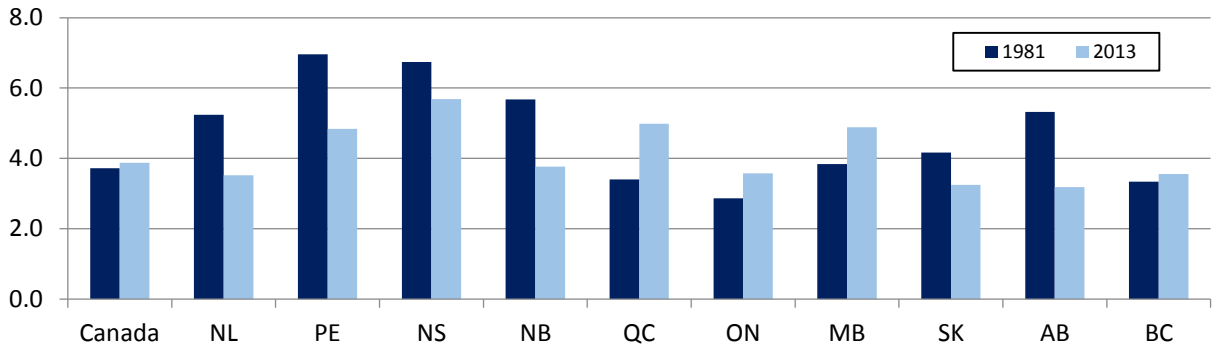
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0064, 380-0068 and 051-0005.

In 2013, the intensity of gross public investment varied greatly across the provinces (Appendix Chart B22). The intensity of gross public investment was highest in Nova Scotia (5.7 per cent), followed by Quebec (5.0 per cent), Manitoba (4.9 per cent), and Prince Edward Island (4.8 per cent). In contrast, the intensity of gross public investment was lower than the national average (3.9 per cent) in the remaining provinces. Alberta and Saskatchewan recorded the lowest intensities of gross public investment in 2013, at 3.2 per cent in both provinces.

Between 1981 and 2013, gross public investment intensity fell in six provinces (the Atlantic provinces, Saskatchewan, and Alberta) and rose in the remaining four. The intensity of gross public investment decreased the most in Alberta (2.1 percentage points), followed by Prince Edward Island (2.1 percentage points), New Brunswick (1.9 percentage points), and

Newfoundland and Labrador (1.7 percentage points). In contrast, the intensity of gross public investment increased the most in Quebec (1.6 percentage points).

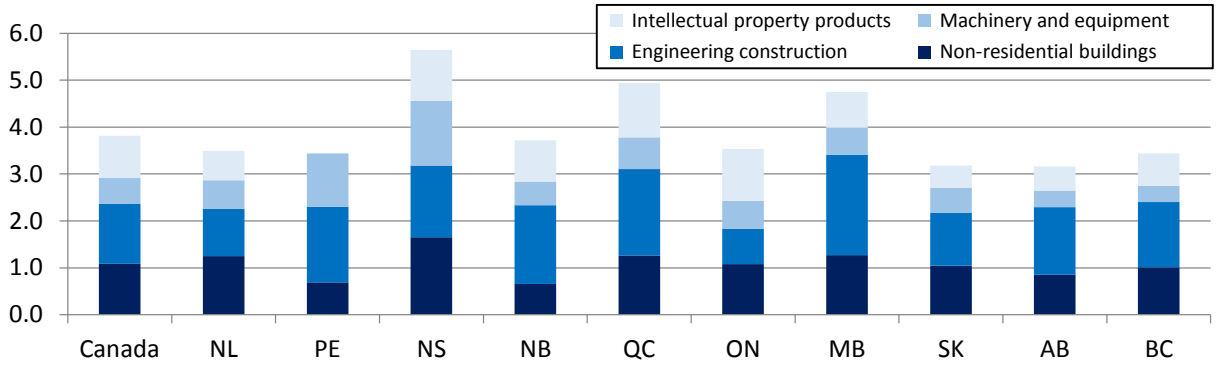
Appendix Chart B22: General Government Gross Fixed Investment, Share of Nominal GDP, Per Cent, Canada and the Provinces, 1981 and 2013



Source: CSLS calculations based on Statistics Canada data. CANSIM table 384-0038.

The composition of gross public investment differed greatly across the provinces in 2013 (Appendix Chart B23). However, in most provinces, public investment in engineering construction and non-residential buildings accounted for the largest shares of nominal GDP, followed by public investment in IPP, and public investment in M&E.

Appendix Chart B23: Government Sector Gross Fixed, Non-Residential Investment by Component, Share of Nominal GDP, Per Cent, Canada and the Provinces, 2013

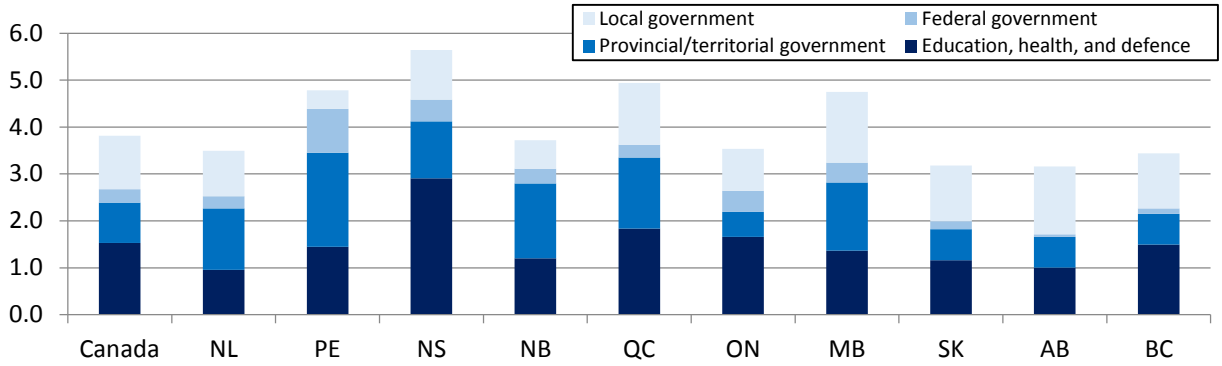


Note: Data on public investment in IPP were available for Prince Edward Island for 2014.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 384-0038 and 031-0005.

The breakdown of gross public investment by level of government also differed greatly across the provinces in 2013 (Appendix Chart B24). In most of the provinces, provincial governments accounted for most of the public investment; this is increasingly clear if you include the education, health and defence component along with the provincial government

component. Local governments were the second largest investor, and the federal government was third.[87]

Appendix Chart B24: Government Sector Gross Fixed, Non-Residential Investment by Level of Government, Share of Nominal GDP, Per Cent, Canada and the Provinces, 2013



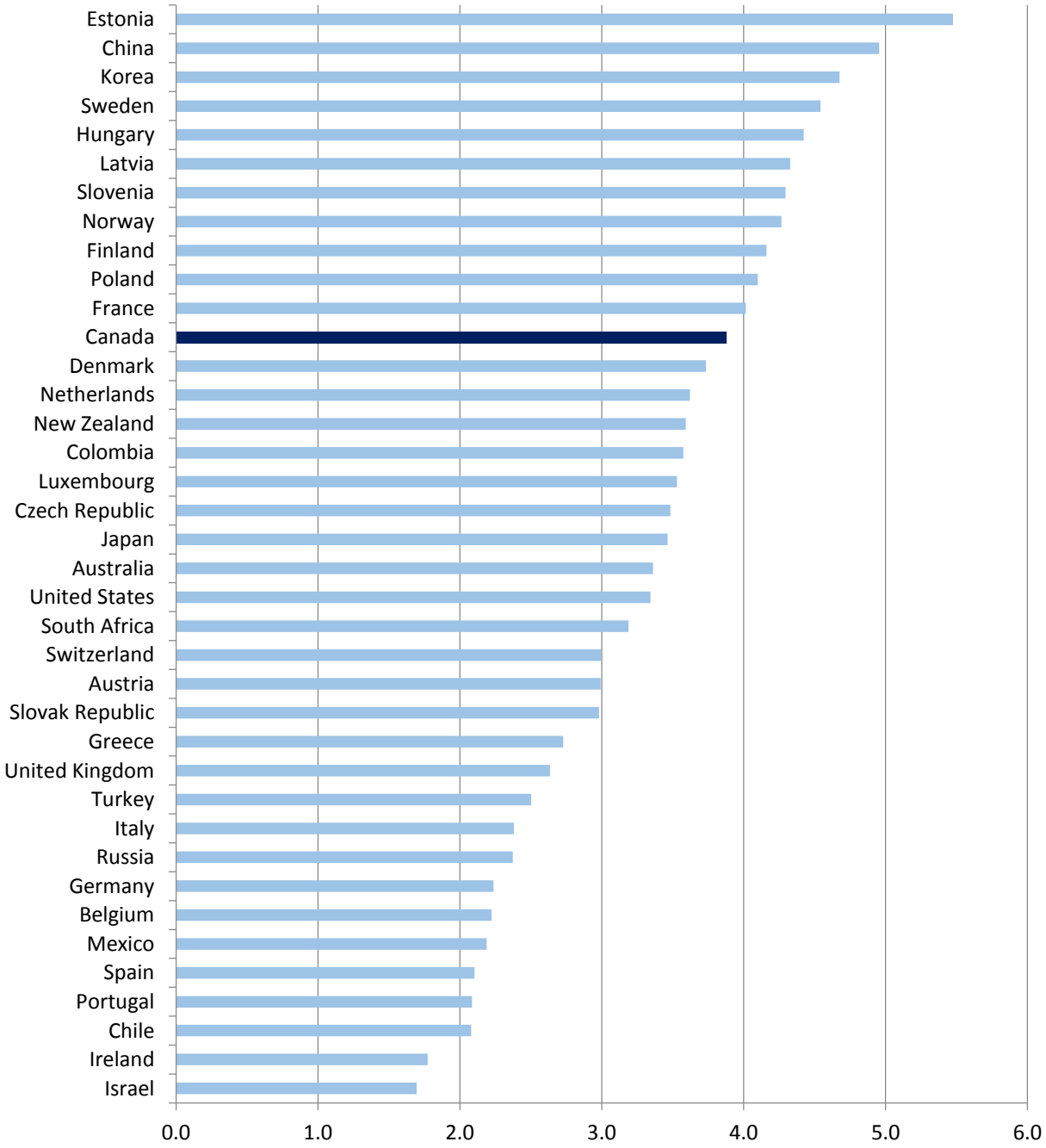
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 384-0038 and 031-0005.

Appendix Chart B25 presents an international comparison of gross public investment intensity in 2013.[88] Among thirty-eight countries, Canada ranked twelfth in terms of the intensity of gross public investment with 3.9 per cent. Generally speaking, Canada ranked behind emerging economies in Eastern Europe (Estonia, Hungary, Latvia, Slovenia, and Poland), the Nordic countries (Sweden, Norway and Finland), and emerging economies in East Asia (China and Korea). Canada ranked ahead of most economies in Western Europe, Central Europe and Latin America, as well as the United States, Japan, Australia and New Zealand.

[87] It is important to note that the federal government funds public investments that are made at different levels of government. provides public investment intensity by the level of government that is actually spending, not public investment intensity by the level of government that is the source of funds.

[88] It is important to note that institutional differences between countries, such as differences in terms of the extent of public ownership and the size of the public sector, may account for a large part of the disparities in gross public investment intensity. Generally speaking, countries with a larger public sector (as a share of GDP) should also have higher public investment intensities, *ceteris paribus*.

Appendix Chart B25: International Comparison of General Government Gross Fixed Investment, Share of Nominal GDP, Per Cent, 2013

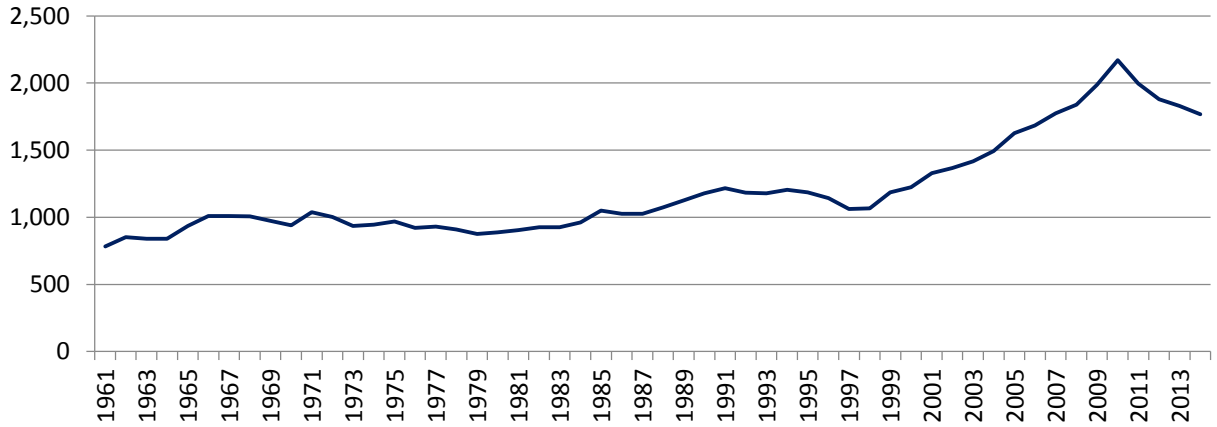


Note: The data for Turkey are for 2011. The data for China, Colombia and Russia are for 2012.
Source: CSLS calculations based on OECD data.

We will now examine trends in gross public investment on a real per capita basis. At the national level, real per capita gross public investment increased at an average annual rate of 1.5 per cent between 1961 and 2014, with the annual growth rate increasing from 0.8 per cent in 1961-1998 to 3.2 per cent per year in 1998-2014 (Appendix Chart B26). At first glance, this

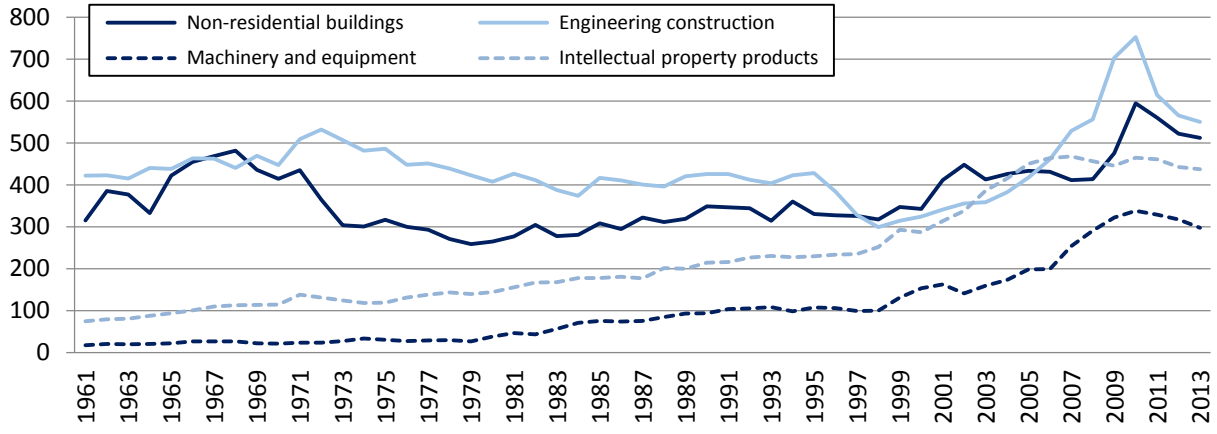
appears to suggest that the higher levels of public gross investment intensity observed in the 1960s were related to faster growth in the population rather than to higher levels of real per capita public investment. However, as we shall see later in this sub-section, the replacement requirements were much higher later in the 1961-2014 period since the stock of public capital was much higher in 2014 compared to 1961. In other words, a higher level of real per capita gross public investment was needed to simply maintain (as opposed to augment) the stock of public capital in 2014 compared to 1961.

Appendix Chart B26: General Government Gross Fixed Investment Per Capita, Chained (2007) Dollars, Canada, 1961-2014



Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017, 380-0064 and 051-0005.

Appendix Chart B27: Government Sector Gross Fixed, Non-Residential Investment Per Capita by Component, Chained (2007) Dollars, Canada, 1961-2013



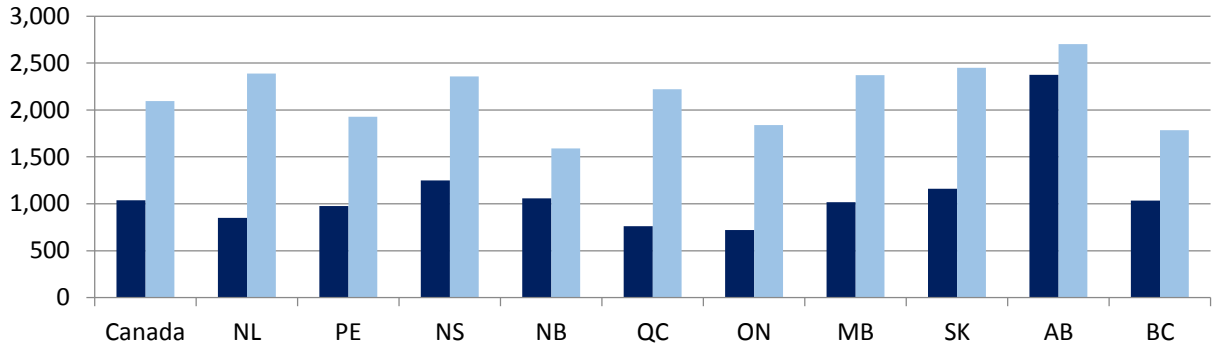
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 051-0005 and 031-0006.

Appendix Chart B27 provides a breakdown of real per capita gross public investment by type of investment. It shows that annual growth in real per capita gross public investment in 1961-2013 was driven by annual growth in real per capita gross public investment in M&E (5.5 per cent) and IPP (3.5 per cent), while annual growth in real per capita gross public investment in

non-residential buildings and engineering construction was quite weak (0.9 and 0.5 per cent, respectively). However, real per capita gross public investment in non-residential buildings and engineering construction was quite strong in 1998-2013, at 3.2 and 4.1 per cent, respectively.

In 2013, per capita gross public investment varied greatly across the provinces (Appendix Chart B28), ranging from $2,703 in Alberta to $1,591 in New Brunswick. Between 1981 and 2013, real per capita gross public investment exhibited annual growth rate in Quebec (3.4 per cent per year), followed by Newfoundland and Labrador (3.3 per cent per year), Ontario (3.0 per cent per year), Manitoba (2.7 per cent per year), Saskatchewan (2.4 per cent per year), Prince Edward Island (2.1 per cent per year), Nova Scotia (2.0 per cent per year), British Columbia (1.7 per cent per year), New Brunswick (1.3 per cent per year), and finally Alberta (0.4 per cent per year).

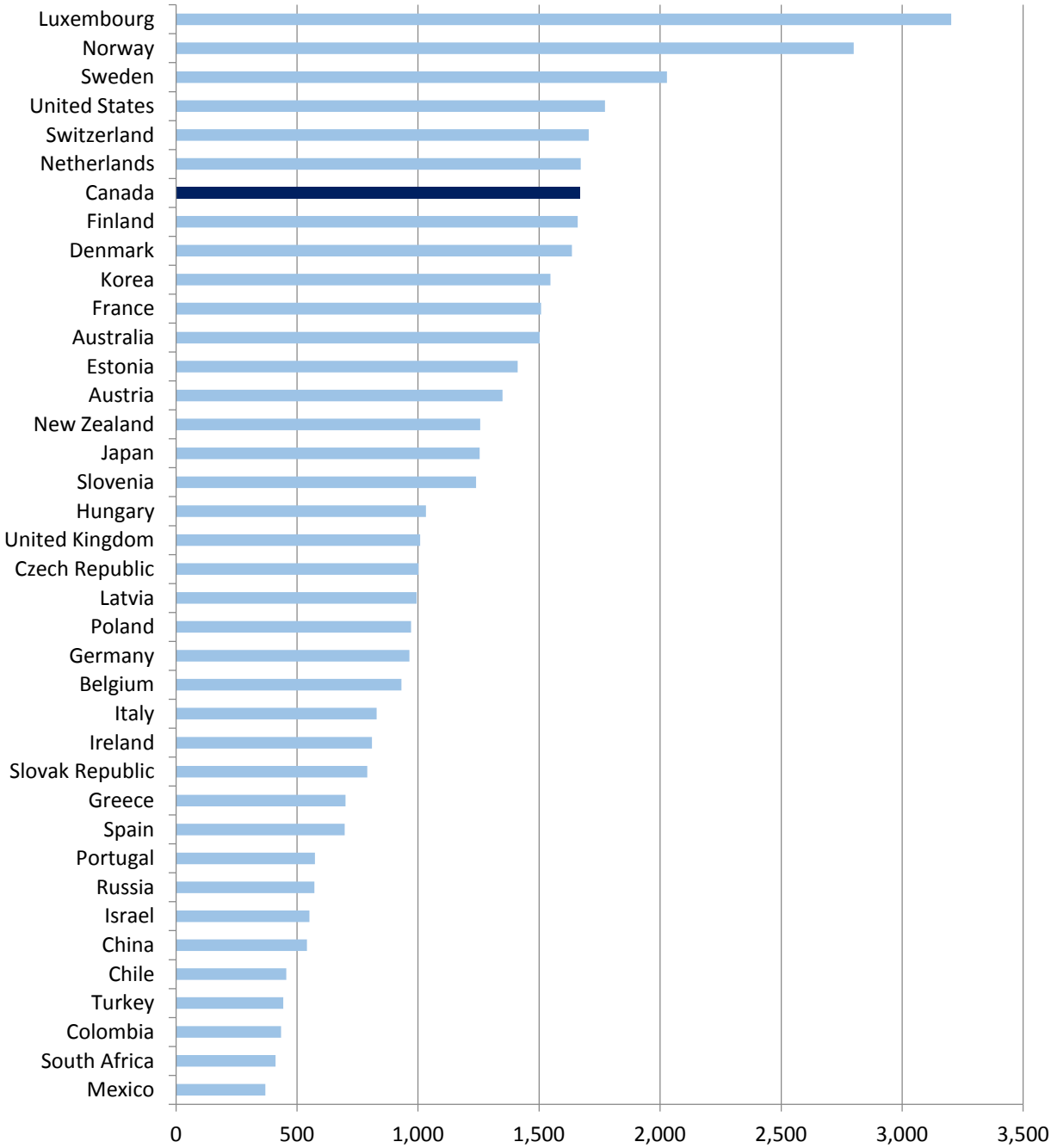
Appendix Chart B28: General Government Gross Fixed Investment Per Capita, Chained (2013) Dollars, Canada and the Provinces, 1981 and 2013



Source: CSLS calculations based on Statistics Canada data. CANSIM tables 384-0038 and 051-0005.

Appendix Chart B29 presents an international comparison of per capita gross public investment (in PPP-adjusted U.S. dollars) in 2013. In 2013, the highest level of per capita gross public investment was exhibited by Luxembourg ($3,203), followed by Norway ($2,800), Sweden ($2,028), and the United States ($1,772). Canada ranked seventh among thirty-eight countries with per capita gross public investment of $1,670. The rankings in terms of per capita gross public investment are quite different from the rankings in terms of the intensity of gross public investment, reflecting the fact that wealthier countries can afford higher levels of gross public investment and that the replacement requirements tend to be larger in wealthier countries with larger stocks of public capital. Generally speaking, the emerging economies in Eastern Europe (Estonia, Hungary, Latvia, Slovenia, and Poland) and in East Asia (China and Korea) which Canada ranked behind in terms of the intensity of gross public investment exhibited lower levels of per capita gross public investment compared to Canada in 2013.

Appendix Chart B29: International Comparison of General Government Gross Fixed Investment Per Capita, PPP-adjusted U.S. Dollars, 2013



Note: The data for Turkey are for 2011. The data for China, Colombia and Russia are for 2012
Source: CSLS calculations based on OECD data.

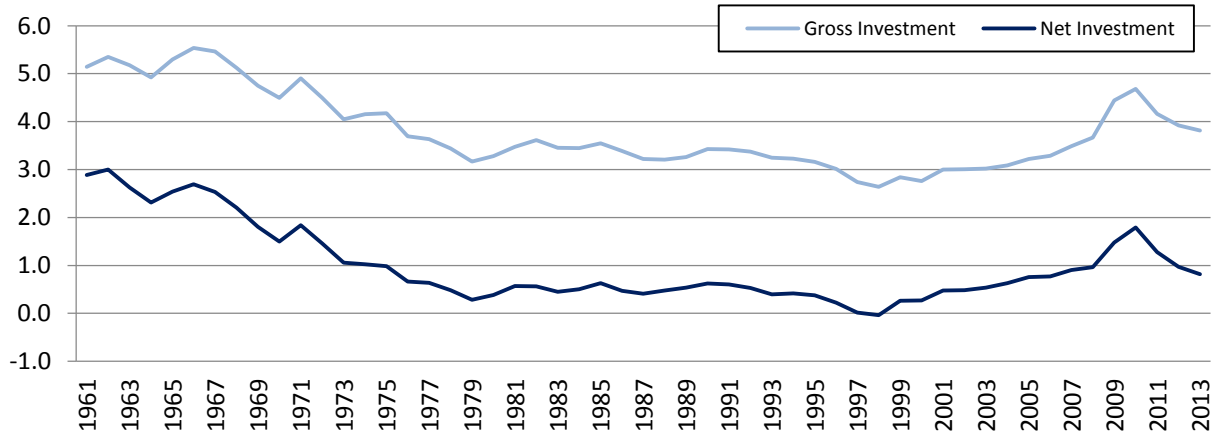
General Government Net Investment

In the previous sub-section, we discussed trends in the intensity of *gross* public investment in Canada and the provinces. We will now turn our attention to the intensity of *net* public investment, as this metric provides information on whether Canadians governments are adding to the stock of public capital or simply maintaining the existing stock of public capital.

At the national level, gross public investment accounted for approximately 2.5 to 5.5 per cent of nominal GDP for most of the 1961-2013 period, while net public investment accounted for only 0.0 to 3.0 per cent of nominal GDP (Appendix Chart B30).[89] In 2013, net public investment intensity was 0.8 per cent, down 2.1 percentage points from 2.9 per cent in 1961.

As was the case of gross public investment intensity, net public investment intensity declined dramatically from 1961 to 1979 and then stabilized at a relatively low level from 1979 to 1998. In fact, the share of net public investment in nominal GDP was below 0.5 per cent for most of the 1980s and 1990s, and was actually negative in 1998. The intensity of net public investment recovered between 1998 and 2010, increasing 1.8 percentage points from 0.0 to 1.8 per cent, before falling again between 2010 and 2014.

Appendix Chart B30: Government Sector Gross and Net Fixed, Non-Residential Investment, Share of Nominal GDP, Per Cent, Canada, 1961-2013



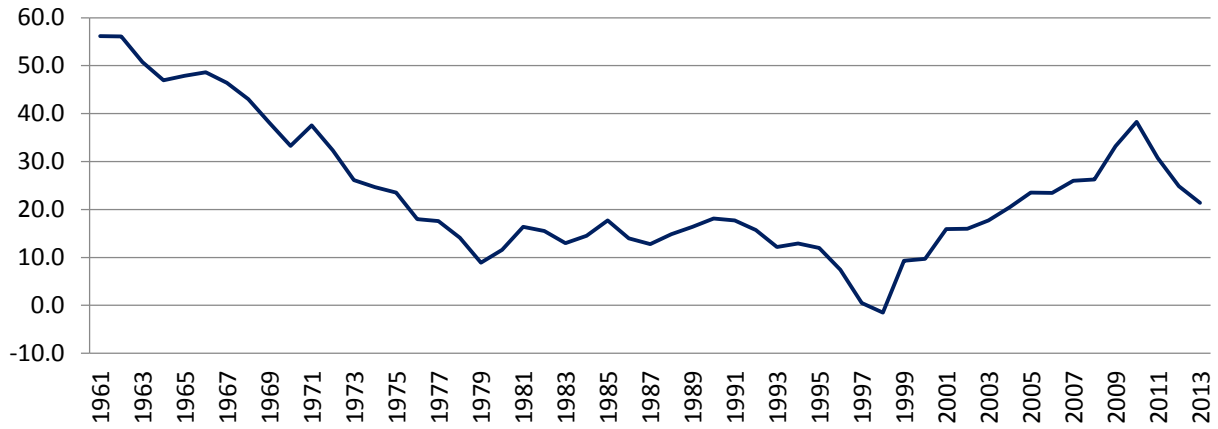
Note: Linear depreciation was used to calculate net fixed, non-residential investment.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017, 380-0064 and 031-0006.

Appendix Chart B31 shows the share of net public investment in gross public investment in Canada over the 1961-2013 period. In other words, it shows the share of gross public

[89] Statistics Canada does not publish data on net investment. The net investment figures presented in this report were calculated using Statistics Canada data on gross investment and linear depreciation. Statistics Canada publishes three series for depreciation: linear, hyperbolic, and geometric. Among the three series, linear depreciation is always in the middle (with net public investment intensity of 0.8 per cent in 2013), with hyperbolic slightly above (with net public investment intensity of 1.1 per cent in 2013) and geometric slightly below (with net public investment intensity of 0.6 per cent in 2013). It is important to note that the evolution of net public investment intensity over time is not greatly affected by the choice of depreciation data.

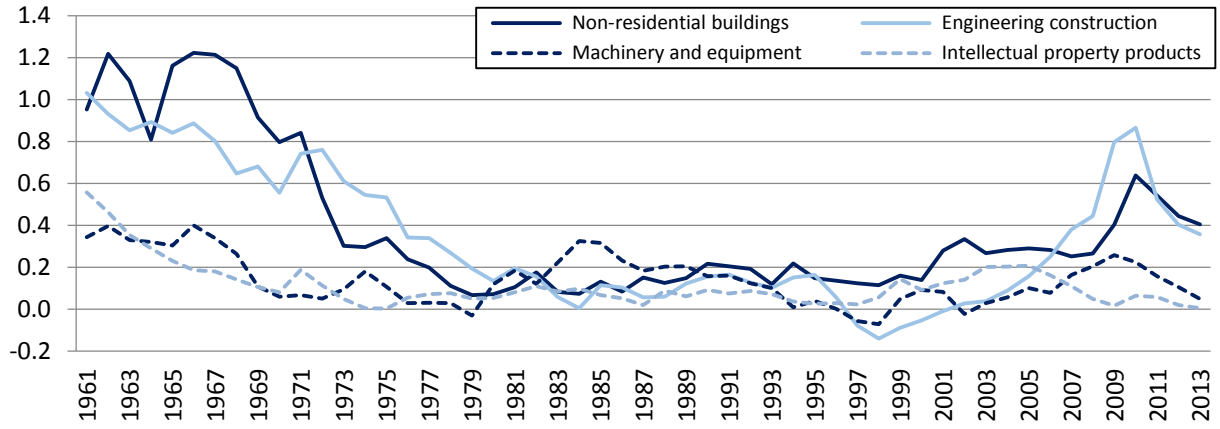
investment that was adding to the stock of public capital as opposed to maintaining the existing stock of public capital. Unsurprisingly, the share of net public investment in gross public investment was higher (lower) in periods when the intensity of gross public investment was higher (lower).

Appendix Chart B31: Share of Net Public Investment in Gross Public Investment, Government Sector Fixed, Non-Residential Investment, Per Cent, Canada, 1961-2013



Note: Linear depreciation was used to calculate net fixed, non-residential investment.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 051-0005 and 031-0006.

Appendix Chart B32: Government Sector Net Fixed, Non-Residential Investment by Component, Share of Nominal GDP, Per Cent, Canada, 1961-2013

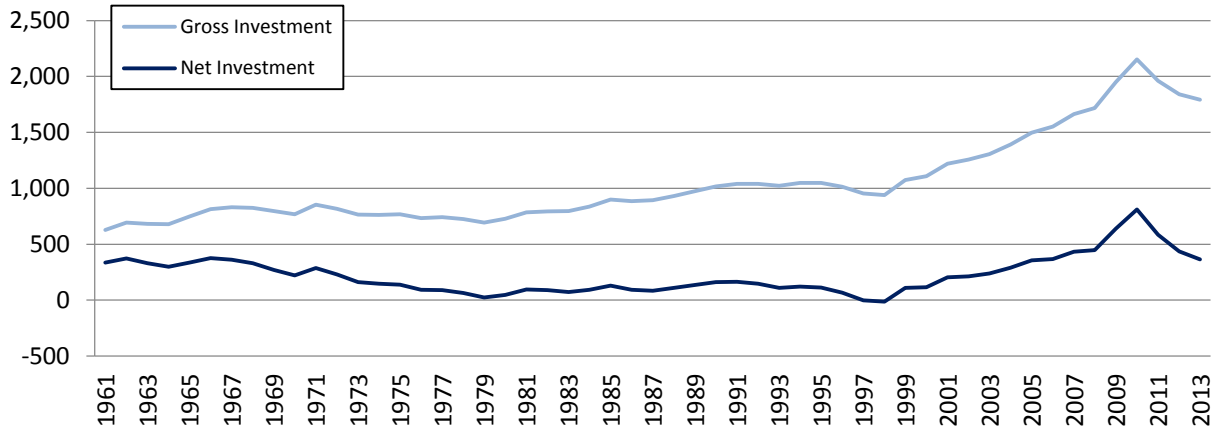


Note: Linear depreciation was used to calculate net fixed, non-residential investment.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017, 380-0064 and 031-0006.

Between 1961 and 1979, the dramatic decline in net public investment intensity was primarily driven by falling net public investment in engineering construction and non-residential buildings, which together accounted for 1.7 percentage points (or 60.8 per cent) of the total decline (Appendix Chart B32). However, falling net public investment intensities for M&E and IPP were also important, contributing 0.4 percentage point (or 13.2 per cent) and 0.5 percentage

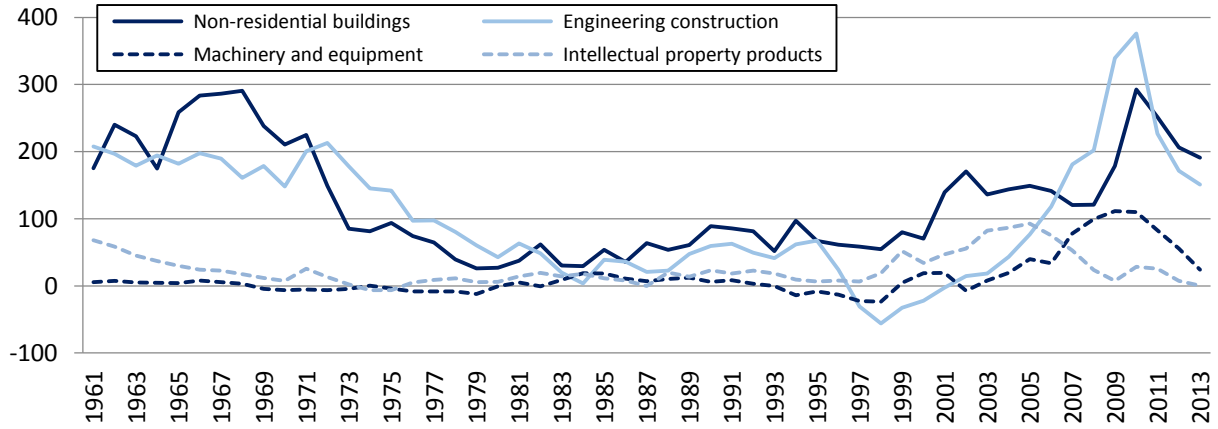
point (or 17.9 per cent) to the overall decline, respectively. While the intensity of net public investment remained low for engineering construction, non-residential buildings and IPP between 1998 and 2013, net public investment in M&E was quite strong for most of this period. Net investment in non-residential buildings and engineering construction improved after 2008, peaking at 0.6 and 0.9 per cent of nominal GDP (respectively) in 2010.

Appendix Chart B33: Government Sector Gross and Net Fixed, Non-Residential Investment Per Capita, Chained (2007) Dollars, Canada, 1961-2013



Note: Linear depreciation was used to calculate net fixed, non-residential investment.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 051-0005 and 031-0006.

Appendix Chart B34: Government Sector Net Fixed, Non-Residential Investment Per Capita by Component, Chained (2007) Dollars, Canada, 1961-2013



Note: Linear depreciation was used to calculate net fixed, non-residential investment.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 051-0005 and 031-0006.

While real per capita gross public investment increased at an annual rate of 2.0 per cent between 1961 and 2013, real per capita net public investment only increased 0.15 per cent per year, as replacement requirements continued to rise in real per capita terms driven by increases in the stock of public capital (Appendix Chart B33). In fact, real per capita net public investment decreased 13.5 per cent per year from $337 in 1961 to $25 in 1979 and remained at a low a level

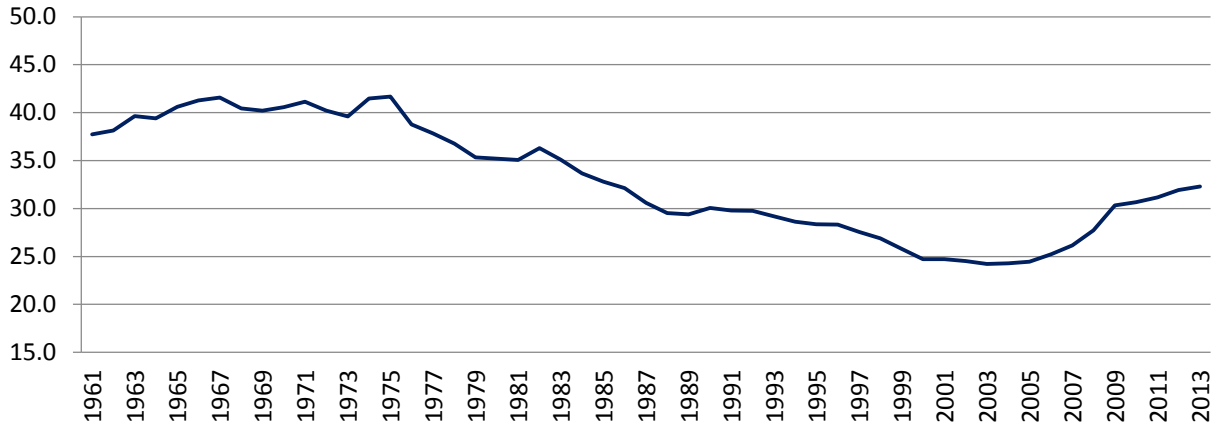
throughout the 1980s and 1990s. However, following 1998, real per capita net public investment increased significantly, driven by stronger growth in real per capita gross public investment.

Appendix Chart B34 provides a breakdown of real per capita net public investment by type of investment. To a large extent, trends in real per capita net public investment by type of investment in 1961-2013 were quite similar to the trends in net public investment intensity by type of investment discussed earlier (Appendix Chart B20).

General Government Net Capital Stock

Between 1961 and 2013, the share of net public capital in nominal GDP fell 5.4 percentage points from 37.7 to 32.3 per cent (Appendix Chart B35), as net public investment did not keep pace with nominal GDP growth for much of this period. After averaging at roughly 40.0 per cent of nominal GDP from 1961 to 1976, the share of net public capital declined in nominal GDP decreased 14.6 percentage points from 38.8 per cent in 1976 to 24.2 per cent in 2003.

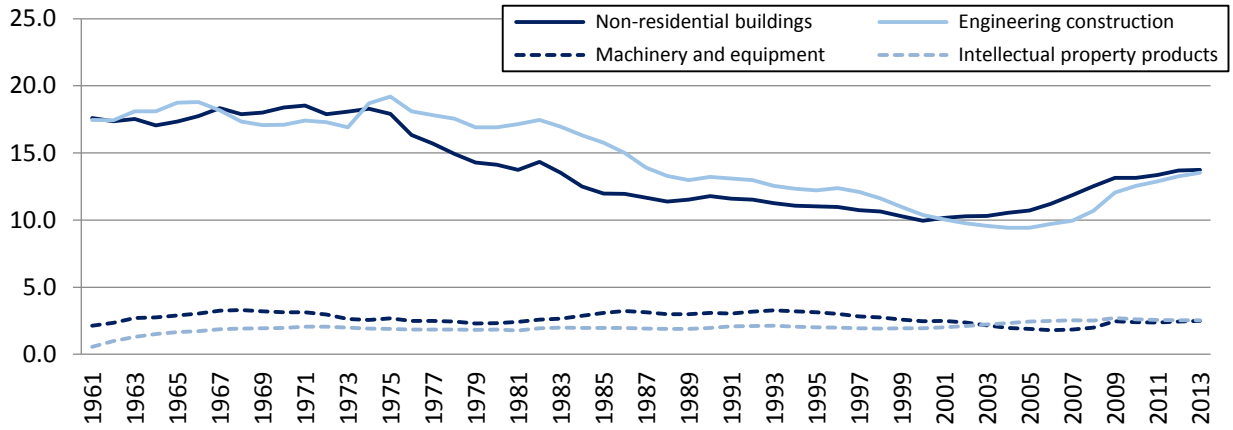
Appendix Chart B35: Government Sector Net Fixed, Non-Residential Capital Stock, Share of Nominal GDP, Per Cent, Canada, 1961-2013



Note: Linear depreciation was used to calculate net fixed, non-residential capital stock.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017, 380-0064 and 031-0006.

Engineering construction and non-residential buildings accounted for 8.5 and 6.0 percentage points of the decline, respectively (Appendix Chart B36). Between 2003 and 2013, the share of net public capital in nominal GDP increased 8.1 percentage points from 24.2 to 32.3 per cent, driven by increased growth in net public investment. Again, engineering construction and non-residential buildings accounted for almost the entire increase, with contributions of 3.4 and 4.0 percentage points, respectively.

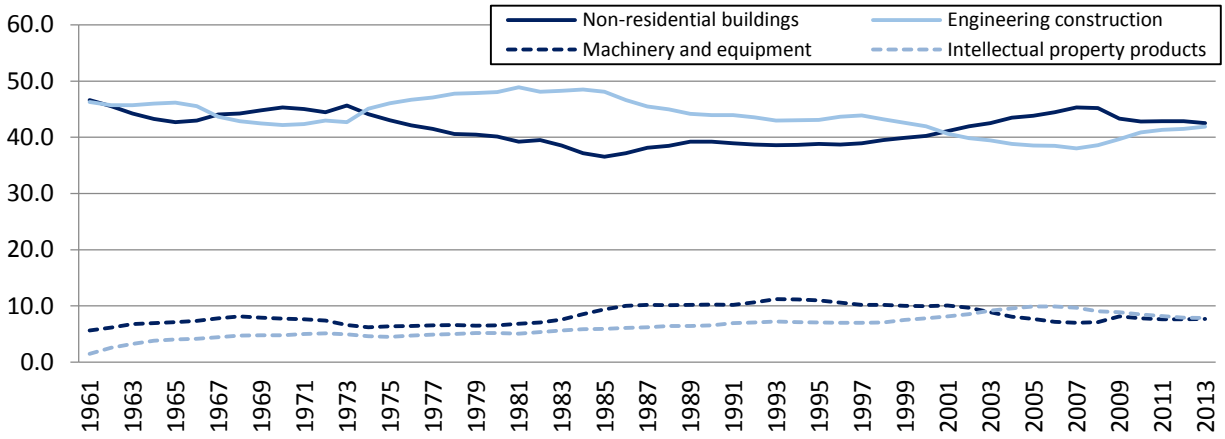
Appendix Chart B36: Government Sector Net Fixed, Non-Residential Capital Stock by Component, Share of Nominal GDP, Per Cent, Canada, 1961-2013



Note: Linear depreciation was used to calculate net fixed, non-residential investment.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 380-0017, 380-0064 and 031-0006.

In 2013, non-residential buildings accounted for the largest share of the net public capital stock (42.5 per cent), followed by engineering construction (41.9 per cent), IPP (7.9 per cent), and M&E (7.7 per cent). This represented a notable change from 1961 when the share of IPP was significantly lower at 1.5 per cent of the stock of public capital. The increase in the share of IPP was almost entirely due to an increase in share of software.

Appendix Chart B37: Shares of Government Sector Net Fixed, Non-Residential Capital Stock by Component, Per Cent, Canada, 1961-2013

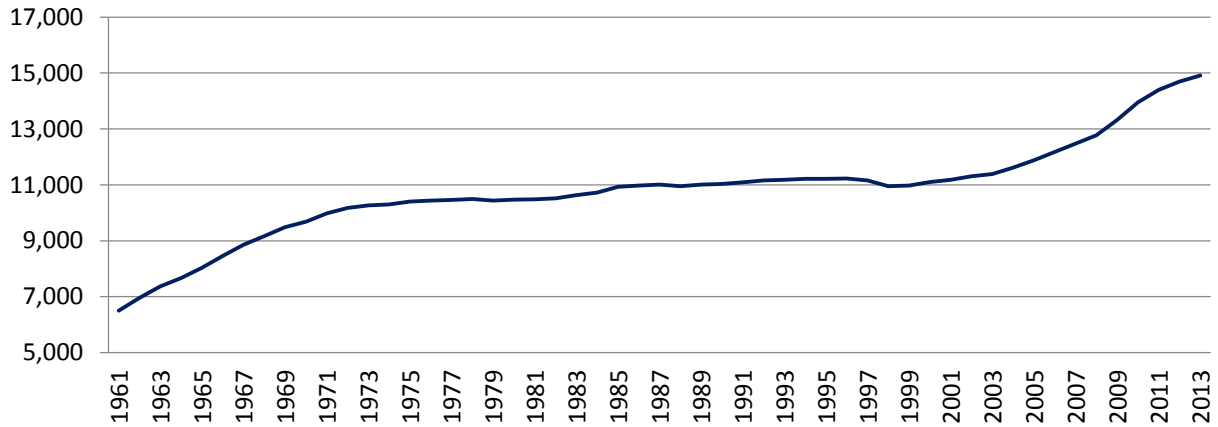


Source: CSLS calculations based on Statistics Canada data. CANSIM table 051-0005.

On a per capita basis, the real net stock of public capital increased 1.6 per cent per year from $6,500 in 1961 to $14,910 in 2013 (Appendix Chart B38). The increase in the real per capita net stock of public capital was concentrated in the 1961-1971 and 2003-2013 periods, with each period accounting for about 42.0 per cent of the total increase. Growth in the real per capita

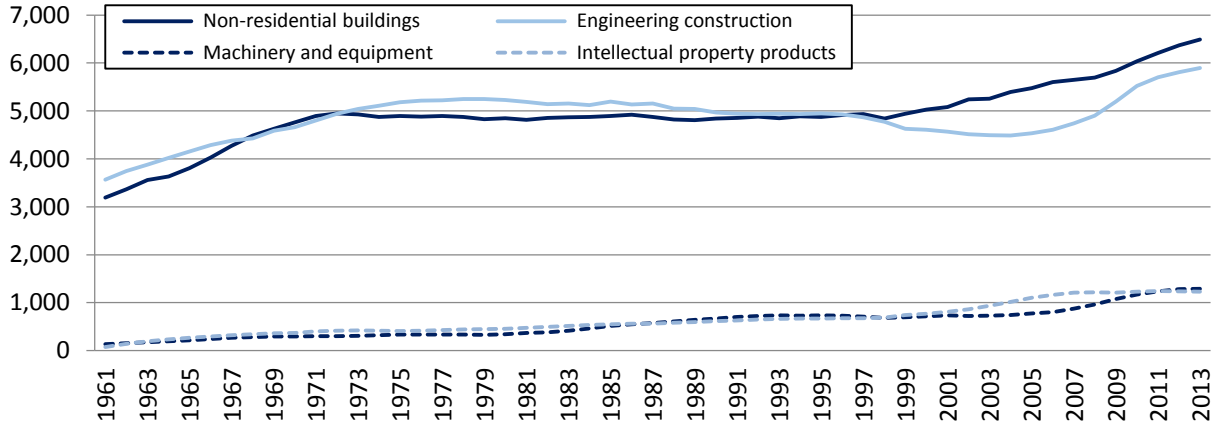
net stock of public capital was extremely weak from 1971 to 2003, growing at a pace of 0.4 per cent per year.

Appendix Chart B38: Government Sector Net Fixed, Non-Residential Capital Stock Per Capita, Chained (2007) Dollars, Canada, 1961-2013



Note: Linear depreciation was used to calculate net fixed, non-residential capital stock.
Source: CSLS calculations based on Statistics Canada data. CANSIM tables 051-0005 and 031-0006.

Appendix Chart B39: Government Sector Net Fixed, Non-Residential Capital Stock Per Capita by Component, Chained (2007) Dollars, Canada, 1961-2013



Source: CSLS calculations based on Statistics Canada data. CANSIM tables 051-0005 and 031-0006.

Appendix Chart B39 provides a breakdown of real per capita net stock of public capital by type of investment. Among the components of the real per capita net stock of public capital, IPP exhibited the largest increase between 1961 and 2013 (5.4 per cent per year), followed by M&E (4.5 per cent per year), non-residential buildings (1.4 per cent per year), and engineering construction (1.0 per cent per year). However, while increases in the real per capita stock of public IPP and M&E were exhibited over most of the 1961-2013 period, increases in the real per capita net stock of public non-residential buildings and engineering construction were concentrated in the first and last ten years of the 1961-2013 period.

b. Key Findings

The key findings from the previous part are briefly outlined below.

- The intensity of public investment strengthened after 2000, following a prolonged period of weakness in the 1980s and 1990s. The recent increase in public investment intensity was driven by increased public investment in engineering construction and, to a lesser extent, non-residential buildings. However, much of the recent improvement in public investment intensity was linked to stimulus spending, and the intensity of public investment has fallen somewhat since 2010.

- The intensity of public investment is still well below the levels exhibited in the 1960s. For example, the intensity of net public investment was 2.9 per cent in 1961, three times higher than the level of net public investment intensity in 2013 (0.8 per cent). This was mostly driven by lower intensity of public investment in engineering construction and non-residential buildings.

- Between 1961 and 2013, real per capita net public investment increased at an average annual rate of 0.15 per cent per year. This slow growth rate was driven by declines in real per capita public investment in the 1970s, after which it remained relatively constant until about 2000. From 2000 to 2013, real per capita public investment increased significantly, driven by more rapid growth in public investment.

- The low intensity of public investment in the 1980s and 1990s resulted in a massive decline in the share of the net stock of public capital in nominal GDP from about 40 per cent in the 1960s and 1970s to a low of 24.2 per cent in 2003. Due to improvements in the intensity of public investment, the share of the net stock of public capital in nominal GDP increased to 32.3 per cent in 2013, which is still well below the levels exhibited in the 1960s and 1970s.

- On a per capita basis, the real net stock of public capital increased 1.6 per cent per year from $6,500 in 1961 to $14,910 in 2013. The increase in the real per capita net stock of public capital was concentrated in the 1960s and post-2000, with each period accounting for somewhat less than half of the total increase.

- In 2013, the intensity of gross public investment varied greatly across the provinces. The intensity of gross public investment was highest in Nova Scotia, followed by Quebec, Manitoba, and Prince Edward Island. The intensity of gross public investment was lower than the national average in the remaining provinces. Between 1981 and 2013, the intensity of public investment fell in six provinces (the Atlantic provinces, Saskatchewan, and Alberta) and rose in the remaining four.

- Per capita public investment varied greatly across the provinces in 2013, ranging from $2,703 in Alberta to $1,591 in New Brunswick. Between 1981 and 2013, real per capita gross public investment exhibited annual growth rate in Quebec, followed by Newfoundland and Labrador, Ontario, Manitoba, and Saskatchewan.

- Among thirty-eight countries, Canada ranked twelfth in terms of the intensity of public investment. Canada ranked behind emerging economies in Eastern Europe, the Nordic countries, and emerging economies in East Asia, while Canada ranked ahead of most economies in Western Europe, Central Europe and Latin America, as well as the United States, Japan, Australia and New Zealand.

- In 2013, Canada ranked seventh among thirty-eight countries with per capita gross public investment of $1,670. The highest level of per capita gross public investment was exhibited by Luxembourg, followed by Norway, Sweden, and the United States. The emerging economies in Eastern Europe and in East Asia which Canada ranked behind in terms of the intensity of gross public investment exhibited lower levels of per capita gross public investment in 2013.

Appendix C: R&D by Province

Research and development (R&D) is defined as the discovery of new knowledge and the application of this knowledge to fill market needs. This appendix examines expenditures on research and development in Canada at the national level between 2000 and 2014 and at the sub-national level between 2000 and 2012. Comparisons with OECD countries are also made, typically focusing on the period between 2008 and 2013. This appendix first examines gross domestic expenditures on research and development (GERD) in Canada. Next, GERD at the provincial level is overviewed. The same national, OECD and sub-national discussion is then undertaken for business expenditures on research and development (BERD) and higher education sector expenditures on research and development (HERD). Finally, government sector expenditures on research and development (GOVERD) follow a similar pattern of a national, OECD and provincial examination. At the end, GOVERD is broken down into federal government sector expenditures on research and development (FERD) and provincial government sector expenditures on research and development (PERD). It is important to note that FERD and PERD data can both be calculated at the national and the provincial level.

a. Gross Domestic Expenditures on Research and Development (GERD)

GERD at the National Level

Appendix Table C1: GERD, Canada, 2000-2014

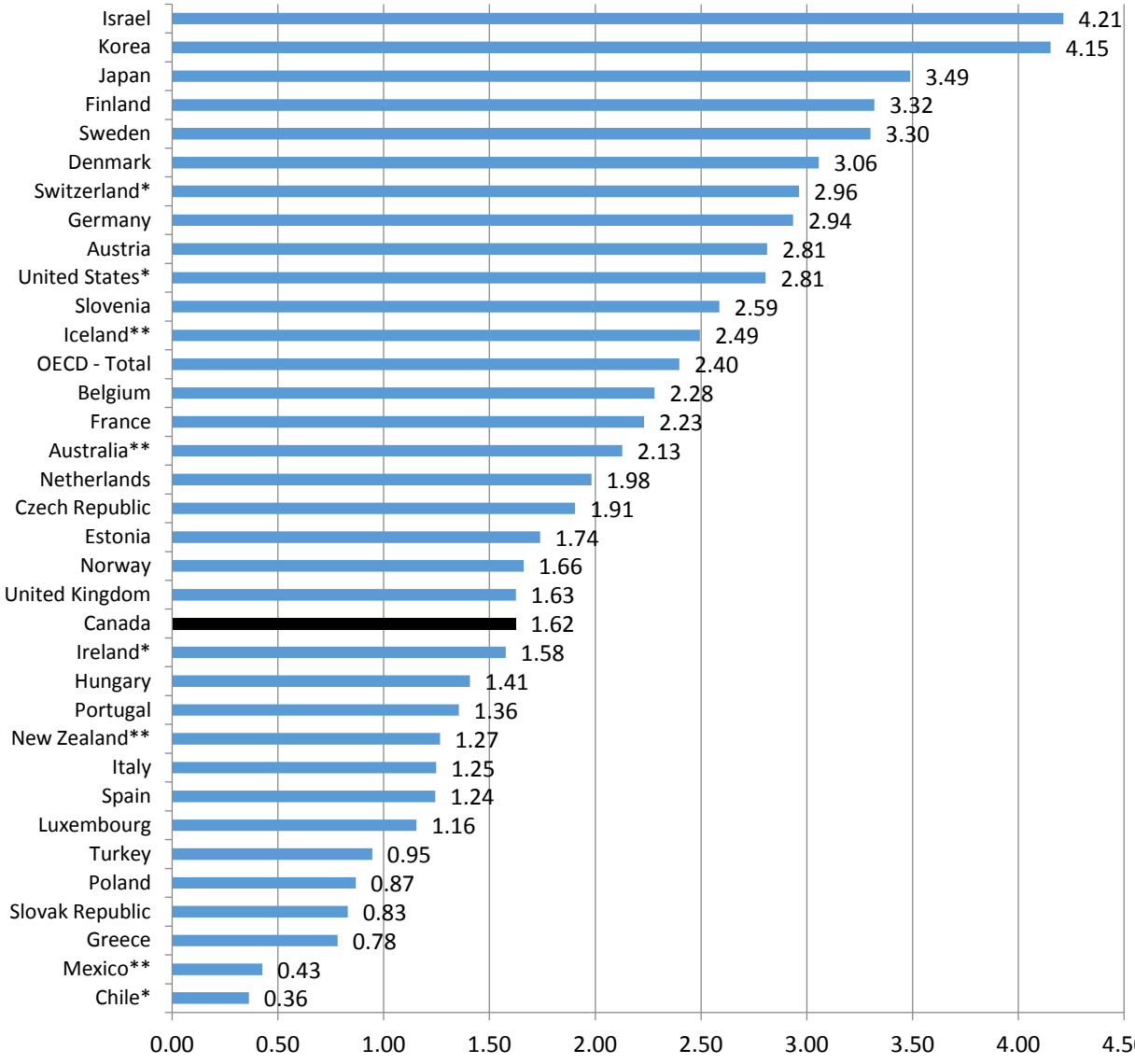
	Current Prices	2007 Constant Prices	Deflator	Nominal GERD Share of Nominal GDP
2000	20,555	24,706	83.20	1.87
2001	23,132	27,343	84.60	2.04
2002	23,534	27,493	85.60	1.99
2003	24,693	27,902	88.50	1.99
2004	26,680	29,190	91.40	2.01
2005	28,022	29,716	94.30	1.99
2006	29,079	30,009	96.90	1.96
2007	30,038	30,038	100.00	1.92
2008	30,751	29,597	103.90	1.87
2009	30,129	29,625	101.70	1.92
2010	30,555	29,267	104.40	1.84
2011	31,486	29,235	107.70	1.78
2012	31,307	28,591	109.50	1.71
2013	30,748	27,701	111.00	1.62
2014	30,572			1.55
	Compound Average Annual Growth			**Percentage Point Change**
2000-2014	2.9			0.32
2000-2008	5.2			0.00
2008-2014	-0.1			0.32
2000-2013		0.9	2.2	
2000-2008		2.3	2.8	
2008-2013		-0.9	1.3	

Source: CANSIM 384-0038 and 358-0001.

In 2014, nominal gross domestic expenditures on research and development (GERD) in Canada reached $30,572 million, up 48.7 per cent from $20,555 million in 2000, representing a

compound average annual growth of 2.9 per cent per year (Appendix Table C1). All of this growth was concentrated between 2000 and 2008, since nominal GERD decreased by approximately $200 million between 2008 and 2014. It is important to note that the fall in nominal GERD is not only the result of the recession; in other words, it is not simply that nominal GERD is rising and has yet to reach its previous peak. Nominal GERD actually surpassed its previous peak in 2011, only to fall in 2012, 2013 and 2014.

Appendix Chart C1: GERD Intensity, OECD Countries, 2013



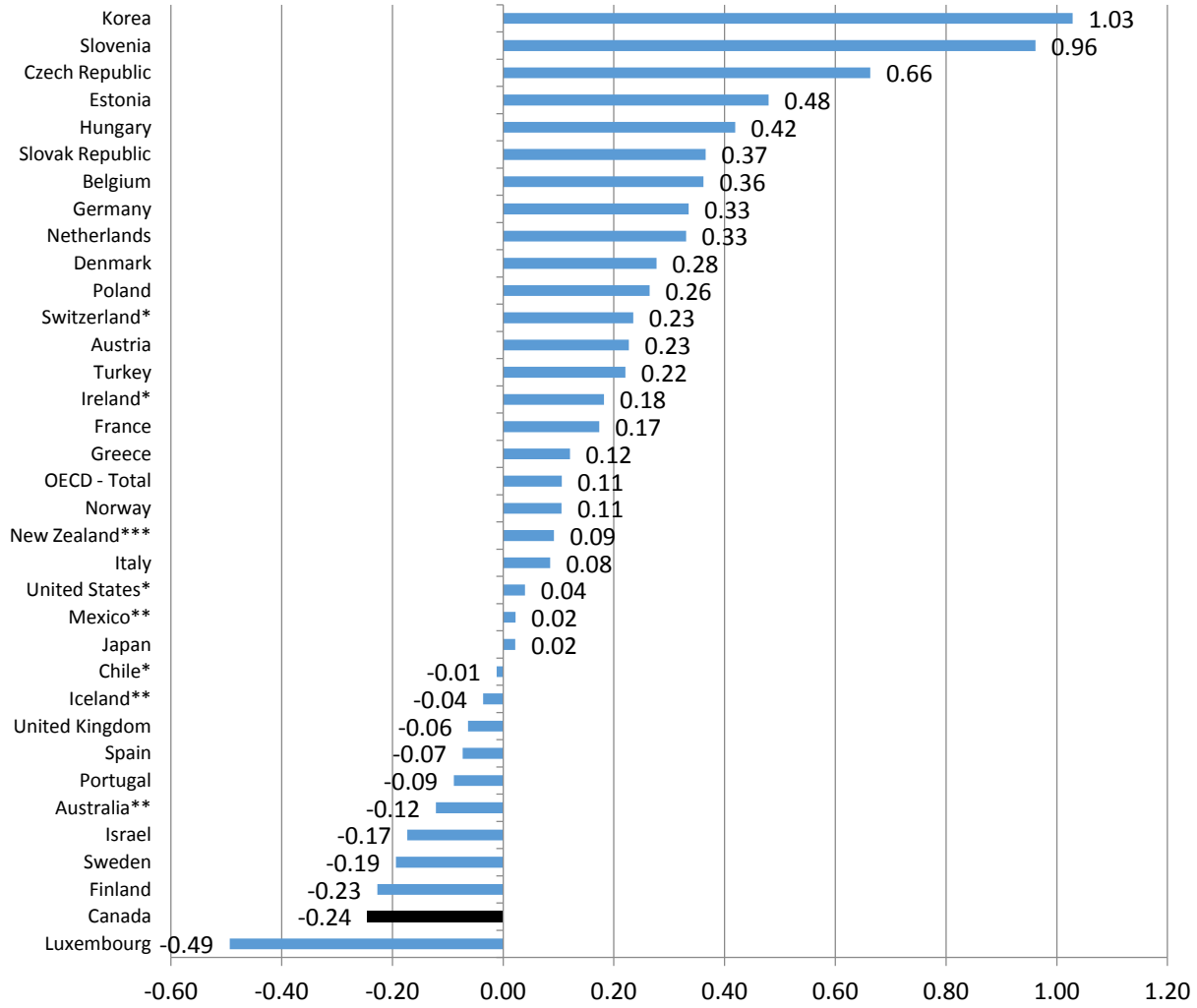
Note: A single asterisk (*) indicates data from the year 2012, while a double asterisk (**) indicates data from the year 2011.
Source: OECD (2015), Gross domestic spending on R&D (indicator). doi: 10.1787/d8b068b4-en (Accessed on 06 May 2015)

In 2013, real GERD (constant 2007 prices) was $27,701 million, up 12.1 per cent (0.9 per cent per year) from $24,706 million in 2000. Similar to nominal GERD, real GERD achieved all

of its growth between 2000 and 2008, since the compound average annual growth rate between 2008 and 2013 was negative (-0.9 per cent per year).

The share of nominal GERD in nominal GDP has declined 0.32 percentage points from 1.87 per cent in 2000 to 1.55 per cent in 2014. This decline took place between 2008 and 2014, since the share of nominal GERD in nominal GDP was unchanged at 1.87 per cent in both 2000 and 2008.

Appendix Chart C2: Change in the Share of GERD in Nominal GDP, OECD Countries, 2008-2013



Note: A single asterisk (*) indicates a change from 2008 to 2012, while a double asterisk (**) indicates a change from 2008 to 2011. A triple asterisk (***) indicates a change from 2007-2011.
Source: OECD (2015), Gross domestic spending on R&D (indicator). doi: 10.1787/d8b068b4-en (Accessed on 06 May 2015)

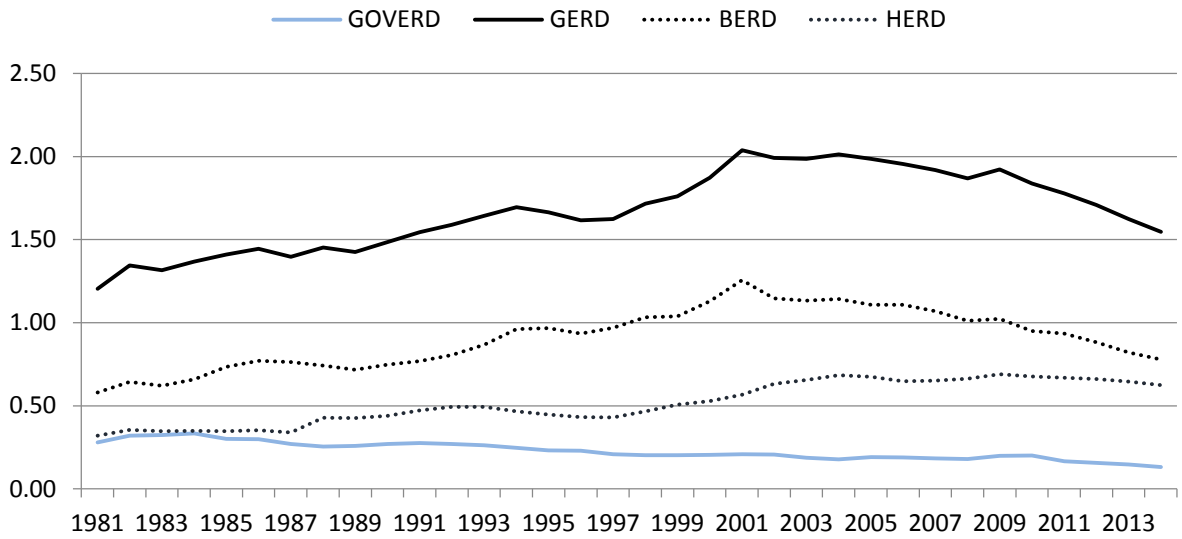
When compared to other OECD countries, Canada ranked twenty-first out of thirty-four in terms of GERD intensity (the share of GERD in nominal GDP) in 2013 at 1.62 per cent. Israel had the highest GERD intensity (4.21 per cent), while Chile had the lowest (0.36 per cent). Many of the Nordic countries ranked at the top in terms of GERD intensity, as did two big Asian

economies (Korea and Japan). Many of the developing countries (Chile, Mexico and Turkey) were ranked at the bottom end, as were many of the European economies facing troubles in the late-2000s (Greece, Italy and Spain). It is also important to note that Canada is well below the OECD aggregate (2.40 per cent).

Relative to other OECD countries, Canada's share of nominal GERD in nominal GDP saw the second largest fall between 2008 and 2013 (-0.24 percentage points), only surpassed by Luxembourg (-0.49 percentage points) (Appendix Chart C2). Finland and Sweden also saw their share of nominal GERD in nominal GDP fall quite rapidly during this period (-0.23 and -0.19 percentage points respectively). At the top end, Korea and Slovenia saw the largest increase in their shares of nominal GERD in nominal GDP.

Although GERD as a per cent of nominal GDP has been declining in recent years, reaching 1.55 per cent in 2014, it is still somewhat higher than it was in 1981 (1.20 per cent) (Appendix Chart C3). However, it is also significantly lower than the peak in 2001 (2.04 per cent) and equivalent to GERD intensity in 1991. The surge in growth between the early-1980s and the late-1990s was largely driven by the boom in computer technologies and the rise of Nortel. Since the dot-come bubble burst in the early-2000s, and since there was no resurgence of technological companies in Canada comparable to Nortel in terms of their research and development expenditures, there has been a weak downward trend in GERD intensity that was only further accentuated by the financial crisis and the continued weakening of the Canadian high tech sector post-financial crisis.

Appendix Chart C3: GERD, GOVERD, BERD and HERD Shares in Nominal GDP, Canada, 1981-2014



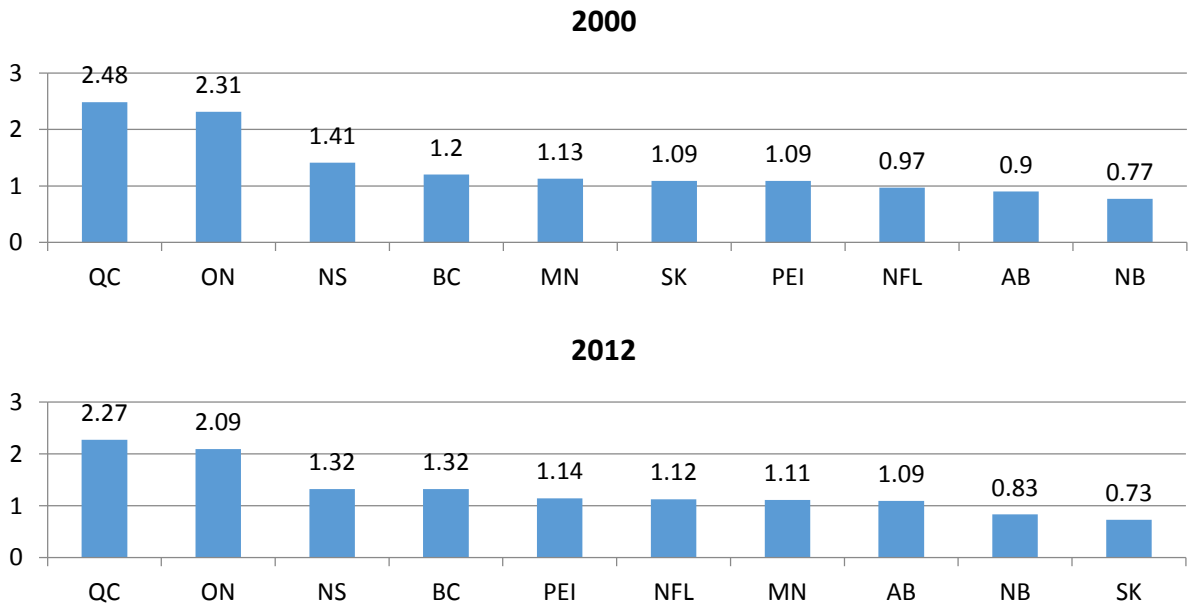
Source: CANSIM 384-0038 and 358-0001.

GERD at the Provincial Level

In 2012, Quebec and Ontario showed the highest GERD intensity in Canada (2.27 and 2.09 per cent) (Appendix Chart C4). They were followed by Nova Scotia and British Columbia (1.32 per cent and 1.32 per cent). The situation in 2012 was unchanged from 2000 when these four provinces also showed the highest GERD intensities in Canada. The only other province to show significant changes in their GERD intensity relative to the other Canadian provinces was Saskatchewan, which saw its GERD intensity decrease by 0.36 percentage points between 2000 and 2012, and its ranking fall from sixth to tenth.

In terms of compound average annual growth rates at the provincial level, a similar pattern emerges when compared to Canada. In all provinces except Newfoundland and Labrador, growth in nominal GERD was strong between 2000 and 2008 as a whole, while growth was weaker between 2008 and 2012. Hence, the majority of the growth over the twelve year period between 2000 and 2012 was concentrated between 2000 and 2008 (Appendix Table C2). Of particular interest are the high growth rates in Alberta and Newfoundland and Labrador between 2000 and 2012. There was also an incredibly strong annual growth rate in Newfoundland. These growth rates are most likely driven by the strong energy sector in these two provinces.

Appendix Chart C4: GERD Share in Nominal GDP, Provinces, 2000 and 2012



Source: CANSIM 384-0038 and 358-0001.

Of the total Canadian GERD in 2012, Ontario and Quebec represent 71.3 per cent, while the Western Provinces represent 23.3 per cent.[90] The Atlantic Provinces represented 3.8 per cent

[90] Of these Western Provinces, British Columbia and Alberta represent the majority (83 per cent).

of total Canadian GERD, compared to 6.8 per cent of the population and 5.9 per cent of GDP.[91] Compared with 2000, the Atlantic Provinces have maintained approximately the same proportion of total Canadian GERD (3.4 per cent), while the Western Provinces have gained a larger proportion (6.4 percentage points) at the expense of Ontario and Quebec (7.0 percentage points). All together, in absolute terms, the six major R&D provinces represented 94.6 per cent of GERD, while they only represent approximately 92.8 per cent of the population and 93.6 per cent of GDP.

Appendix Table C2: GERD, Provinces, 2000, 2008 and 2012

	CAN	NFL	PEI	NS	NB	QC	ON	MN	SK	AB	BC
Absolute Level (Millions)											
2000	20,555	138	37	361	159	5,717	10,383	393	376	1,321	1,606
2008	30,751	259	66	525	320	8,086	14,194	588	542	3,019	2,947
2012	31,307	363	63	503	262	8,123	14,205	658	578	3,450	2,941
Δ(2000-2012)	10,752	225	26	142	103	2,406	3,822	265	202	2,129	1,335
Compound Average Annual Growth											
2000-2012	3.6	8.4	4.5	2.8	4.3	3	2.7	4.4	3.7	8.3	5.2
2000-2008	5.2	8.2	7.5	4.8	9.1	4.4	4	5.2	4.7	10.9	7.9
2008-2012	0.5	8.8	-1.2	-1.1	-4.9	0.1	0	2.9	1.6	3.4	-0.1
GERD Intensity (Per Cent of Nominal GDP)											
2000	1.87	0.97	1.09	1.41	0.77	2.48	2.31	1.13	1.09	0.90	1.20
2008	1.87	0.82	1.38	1.48	1.13	2.58	2.35	1.13	0.80	1.02	1.44
2012	1.71	1.12	1.14	1.32	0.83	2.27	2.09	1.11	0.73	1.09	1.32
Δ(2000-2012)	-0.16	0.15	0.05	-0.09	0.06	-0.21	-0.22	-0.02	-0.36	0.19	0.12

Source: CANSIM 384-0038 and 358-0001.

Between 2000 and 2012, Quebec and Ontario saw their shares of nominal GERD in nominal GDP decline, as did Manitoba, Saskatchewan and Nova Scotia. In contrast, Newfoundland and Labrador, Prince Edward Island, New Brunswick, Alberta and British Columbia all saw their shares rise. This leads to the general observance that half of the Western Provinces and most of the Atlantic Provinces had increasing shares between 2000 and 2012, while both Central Provinces had significant decreases in their shares. Only Saskatchewan, Manitoba and Nova Scotia are exceptions to this complex geographical pattern.

Appendix Table C3: Breakdown of Change in GERD Intensity, Quebec and Ontario, 2000-2012

Intensity	Quebec	Ontario
GERD	-0.21	-0.22
BERD	-0.27	-0.46
HERD	0.15	0.23
GOVERD	-0.09	0.00

Source: CANSIM 384-0038 and 358-0001.

For Quebec and Ontario, the change in GERD intensity was almost identical between 2000 and 2012. This is interesting given their close proximity and similar economies. However, when broken down, there is a major divergence in the changes in the components of GERD. In

[91] The absolute values of provincial R&D do not sum to total Canadian GERD, so there is necessarily an unaccounted for 1.6 per cent in 2012 and a similar per cent in 2000 (2.6 per cent).

particular, Quebec saw its BERD intensity fall less than Ontario, its HERD intensity grow less, and its GOVERD intensity fall more (Appendix Table C3). These trends will be discussed later.

Appendix Table C4: GERD by Canadian Region, 2000, 2008, 2012

	Canada	Atlantic Provinces	Central Provinces	Western Provinces
Absolute Level (Millions)				
2000	20,555	695	16,100	3,696
2008	30,751	1,170	22,280	7,096
2012	31,307	1,191	22,328	7,627
Compound Average Annual Growth				
2000-2012	3.6	4.6	2.8	6.2
2000-2008	5.2	6.7	4.1	8.5
2008-2012	0.5	0.4	0.1	1.8
Intensity (Per Cent of Nominal GDP)				
2000	1.87	1.09	2.37	1.06
2008	1.87	1.17	2.43	1.15
2012	1.71	1.10	2.15	1.13
Per Cent of National Total				
2000	100.00	3.4	78.3	18.0
2008	100.00	3.8	72.5	23.1
2012	100.00	3.8	71.3	24.4

Source: CANSIM 384-0038 and 358-0001.

b. Business Enterprise Sector Expenditures on Research and Development (BERD)

Appendix Table C5: BERD, Canada, 2000-2014

	Current Prices	2007 Constant Prices	Deflator	Nominal BERD Share of Nominal GDP
2000	12,395	14,898	83.20	1.13
2001	14,266	16,863	84.60	1.26
2002	13,545	15,824	85.60	1.15
2003	14,094	15,925	88.50	1.13
2004	15,144	16,569	91.40	1.14
2005	15,638	16,583	94.30	1.11
2006	16,474	17,001	96.90	1.11
2007	16,756	16,756	100.00	1.07
2008	16,644	16,019	103.90	1.01
2009	16,038	15,770	101.70	1.02
2010	15,803	15,137	104.40	0.95
2011	16,545	15,362	107.70	0.93
2012	16,153	14,752	109.50	0.88
2013	15,535	13,995	111.00	0.82
2014	15,401	..		0.78
	Compound Average Annual Growth			Percentage Point Change
2000-2014	1.6			-0.35
2000-2008	3.8			-0.12
2008-2014	-1.3			-0.23
2000-2013		-0.5	2.2	
2000-2008		0.9	2.8	
2008-2013		-2.7	1.3	

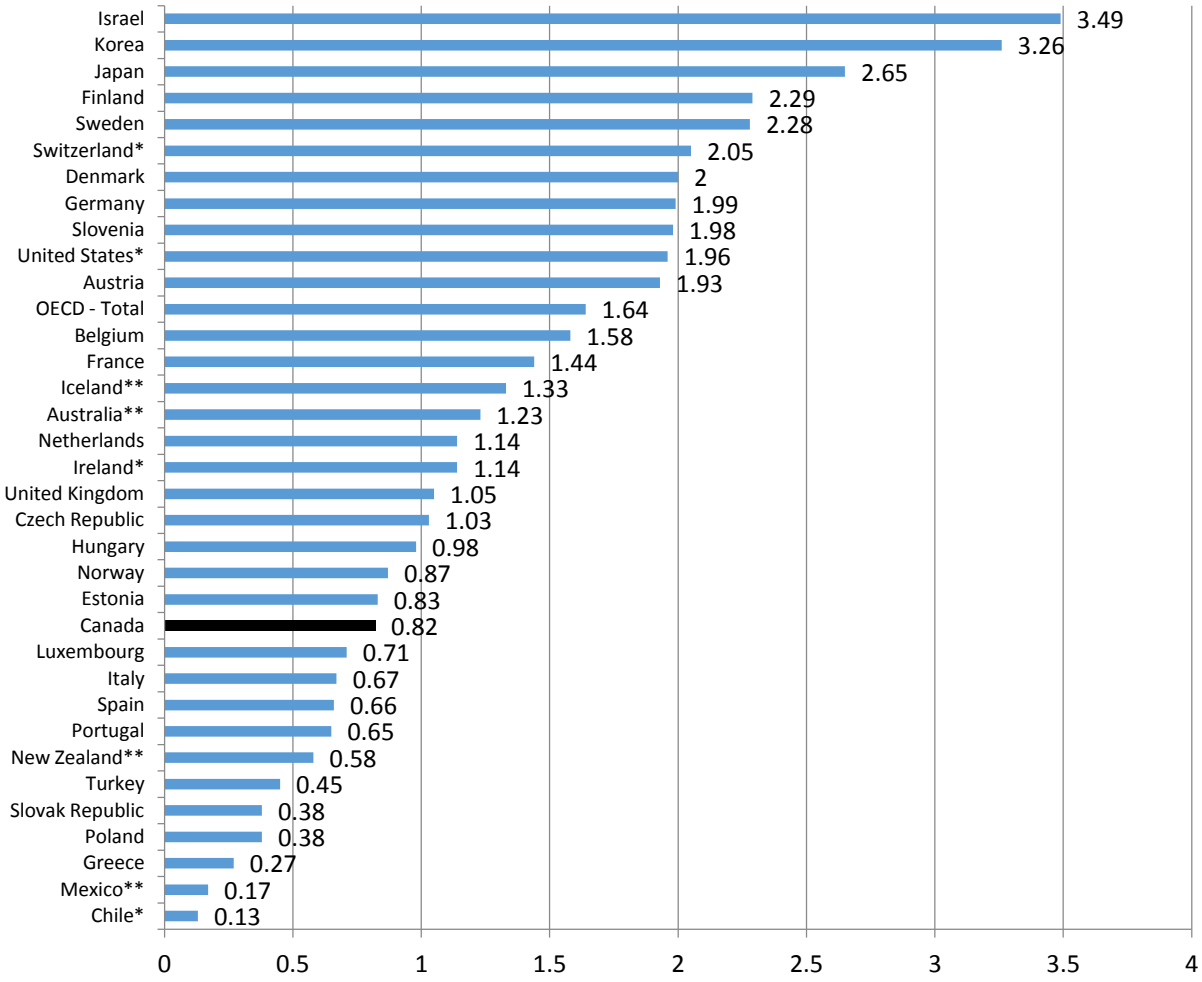
Source: CANSIM 384-0038 and 358-0001.

BERD is considered to be one of the most important components of GERD as it is the largest component of BERD and is seen to be most closely related to business sector productivity growth.

BERD at the National Level

In 2014, nominal business sector expenditures on research and development (BERD) was $15,401 million, up 24.3 per cent from $12,395 million in 2000, representing a compound average annual growth rate of 1.6 per cent per year (Appendix Table C5). All of this growth was concentrated between 2000 and 2008, since nominal BERD decreased by approximately $1,200 million between 2008 and 2014. It is interesting to note that the fall in nominal BERD is not only the result of the recession; nominal BERD has not risen consistently since the recovery. In other words, nominal BERD rebounded in 2011, but never regained the pre-recession peak ($16,545 million), only to fall back down again throughout the 2012-2014 period.

Appendix Chart C5: BERD Intensity, OECD Countries, 2013



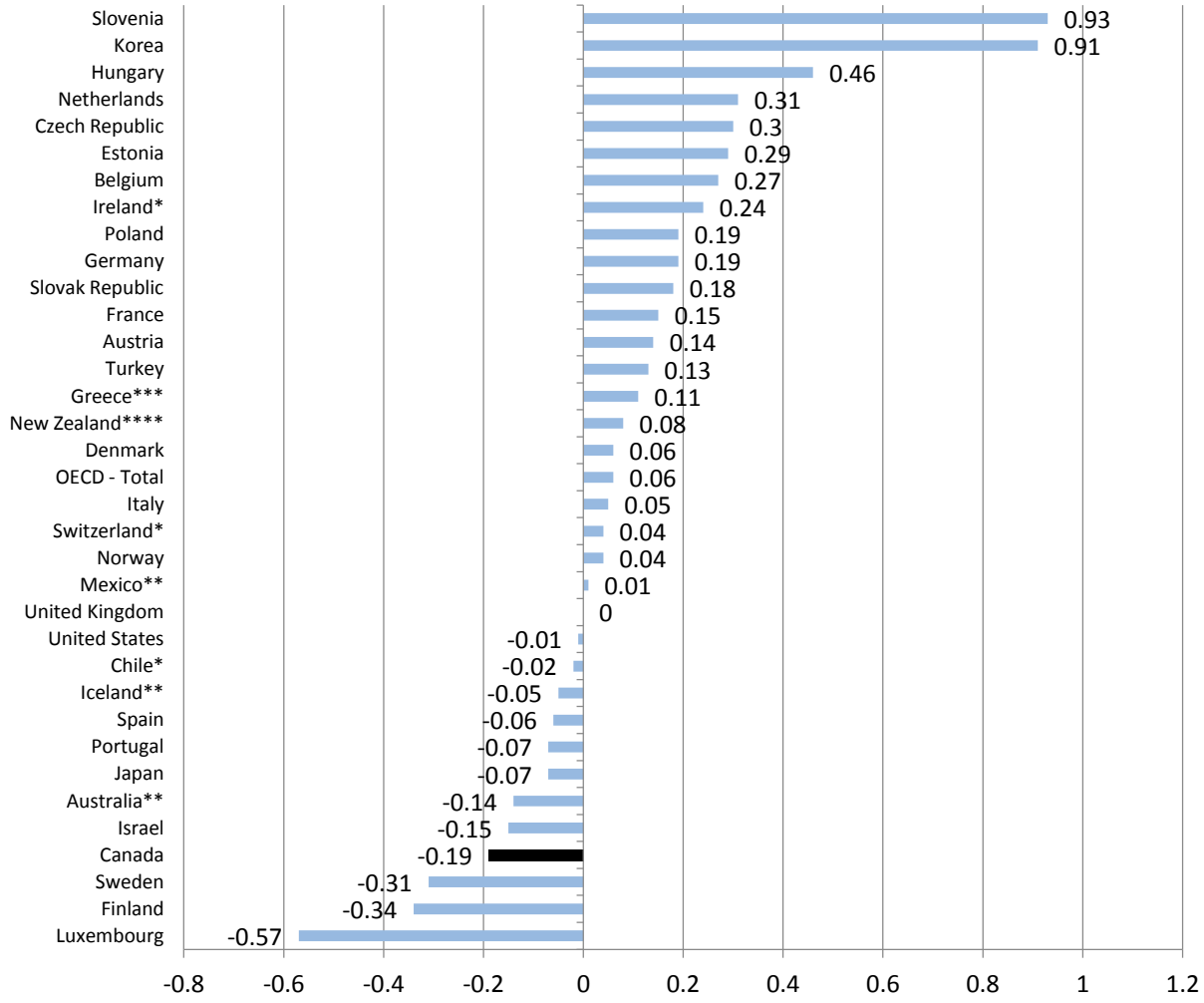
Note: A single asterisk (*) indicates data from the year 2012, while a double asterisk (**) indicates data from the year 2011.
Source: OECD, Main Science and Technology Indicators.

In 2013, real BERD (constant 2007 prices) was $13,995 million, down 6.1 per cent (-0.5 per cent per year) from $14,898 million in 2000. Similar to nominal BERD, real BERD

demonstrated all of its growth between 2000 and 2008, since real BERD had risen to $16,019 million by 2007.[92]

The share of nominal BERD in nominal GDP decreased 0.35 percentage points from 1.13 per cent in 2000 to 0.78 per cent in 2014 (and decreased 0.48 percentage points from the peak of 1.26 per cent in 2001). This decline occurred in both periods, although the majority of it took place between 2008 and 2014 (0.23 percentage points).

Appendix Chart C6: Percentage Point Change in the Share of BERD in Nominal GDP, OECD Countries, 2008-2013



Note: A single asterisk (*) indicates a change from 2008 to 2012, while a double asterisk (**) indicates a change from 2008 to 2011. A triple asterisk (***) indicates a change from 2007 to 2013, while a quadruple asterisk (****) indicates a change from 2007 to 2011.
Source: OECD, Main Science and Technology Indicators.

[92] The peak of real BERD was in 2007 at $16,756 million.

When compared to other OECD countries, Canada ranked twenty-third out of thirty-four in terms of GERD intensity in 2013 at 0.82 per cent. Israel had the highest GERD intensity (3.49 per cent), while Chile had the lowest (0.13 per cent). Similar to overall GERD, many Nordic countries and two big Asian economies (Korea and Japan) ranked at the top for BERD intensity, while many developing countries and the southern European economies plagued by financial troubles in the late-2000s ranked at the bottom.

Relative to the other OECD Countries, Canada's share of nominal BERD in nominal GDP saw the fourth largest decline between 2008 and 2014 (-0.19 percentage points) (Appendix Chart C6). The only countries to demonstrated a larger change between this time period were Sweden (-0.31 percentage points), Finland (-0.34 percentage points), and Luxembourg (-0.57 percentage points). At the top end, Korea and Slovenia saw their shares of BERD in nominal GDP increase by 0.91 and 0.93 percentage points respectively, much higher than their closest competitor, Hungary (0.46 percentage points).

Over a longer time series, it is possible to show that BERD is the main contributor to the boom and bust cycle seen in GERD (Appendix Chart C6). BERD represented only 0.58 per cent of nominal GDP in 1981, increasing extremely rapidly to 1.26 by 2001, only to fall back downwards to 0.78 by 2014. This downward decline, as previously mentioned, is not solely the result of the recession; instead, it may perhaps signal a longer-term trend of declining BERD as a per cent of nominal GDP and represent a serious challenge for the Canadian economy.

BERD at the Provincial Level

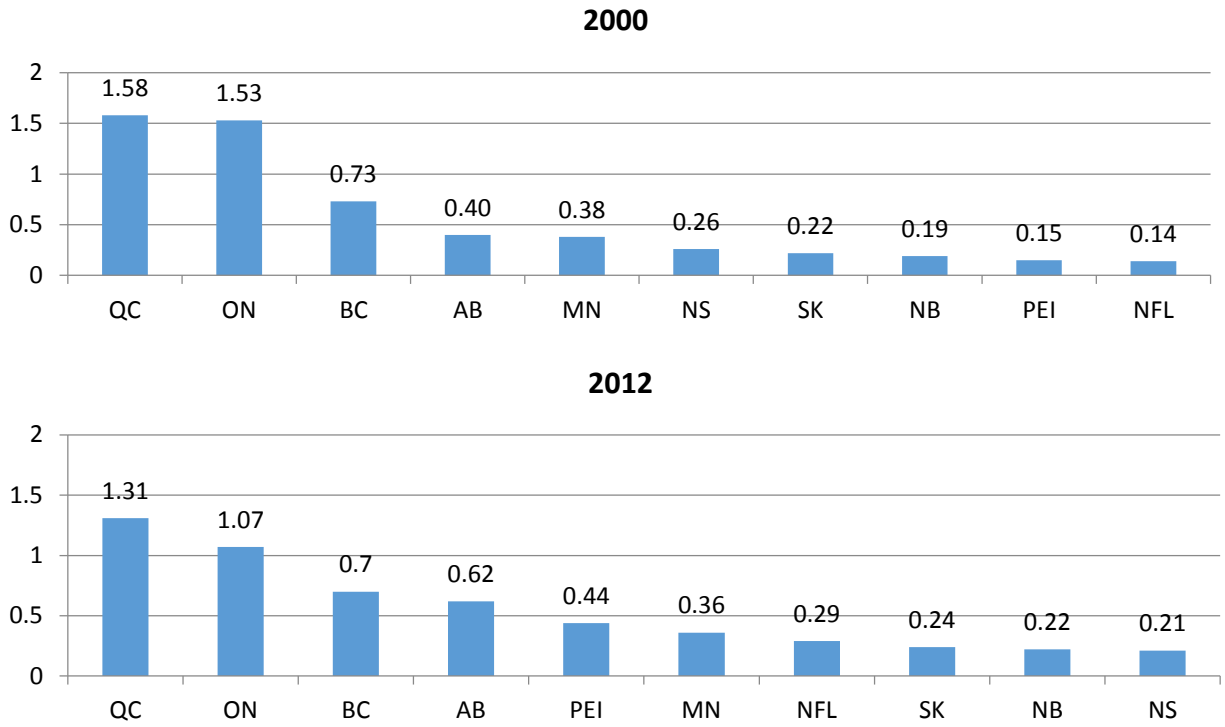
Similar to GERD, Quebec and Ontario have the highest BERD intensities in Canada (Appendix Chart C7) in both 2000 and 2012. In both years, British Columbia and Alberta had the next highest GERD intensities. Other noteworthy observations are the significant increases in Prince Edward Island and Newfoundland in BERD intensity between 2000 and 2012 (0.29 percentage points and 0.15 percentage points).

At the provincial level, every province registered positive growth between 2000 and 2008 and between 2000 and 2012 (Appendix Table C6). While between 2008 and 2012, half of the Atlantic Provinces and both Central Provinces saw their BERD decrease. British Columbia also saw its BERD decrease during this period. Surprisingly, Prince Edward Island actually saw a very large increase between 2008 and 2012 (12.5 per cent per year), despite the financial crisis of 2008-2009 and the low or negative growth seen in every other province in Canada during this period.

Between 2000 and 2012, Quebec, Ontario, Manitoba and Nova Scotia saw their shares of nominal BERD in nominal GDP fall. The largest fall was registered in Ontario (0.46 percentage points), followed by Quebec (0.27 percentage points). Every other province saw their share of nominal BERD in nominal GDP rise. The largest increase was seen in Prince Edward Island (0.29 percentage points) from a very low base of 0.15 per cent, followed by Alberta (0.22

percentage points). The general geographic pattern is that the Western and Atlantic Provinces saw their shares increase, while Ontario and Quebec saw their shares decrease.[93]

Appendix Chart C7: BERD Share in Nominal GDP, Provinces, 2000 and 2012



Source: CANSIM 384-0038 and 358-0001.

Appendix Table C6: BERD, Provinces, 2000, 2008, 2012:

	CAN	NFL	PEI	NS	NB	QC	ON	MN	SK	AB	BC
Absolute Level (Millions)											
2000	12,395	20	5	67	40	3,642	6,857	133	76	583	973
2008	16,644	90	15	105	121	4,794	7,883	182	146	1,618	1,685
2012	16,153	95	24	81	69	4,692	7,268	215	188	1,951	1,563
Δ(2000-2012)	3,758	75	19	14	29	1,050	411	82	112	1,368	590
Compound Average Annual Growth											
2000-2012	2.2	13.9	14	1.6	4.6	2.1	0.5	4.1	7.8	10.6	4.0
2000-2008	3.8	20.7	14.7	5.8	14.8	3.5	1.8	4	8.5	13.6	7.1
2008-2012	-0.7	1.4	12.5	-6.3	-13.1	-0.5	-2	4.3	6.5	4.8	-1.9
Intensity (Per Cent of Nominal GDP)											
2000	1.13	0.14	0.15	0.26	0.19	1.58	1.53	0.38	0.22	0.40	0.73
2008	1.01	0.29	0.31	0.30	0.43	1.53	1.30	0.35	0.22	0.55	0.83
2012	0.88	0.29	0.44	0.21	0.22	1.31	1.07	0.36	0.24	0.62	0.70
Δ(2000-2012)	-0.25	0.15	0.29	-0.05	0.03	-0.27	-0.46	-0.02	0.02	0.22	-0.03

Source: CANSIM 384-0038 and 358-0001.

[93] New Brunswick saw an interesting boom and bust cycle of its own in terms of BERD intensity. In 2002, BERD intensity increased in New Brunswick by 0.10 percentage points to 0.29 per cent. It increased another 0.10 percentage points to 0.39 per cent by 2005. The final swing to 0.44 per cent occurred by 2007. All of these gains were lost by 2012, as BERD intensity fell back down to 0.22 per cent.

Appendix Table C7: BERD by Canadian Region, 2000, 2008, 2012

	Canada	Atlantic Provinces	Central Provinces	Western Provinces
Absolute Level (Millions)				
2000	12,395	132	10,499	1,765
2008	16,644	331	12,677	3,631
2012	16,153	269	11,960	3,917
Compound Average Annual Growth Rate				
2000-2012	1.6	6.1	1.1	6.9
2000-2008	3.8	12.2	2.4	9.4
2008-2012	-1.3	-5.1	-1.4	1.9
Intensity (Per Cent of Nominal GDP)				
2000	1.13	0.21	1.54	0.51
2008	1.01	0.33	1.38	0.59
2012	0.88	0.25	1.15	0.58
Per Cent of National Total				
2000	100.00	1.1	84.7	14.2
2008	100.00	2.0	76.2	21.8
2012	100.00	1.7	74.0	24.2

Source: CANSIM 384-0038 and 358-0001.

c. Higher Education Sector Expenditures on Research and Development (HERD)

HERD at the National Level

In 2014, nominal higher education sector expenditures on research and development (HERD) in Canada reached $12,360 million, up 113.4 per cent from $5,793 million in 2000, representing a compound average annual growth of 5.6 per cent per year (Appendix Table C8). This growth occurred during both periods (2000-2014 and 2008-2014). Between 2008 and 2014, the growth rate was 2.1 per cent per year. It is interesting to note that unlike BERD, which increased after the recession, only to decrease again, HERD has increase continually, after only suffering marginally in 2009.

In 2013, real HERD (constant 2007 prices) was $11,024 million, up 58.3 per cent (3.6 per cent per year) from $6,963 million in 2000. Similar to nominal HERD, real HERD demonstrated growth in both periods, with a compound average annual growth rate of 5.3 per cent between 2000 and 2008 and 0.9 per cent between 2008 and 2014. Unlike nominal HERD, real HERD did not seem to decrease because of the recession.

The share of nominal HERD in GDP increased 0.10 percentage points between 2000 and 2014, up to 0.63 from 0.53 per cent, peaking at 0.69 in 2009. Since nominal GDP increased faster than nominal HERD between 2008 and 2014, the share of nominal HERD in nominal GDP decreased during this period by 0.03 percentage points.

When compared to other OECD countries, Canada ranked eighth out of thirty-four in terms of its HERD intensity in 2013, much higher than its BERD intensity or its GERD intensity ranking. Denmark had the highest HERD intensity at 0.97 per cent, followed by Sweden, while Chile had the lowest at 0.12 per cent. Unlike GERD and BERD, the Asian economies (Japan and Korea) did not rank very highly, although the Nordic countries still performed quite well. The developing countries and the financially struggling European economies were still ranked closer to the bottom.

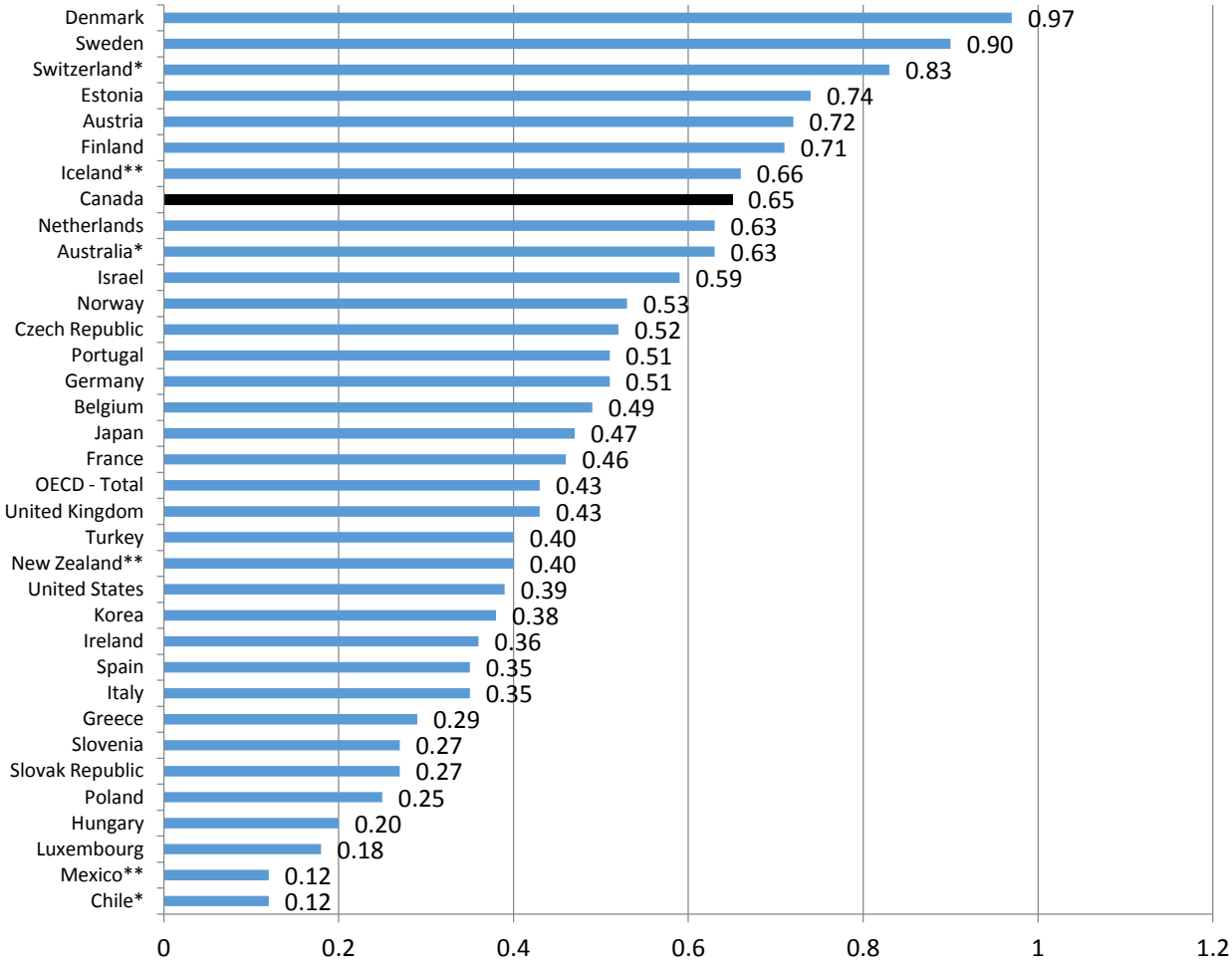
Appendix Table C8: HERD, Canada, 2000-2014

	Current Prices	2007 Constant Prices	Deflator	Nominal HERD Share of Nominal GDP
2000	5,793	6,963	83.20	0.53
2001	6,423	7,592	84.60	0.57
2002	7,455	8,709	85.60	0.63
2003	8,144	9,202	88.50	0.65
2004	9,058	9,910	91.40	0.68
2005	9,518	10,093	94.30	0.67
2006	9,625	9,933	96.90	0.65
2007	10,187	10,187	100.00	0.65
2008	10,927	10,517	103.90	0.66
2009	10,818	10,637	101.70	0.69
2010	11,249	10,775	104.40	0.68
2011	11,832	10,986	107.70	0.67
2012	12,099	11,050	109.49	0.66
2013	12,237	11,024	111.00	0.65
2014	12,360	..		0.63
	Compound Average Annual Growth			
2000-2014	5.6			0.10
2000-2008	8.3			0.13
2008-2014	2.1			-0.03
2000-2013		3.6	2.2	
2000-2008		5.3	2.8	
2008-2013		0.9	1.3	

Source: CANSIM 384-0038 and 358-0001.

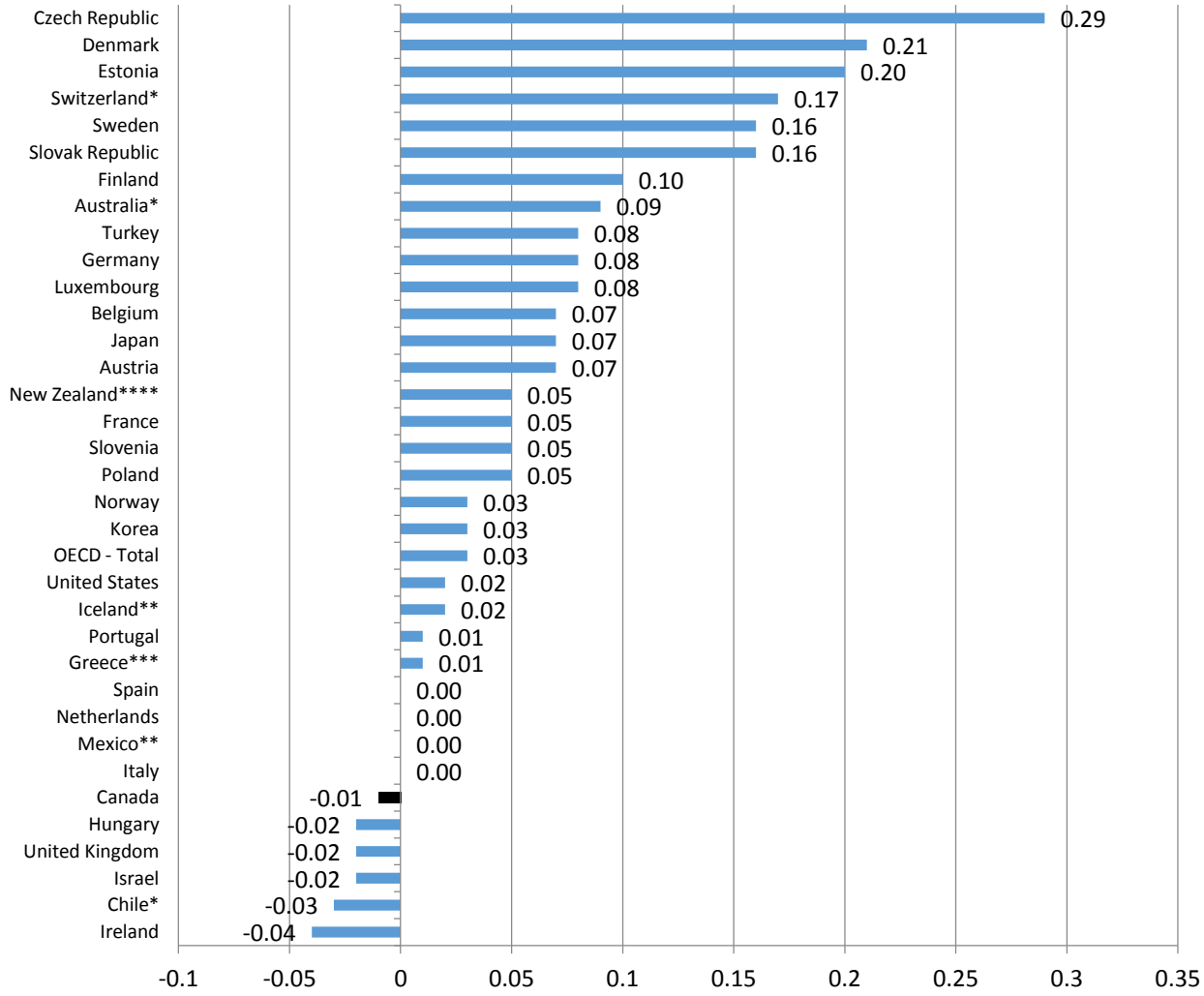
Relative to other OECD countries, Canada's share of nominal HERD in nominal GDP saw the sixth largest decline (0.01 percentage points) between 2008 and 2013 (Appendix Chart C8). The largest decline was seen in Ireland (0.04 percentage points), followed by Chile (0.03 percentage points) and Hungary, the UK and Israel, all tied with a loss of 0.02 percentage points in their shares. At the top end, the Czech Republic saw its share of HERD in nominal GDP increase by 0.29 percentage points, followed by Denmark, which saw its share increase by 0.21 percentage points.

Appendix Chart C8: HERD Intensity, OECD Countries, 2013



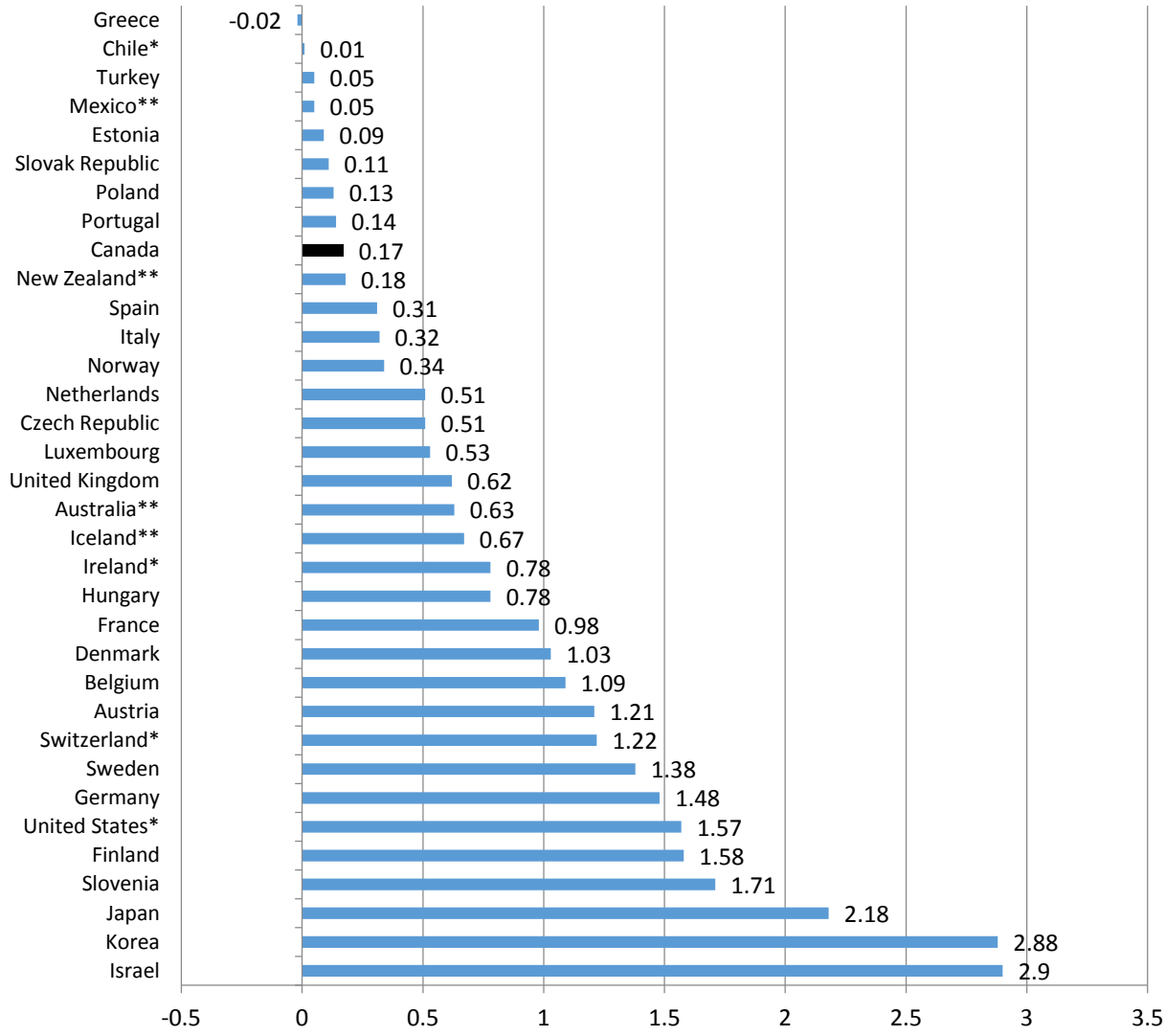
Note: A single asterisk (*) indicates data for the year 2012, while a double asterisk (**) indicates data for the year 2011.
Source: OECD, Main Science and Technology Indicators.

Appendix Chart C9: Change in the Share of HERD in Nominal GDP, OECD Countries, 2008-2013



Note: A single asterisk (*) indicates a change from 2008 to 2012, while a double asterisk (**) indicates a change from 2008 to 2011. A triple asterisk (***) indicates a change from 2007 to 2013, while a quadruple asterisk (****) indicates a change from 2007 to 2011.
Source: OECD, Main Science and Technology Indicators.

Appendix Chart C10: BERD-HERD, OECD Countries, 2013



Source: OECD, Main Science and Technology Indicators.

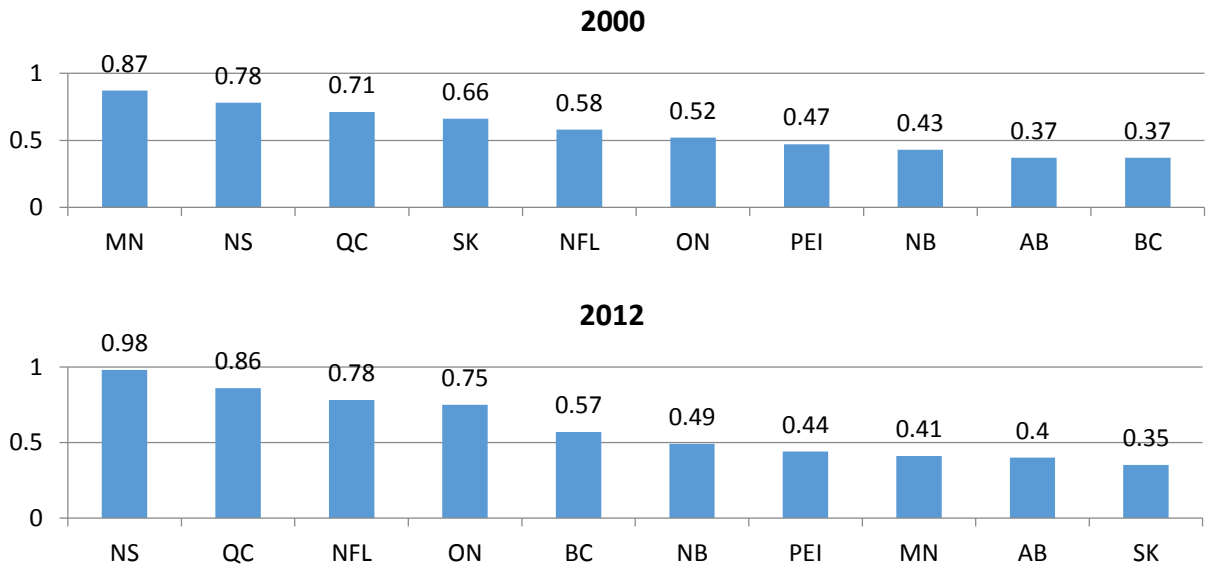
Over the long-term, the share of nominal HERD in nominal GDP has been steadily increasing (

Appendix Chart C9), at least until 2009. In 1981, HERD represented only 0.36 per cent of nominal GDP. By 2009 it had increased to 0.69 per cent. This is an astounding 0.33 percentage point increase in less than three decades. It appears that if current trends persist, higher education will surpass business as the sector with the highest expenditures on research and development share in nominal GDP. This won't necessarily occur because HERD is rising, but instead, because BERD is falling.

HERD at the Provincial Level

In 2012, Nova Scotia and Quebec had the highest HERD intensities (0.98 and 0.86 per cent respectively). These two provinces were followed by Newfoundland and Ontario at 0.78 and 0.75 per cent respectively. Compared to 2000, only Nova Scotia and Quebec were in the top four at 0.78 per cent and 0.71 per cent respectively. Manitoba had the highest share at this time, with 0.87 per cent and Saskatchewan had the fourth highest share at this time, with 0.66 per cent. Manitoba and Saskatchewan both lost their places by experiencing very large decreases in their HERD intensities by 2012 (0.46 percentage points and 0.31 percentage points respectively). Relative to GERD and BERD intensities, HERD intensities seem to show a much larger variance between 2000 and 2012, since Newfoundland saw a large increase, as did Ontario and British Columbia.

Appendix Chart C11: HERD Share in Nominal GDP, Provinces, 2000 and 2012



Source: CANSIM 384-0038 and 358-0001.

Appendix Table C9: HERD, Provinces, 2000, 2008, 2012

	CAN	NFL	PEI	NS	NB	QC	ON	MN	SK	AB	BC
Absolute Level (Millions)											

2000	5,793	83	16	200	89	1,629	2,316	189	228	547	497
2008	10,927	146	37	342	150	2,784	4,581	312	315	1,123	1,136
2012	12,099	251	24	374	156	3,064	5,114	324	273	1,256	1,263
Δ(2000-2012)	6,306	168	8	174	67	1,435	2,798	135	45	709	766
Compound Average Annual Growth											
2000-2012	6.3	9.7	3.4	5.4	4.8	5.4	6.8	4.6	1.5	7.2	8.1
2000-2008	8.3	7.3	11	6.9	6.7	6.9	8.9	6.5	4.1	9.4	10.9
2008-2012	2.6	14.5	-10.3	2.3	1	2.4	2.8	0.9	-3.5	2.8	2.7
Intensity (Per Cent of Nominal GDP)											
2000	0.53	0.58	0.47	0.78	0.43	0.71	0.52	0.87	0.66	0.37	0.37
2008	0.66	0.46	0.78	0.96	0.53	0.89	0.76	0.47	0.47	0.38	0.56
2012	0.63	0.78	0.44	0.98	0.49	0.86	0.75	0.41	0.35	0.40	0.57
Δ(2000-2012)	0.10	0.20	-0.03	0.20	0.06	0.15	0.23	-0.46	-0.31	0.03	0.20

Source: CANSIM 384-0038 and 358-0001.

At the provincial level, every province saw its HERD grow between 2000 and 2012 and between 2000 and 2008 (Appendix Table C9). Between 2008 and 2012, almost every single province saw their HERD grow. The only exceptions are Saskatchewan and Prince Edward Island, which demonstrated negative growth between 2008 and 2012.

Between 2000 and 2012, seven out of ten provinces saw their shares of nominal HERD in nominal GDP increase (Appendix Table C9). The only three provinces that saw declines were Saskatchewan (0.31 percentage points), Manitoba (0.46 percentage points) and Prince Edward Island (0.03 percentage points). It is also interesting to note that in four provinces, HERD intensity is actually larger than BERD intensity, which is very uncommon at the OECD level.

Appendix Table C10: HERD by Canadian Region, 2000, 2008, 2012

	Canada	Atlantic Provinces	Central Provinces	Western Provinces
Absolute Level (Millions)				
2000	5,793	388	3,945	1,461
2008	10,927	675	7,365	2,886
2012	12,099	805	8,178	3,116
Compound Average Annual Growth				
2000-2012	6.3	6.3	6.3	6.5
2000-2008	8.3	7.2	8.1	8.9
2008-2012	2.6	4.5	2.7	1.9
Intensity (Per Cent of Nominal GDP)				
2000	0.53	0.61	0.58	0.42
2008	0.66	0.67	0.80	0.47
2012	0.63	0.75	0.79	0.46
Per Cent of National Total				
2000	100.00	6.7	68.1	25.2
2008	100.00	6.2	67.4	26.4
2012	100.00	6.7	67.6	25.8

Source: CANSIM 384-0038 and 358-0001.

d. Government Sector Gross Domestic Expenditures on Research and Development (GOVERD)

Total GOVERD

Total government sector expenditures on research and development (GOVERD) in Canada are made up of provincial government sector R&D expenditures and federal government

sector R&D expenditures. In 2014, federal government sector R&D expenditures accounted for 88.3 per cent of total GOVERD.

GOVERD at the National Level

In 2014, government sector gross domestic expenditures on research and development (GOVERD) was $2,609 million, up 16.3 per cent from $2,244 million in 2000, representing a compound average annual growth rate of 1.1 per cent per year (Appendix Table C11). All of this growth occurred between 2000 and 2008, since nominal GOVERD decreased by approximately $360 million between 2008 and 2014 (-2.1 per cent per year). It is interesting to note that GOVERD actually increased during the recession, and only began to decrease in 2011, where it continued to decrease through 2012, 2013 and 2014.

In 2013, real GOVERD (constant 2007 prices) was $2,505 million, down 7.1 per cent (-0.6 per cent per year) from $2,697 million in 2000. Similar to nominal GOVERD, real GOVERD demonstrated growth between 2000 and 2008 and declines between 2008 and 2014.

Nominal GOVERD intensity (the share of nominal GOVERD in nominal GDP) decreased 0.07 percentage points from 0.20 to 0.13 per cent between 2000 and 2014. This decline happened during both periods, but the rapidity of the decline increased between 2008 and 2014.

When compared to other OECD countries, Canada ranked twenty-fourth out of thirty-four in terms of GOVERD intensity in 2013 at 0.15 per cent. Korea and Iceland topped the charts, with 0.45 per cent and 0.44 per cent respectively. At the bottom, Chile and Switzerland registered 0.01 per cent and 0.02 per cent. Unlike HERD, BERD and GERD, there does not appear to be a clear pattern in GOVERD intensity for Nordic Countries; however, the Asian economies appear to be at the top of the charts, as they were for BERD and GERD. The financially struggling European economies do not seem to demonstrate a pattern.

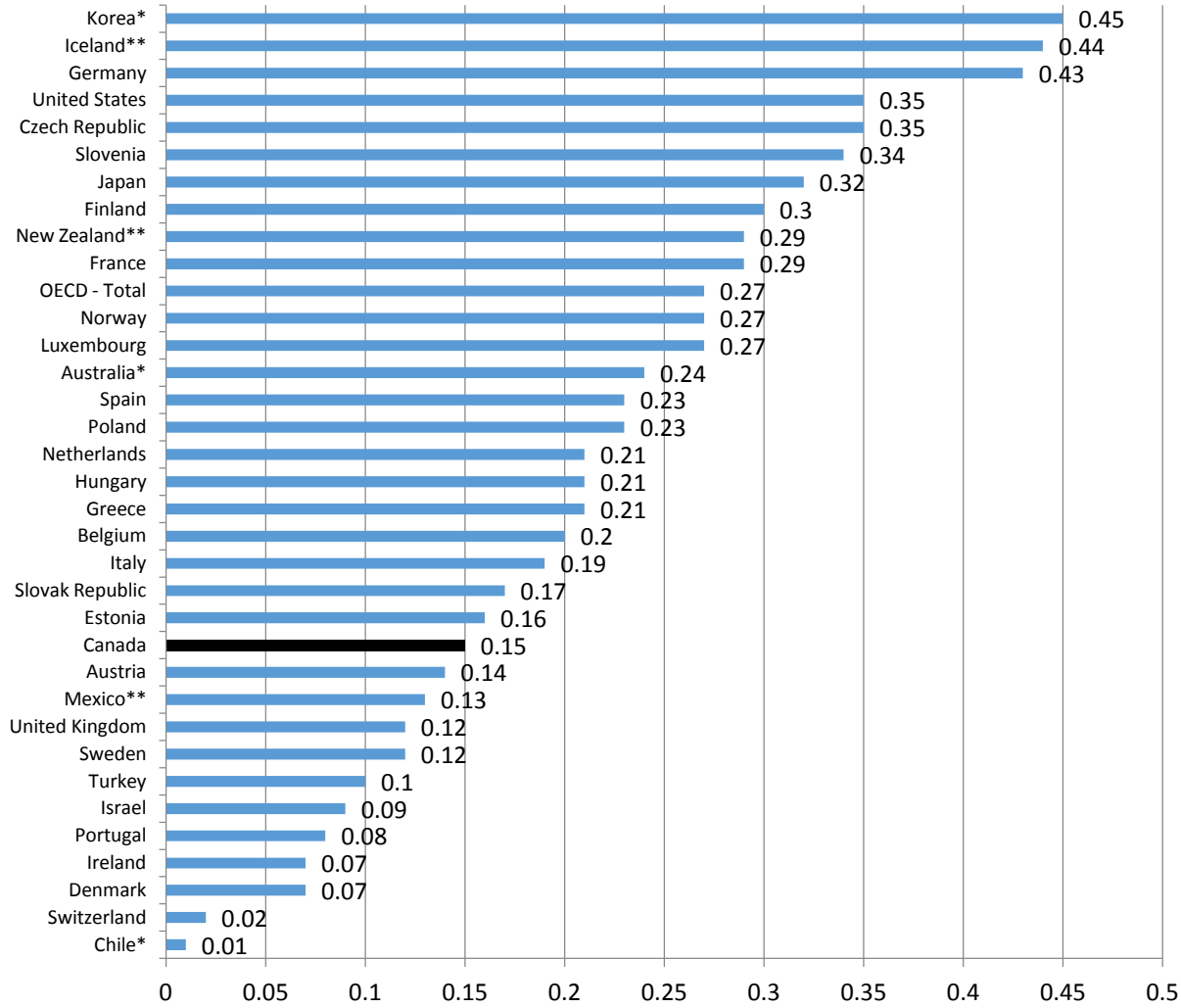
Appendix Table C11: GOVERD, Canada, 2000-2014

	Current Prices	2007 Constant Prices	Deflator	Nominal FERD Share of Nominal GDP
2000	2,244	2,697	83.20	0.20
2001	2,356	2,785	84.60	0.21
2002	2,446	2,857	85.61	0.21
2003	2,337	2,641	88.49	0.19
2004	2,349	2,570	91.40	0.18
2005	2,694	2,857	94.29	0.19
2006	2,806	2,896	96.89	0.19
2007	2,867	2,867	100.00	0.18
2008	2,963	2,851	103.93	0.18
2009	3,114	3,062	101.70	0.20
2010	3,332	3,191	104.42	0.20
2011	2,949	2,739	107.67	0.17
2012	2,867	2,618	109.51	0.16
2013	2,780	2,505	110.98	0.15
2014	2,609			0.13
	Compound Average Annual Growth			Percentage Point Change
2000-2014	1.1			-0.07
2000-2008	3.5			-0.02

2008-2014	-2.1			-0.05
2000-2013		-0.6	2.2	
2000-2008		0.7	2.8	
2008-2013		-2.6	1.3	

Source: CANSIM 384-0038 and 358-0001.

Appendix Chart C12: GOVERD Intensity, OECD Countries, 2013

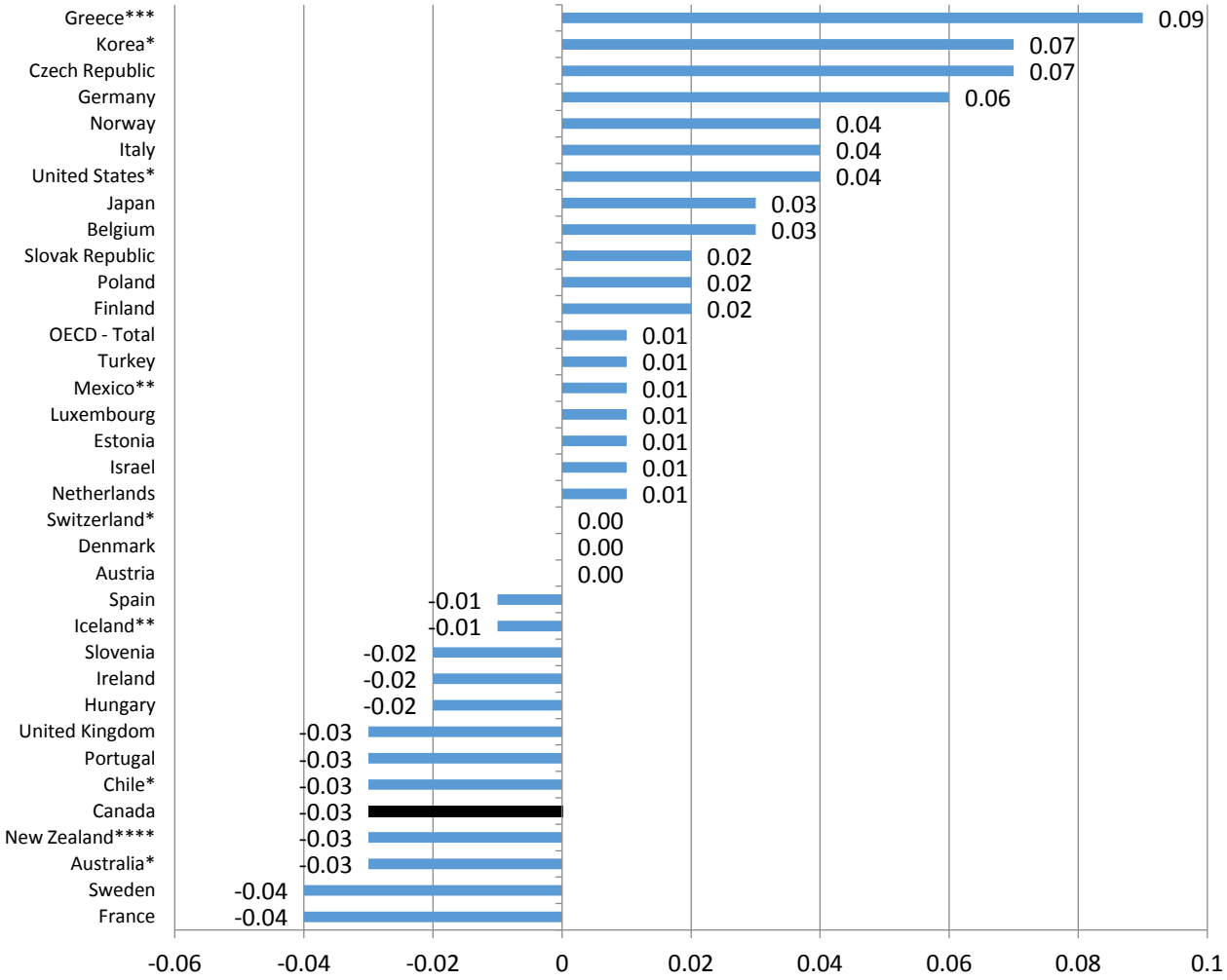


Note: A single asterisk (*) indicates data for the year 2012, while a double asterisk (**) indicates data for the year 2011.
Source: OECD, Main Science and Technology Indicators.

Relative to other OECD countries, Canada's share of nominal government sector expenditures on research and development (GOVERD) in nominal GDP saw the second largest

fall between 2008 and 2013 (-0.03 percentage points) (Appendix Chart C13).[94] Only Sweden and France saw larger falls in their shares of nominal GOVERD (-0.04 percentage points). Along with Canada, five other countries saw their shares of nominal GOVERD fall by 0.03 percentage points: Australia, New Zealand, Chile, Portugal and the United Kingdom. At the top end, Greece surprisingly saw its share of nominal GOVERD rise 0.09 percentage points, followed by Korea and the Czech Republic with 0.07 percentage points.

Appendix Chart C13: Change in the Share of GOVERD in Nominal GDP, OECD Countries, 2008-2013



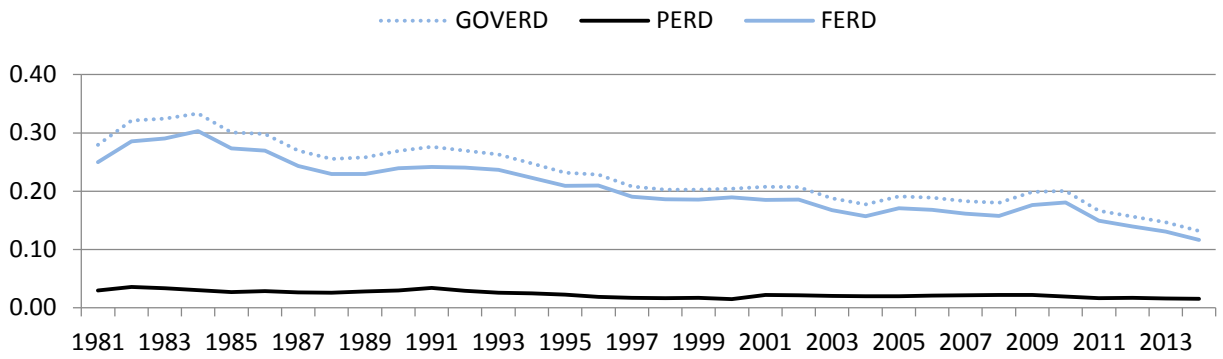
Note: A single asterisk (*) indicates a change from 2008 to 2012, while a double asterisk (**) indicates a change from 2008 to 2011. A triple asterisk (***) indicates a change from 2007 to 2013, while a quadruple asterisk (****) indicates a change from 2007 to 2011.
Source: OECD, Main Science and Technology Indicators.

Over the long term, GOVERD has been steadily decreasing in Canada (Appendix Chart C14). It reached a peak of 0.33 per cent in 1984, only to fall by over half to 0.15 per cent in

[94] It is important to note that (1) these data represent all government expenditures; there is no national and sub-national distinction in the OECD data, and (2) these data represent intramural expenditures.

2014. This downward trend is heavily influenced by decreases in federal government R&D expenditures, as provincial government R&D expenditures make up a much smaller proportion of GOVERD (only approximately 12 per cent in 2014).

Appendix Chart C14: GOVERD, PERD and FERD, Canada, 1981-2014

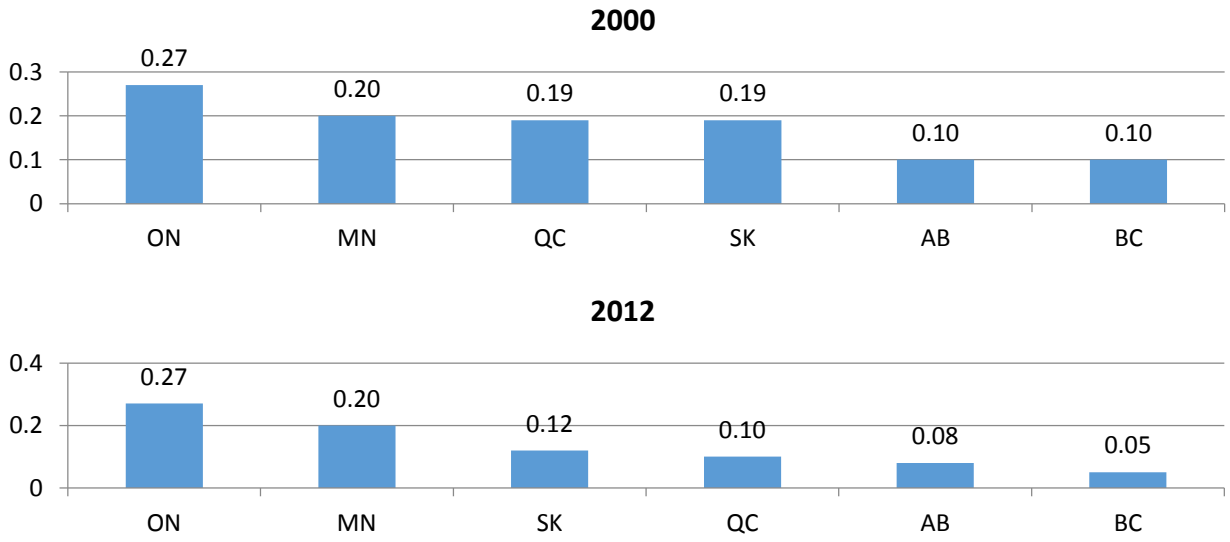


Source: CANSIM 384-0038 and 358-0001.

GOVERD at the Provincial Level

In 2012, Ontario and Manitoba had the highest GOVERD intensities (0.27 and 0.20 per cent), followed by Saskatchewan (0.12 per cent). The ranking has remained unchanged since 2000: Ontario and Manitoba were still at the same percentages and still had the highest GOVERD intensities. Saskatchewan still had the third highest GOVERD intensity, although Quebec was tied with Saskatchewan in 2000.

Appendix Chart C15: GOVERD Share in Nominal GDP, Provinces, 2000 and 2012



Source: CANSIM 384-0038 and 358-0001.

At the provincial level, the compound average annual growth rates for the individual Atlantic provinces cannot be calculated since data for certain years are not available through Statistics Canada for provincial government expenditures on R&D. However, data for Ontario and the Western Provinces are available. The data does not suggest any strong geographical pattern. However, it is interesting to note the strong growth rates in Saskatchewan and Manitoba between 2008 and 2012. These growth rates were driven entirely by federal government sector spending on research and development.

Between 2000 and 2012, almost every province for which data are available saw its GOVERD intensity fall. The only two exceptions were Ontario and Manitoba, for which GOVERD intensity was identical in 2000 and 2012.

Appendix Table C12: GOVERD, Provinces, 2000, 2008, 2012

.	CAN	NFL	PEI	NS	NB	QC	ON	MN	SK	AB	BC
Absolute Level (Millions)											
2000	2,244	35	--	94	29	434	1,210	71	65	146	136
2008	2,963	24	--	--	47	500	1,730	95	69	278	126
2012	2,867	--	14	--	--	355	1,823	118	98	242	115
Δ(2000-2012)	623	--	--	--	--	-79	613	47	33	96	-21
Compound Average Annual Growth											
2000-2012	2.1	--	--	--	--	-1.7	3.5	4.3	3.5	4.3	-1.4
2000-2008	3.5	-4.6	--	--	6.2	1.8	4.6	3.7	0.7	8.4	-1
2008-2012	-0.8	--	--	--	--	-8.2	1.3	5.6	9.2	-3.4	-2.3
Intensity (Per Cent of Nominal GDP)											
2000	0.20	0.25	--	0.37	0.14	0.19	0.27	0.20	0.19	0.10	0.10
2008	0.18	0.08	--	--	0.17	0.16	0.29	0.18	0.10	0.09	0.06
2012	0.16	--	0.25	--	--	0.10	0.27	0.20	0.12	0.08	0.05
Δ(2000-2012)	-0.04	--	--	--	--	-0.09	0.00	0.00	-0.07	-0.02	-0.05

Source: CANSIM 384-0038 and 358-0001

Appendix Table C13: GOVERD by Canadian Region, 2000, 2008, 2012

	Canada	Atlantic Provinces	Central Provinces	Western Provinces
Absolute Level				
2000	2,244	182	1,644	418
2008	2,963	165	2,230	568
2012	2,867	116	2,178	573
Compound Average Annual Growth				
2000-2012	2.1	-3.7	2.4	2.7
2000-2008	3.5	-1.2	3.9	3.9
2008-2012	-0.8	-8.4	-0.6	0.2
Intensity				
2000	0.20	0.29	0.24	0.12
2008	0.18	0.16	0.24	0.09
2012	0.16	0.11	0.21	0.08
Per Cent of National Total				
2000	100.00	8.1	73.3	18.6
2008	100.00	5.6	75.3	19.2
2012	100.00	4.0	76.0	20.0

Note: The Atlantic Provinces were calculated as the residual of Canada minus the Central Provinces and the Western Provinces in this table.
Source: CANSIM 384-0038 and 358-0001.

Federal Government Sector Gross Domestic Expenditures on Research and Development (FERD)

This is one component of GOVERD.

FERD at the National Level

In 2014, nominal expenditures on research and development performed by the federal government sector (FERD) reached $2,305 million, up 10.8 per cent from $2,080 million in 2000, representing a compound average annual growth of 0.7 per cent per year (Appendix Table C14). All of this growth was concentrated between 2000 and 2008, since FERD decreased by approximately $300 million between 2008 and 2014 at a rate of -2.0 per cent per year. Unlike GERD, FERD actually increased in 2009 and 2010, and only began to register downward movements in 2011.

Appendix Table C14: FERD, Canada, 2000-2014

	Current Prices	2007 Constant Prices	Deflator	Nominal FERD Share of Nominal GDP
2000	2,080	2,500	83.20	0.19
2001	2,103	2,486	84.59	0.19
2002	2,190	2,558	85.61	0.19
2003	2,083	2,354	88.49	0.17
2004	2,084	2,280	91.40	0.16
2005	2,414	2,560	94.30	0.17
2006	2,496	2,576	96.89	0.17
2007	2,532	2,532	100.00	0.16
2008	2,599	2,501	103.92	0.16
2009	2,762	2,716	101.69	0.18
2010	3,007	2,880	104.41	0.18
2011	2,649	2,460	107.68	0.15
2012	2,555	2,333	109.52	0.14
2013	2,475	2,230	110.99	0.13
2014	2,305	..		0.12
	Compound Average Annual Growth			Percentage Point Change
2000-2014	0.7			-0.07
2000-2008	2.8			-0.03
2008-2014	-2.0			-0.04
2000-2013		-0.9	2.2	
2000-2008		0.0	2.8	
2008-2013		-2.3	1.3	

Source: CANSIM 384-0038 and 358-0001.

In 2013, real FERD (constant 2007 prices) was $2,230 million, down 10.8 per cent (0.9 per cent per year) from $2,500 million in 2000. Unlike nominal FERD, real FERD demonstrated decreases in both periods (2000-2008 and 2008-2014).

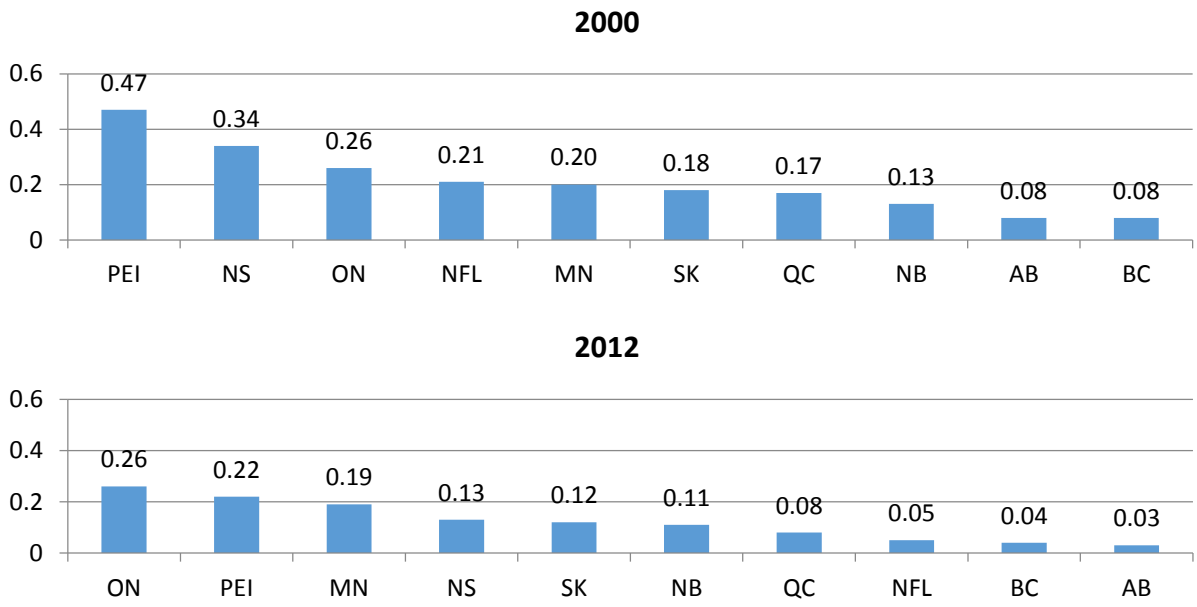
The share of nominal FERD in nominal GDP has been declining since 2000, falling from 0.19 per cent to 0.12 per cent in 2014. This decline was spread out evenly between both periods, falling 0.04 percentage points in the first period and 0.04 percentage points in the second period.

Although it may seem like the downward trend in federal FERD is a recent phenomenon, FERD in Canada has been tumbling quite continuously since the early-1980s, falling from 0.25 per cent in 1981 to 0.12 per cent in 2012. This suggests that FERD as a share of GDP did not contribute to the boom and bust cycle seen in GERD as a share of GDP.

FERD at the Provincial Level

In 2012, Ontario had the highest FERD intensity (0.26 per cent), followed by Prince Edward Island, Manitoba and Nova Scotia (0.22 per cent, 0.19 per cent and 0.13 per cent). Compared with 2000, only Manitoba was not in the top four. Manitoba shifted into the top four in 2012, despite seeing its FERD intensity fall because many other provinces saw their FERD intensities fall more.

Appendix Chart C16: FERD Share in Nominal GDP, Provinces, 2000 and 2012



Source: CANSIM 384-0038 and 358-0001.

At the provincial level, there is little similarity in federal government spending on R&D. However, there is the indication of a geographical pattern: the Atlantic Provinces and the Western Provinces, barring New Brunswick, Saskatchewan and Manitoba, saw their FERD fall throughout 2000 to 2012, but it fell faster in the latter period between 2008 and 2012. In contrast, central Canada, including Manitoba and Ontario, saw their FERD rise throughout both periods, although it rose more slowly between 2008 and 2012.

Between 2000 and 2012, almost every province saw its share of FERD in nominal GDP fall (Appendix Table C15). The only province to prove an exception is Ontario, where FERD as a share of nominal GDP stayed constant at 0.26 per cent. This trend largely matches up with the observance for Canada as whole where FERD has been falling throughout the period.

Appendix Table C15: FERD, Provinces, 2000, 2008, 2012

	CAN	NFL	PEI	NS	NB	QC	ON	MN	SK	AB	BC
Absolute Level (Millions)											
2000	2,080	30	16	88	27	389	1,164	68	62	117	111
2008	2,599	19	14	77	36	413	1,668	85	64	126	93
2012	2,555	17	12	48	34	273	1,768	111	94	103	93
Δ(2000-2012)	475	-13	-4	-40	7	-116	604	43	32	-14	-18
Compound Average Annual Growth											
2000-2012	1.7	-4.6	-2.4	-4.9	1.9	-2.9	3.5	4.2	3.5	-1.1	-1.5
2000-2008	2.8	-5.5	-1.7	-1.7	3.7	0.8	4.6	2.8	0.4	0.9	-2.2
2008-2012	-0.4	-2.7	-3.8	-11.1	-1.4	-9.8	1.5	6.9	1	-4.9	0
Intensity (Per Cent of Nominal GDP)											
2000	0.19	0.21	0.47	0.34	0.13	0.17	0.26	0.20	0.18	0.08	0.08
2008	0.16	0.06	0.29	0.22	0.13	0.13	0.28	0.16	0.09	0.04	0.05
2012	0.14	0.05	0.22	0.13	0.11	0.08	0.26	0.19	0.12	0.03	0.04
Δ(2000-2012)	-0.05	-0.16	-0.25	-0.21	-0.02	-0.09	0.00	-0.01	-0.06	-0.05	-0.04

Source: CANSIM 384-0038 and 358-0001.

Appendix Table C16: FERD by Canadian Region, 2000, 2008, 2012

	Canada	Atlantic Provinces	Central Provinces	Western Provinces
Absolute Level				
2000	2,080	161	1,553	358
2008	2,599	146	2,081	368
2012	2,555	111	2,041	401
Compound Average Annual Growth				
2000-2012	1.7	-3.1	2.3	0.9
2000-2008	2.8	-1.2	3.7	0.3
2008-2012	-0.4	-6.6	-0.5	2.2
Intensity				
2000	0.19	0.25	0.23	0.10
2008	0.16	0.15	0.23	0.06
2012	0.14	0.10	0.20	0.06
Per Cent of National Total				
2000	100.00	7.7	74.7	17.2
2008	100.00	5.6	80.1	14.2
2012	100.00	4.3	79.9	15.7

Source: CANSIM 384-0038 and 358-0001.

Provincial Government Sector Gross Domestic Expenditures on Research and Development (PERD)

This is the second component of GOVERD.

PERD at the National Level

In 2014, provincial government sector gross domestic expenditures on research and development (PERD) reached $304 million, up 85.4 per cent from $164 million in 2000, representing a compound average annual growth rate of 4.5 per cent per year (Appendix Table C17). All of this growth was concentrated between 2000 and 2008, since nominal PERD decreased by $60 million between 2008 and 2014. It is interesting to note that the fall in PERD

has been relatively consistent since the financial crisis in 2008-2009. Unlike total GERD, there was no rebound in PERD.

In 2013, real PERD (constant 2007 prices) was $275 million, up 39.6 per cent (2.6 per cent per year) from $197 million in 2000. Similar to nominal PERD, real PERD demonstrated all of its growth between 2000 and 2008, since the compound average annual growth rate between 2008 and 2014 was negative (-4.7 per cent per year).

In addition to performing some R&D, provincial and territorial governments also fund R&D. In 2014, this amount was $2,061 million, up 21.4 per cent from 2010. In contrast, federal government funding of R&D fell 10.2 per cent between 2010 and 2014.

The share of PERD in nominal GDP saw no increase between 2000 and 2014, unchanged at 0.015 per cent. PERD reached a peak of 0.022 per cent in 2008 and 2009.

Although the uptick in 2001 and the consistency thereafter may seem promising, it is interesting to note that PERD has decreased from a high of 0.04 per cent in 1982 to 0.02 per cent in 2014.

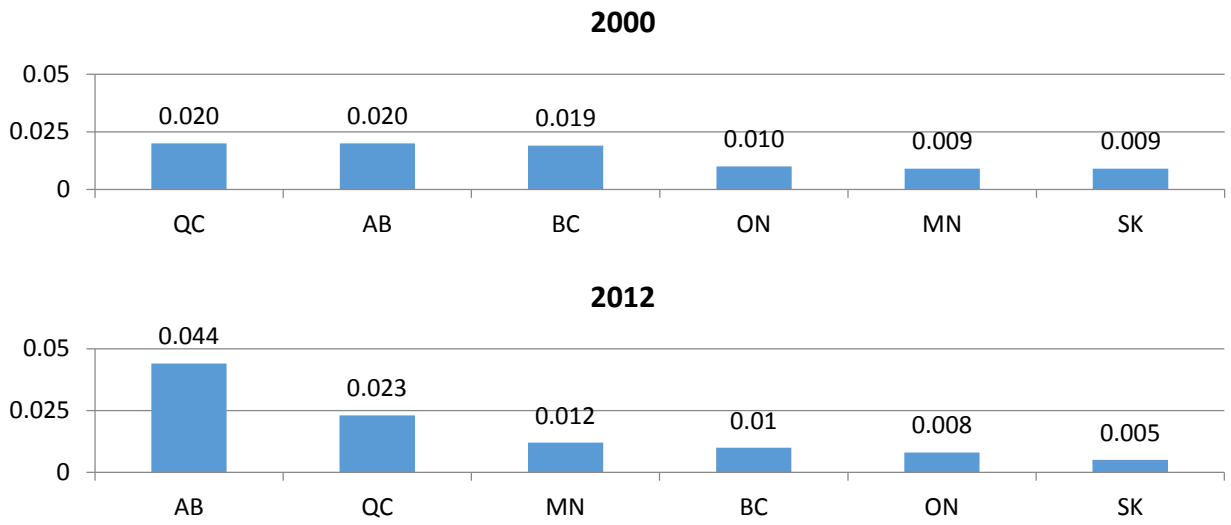
Appendix Table C17: PERD, Canada, 2000-2014

	Current Prices	2007 Constant Prices	Deflator	Nominal PERD Share of Nominal GDP
2000	164	197	83.25	0.015
2001	253	299	84.62	0.022
2002	256	299	85.62	0.022
2003	254	287	88.50	0.020
2004	265	290	91.38	0.020
2005	280	297	94.28	0.020
2006	310	320	96.88	0.021
2007	335	335	100.00	0.021
2008	364	350	104.00	0.022
2009	352	346	101.73	0.022
2010	325	311	104.50	0.020
2011	300	279	107.53	0.017
2012	312	285	109.47	0.017
2013	305	275	110.91	0.016
2014	304	..		0.015
	Compound Average Annual Growth			Percentage Point Change
2000-2014	4.5			0.000
2000-2008	10.5			0.007
2008-2014	-3.0			-0.007
2000-2013		2.6	2.2	
2000-2008		7.4	2.8	
2008-2013		-4.7	1.3	

Source: CANSIM 384-0038 and 358-0001.

PERD at the Provincial Level

Appendix Chart C17: FERD Share in Nominal GDP, Provinces, 2000 and 2012



Source: CANSIM 384-0038 and 358-0001.

In 2012, Alberta and Quebec had the highest PERD intensities (0.044 per cent and 0.023 per cent) followed by Manitoba (0.012 per cent). Compared with 2000, Quebec and Alberta still had the highest PERD intensities, although Quebec and Alberta were actually tied. Following in close behind was British Columbia, with 0.019 per cent. British Columbia had lost its place in the top three provinces by PERD intensity because its PERD intensity fell by 0.009 percentage points between 2000 and 2012, while Manitoba's increased by 0.003 percentage points.

At the provincial level, the compound average annual growth rates for the Atlantic Provinces cannot be calculated since data for certain years are not available through Statistics Canada. However, Ontario westward is available and it suggests that for most provinces, 2008 to 2012 was a slower growth period than 2000 to 2012, while for two provinces, British Columbia and Ontario, PERD actually fell between 2008 and 2012. Unlike GERD and FERD, there does not seem to be a general geographic trend.

Between 2000 and 2012, there was almost no movement in PERD shares in nominal GDP by province. Ontario, Quebec, Manitoba and Saskatchewan saw no change between 2000 and 2012, while Alberta saw a 0.02 percentage point increase and British Columbia saw a 0.01 percentage point decrease.

Appendix Table C18: PERD, Millions of Current Dollars, Provinces, 2000, 2008, 2012

	CAN	NFL	PEI	NS	NB	QC	ON	MN	SK	AB	BC
Absolute Level (Millions)											
2000	164	5	--	6	2	45	46	3	3	29	25
2008	364	5	--	--	11	87	62	10	5	152	33
2012	312	--	2	--	--	82	55	7	4	139	22
Δ(2000-2012)	148	--	--	--	--	37	9	4	1	110	-3
Compound Average Annual Growth											
2000-2012	5.5	--	--	--	--	5.1	1.5	7.3	2.4	14	-1.1
2000-2008	10.5	0	--	--	23.8	8.6	3.8	16.2	6.6	23	3.5
2008-2012	-3.8	--	--	--	--	-1.5	-3	-8.5	-5.4	-2.2	-9.6
Intensity (Per Cent of Nominal GDP)											
2000	0.015	0.035	--	0.023	0.010	0.020	0.010	0.009	0.009	0.020	0.019
2008	0.022	0.016	--	--	0.039	0.028	0.010	0.019	0.007	0.052	0.016
2012	0.017	--	0.036	--	--	0.023	0.008	0.012	0.005	0.044	0.010
Δ(2000-2012)	0.002	--	--	--	--	0.003	0.002	0.003	0.004	0.024	-0.009

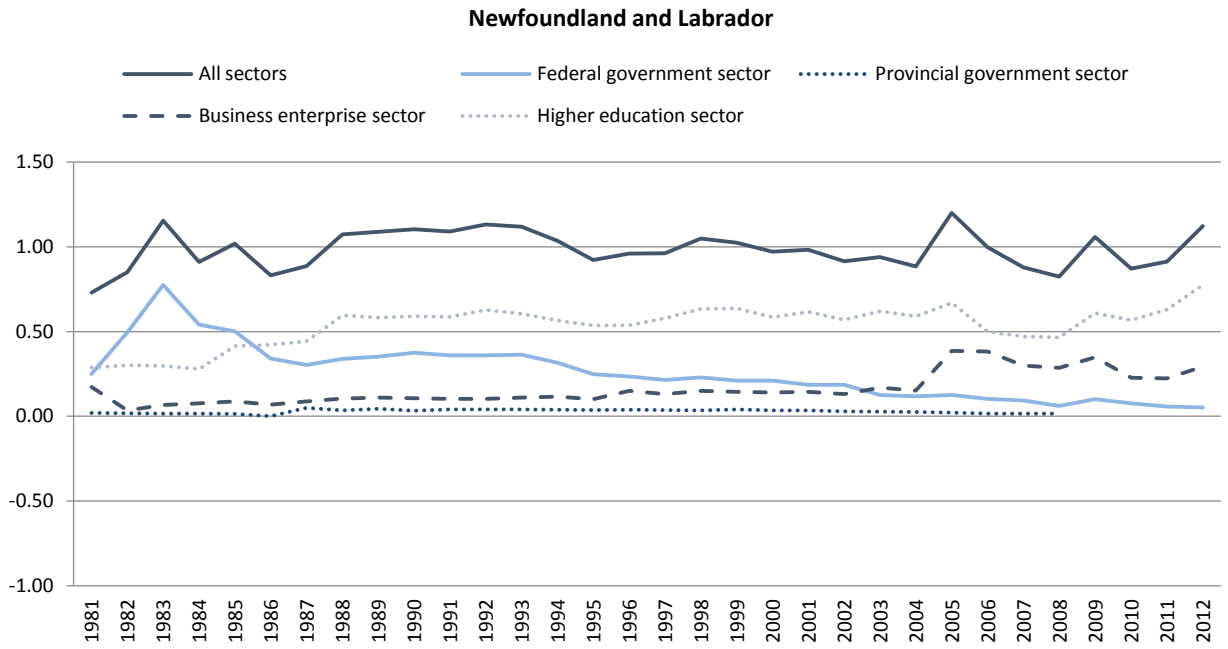
Source: CANSIM 384-0038 and 358-0001.

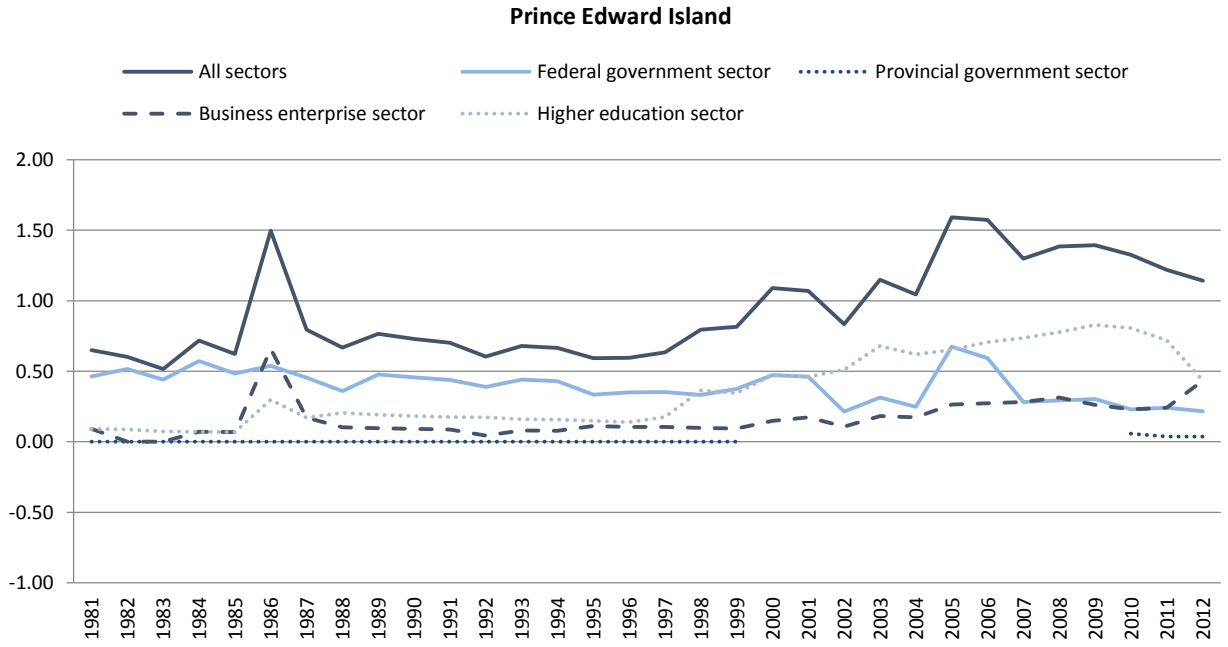
Appendix Table C19: PERD by Canadian Region, 2000, 2008, 2012

	Canada	Atlantic Provinces	Central Provinces	Western Provinces
Absolute Level				
2000	164	13	91	60
2008	364	15	149	200
2012	312	3	137	172
Compound Average Annual Growth				
2000-2012	5.5	-11.5	3.5	9.2
2000-2008	10.5	1.8	6.4	16.2
2008-2012	-3.8	-33.1	-2.1	-3.7
Intensity				
2000	0.015	0.020	0.013	0.017
2008	0.022	0.015	0.016	0.032
2012	0.017	0.003	0.013	0.025
Per Cent of National Total				
2000	100.00	7.9	55.5	36.6
2008	100.00	4.1	40.9	54.9
2012	100.00	1.0	43.9	55.1

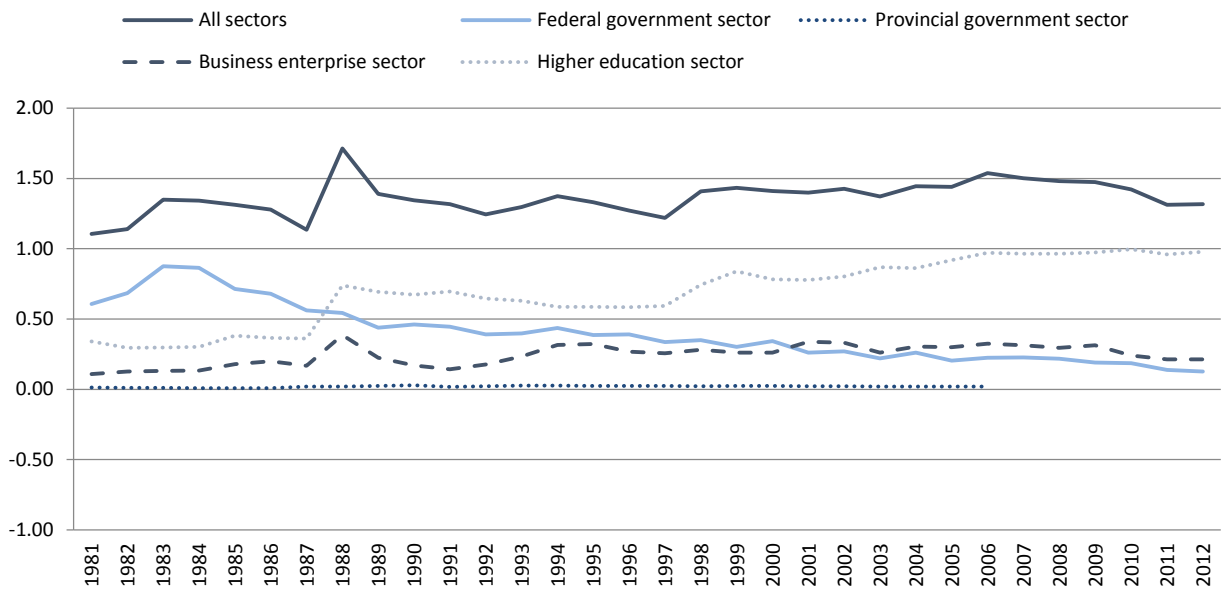
Note: The Atlantic Provinces were calculated as the residual of Canada minus the Central Provinces and the Western Provinces in this table.
Source: CANSIM 384-0038 and 358-0001.

e. GERD, FERD, PERD, BERD and HERD Shares in Nominal GDP, Provinces, 1981-2012

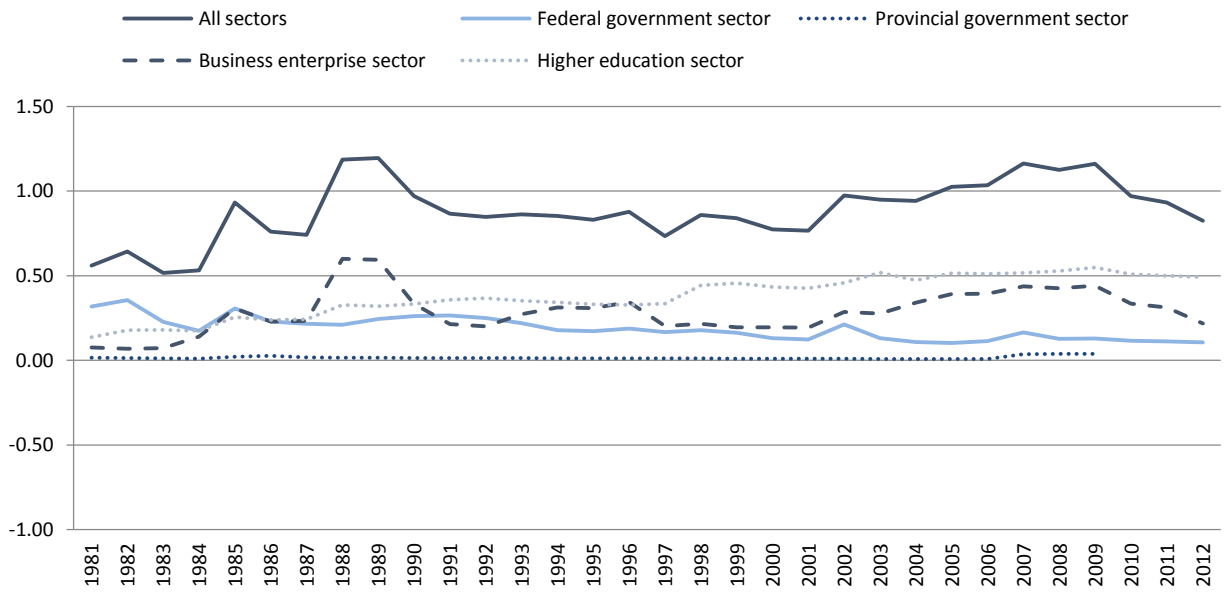




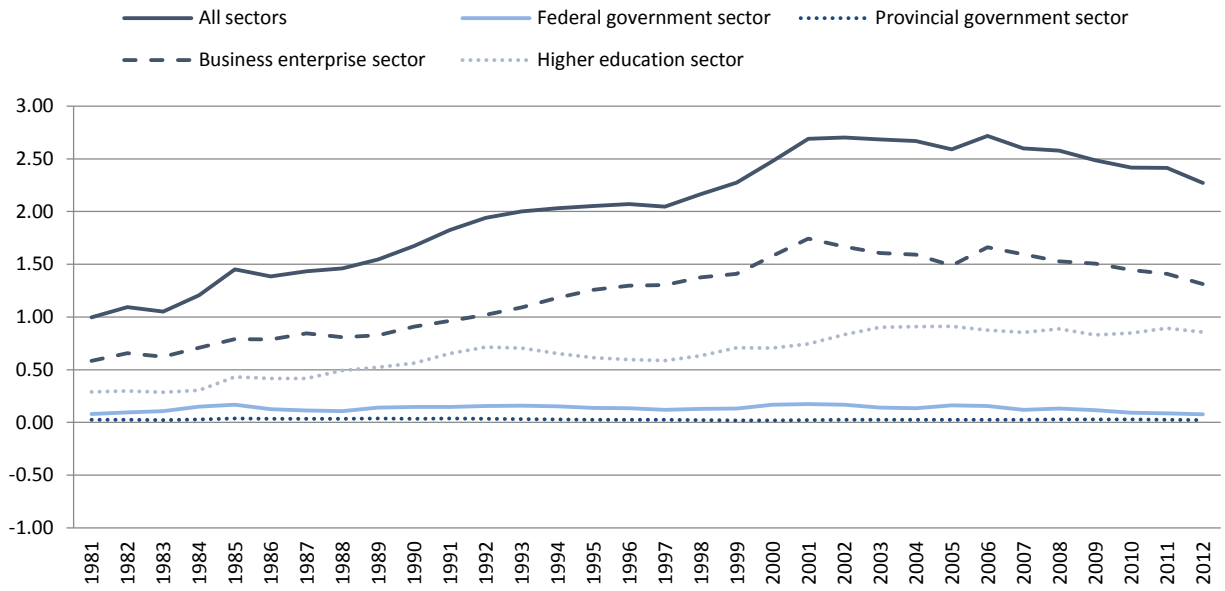
Nova Scotia



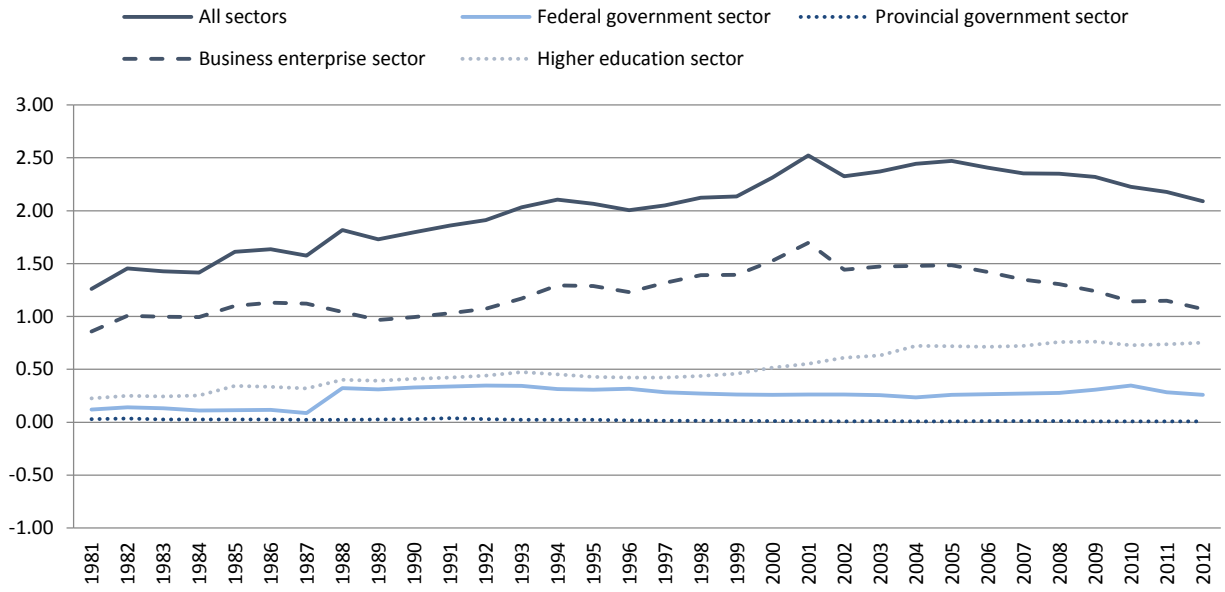
New Brunswick



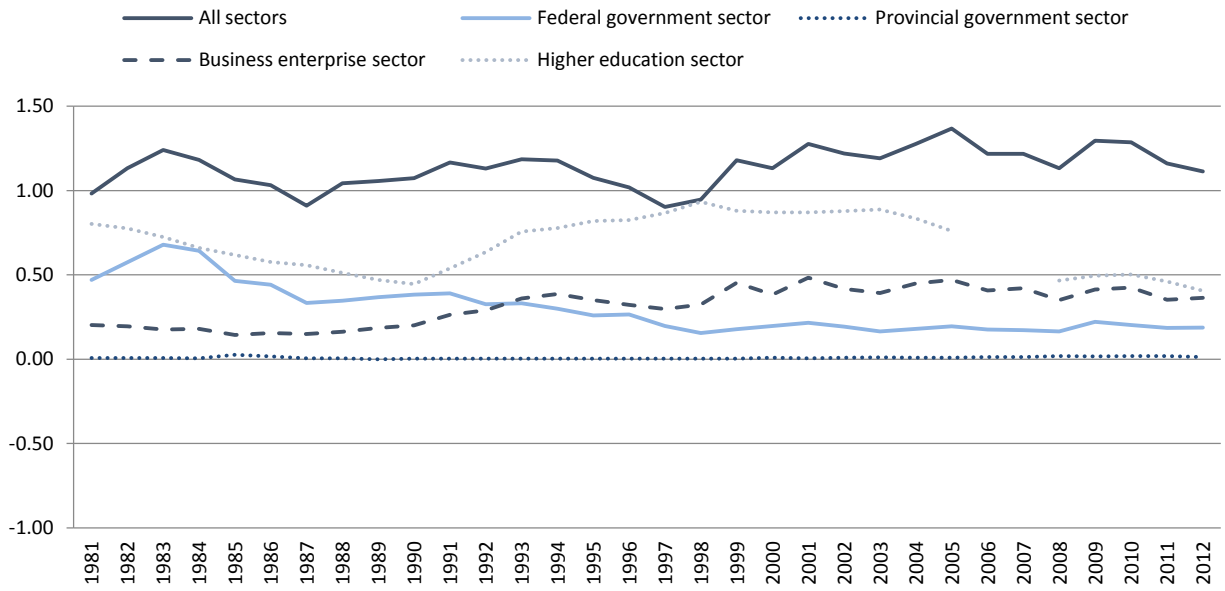
Quebec



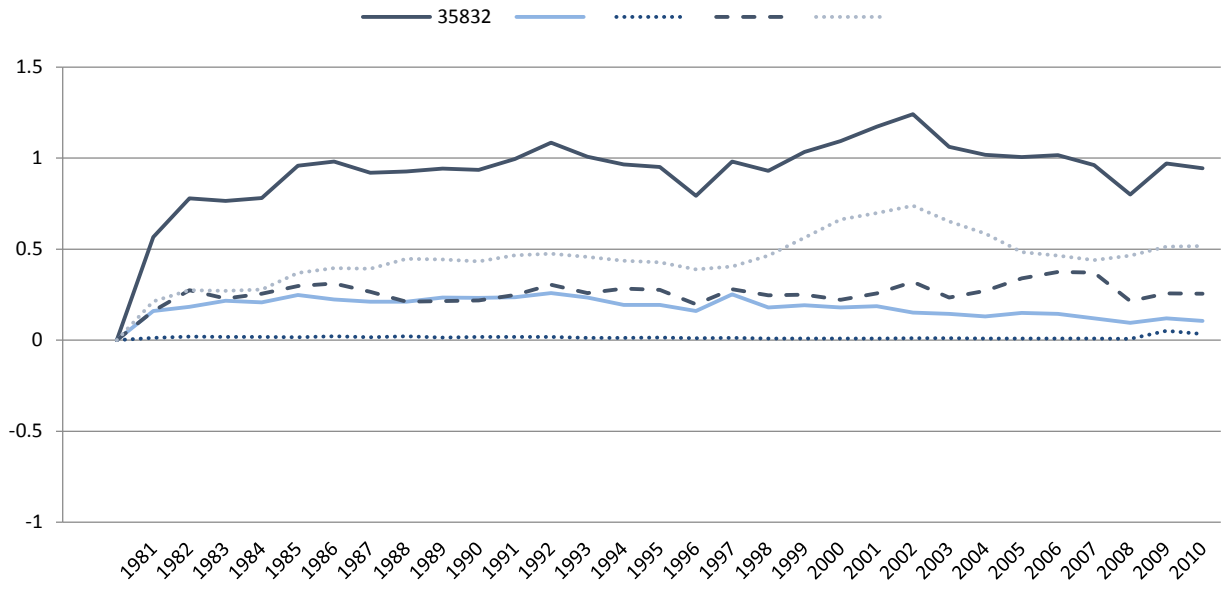
Ontario

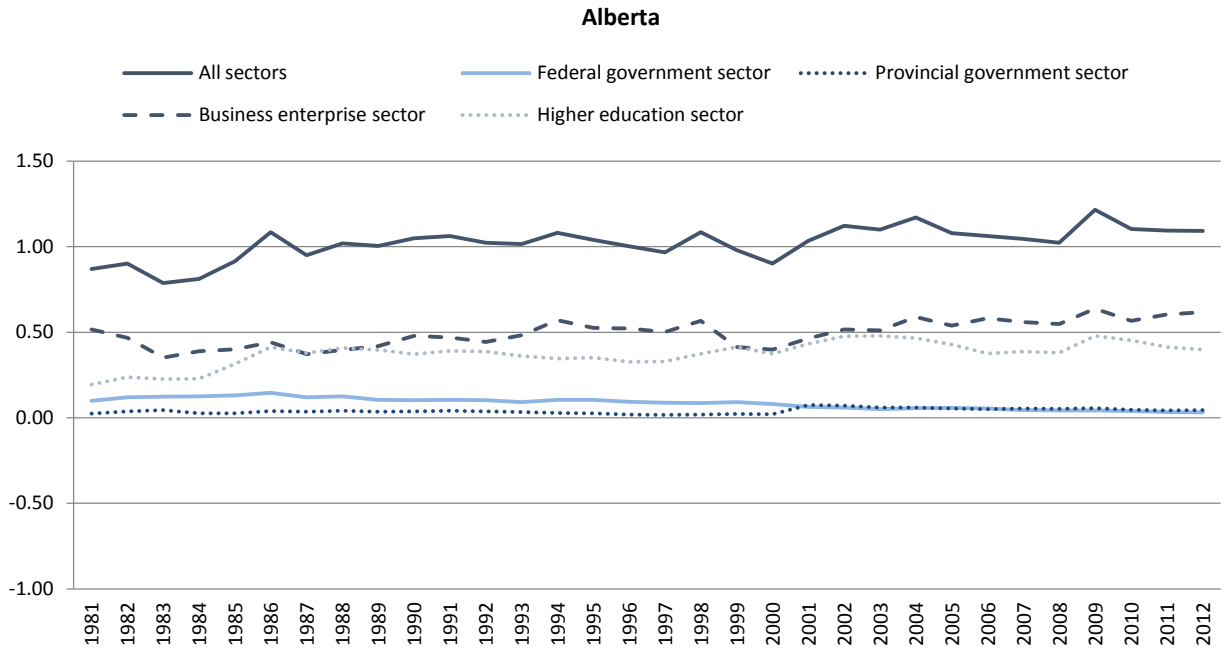


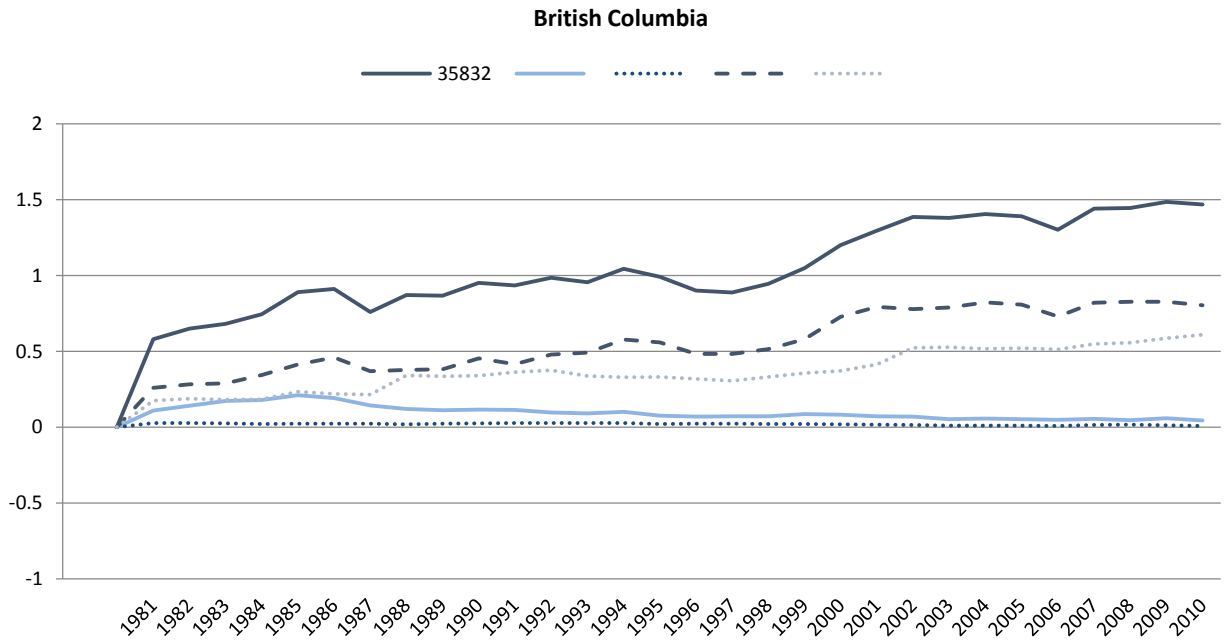
Manitoba



Saskatchewan







Source: CANSIM 384-0038 and 358-0001.

Appendix D: Ecofiscal Recommendations

1. All Canadian provinces should put a price on carbon.

Provincial carbon pricing will set every province, and our country as a whole, on a path to increased emissions reductions. We can seize the momentum and opportunity of provincial action while ensuring that the differences between our regions don't become barriers to the progress we need now. Different paths to strong carbon-pricing policy can, and do, exist. The key-for existing provincial policies and new ones-is to make the best design choices possible.

2. Plan for policies to ramp up over time.

As the world moves toward decarbonization and international markets shift, Canada must advance greenhouse gas-reducing policies; the only question is *when*. By starting now, we can ramp up in a smooth and predictable way, and that’s best for our economies. Delaying action is costly. Provinces should therefore design (or redesign) policies to incentivize lower carbon choices now, with an eye to steadily ramping them up so people and businesses can adjust and plan.

3. Make coverage as broad as practically possible.

It's not only more effective to apply policy to a larger share of emissions, it also makes reducing emissions cheaper overall. Emissions come from varied sources: fuel combustion, industrial processes, and agriculture; and from different types of emitters: industry, vehicles, and buildings. The more sources and emitters included in the policy, the more cost-effective.

4. Root policies in provincial context, with an eye to moving toward national coordination.

Ultimately, it's both sensible and efficient to have a consistent carbon price across Canada, and a number of different routes can get us there. As provinces design independent policies, they should plan for future coordination. However, some of the most important details of policy design, like how best to recycle revenue, may always need to stay grounded in local priorities and needs.