



**Canadian  
Manufacturers &  
Exporters**

**Manufacturiers et  
Exportateurs du  
Canada**

Roadmap to Recovery

# **Invest to Grow: Technology, Innovation and Canada's Productivity Challenge**

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 **CME Intelligence**

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***Invest to Grow: Technology, Innovation, and Canada's Productivity Challenge***©

**October 2010 – Canadian Manufacturers & Exporters**

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**Canadian Manufacturers & Exporters (CME) is Canada's leading trade and industry association and the voice of manufacturing and global business in Canada.**

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**Since 1871, we have made a difference for Canada's manufacturing and exporting communities. Fighting for their future. Saving them money. Helping them grow.**

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**CME's membership network accounts for an estimated 82% of total manufacturing production and 90% of Canada's exports.**

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# Invest to Grow: Technology, Innovation, and Canada's Productivity Challenge

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## Executive Summary

- Innovation is the most important determinant of business competitiveness, productivity growth, and economic prosperity in a world of global markets and rapid technological change. By providing new and improved solutions in health care, personal security, and the quality of our environment, innovation also improves the quality of life of every Canadian.
- The problem is that Canada lags behind the United States and other countries with respect to both innovation and productivity growth.
- Innovation is ultimately a business investment decision.
- Innovation is driven by investments in productive assets – in knowledge (R&D), technology (new machinery and equipment), and workforce skills (workplace training).
- For businesses, these investments are in turn driven by after-tax cash flow performance. (After-tax cash flow is the amount of money companies have available to invest after business costs and taxes are paid. It is calculated as the sum of after-tax profits plus capital consumption allowances.) In manufacturing and other sectors of Canadian business, there is a close relationship between after-tax cash flow on one hand and research and development spending and investments in new machinery and equipment on the other.
- Government policies aiming to encourage business investment in innovation should:
  1. Encourage investment in productive assets – in R&D, machinery and equipment used in producing goods and services of greater value, and workplace training;
  2. Increase the cash that businesses have available to invest by leaving more money in the hands of those companies making the investments;
  3. Raise the rate of return on productive assets, thereby making investments in R&D, technology, and workforce skills more attractive for businesses than other ways of

allocating cash (such as investing outside Canada, acquiring existing assets, paying dividends, or increasing savings); and,

4. Assure businesses that policy measures will remain in place during the course of their investment cycle and provide greater certainty and consistency with respect to the application of rules and eligibility requirements.
- Refundable tax credits increase cash flow as well as rates of return on investment and are likely to have the greatest positive impact on business investment decisions. Accelerated capital cost allowances have the second largest impact on investment decisions. Reductions in direct tax rates, as well as in indirect taxes paid by business, also have positive but more muted impacts on investment.
  - Tax reforms undertaken in Canada between 2006 and 2009, are estimated to have led to a 14% increase in manufacturing investment in new machinery and equipment over levels of investment that might have been expected if the tax changes had not been made.
  - Canadian Manufacturers & Exporters makes the following tax policy recommendations to encourage more business investment in those productive assets necessary to improve Canada's innovation and productivity performance:
    1. Extend the two-year write off for investments in manufacturing and processing technologies to at least the end of 2016, and consider making this accelerated capital cost allowance permanent;
    2. Make Canada's Scientific Research and Experimental Development (SR&ED) tax credit refundable and improve the administration of the tax credit;
    3. Introduce a refundable tax credit for workplace training in order to offset the impact of rising Employment Insurance premiums;
    4. Introduce a refundable tax credit for investments required for regulatory compliance purposes;
    5. Follow through on commitments to reduce the federal corporate income tax rate to 15% and average combined federal and provincial tax rates to 25% by 2012; and,
    6. Follow through on commitments to harmonize provincial sales taxes with the GST.
  - Tax measures to encourage business investment and innovation need to be supported by other policy initiatives as well, in order to:
    - Help Canadian businesses find new customers and identify new opportunities to participate in technology development initiatives in Canada and around the world;

- Support the development, commercialization, and adoption of new and improved products and processes by Canadian industry;
  - Strengthen technology transfer to Canadian business;
  - Maintain an innovative workforce;
  - Improve the availability of financing for innovation and business growth; and,
  - Ensure a business environment that promotes innovation.
- Above all, Canada requires a nationally coordinated innovation strategy that more effectively aligns public policies and programs to what businesses need to compete and win in the global economy of the 21<sup>st</sup> century.

### **Key Observations**

Manufacturers account for 56% of all R&D investments by Canadian business.

For every dollar Canadian manufacturers spend on research and development, they invest \$32 in design, engineering, scale-up, production, and marketing of the new and improved goods and services they bring to market.

Capital turnover and investments in new machinery and equipment enabled Canadian manufacturers to cut their greenhouse gas emissions by more than 6% since 1990.

Technology investments by Canadian manufacturers have fallen 37% over the past ten years.

Businesses base R&D spending decisions on their previous year's cash flow performance.

After-tax cash flow drives business investment activity. Investments in new machinery and equipment follow closely behind changes in after-tax cash flow performance.

Canadian businesses invest roughly the same proportion of after-tax cash flow in machinery and equipment over time.

Contrary to conventional wisdom, Canadian companies invested proportionately more of their available cash in new machinery and equipment when the Canadian dollar was depreciating in value against its U.S. counterpart during the latter half of the 1990s.

Tax measures adopted by federal and provincial governments since 2006 have encouraged Canadian manufacturers to allocate more cash to technology investments.

## Innovation, Productivity, & Prosperity

Today, in a world of global markets, intense competitive pressures, and rapid technological change, business success and economic prosperity depend on innovation. As Canadians, our ability to discover, create, source, produce, and market new goods and services, and adopt new ways of doing things (new processes), is the most important factor determining productivity performance.<sup>1</sup> And, in turn, productivity growth is what sustains business competitiveness, Canada's economic growth potential, employment prospects, and the standard of living of each and every Canadian. "Improvements in our health, personal security, and the quality of our environment all go hand-in-hand with our ability to innovate."<sup>2</sup>

"Innovation matters enormously for society because it is the means by which problems are solved and new opportunities are created."<sup>3</sup> For business, the introduction of new, differentiated, and improved products and processes creates value for customers and improves operating efficiencies. Innovation will be essential in sustaining Canada's economic recovery. It will also help Canadians meet the challenges and take advantage of the opportunities arising from the structural changes that are reshaping economic activity at home and around the world:

- Changing consumer expectations. Consumers have become more cautious. They are saving more and spending less. They are focusing on price competitiveness, but also increasingly on immediate service, customized solutions, quality, safety, brand promises, and local production.
- Intensified global competition and a shift in market power and economic growth potential away from the developed markets of North America, Europe, and Japan, to the emerging markets of China, India, Southeast Asia, and Latin America.
- Strong international demand for Canada's natural resources which has pushed up the cost of energy and raw materials along with the exchange value of the Canadian dollar.

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<sup>1</sup> See S. Rao, A. Ahmad, W. Horsman, & P. Kaptein-Russell, "The Importance of Innovation for Productivity", *International Productivity Monitor*, No. 2, Spring 2001.

<sup>2</sup> Science, Technology and Innovation Council (STIC), *State of the Nation 2008: Canada's Science, Technology and Innovation System*, Government of Canada, 2009, p.5.

<sup>3</sup> Council of Canadian Academies (CCA), *Innovation and Business Strategy: Why Canada Falls Short*, CCA, 2009, p.3.

- Corporate consolidation and the restructuring of supply chains in response to shifting patterns of industrial production and trade around the world.
- Rapid technological advance and the emergence of new transformative technologies, particularly in the fields of information and communications, life sciences, and advanced materials.
- Elevated levels of government debt as a result of stimulus spending to offset the impacts of financial deflation and recession.
- An aging population. By 2012 more Canadians will be leaving employment than entering the workforce. An older population will increase demand for health care and social services and place further strains on government finances. More seniors will depend on personal savings, pensions, or public income support programs at a time when fewer people will be employed and investing in either property or financial assets. An aging population threatens to bring with it shortages of capital and skilled labour. It will shift the onus to the fewer people in the workforce to boost productivity and create the income required to sustain the needs of an older generation.
- Energy constraints and environmental priorities. How we respond to climate change and other environmental challenges will fundamentally reshape economic activity in Canada and around the world. Energy and resources are consumed, and waste is generated, in everything that humans do. If we are to maintain economic growth and improve living standards in developed and developing countries alike, then the only way to reduce our environmental footprint is to accelerate technological progress. Innovation will be crucial in developing and adopting the technological solutions we need to increase energy efficiency, replace industrial processes, reduce harmful environmental impacts, and transition to alternative energy or less carbon intensive products and fuels.

Manufacturing will play a critical role in improving productivity and bringing to market the technological solutions required to respond to structural change, sustain economic growth, and create high quality jobs. Manufacturing is Canada's largest single business sector, directly employing 1.8 million Canadians. Over the past decade, manufacturers have accounted for two-thirds of Canada's goods and services exports, 56% of business sector research and development, and 80 percent of all new patents commercialized in Canada. In addition, every dollar of manufacturing output creates more than three dollars in total economic activity, leveraging sales, innovation, and investments in primary industries, utilities, construction, and business services including research, design, engineering, software and technical services,

transportation, warehousing, distribution, information and communication services, as well as administrative, business management, and financial services.

More than ever before, business innovation is a strategic imperative. To stay in the game, companies in manufacturing as well as in other business sectors must differentiate themselves through innovation – new products and services, new ways of working, new ways of going to market – in order to compete and win in the global economy.

## **Investing in Productive Assets**

Canada's place in a competitive world – our ability to sustain and increase the economic prosperity and the standard of living of all Canadians – depends on our ability to add value in the economic activities, the businesses, the jobs, in which we are engaged. Today, our customers and our competitors are located around the world. The competition for investment, market share, knowledge, technology, and skilled workers is intense. But, Canadians have remarkable assets working in our favour – the richness of our natural resources, a highly educated and highly skilled workforce, our knowledge base, a flexible and highly responsive industrial sector, as well as our well developed logistics, energy, services, and knowledge infrastructure. Our future economic prosperity rests on our ability to grow those assets and to create greater value from them. That depends, in turn, on an investment strategy focused on productive assets:

1. Investing in knowledge – in the research, development, application, and commercialization of new products and processes;
2. Investing in productive technologies – technologies that produce things of greater value; and,
3. Investing in people – specifically in the skills and capabilities of a productive workforce.

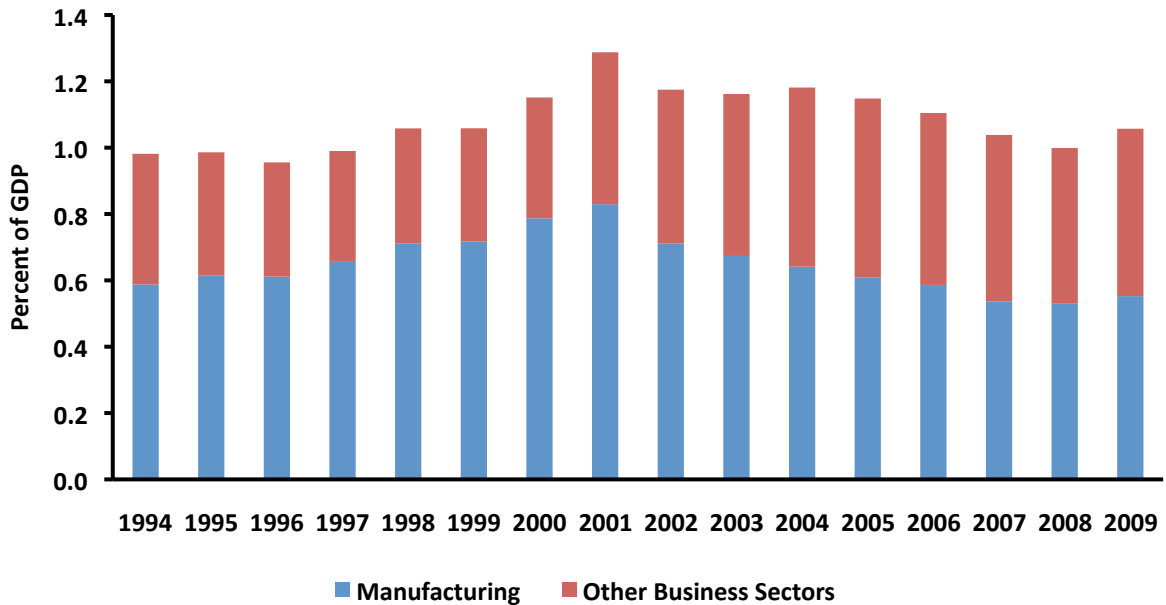
### **i. Investing in Knowledge**

An important indicator of a country's innovation performance is the total amount of money spent on research and development relative to the size of its economy (GDP). This is a measure of the intensity of R&D activity. In 2009, R&D expenditures in Canada are estimated to have been just over \$29.8 billion or 1.95% of GDP.<sup>4</sup> R&D spending accounted for the same share of Canada's GDP in 2006. And, that is 18% higher than R&D intensity in 1996.

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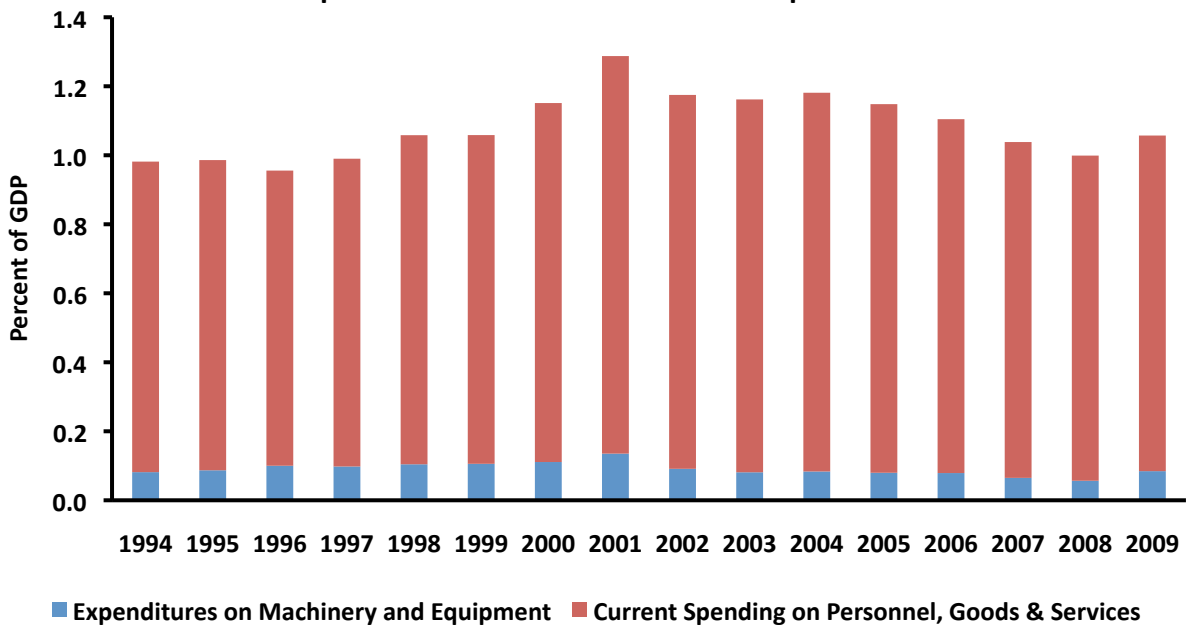
<sup>4</sup> Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces, 2009*.

**Business Expenditures on Research and Development in Canada**



Businesses accounted for 54% of Canada’s total spending in research and development in 2009. Companies invested an estimated \$16.1 billion (or 1.1% of Canada’s GDP) on internal research and development activities, and manufacturers invested \$8.4 billion, about 52% of total business investment in R&D. In 2009, Canadian firms spent \$1.3 billion on R&D related equipment and \$14.9 billion in current R&D expenses such as salaries, materials, and services.<sup>5</sup>

**Business Expenditures on Research and Development in Canada**



<sup>5</sup> *ibid.*

Over 6% of all R&D financed by Canadian business is performed by the academic sector. Canadian companies invest about 0.07% of GDP annually in university research, one of the highest levels of business financing for academic research in the world.<sup>6</sup>

## ii. Investing in Technology

Technology investment is another important driver of productivity growth and innovation performance in private and public sectors alike. For businesses, investment in new machinery and equipment provides the tools that enhance the capacity and capabilities of their workforce and improve their health, safety, and environmental performance.

New technologies are employed directly in research and development activities as well. Investment in new machinery and equipment accounted for 7.5% of total R&D spending by Canadian business between 2000 and 2009.

Technology investments help to spur innovation because, as the Council of Canadian Academies notes, “innovation encompasses not only the direct innovative activities initiated within a business but also the capital investment and knowledge acquisition by which the business captures and employs innovation that is generated elsewhere... Machinery and equipment is the embodiment of R&D, and is a critical link in the chain of economic value creation, whether it is performed directly by a business firm or acquired indirectly.”<sup>7</sup>

Investments in new machinery and equipment offer opportunities for businesses to develop new and improved products and services. They demand new skills and knowledge on the part of the workforce in order to operate them effectively. And, they often require new operating procedures, business processes, and new methods of business organization to optimize their use.

Information and communication technologies (ICT) account for approximately one-third of total investments in machinery and equipment made by Canadian business. But, ICT is also embodied in other product and process technologies deployed across all sectors of industry. Studies have shown the important contribution that investments in information and communication technologies have made to boosting productivity and innovation performance, particularly in more labour-intensive services sectors.<sup>8</sup>

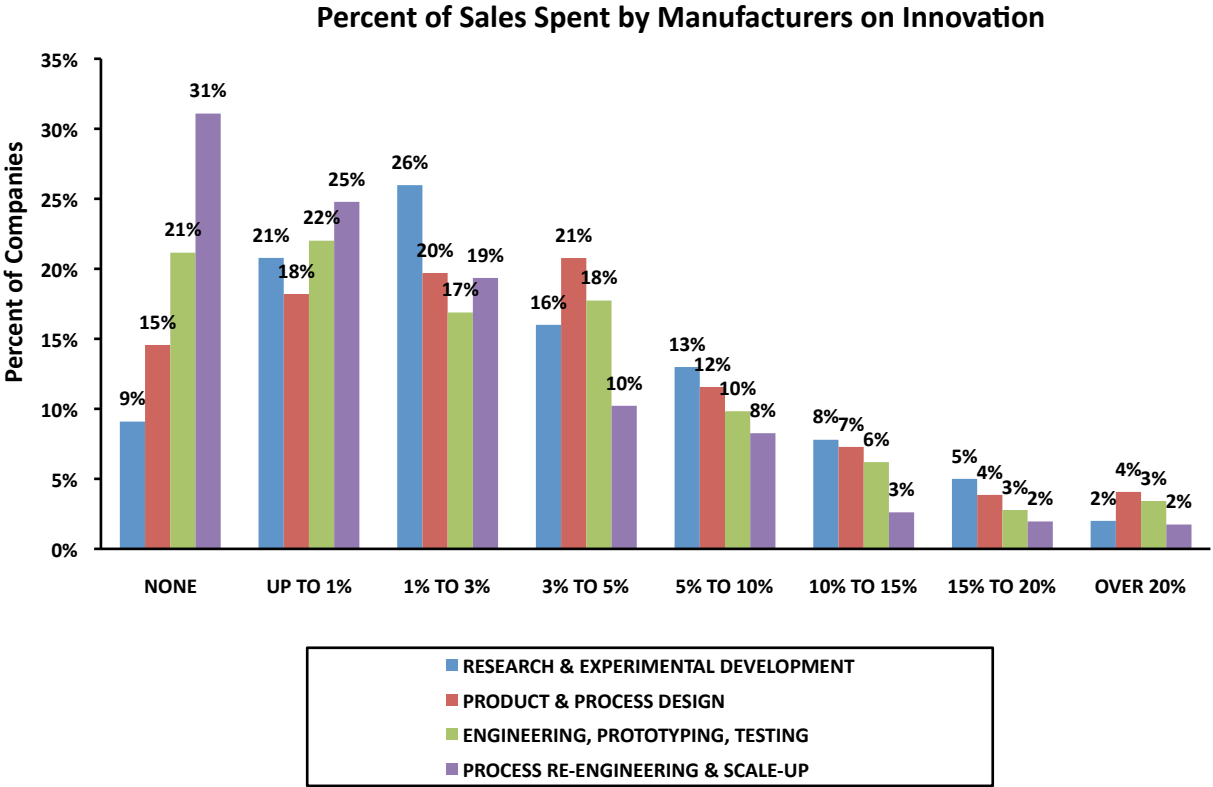
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<sup>6</sup> OECD, *Gross Domestic Expenditure on R&D by Sector of Performance and Source of Funds, 2008/10*.

<sup>7</sup> CCA, *Innovation and Business Strategy*, pp. 5, 7.

<sup>8</sup> See in particular A. Sharpe, *What Explains the Canada-U.S. ICT Investment Intensity Gap?*, Centre for the Study of Living Standards, 2005.

Investment in new technologies is an especially important source of innovation activity for Canada’s manufacturing sector. Over 55% of Canadian manufacturers introducing advanced technologies to the market are technology purchasers, while 42% of manufacturing firms modify the technology they purchase or develop it further themselves. As Canada’s Science, Technology and Innovation Council points out, there is a considerable amount of user-driven innovation that takes place in Canadian industry.<sup>9</sup>



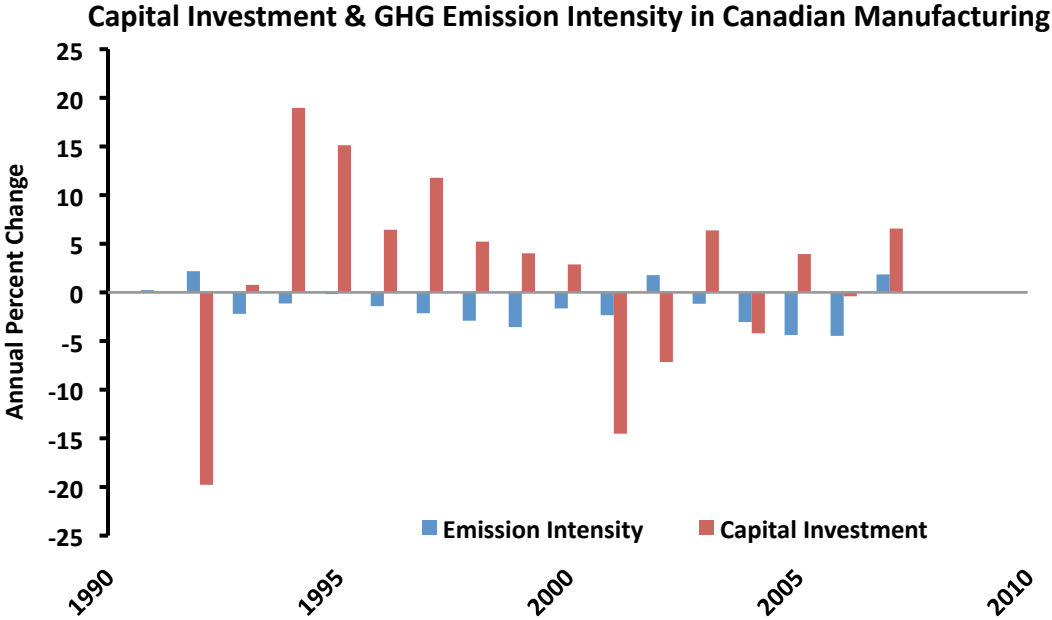
Technology investments are also needed to commercialize new products. For every dollar Canadian manufacturers spent on research and development between 2000 and 2009, they invested \$32 in commercialization activities including the design, engineering, scale-up, production, and marketing of the new and improved goods and services they brought to market.<sup>10</sup>

There are other benefits to be derived from business investment in new machinery and equipment, and in new facilities too. An important example is the progress made by Canadian

<sup>9</sup> Statistics Canada, *Follow-up to the Survey of Advanced Technology, 2007*; STIC, *State of the Nation 2008*, p. 22.  
<sup>10</sup> Canadian Manufacturers & Exporters, *Management Issues Survey 2008-2009*; Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces, 2009*.

manufacturers in reducing greenhouse gas (GHG) emissions between 1990 and 2007. Over that period of time, manufacturers cut their GHG emissions by 6.5% (exceeding Canada’s 6% Kyoto Protocol target), even as levels of output expanded by close to 50%. Half of the reduction in emissions intensity (emissions per unit of output) that was required to reduce emissions levels came from improvements in energy efficiency, another 30% from the replacement of industrial processes, and 20% from switching to less carbon-intensive fuels. All of these process improvements required capital turnover and investments in new machinery and equipment.

There is a strong and demonstrable relationship between manufacturers’ investments in new machinery and equipment and progress in reducing carbon intensity – and ultimately lowering GHG emissions. On average, every billion dollars that Canadian manufacturers invested in new technology and structures between 1990 and 2007 resulted in a 0.2% annual reduction in GHG emission intensity.<sup>11</sup>



**iii. Investing in People**

While investments in research and development and new machinery and equipment are essential for strengthening productivity, innovation, and environmental performance, they are not sufficient in themselves to guarantee success. They must also be accompanied by strategic

<sup>11</sup> Environment Canada, *Canada’s Greenhouse Gas Inventory*, 2010; Statistics Canada, *National Income and Expenditure Accounts*, 2010.

leadership, workforce training and significant changes in business organization, market development, and work practices.<sup>12</sup>

There are three inter-related issues that help determine the innovative capacity of a country's workforce. First, what are the competencies of the labour force? Second, do businesses and other organizations have access to personnel with the skills, expertise, and experience they require now and in the future? And third, do businesses and other organizations have the leadership, managerial expertise, and workforce capabilities they need to achieve new and changing operational objectives? All three issues underline the importance of investments in education, skills training, improved work practices, and workforce development. Unfortunately, there are no statistics in Canada that track this important area of investment activity on a regular basis.

### **Canada Lags Behind in Productivity, Innovation, and Investment**

The problem is that Canada lags significantly behind many other countries – including our largest trading partner, the United States – when it comes to productivity growth, innovation performance, and investment. Our record in this regard is well documented in recent analyses.<sup>13</sup>

Labour productivity in Canada's business sector fell from 93% of the U.S. level in 1984 to 76% in 2007, just prior to the recession. Between 1985 and 2006, Canada ranked 15<sup>th</sup> out of 18 OECD countries in terms of labour productivity growth. As the expert studies point out, Canada's lagging productivity record is due largely to weak innovation performance, particularly on the part of business.

Canada lags behind many other countries when it comes to investments in research and development. With total R&D expenditures at 1.95% of GDP, Canada performs just slightly better than the OECD average, but we still rank 12<sup>th</sup> out of 29 economies in the OECD database on this measure of R&D intensity. We trail behind the G7 average of 2.2% and we fall well short of the 2.6% share of GDP recorded by the United States. We lag even further behind Sweden,

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<sup>12</sup> CCA, *Innovation and Business Strategy*, p. 9.

<sup>13</sup> See STIC, *State of the Nation 2008*; CCA, *Innovation and Business Strategy*; Canadian Manufacturers & Exporters, *Manufacturing 20/20*, CME, 2005; J. Baldwin & W. Gu, *Long-Term Productivity Growth in Canada and the United States*, Statistics Canada, 2007; J. Baldwin, A Fisher, W. Gu, & B. Robidoux, "Capital Intensity in Canada and the United States, 1987 to 2003", *The Canadian Productivity Review*, Statistics Canada, 2008; World Economic Forum, *The Global Competitiveness Report 2008-2009*, WEF, 2009; OECD, *Main Science and Technology Indicators*, 2009; OECD, *Science, Technology and Industry Scoreboard*, 2007.

Finland, Japan, and Korea where total R&D spending accounts for more than 3% of GDP and intensity levels have grown more rapidly than in Canada since the mid-1990s.<sup>14</sup>

Canada's R&D performance should also be compared with that of China and India. Both of these countries have emerged over the past decade as world leaders in innovation. According to the OECD, China now ranks as the third largest investor in research and development globally.<sup>15</sup> The Economist Intelligence Unit now ranks India as the best overall location for research and development. The U.S. and China were respectively second and third.<sup>16</sup>

While many Canadian businesses draw from research and development performed by Canada's academic and public sectors, as well as from R&D activities undertaken in other countries, their own rate of R&D spending is cause for significant concern.

Over the past decade, we have witnessed the increasing globalization of markets, supply chains, and business activity, the rise of China, India, and Brazil as major markets and leading centres of innovation and industrial production, intensified competition, rapid technological development, the widespread use of transformative communication technologies, and the accelerated commoditization of goods and services around the world. Even so, in Canada, business spending on research and development has failed to keep pace with economic growth.

Canadian businesses spent 1.06% of GDP on R&D in 2006 – slightly higher than in 1996, but 20% down from the peak of 1.29% of GDP recorded in 2001. Manufacturing accounted for 68% of R&D spending by Canadian business in 1999, but for only 52% in 2009. As a share of total GDP, R&D spending by Canadian manufacturers has fallen by 33% over the past ten years.<sup>17</sup>

The R&D performance of Canadian business contrasts sharply with R&D intensities recorded in many other countries. Businesses spending on R&D averaged 1.57% of GDP across the OECD in 2001 and 1.56% in 2006. In fact, Canada ranked 16<sup>th</sup> out of 30 OECD countries in terms of R&D spending by businesses in 2006. Firms in the United States, Switzerland, Finland, Korea, Japan, Sweden, and Israel all spent 2X to 3.5X more on R&D in relation to the size of their respective economies than their Canadian counterparts.<sup>18</sup>

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<sup>14</sup> OECD, *Main Science and Technology Indicators*, 2008.

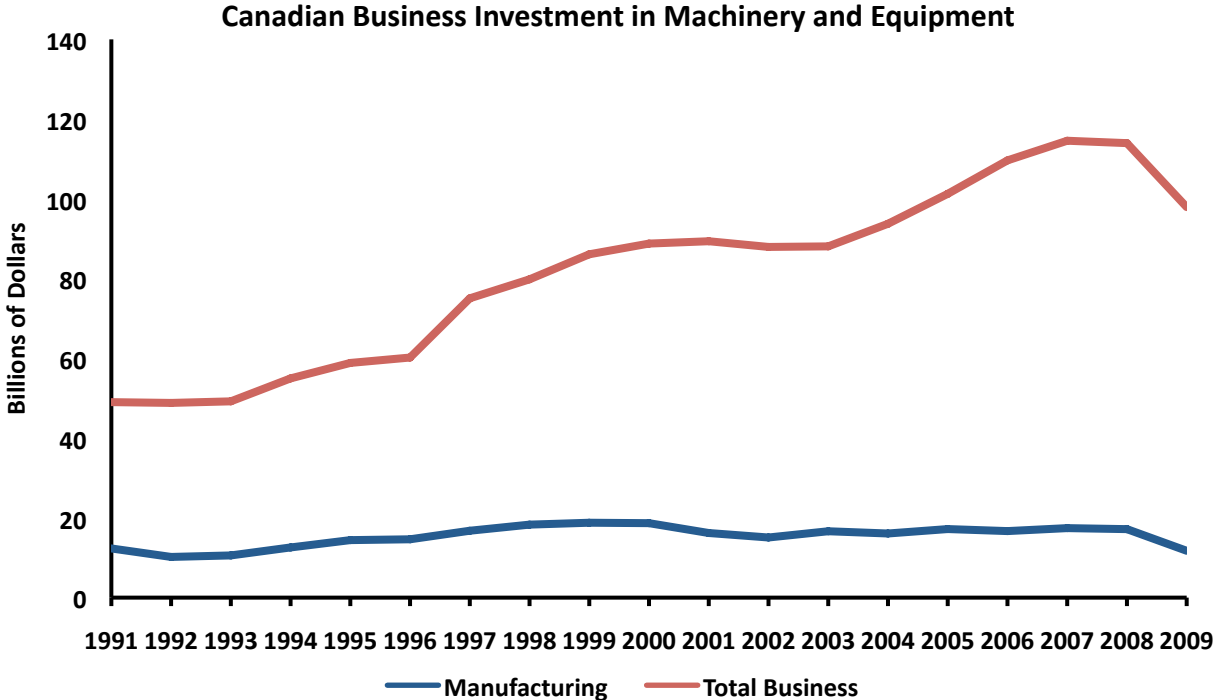
<sup>15</sup> OECD, *Main Science and Technology Indicators*, 2008.

<sup>16</sup> Economist Intelligence Unit, *Scattering the Seeds of Invention: The Globalisation of Research and Development*, 2004, p.9.

<sup>17</sup> Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces*, 2009.

<sup>18</sup> OECD, *Main Science and Technology Indicators*, 2008.

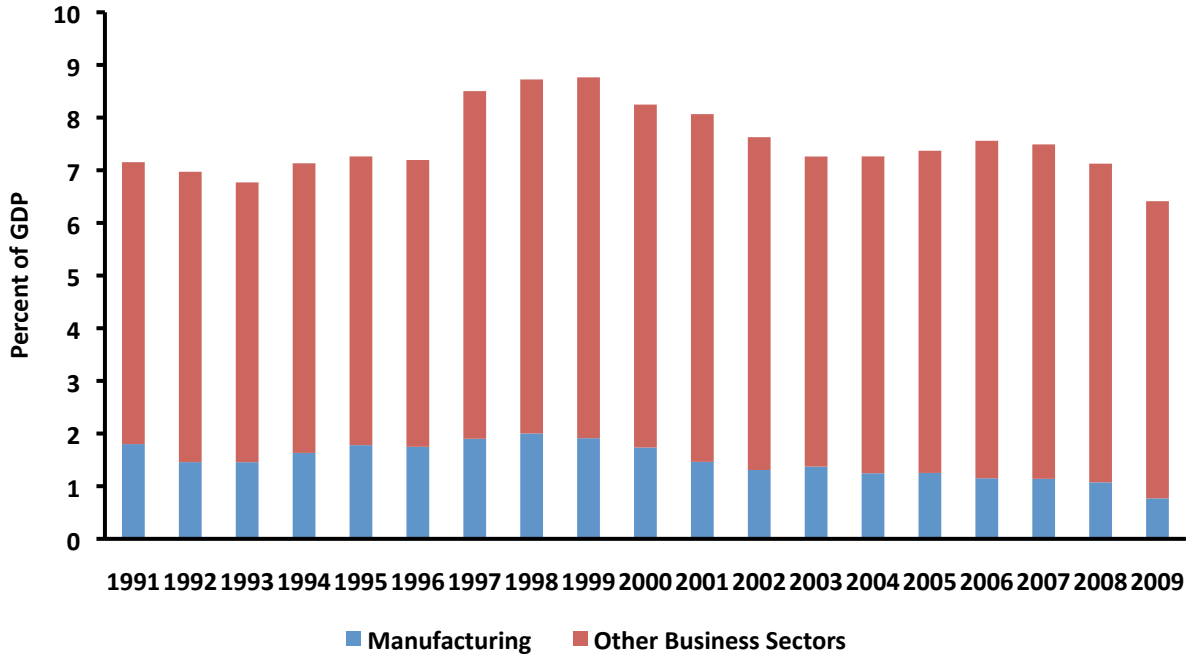
Canada’s lagging performance when it comes to business investment in new machinery and equipment is another source of concern, given the importance of technology as a driver of innovation and productivity improvement. Technology investments were on the upswing in relation to overall economic activity in Canada throughout the 1990s. Total business investment in new machinery and equipment grew by 76%, and technology investments by manufacturers increased by 52%, while the Canadian economy expanded by 57% between 1991 and 1999. Business investment in machinery and equipment reached a peak of 8.76% of GDP at the end of the decade.



Over the past ten years, however, business investment in machinery and equipment has failed to keep pace with economic growth. While the Canadian economy grew by 55% between 1999 and 2009, technology investments by business rose by only 14%. In 2009, business investment in machinery and equipment amounted to 6.41% of GDP – driven down by recession but more consistent with an average 7% investment rate apparent in the early 1990s and between the years 2002 and 2007. In Canada’s manufacturing sector, annual levels of investment in new machinery and equipment have fallen by 37% over the past decade. Canadian manufacturers actually spent 5% less on machinery and equipment in 2009 than in 1991, at the end of Canada’s last major recession.<sup>19</sup>

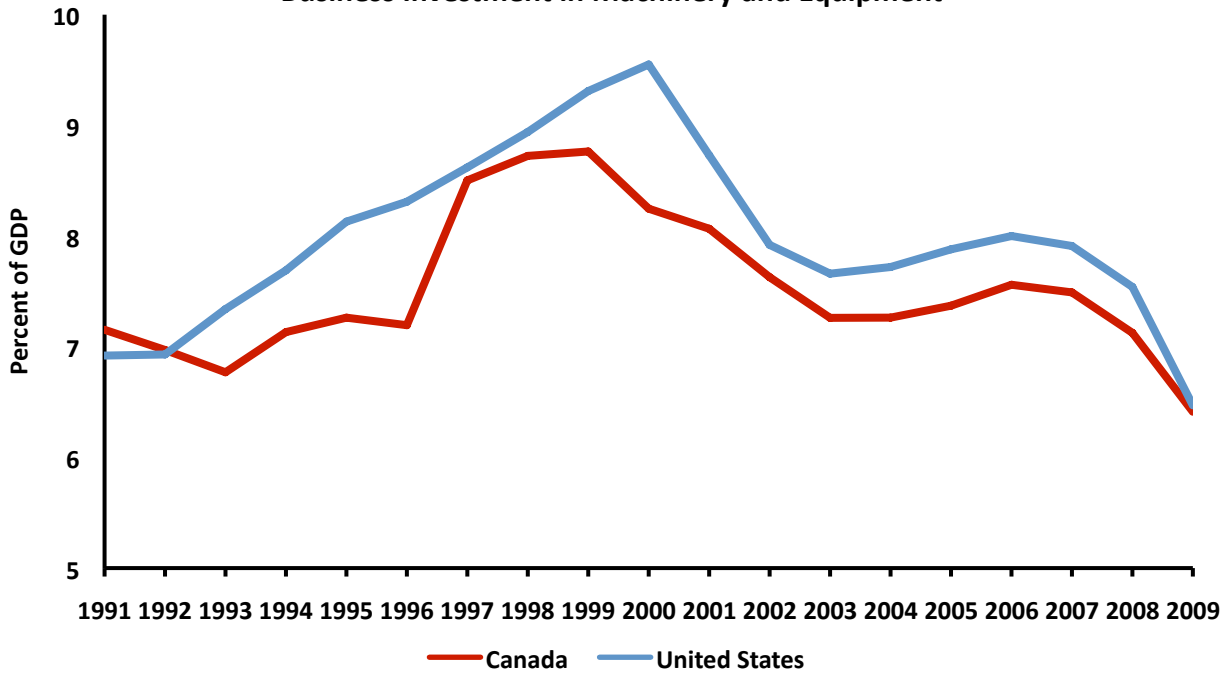
<sup>19</sup> Statistics Canada, *National Income and Expenditure Accounts*; Statistics Canada, *Private and Public Investment in Canada*.

### Canadian Business Investment in Machinery and Equipment



Compared to other countries, Canada is falling behind. In 2004, the last year for which statistics are available, Canada ranked 13<sup>th</sup> among all OECD countries in terms of business investment in machinery and equipment as a share of GDP. We fell 5% short of the OECD average.<sup>20</sup>

### Business Investment in Machinery and Equipment



<sup>20</sup> OECD, *Science, Technology and Industry Scoreboard*, 2007.

Canadian companies have lagged behind US businesses in investing in machinery and equipment since 1992.<sup>21</sup> In large part the gap reflects Canada's weaker investment in information and communication technologies. Studies show that about 20% of the Canada-U.S. ICT investment gap is due to differences in industrial structure between the two countries – a higher share of output in ICT-intensive industries in the United States and a higher proportion of small firms in Canada, which tend to invest less in ITC. But, research also indicates that after “industry structure is taken into account for the M&E [machinery and equipment] asset class, most industries of Canada's business sector are less capital intensive than that of the U.S. In the case of non-ICT M&E, there is small deficit of about 12 percent. The deficit is more pronounced for ICT investments – some 33 percent.”<sup>22</sup> The weaker technology investment performance of Canadian businesses vis-à-vis their American customers and competitors is an important factor in explaining why Canada lags behind in productivity growth as well.

As for workforce qualifications, Canada ranks favourably in international tables when it comes to some comparisons. For instance, the Programme for International Student Assessment (PISA) is a collaborative initiative involving 57 countries that assesses the ability of 15-year-old students to apply knowledge and skills in key subject areas including reading, mathematics, and science. According to PISA, Canadian students rank third overall (behind Finland and Hong Kong) in science, fourth (behind Finland, Hong Kong, and Korea) in reading skills, and seventh (behind Taipei, Finland, Hong Kong, Korea, the Netherlands, and Switzerland) in mathematics.<sup>23</sup> Canada ranks in first place among all OECD countries with respect to the educational attainment of its workforce. Over 47% of Canadians have a tertiary education, and over the past decade Canada has experienced the second largest increase in tertiary attainment (Korea had the largest increase) in the OECD.<sup>24</sup>

However, other indicators of workforce development are not as positive. Twenty-four percent of Canadians have attained a university education, which places Canada sixth among OECD countries, behind the United States, Norway, the Netherlands, Denmark, and Iceland.<sup>25</sup> In Canada, about 20% of all new degrees are in science and engineering, which places us 21<sup>st</sup> among OECD countries, and well behind Korea, Germany, and Finland where science and engineering graduates account for 30% or more of all new degrees granted by post-secondary

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<sup>21</sup> Statistics Canada, *National Income and Expenditure Accounts*; U.S. Department of Commerce, Bureau of Economic Analysis, *National Income and Product Accounts*.

<sup>22</sup> Baldwin, Fisher, et al., “Capital Intensity in Canada and the United States”, *The Canadian Productivity Review*, 2008, p. 41.

<sup>23</sup> Statistics Canada, *Measuring Up: Canadian results of the OECD PISA Study, The Performance of Canada's Youth in Science, Reading and Mathematics*, 2006.

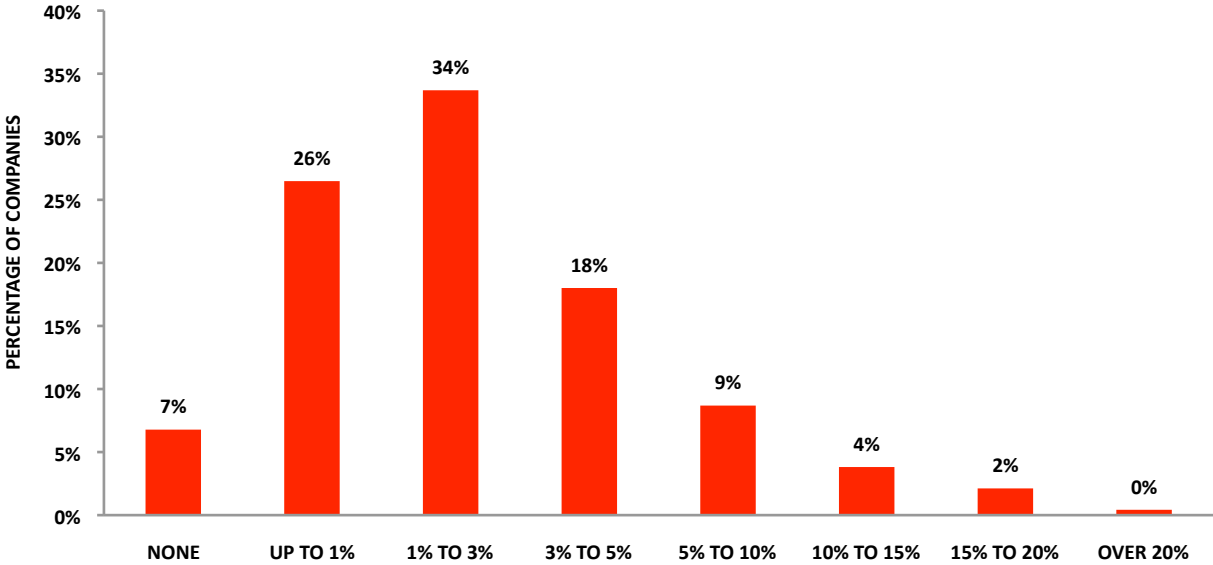
<sup>24</sup> OECD, *Education at a Glance*, 2008.

<sup>25</sup> *Ibid.*

institutions.<sup>26</sup> On a per capita basis, there are fewer PhD graduates in science, engineering, as well as other subjects in Canada than in many other countries (Canada ranks 20<sup>th</sup> among OECD countries).<sup>27</sup> Managers and senior executives in Canadian businesses also have lower levels of educational qualifications and international work experience than their counterparts in the United States, Europe, and Japan.<sup>28</sup>

Canadian companies lag behind as well when it comes to the investments they make in formal workplace training. According to the Conference Board of Canada, Canadian businesses invest relatively less in workplace training than their American and European counterparts. Real per capita investment in training in Canada is actually falling – from \$842 per employee in 1996 to \$699 per employee in 2006.<sup>29</sup>

**Percent of Payroll Invested in Workforce Training**

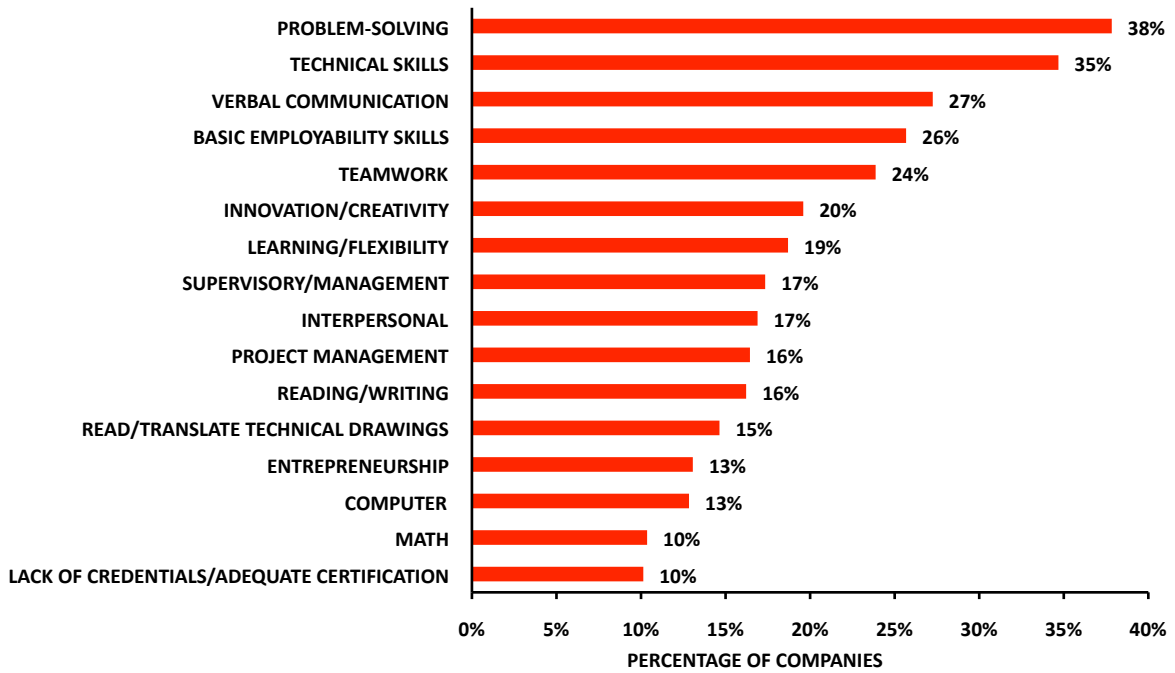


Between 2000 and 2008, Canadian manufacturers invested approximately 3% of payroll in workforce training. Nevertheless, manufacturers still reported difficulties in retaining and acquiring employees with the essential and technical skills they required.<sup>30</sup>

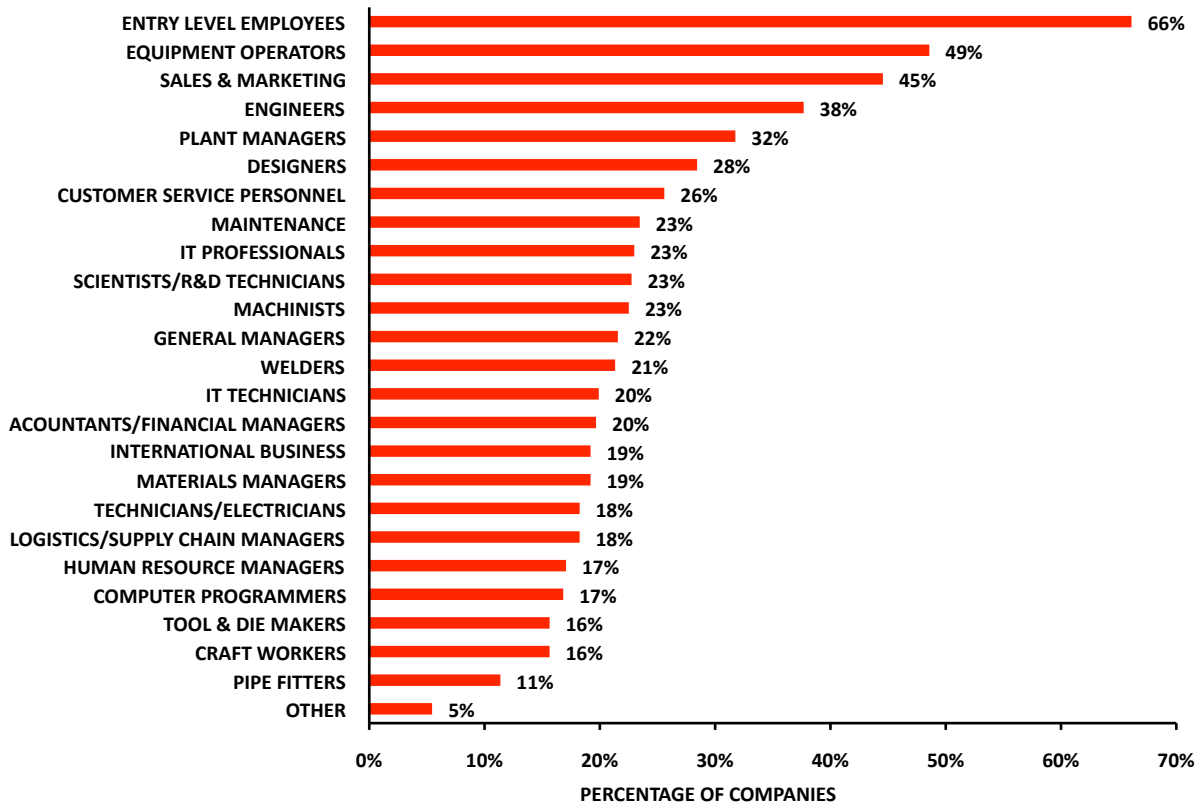
The development and availability of a skilled and competent workforce are strategic priorities for manufacturers in Canada and throughout the world.

<sup>26</sup> OECD, *Graduates by Field of Study*, 2005.  
<sup>27</sup> OECD, *Science, Technology and Industry Outlook*, 2006.  
<sup>28</sup> R. Martin & J. Milway, *Strengthening Management for Prosperity*, 2007.  
<sup>29</sup> The Conference Board of Canada, *How Canada Performs: A Report Card on Canada*, 2007.  
<sup>30</sup> CME, *Management Issues Survey*, 2008-2009.

### Workforce Skills in Need of Improvement



### Difficulties Finding and Keeping Skilled Workers



Analyses by both Statistics Canada and the OECD indicate that Canada's relatively poor productivity performance is due mainly to weak growth in multi-factor productivity, a measure that reflects the contributions to productivity and innovation derived from business leadership, workforce capabilities, entrepreneurship, the adoption of new business models, improvements in the organization of work, better work practices, the efficient and effective incorporation of new technologies, and the commercialization of new products and services resulting from R&D.<sup>31</sup> They show that Canadian companies have failed to keep up with their customers, competitors, and business partners when it comes first of all to investing in productive assets and second to leveraging those investments to generate greater value and lower unit production costs.

### **What Holds Canada Back?**

What explains Canada's relatively weak record on productivity, innovation, and investment? The issue has been examined in detail by the Council of Canadian Academies. The Council's report provides a useful summary of many of the factors that could potentially influence the choice of innovation as a business strategy.<sup>32</sup>

As the Council points out, some structural characteristics of the Canadian economy provide a better explanation of Canada's lagging innovation performance vis-à-vis the United States than others. For instance, it finds that differing levels of R&D intensity are more important than differences in sector mix between the two countries.<sup>33</sup> Moreover, while some industry sectors are more R&D intensive, others rely instead on technology embodied in capital equipment.

Foreign control of R&D expenditure is not an adequate explanation either. Canadian-owned multinationals are most likely to engage in product innovation and R&D spending. In fact, the Council concludes that Canada's failure to develop a greater number of Canadian-based multinational enterprises has been a key contributor to the country's overall weakness. But, Canadian subsidiaries of foreign multinationals are also among the country's top R&D performers, and generally have higher levels of R&D intensity and better access to capital, as well as to innovative technologies and work practices, than Canadian firms with only domestic operations.<sup>34</sup>

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<sup>31</sup> CCA, *Innovation and Business Strategy*, p. 6.

<sup>32</sup> *Ibid.*, pp. 10-21.

<sup>33</sup> *Ibid.*, p. 12.

<sup>34</sup> *Ibid.*, p. 12.

Does size make a difference? Smaller businesses spend relatively less on research and development than larger firms, and Canada has a higher proportion of small and mid-sized companies than the United States. But, there is little difference in the innovation performance of smaller firms in Canada and the United States. Moreover, as the Council points out, small firms account for a minor share of the R&D spending gap by business. Again, it is the failure to grow larger and more R&D-intensive Canadian-based multinationals that provides a more telling explanation of Canada's relatively weak performance.<sup>35</sup>

Where Canadian companies operate within value chains also makes a difference in explaining Canada's weak record. The Council notes that Canadian manufacturers (with some significant exceptions) tend to occupy an upstream position in North American value chains. They are more often found as suppliers of commodities or intermediate goods to other businesses that are closer to their ultimate customers. According to the Council, "successful innovation, especially in respect of goods and services, is most likely to come from businesses that have direct contact with end-users and thereby develop understanding of what those ultimate customers need or want. It is also the case that firms at the upstream end of the value chain are removed from the leading edge of business decision making regarding innovation, especially in respect of product development, marketing, and new business models".<sup>36</sup> And, today the more demanding customers who lead in the adoption of new technologies are to be found increasingly outside North America.

The structural challenge for Canada, then, is to develop more multinational leaders in innovation and technology development and more innovative suppliers in value chains within closer proximity to final customers around the world.

A second factor identified by the Council is the role that competition plays in influencing innovation performance. Canada's relatively small, fragmented markets require companies to export in order to find the customers and the returns on investment that are required for new product innovation. As a result, export-oriented businesses tend to be both more innovative and more productive.<sup>37</sup> On the other hand, both the Council and Canada's Competition Policy Review Panel point to regulations that restrict foreign investment and government procurement, internal barriers that inhibit the inter-provincial flow of goods and services, capital, and labour, as well as regulatory differences that increase the complexity and cost of

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<sup>35</sup> *Ibid.*, p. 13.

<sup>36</sup> *Ibid.*, p. 13.

<sup>37</sup> *Ibid.*, p. 13.

regulatory compliance, as significant constraints on competition and, therefore, on investment, innovation, and productivity growth within Canada's domestic market.<sup>38</sup>

The climate for new ventures – including the availability of financing, the effectiveness of technology transfer, and the prevalence of business clusters – is a third set of that influences the choice of innovation as a business strategy.

A “persistent shortage of risk capital through the funding cycle, from seed capital through the venture stage to mature growth” is widely identified as an impediment to innovation in Canada, and to the growth of small and mid-sized R&D intensive companies headquartered in the country.<sup>39</sup>

The Council of Canadian Academies finds that Canada's venture capital (VC) industry falls well behind VC firms in the United States and many other countries in financing innovative businesses. In 2007, just prior to the recession, Canada's VC firms raised only \$1.2 billion, or 3% of the \$37 billion their counterparts raised in the United States.<sup>40</sup> Fundraising by VC firms in Canada actually fell by 40% between 2003 and 2007. By contrast, in the United States, the amount of funds raised by VC firms grew by 167% over that same period of time.<sup>41</sup>

There is proportionately less venture capital raised in Canada than in other countries. Less than 2% of total small and medium-sized business financing in Canada comes from venture capital (53% comes from domestic banks, 16% from other banks, 10% from credit unions and caisses populaires, 11% from finance companies, and 8% from insurance companies).<sup>42</sup> In 2007, venture capital amounted to 0.12% of GDP in Canada. That was less than half the proportionate amount raised in the United Kingdom, Sweden, and Finland. It was also lower than the United States, Norway, and Belgium.<sup>43</sup> Moreover, in 2007, Canada ranked 10<sup>th</sup> among OECD countries in terms of the average size of VC deals. In fact, the average size of VC deals in Canada was only one-third of that in the United States.<sup>44</sup>

Studies indicate that the relatively low level of institutional VC investment in Canada acts as a constraint on the supply of VC funds. (In 2006, the Canadian VC industry raised 10% of its capital from pension and other investment funds and 58% from individuals. In contrast, the VC

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<sup>38</sup> *Ibid.*, pp. 13-14; *Competition Policy Review Panel, Compete to Win – Final Report*, Ottawa, Industry Canada, 2008.

<sup>39</sup> Coalition for Action on Innovation in Canada, *An Action Plan for Prosperity*, p. 3.

<sup>40</sup> CCA, *Innovation and Business Strategy*, p. 15.

<sup>41</sup> *Ibid.*, p.15.

<sup>42</sup> Statistics Canada, *Survey of Suppliers of Business Financing, The Daily*, December 5, 2008.

<sup>43</sup> STIC, *State of the Nation 2008*, p. 23.

<sup>44</sup> *Ibid.*, p. 24.

industry in the United States raised 42% of its capital from pension funds and another 25% from banks and insurance companies.)<sup>45</sup> Relatively low returns expected on start-up investments may also be a constraint, but as the Council of Canadian Academies notes, Canadian buy-out funds targeting more mature businesses have performed relatively well in Canada and have not experienced the same fundraising issues as their VC counterparts.<sup>46</sup>

The availability of financing for new ventures, as well as for investments in innovation and technology, has become much more limited in Canada as a result of recession. Canadian Manufacturers & Exporters (CME) has surveyed business conditions facing its members since the beginning of the market downturn. As the following table indicates, in June 2010, a full year after hitting the bottom of the recession, a significant number of manufacturers and exporters were still reporting difficulties in obtaining financing for the development of new products, new technologies, and new markets, as well as for business improvement and expansion purposes.<sup>47</sup>

***CME Business Conditions Survey, June 2010***

	Percentage of Responding Companies (n=954)				
	Unable to Obtain Financing	Experiencing Significant Difficulties	Experiencing Difficulties Including Higher Costs	No Difficulties	Not Applicable
Companies experiencing difficulties in accessing:					
Financing for working capital purposes	5%	8%	14%	51%	22%
Operating line of credit	5%	8%	14%	58%	15%
Equity financing	2%	6%	6%	32%	54%
Financing for capital investment	5%	8%	12%	39%	36%
Financing for investments in new technologies	4%	7%	9%	29%	51%
Equipment leasing	2%	5%	7%	34%	52%
Financing through bonds or commercial paper	1%	2%	2%	11%	84%

<sup>45</sup> STIC, *State of the Nation 2008*, p. 25.

<sup>46</sup> CCA, *Innovation and Business Strategy*, p. 16.

<sup>47</sup> Canadian Manufacturers & Exporters, *Business Conditions Survey*, June 2010.

Venture capital	2%	5%	2%	2%	89%
Financing for new product development	2%	5%	6%	30%	57%
Export financing	2%	5%	7%	22%	64%
Export credit insurance	2%	4%	6%	25%	63%
Financing for business acquisitions	4%	4%	6%	18%	68%
Other types of business financing	2%	3%	3%	20%	72%

The effectiveness of technology transfer mechanisms is another aspect of the climate for new ventures examined by the Council of Canadian Academies and by Canada’s Science, Technology, and Innovation Council. How well technology transfer works in Canada is particularly important given the relatively large investments made in academic and government research organizations which account in turn for almost half of the R&D performed in the country. Yet, Canada fairs relatively poorly when it comes to applying this research to new products and processes that are then commercialized by business.

Canada ranks 24<sup>th</sup> among OECD countries in terms of the percentage of businesses that undertake collaborative innovation work with other firms or research organizations.<sup>48</sup> To some extent, this is due to a lack of interest or lack of awareness on the part of companies about the research capabilities of colleges, universities, and government research organizations. It is in part a reflection of the relatively low level of R&D intensity by businesses themselves. But, technology transfer from universities and government research centres has also been weak.

Much of the research currently performed in university or government research centres is simply not useful for companies looking to apply innovative solutions in their business.

Most research funding – and therefore most research activities in Canadian universities – has been directed to basic research. When applications do result, there are further problems in transferring technology to the private sector. In fact, the Council of Canadian Academies notes that licensing revenues are insufficient to cover office costs for most university technology transfer offices in Canada.<sup>49</sup> And, collaborative ventures among researchers, entrepreneurs, and other businesses are further constrained when intellectual property rights are retained by

<sup>48</sup> OECD, *STI Scoreboard*, 2007.

<sup>49</sup> CCA, *Innovation and Business Strategy*, p. 16.

university or government institutions.<sup>50</sup> Canada's universities and colleges do a better job educating and graduating personnel with strong research and technical skills than transferring technology and applied research results to Canadian business. It is the concentration of highly qualified personnel that forms the basis for the innovation and technology clusters that exist across the country.

Ultimately, there is a fourth set of factors that the Council of Canadian Academies and Canada's Science, Technology and Innovation Council both emphasize in explaining Canada's weak innovation performance – a lack of “business ambition”. In its report, the Council of Canadian Academies concludes that there are simply not enough Canadian businesses “good enough to compete in global markets, aggressive enough, willing to take risks, and sufficiently outward-looking beyond the huge and accessible U.S. market”.<sup>51</sup>

The implication is that business has simply been too easy for most Canadian companies that have been able to rely on either a protected domestic market or easy access to the U.S. market, a low Canadian dollar exchange rate, high commodity prices, and a comfortable position as upstream suppliers into stable North American supply chains for profitable returns. In fact, those firms that have invested in new products and services, new technologies, and new markets outside Canada and the United States stand out as widely acknowledged and notable exceptions. They are the companies that have grown into Canada's successful multinational enterprises.

But, business conditions are changing. Business strategies also need to change – and along with them, the strategic importance that Canadian companies ascribe to innovation.

## **The Innovation Imperative**

For Canada's manufacturers and exporters, business conditions have changed dramatically over the past five years, both aggravated and accelerated by recession. Customer demand has fallen precipitously in the United States while market power has shifted to the newly industrialized economies of Asia and Latin America. The Canadian dollar has risen to near parity with its US counterpart. New security, customs, and product safety regulations are increasing the cost and complexity of commercial transactions across the Canada-U.S. border and around the world. Health, safety, and environmental regulations are requiring improvements to be made in products and production processes. Meanwhile, multinational enterprises have consolidated their operations, increased investments in growth markets and shut down operations and

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<sup>50</sup> *Ibid.*, p. 17.

<sup>51</sup> *Ibid.*, p. 21.

product mandates in Canada, requiring Canadian suppliers either to move with them or build new multinational supply chain relationships. At the same time, business competition has become more intense with conditions of overcapacity prevailing in many industrial markets, new multinational enterprises emerging in Asia and Latin America, and new technologies that are being commercialized at a rapid pace.

The recession has taught Canadian companies that business as usual cannot be an option for businesses that are aiming to compete and grow in domestic or global markets. If companies are doing business today the same way they were five years ago, they are very likely facing severe financial difficulties. At the same time, no business is likely to prosper if it does not take the new challenges and opportunities that recovery will bring over the next five years into account, and adjust its competitive strategy accordingly.

Today, innovation is an imperative for business survival, and for growth. In order to succeed, Canada's business leaders cannot think of what their companies do as simply getting product out the door. Instead, they have to see that they are in the business of providing solutions for customers through the capabilities that their organizations have to offer. In order to compete and grow, their businesses need to differentiate themselves from the competition. In order to do that, they need to:

1. Find new customers, business partners, and distribution channels in markets around the world;
2. Improve existing products through more customized design and services;
3. Develop and bring to market new and more specialized products and technologies;
4. Improve operating efficiencies and lower costs by focusing on the value that customers will pay for and eliminating wasteful non value-adding activities throughout their enterprise;
5. Adopt new, more productive, safer, and more environmentally friendly production, information, and communication technologies;
6. Work with suppliers to lower costs, develop new materials, components, and services, and speed up and improve the reliability of supply;
7. Manage logistics systems to ensure rapid and reliable delivery of products and services to customers; and,
8. Ensure that their employees have the skill sets and competencies required for business success.

Rapidly changing business conditions have elevated the importance for Canadian companies of finding new customers and developing new and improved products and processes. This is

especially true for Canadian manufacturers and exporters – those sectors most exposed to recession and global competition. The importance of innovation is an imperative echoed by business and policy leaders alike. Policy-makers and other commentators now say that it is up to Canadian businesses to invest. Yet, business investment in R&D, technology, and skills training remains weak, even as the economy recovers from recession. And, explanations tend to fall back again to a lack of ambition on the part of Canadian firms.

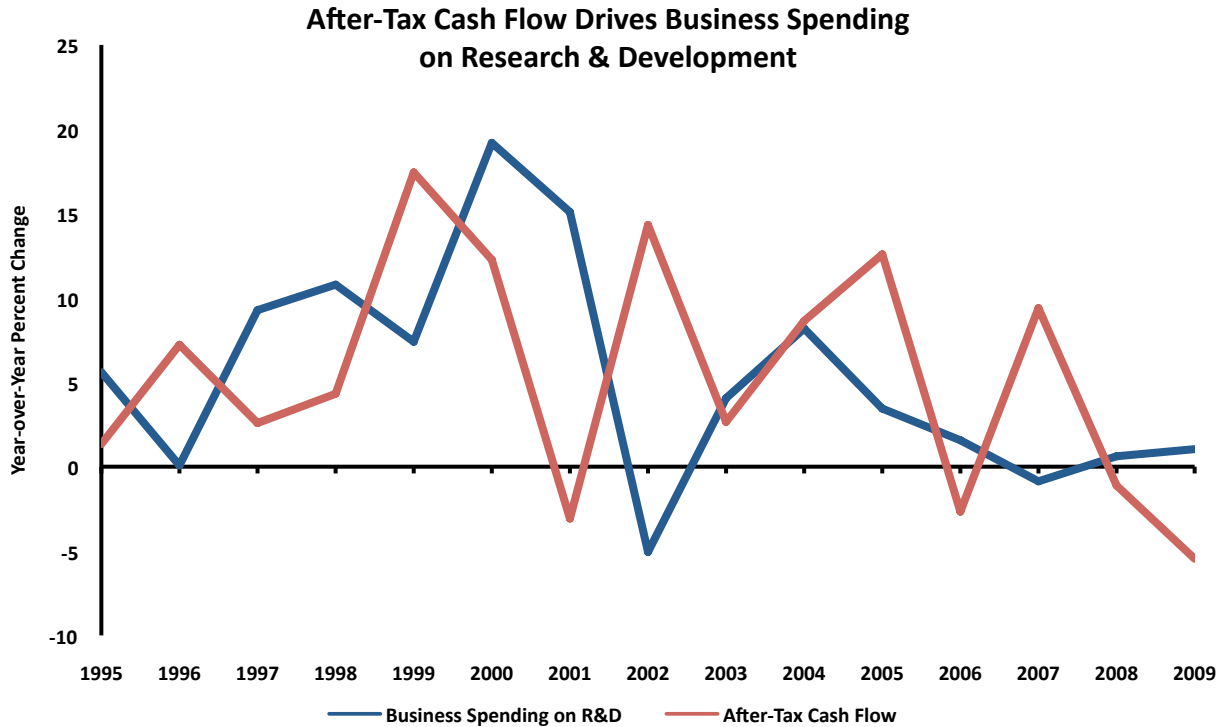
There is, however, another factor that needs to be taken into account in explaining Canada's lagging innovation and productivity performance, and ultimately the degree of ambition exhibited by Canadian business. Innovation is a strategic business decision. But, it is ultimately an investment decision. For that reason, Canada's performance should also be analyzed through the lens of cash flow performance and the competitive returns that can be expected from business investment.

### **Canada's Investment Challenge**

Companies invest in research and development, new technologies, and workforce training because they expect that those investments will enable them to serve customers better, enhance their competitiveness, and grow their business – all with an eye to increasing profitability and generating a competitive rate of return on their investments. However, businesses also need the cash and the financing to be able to pay for the investments they make. After-tax cash flow is the cash generated internally by a company that is available for investment. After-tax cash flow is derived from after-tax profits and accumulated savings in the form of capital consumption allowances. It is this cash that generates the additional financing available for investments in new or existing assets. It is also the source of the dividends that companies distribute to their shareholders. Across Canada's business sector, a clearly evident relationship exists between after-tax cash flow performance and investments in productive assets.<sup>52</sup>

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<sup>52</sup> For any business: After-tax Cash Flow [Before-Tax Profits – Direct Taxes payable on profits + Capital Consumption Allowances] + Financial Borrowing = Capital Investment [Investment in Machinery & Equipment + Investment in New Structures & Non-Residential Construction] + Investment in Existing Assets + Dividends & Other Capital Transfers + Financial Savings. This analysis shows that, across Canada's business sector, R&D spending and Investment in Machinery & Equipment are both functions of After-Tax Cash Flow.



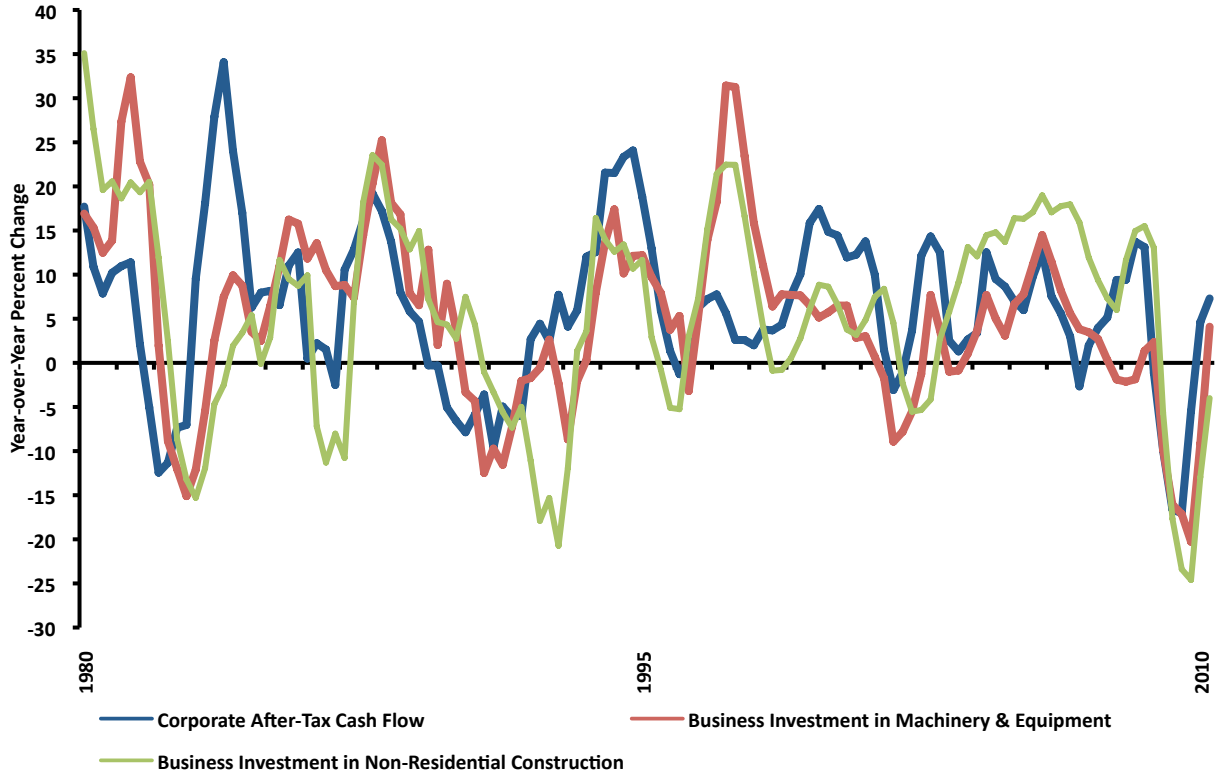
In the first place, after-tax cash flow drives business spending on research and development activity in Canada.<sup>53</sup> Changes in cash flow tend to precede changes in R&D spending by about a year. This indicates that companies tend to base the level of their R&D expenditures in any year on the basis of the previous year’s cash flow performance. The evidence also indicates that because of the time lag involved, R&D spending tends to be on the increase just at times when profit margins and cash flow begin to decline.

An even more evident relationship exists between after-tax cash flow and capital investment on the part of Canadian businesses. Again, cash flow performance leads investment activity. Investments in new machinery and equipment tend to follow closely behind changes in after-tax cash flow performance, while business investments in non-residential construction require a somewhat longer lead time.<sup>54</sup>

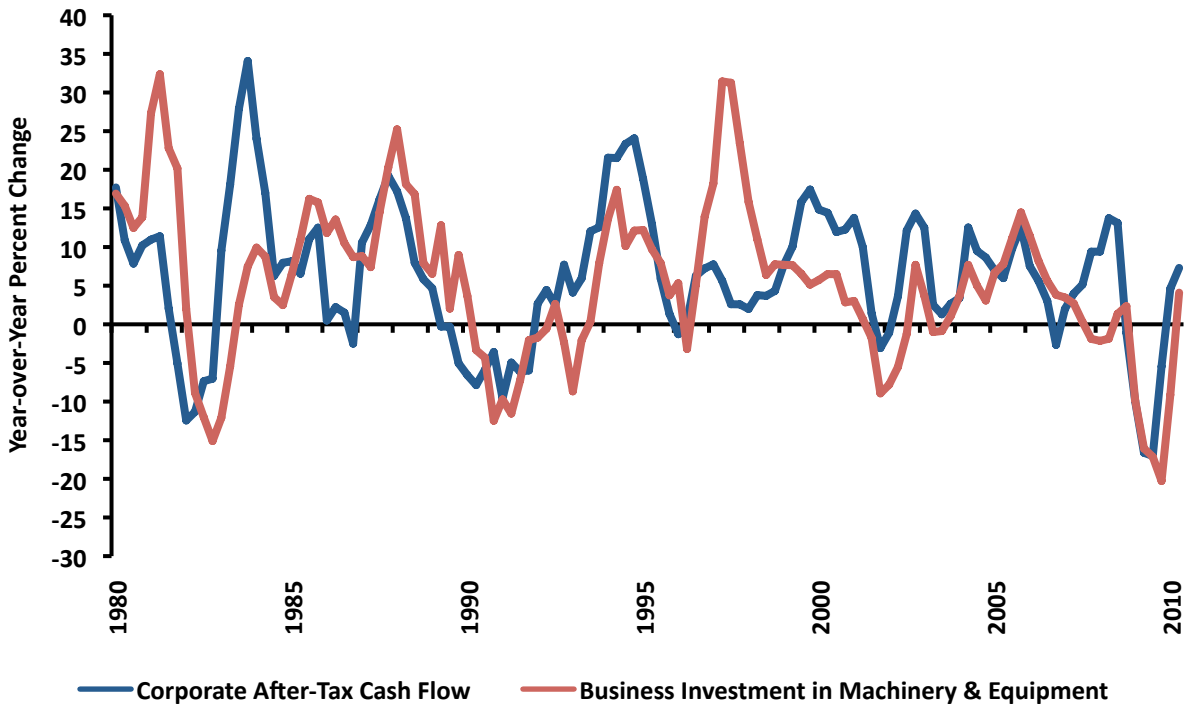
<sup>53</sup> Statistics Canada, *National Income and Expenditure Accounts; Gross Domestic Expenditures of Research and Development*.

<sup>54</sup> Statistics Canada, *National Income and Expenditure Accounts*.

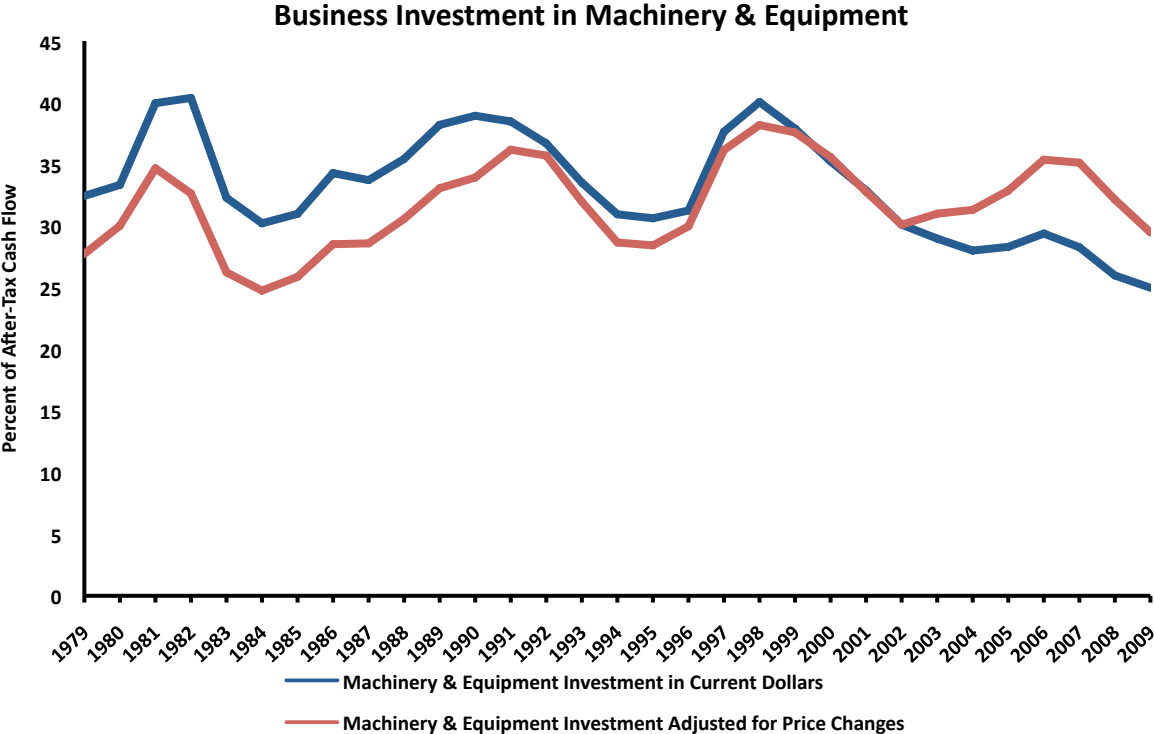
**After-Tax Cash Flow Drives Capital Investment by Business**



**After-Tax Cash Flow Drives Business Investment in Machinery & Equipment**



There is another important feature of business investment in technology as it relates to corporate cash flow performance. Canadian businesses tend to invest the same proportion of after-tax cash flow in machinery and equipment over time. Between 1979 and 2002, their technology investments accounted for between 33% and 40% of after-tax cash flow. That proportion fell to around 25% in 2009. However, the price of machinery and equipment should also be taken into account, including the impact of the Canadian dollar exchange rate which affects the purchase price of technology imports. After discounting for price variations, the constant dollar value of business investment in machinery and equipment has usually varied between 25% and 35% of after-tax cash flow.



The variation in the share of after-tax cash flow allocated for the purpose of investing in new machinery and equipment can, in turn, be interpreted as a reflection of the relative returns that businesses expect to generate from their investments. Near the upper end of the range, companies expect to receive a higher payback by investing in technology than other ways of using their cash. When near the lower end of the range, businesses are expecting to generate higher returns by using their cash for purposes other than making technology investments.

One important observation to note is that, contrary to conventional wisdom, Canadian companies invested proportionately more of their available cash in new machinery and equipment (in both current and constant dollar terms) as the Canadian dollar was depreciating in value against its U.S. counterpart during the latter half of the 1990s. While technology investments have declined as a share of cash flow in current dollar terms since 2002,

purchasing power has increased as the Canadian dollar has risen in value against its American counterpart and other major currencies. When viewed in constant dollar terms after adjusting for price changes, the share of available cash that Canadian businesses put towards investments in new machinery and equipment increased between 2002 and 2006, before falling back to around 27% of after-tax cash flow in 2008 as the recession got underway.<sup>55</sup>

The consistency that is apparent in the relationship between after-tax cash flow and investment in machinery and equipment is significant because it provides a degree of predictability in estimating the impact of changes in cash flow performance on technology investment decisions by Canadian business. It indicates that a percentage change in after-tax cash flow should be expected to lead to a change in real (constant dollar) technology investment of a similar magnitude, with a range of variability of about 17%. A one percent change in cash flow should, for example, result in a 0.83% to 1.17% increase in investment. The impact of cash flow performance on technology investment is stronger at upper levels of the range of variability, where businesses find it relatively more attractive to invest in machinery and equipment, than at lower levels.

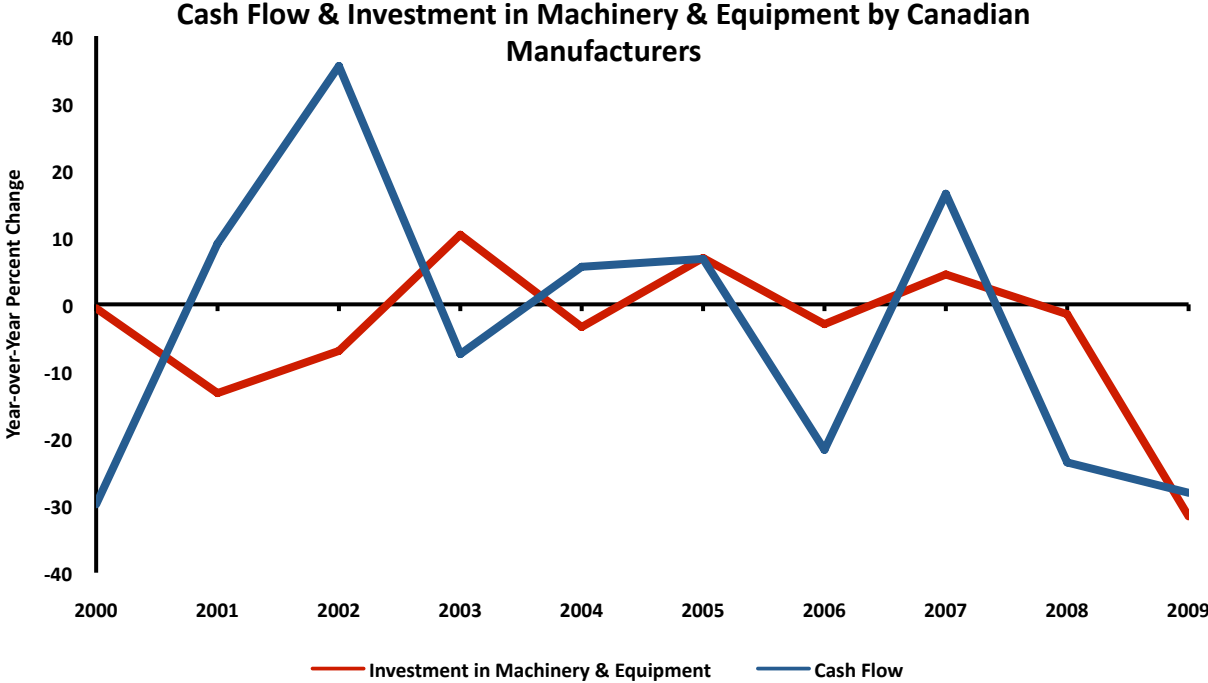
After-tax cash flow is calculated as the sum of before-tax business profits plus capital consumption allowances minus direct taxes paid on profits. Based on this equation and the consistent relationship that exists between cash flow and capital investment, it is possible to estimate the impact at any one period of time of changes in profit margins and capital consumption allowances on business investment decisions. For 2010, the impacts of a one percent change in the components of after-tax cash flow are summarized in the following table.

***Impacts on Business Investment in Machinery & Equipment: 2010***

	<b>Rate of Change</b>	<b>Lower Range: Investment Changes by 83% of Change in Cash Flow</b>	<b>Direct Impact: Investment Changes by 100% Change in Cash Flow</b>	<b>Higher Limit: Investment Changes by 117% Change in Cash Flow</b>
<b>Before-Tax Profits</b>	+ 1%	+ 0.30%	+ 0.36%	+ 0.42%
<b>Effective Direct Tax Rate on Profits</b>	- 1%	+ 0.09%	+ 0.11%	+ 0.13%
<b>Capital Consumption Allowance</b>	+ 1%	+ 0.53%	+ 0.64%	+ 0.75%
<b>Total After-Tax Cash Flow</b>	+ 1%	+ 0.83%	+ 1.00%	+ 1.17%

<sup>55</sup> *Ibid.*

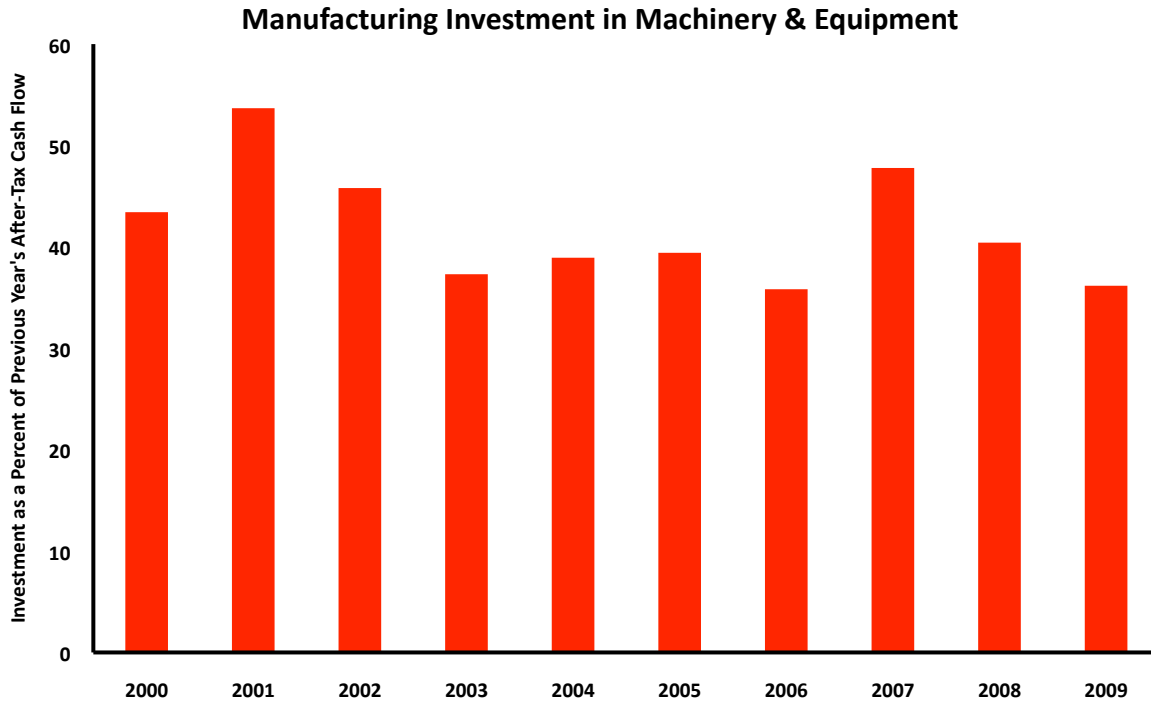
A similar type of relationship exists between cash flow performance and machinery and equipment investment in Canada’s manufacturing sector. However, in manufacturing there is a longer lead time between changes in cash flow and investment performance.<sup>56</sup>



Manufacturers also tend to invest a consistent share of their available cash in machinery and equipment when adjusted for a one-year time lag. Over the past decade the ratio has averaged around 42% of annual cash flow, but it has varied from a low of 36% to a high of 53%. This trend reflects the more capital-intensive nature of manufacturing. It also indicates that a percentage change in cash flow should be expected to lead to a similar change in technology investment in Canada’s manufacturing sector, when measured in current dollar terms and with a slightly higher range of variability of about 19%.<sup>57</sup>

<sup>56</sup> Statistics Canada, *Investment Intentions; Quarterly Financial Statistics for Enterprises*.

<sup>57</sup> *Ibid.*



For 2010, the impacts on manufacturing of a one percent change in the components of after-tax cash flow are summarized in the following table.

***Impacts on Manufacturing Investment in Machinery & Equipment: 2010***

	Rate of Change	Lower Range: Investment Changes by 81% of Change in Cash Flow	Direct Impact: Investment Changes by 100% Change in Cash Flow	Higher Limit: Investment Changes by 119% Change in Cash Flow
<b>Before-Tax Profits</b>	+ 1%	+ 0.29%	+ 0.36%	+ 0.43%
<b>Effective Direct Tax Rate on Profits</b>	- 1%	+ 0.09%	+ 0.11%	+ 0.13%
<b>Capital Consumption Allowance</b>	+ 1%	+ 0.52%	+ 0.64%	+ 0.76%
<b>Total After-Tax Cash Flow</b>	+ 1%	+ 0.81%	+ 1.00%	+ 1.19%

The implication is that the outlook for manufacturing investment remains very weak for 2010. Cash flow in manufacturing fell by 28% in 2009. Assuming that manufacturers continue to invest a consistent proportion of the previous year's cash in 2010 as in 2009, their investments in new machinery and equipment can be also be expected to fall in 2010, by somewhere between 23% to 33%.

## Implications for Fiscal Policy

The close relationships that exist between after-tax cash flow performance on one hand and business spending on research and development and on new machinery and equipment on the other indicate that innovation should be viewed ultimately as an investment decision.

Government fiscal policies that aim to encourage business investment in innovation should therefore have four strategic objectives:

1. Encourage investment in productive assets – in R&D, machinery and equipment used in producing goods and services of greater value, and workplace training;
2. Increase the cash that businesses have available to invest by leaving more money in the hands of those companies making the investments;
3. Raise the rate of return on productive assets, thereby making investments in R&D, technology, and workforce skills more attractive for businesses than other ways of allocating cash (such as investing outside Canada, acquiring existing assets, paying dividends, or increasing savings); and,
4. Assure businesses that policy measures will remain in place during the course of their investment cycle and provide greater certainty and consistency with respect to the application of rules and eligibility requirements.

Governments in Canada use procurement, direct subsidies and loans, as well as tax measures to encourage investments in innovation. Government procurement creates a larger scale domestic market or leverages global opportunities for the commercialization of new products and services. Direct grants or loans to business help subsidize or finance innovation initiatives once investment decisions are made. They also make more cash available for specific investment purposes. Governments can also accelerate business spending on innovation by leaving more money in the hands of those companies that are making investments in productive assets.

Based on the empirical relationship that exists between cash flow and investment activity, and assuming that companies invest the same share of cash flow in R&D and new machinery and equipment from one year to the next, the following table summarizes the impact that changes

in fiscal policy could be expected to have on investment decisions by Canadian business in 2010.

***Fiscal Policy Impacts on Innovation, 2010***

Impact of Policy Measure on Cash Flow	Examples of Policy Measures	Impacts of 1% Change in Cash Flow on Innovation Investments resulting from Policy Measures
Increase in Before-Tax Profits	<ul style="list-style-type: none"> <li>- Harmonization of provincial sales taxes with the GST</li> <li>- Elimination of duties on imported technologies, goods, and services</li> <li>- Reduction in regulatory compliance costs</li> <li>- Subsidies tied to business investment</li> </ul>	+ 0.36%
Reduction of Effective Tax Rate on Profits	<ul style="list-style-type: none"> <li>- Reduction in corporate income tax rate</li> <li>- Elimination of capital taxes</li> </ul>	+ 0.11%
Increase in Capital Cost Allowance	<ul style="list-style-type: none"> <li>- Accelerated depreciation rates</li> </ul>	+ 0.64%
Refundable investment Tax Credit	<ul style="list-style-type: none"> <li>- Scientific Research &amp; Development Tax Credit</li> <li>- Refundable Investment Tax Credit</li> </ul>	+ 3.20%

Refundable tax credits increase cash flow as well as rates of return on investment and are likely to have the greatest positive impact on business investment decisions. Accelerated capital cost allowances have the second largest impact on investment decisions. Reductions in direct tax rates, as well as in indirect taxes paid by business, also have positive if more muted impacts on investment.

Impacts would be larger if policy measures were to make expected returns on innovation investments more attractive than other uses of cash flow. Certainty that fiscal measures will be in place over the duration of the investment planning cycle, and consistency of rules and eligibility requirements, are also essential in establishing and confirming business expectations, and are therefore critical to the effectiveness of any investment incentive regime.

This analysis indicates that there are more effective tax incentives that governments can use to encourage investments in innovation and productive assets than reductions in corporate income tax rates. This does not mean, however, that direct tax rate reductions are unimportant in attracting and retaining business investments and product mandates in Canada. Corporate income and capital tax rates determine how much profit can be kept by businesses and re-invested as part of their cash flow in new structures and equipment or in existing assets, or distributed in the form of dividends to existing investors. Companies will prefer to locate in those jurisdictions where profits can be maximized. Competitive corporate tax rates are, therefore, essential to anchoring business investment in the first place.

It is possible to apply this analytical approach to estimate the impact that tax changes have had upon technology investment in Canada's manufacturing sector between 2006 and 2009. In its 2006/07 budget, the federal government committed to lowering the federal corporate income tax rate to 15% by 2012. It also introduced a two-year straight line depreciation rate for investments in manufacturing and processing machinery and equipment. Provincial governments followed suit in committing to corporate tax rate reductions, accelerated capital cost allowances, and the elimination of capital taxes. In subsequent budgets, the federal government has extended the two-year depreciation rate for manufacturers until the end of 2011 and eliminated duties on imported materials and equipment used in manufacturing, beginning in 2009. The following table estimates the impact that these specific tax changes have had on manufacturing investment between 2006 and 2009.

***Impact of Recent Tax Changes on Manufacturing Investment in Machinery & Equipment***

<b>Tax Measure</b>	<b>Estimated Impact on Cash Flow</b>	<b>Estimated Impact on Investment</b>
Elimination of Capital Tax and Reduction in Corporate Income Tax Rate by the Federal Government	17% reduction in effective tax rate on profits	+ 1.87%
Two-Year Depreciation	18.4% increase in capital consumption allowance	+ 11.78%
Elimination of Import Duties	0.37% increase in before-tax profits	+ 0.13%
Elimination of Capital Taxes & Reduction of Corporate Income Tax Rates by the Provinces	15% reduction in effective tax rate on profits	+ 1.65%

Between 2006 and 2009, these tax measures are estimated to have led to a 14% increase in manufacturing investment in new machinery and equipment over levels of investment that would otherwise have been expected if the tax changes had not been made. Manufacturing investment in machinery and equipment actually fell by about 30% between 2006 and 2009. Our analysis suggests that investment would have fallen even further had these tax changes not been implemented. The consistent ratio of investment to after-tax cash flow indicates that this would indeed have been the case.

Each of the tax measures listed above had a positive impact on manufacturers' cash flow. Manufacturing investment in new machinery and equipment increased significantly in relation to cash flow in 2007, the year when the two-year write-off for investments in manufacturing and processing technologies was fully implemented. Even in 2009, during the depth of recession, manufacturers continued to invest the same share of after-tax cash flow in new machinery and equipment as they had between 2003 and 2006. Without these tax measures in place, this analysis indicates that manufacturing investment in new machinery and equipment would have dropped by more than 45% over the past four years.

## **Tax Policy Recommendations**

Policy-makers need to recognize that innovation is ultimately an investment decision on the part of business and design their policy measures accordingly.

Based on this premise, Canadian Manufacturers & Exporters makes the following tax policy recommendations aimed at encouraging more business investment in those productive assets that are necessary to improve Canada's innovation and productivity performance:

1. Extend the two-year write off for investments in manufacturing and processing technologies to at least the end of 2016, and consider making this accelerated capital cost allowance permanent.

As this analysis indicates, the two-year write-off has been a very important measure for Canada's struggling manufacturing sector. The elimination of accelerated depreciation would, in fact, have a negative impact on both cash flow and investment activity at a time when manufacturers and the Canadian economy can least afford it.

While many businesses have taken advantage of the two-year write-off since it was first introduced, the time frame for eligibility has been too narrow for others to take advantage of this measure. Companies must respond through a capital planning process that in some cases may require several months to determine capital allocations and the most attractive or competitive investment opportunities. Many manufacturers rely on customized machinery and equipment for their operations. Lead times from equipment suppliers are lengthy. And, it requires additional time to receive regulatory approvals, install the equipment, and put it into operation. A commitment to extend the eligibility period for companies to take advantage of this accelerated capital cost allowance for at least another five years would provide the certainty that businesses

require to plan and put in place larger scale technology investments and therefore improve the effectiveness of this tax measure.

Because of the importance of the accelerated capital cost allowance, CME recommends that the Government consider making the two-year depreciation for manufacturing and processing machinery and equipment permanent. A permanent two-year write-off would make this measure an important tool for government to improve the competitiveness of the Canadian tax system for manufacturing investment, encourage innovation, and productivity growth, and improve safety and environmental performance on the part of Canada's largest business sector.

2. Make Canada's Scientific Research and Experimental Development (SR&ED) tax credit refundable and improve the administration of the tax credit system.

The SR&ED tax credit is the most important government incentive for business R&D investment in Canada. According to Finance Canada, the SR&ED credit provides a net economic benefit to Canada of 11 cents per dollar of tax expenditure, or roughly \$400 million annually for the Canadian economy.<sup>58</sup>

This credit provides Canadian businesses critical support for in-house innovation and commercialization. However, during difficult economic times, when companies are investing more than they are making in profits, they cannot take advantage of the credit. Its real value declines over time, reducing the effective returns from investments in SR&ED projects. Making the SR&ED credit refundable would provide a cash-flow infusion the year that R&D investments are made, and would therefore be more effective incentive for companies to sustain their investments in innovation during periods of economic downturn when innovation is needed the most.

Making the tax credit refundable would also extend the benefits of this incentive to companies operating in Canada which, because they are either currently facing a downturn in profits, investing in R&D ahead of their earnings performance, or having to consolidate corporate earnings for foreign tax reporting purposes, are not currently able to take advantage of this important tax measure. It would help liquefy assets of companies that are continuing to invest in innovation, thus improving their cash position for further growth. CME further recommends that full refundability be provided from January 1<sup>st</sup>, 2008. Businesses should still be allowed to apply tax credits accumulated before that date against future taxes payable.

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<sup>58</sup> Parsons, M & Phillips, N., *An Evaluation of the Federal Tax Credit for Scientific Research and Experimental Development*, Ottawa, Finance Canada, 2007.

In spite of commitments made by the Canada Revenue Agency (CRA) to improve the administration of the SR&ED tax credit system, the lack of consistent and scientifically qualified technical interpretations, more and more complex compliance requirements, and lengthy delays in processing and adjudicating claims continue to erode the effectiveness and use of the tax credit. Businesses need to be able to predict with a greater degree of confidence than now exists what types of R&D spending are eligible under the program. The tax credit should also focus more on the experimental development and technologically based innovation that businesses require, and less on the laboratory-based scientific research that seems to be the focus of recent interpretations by the CRA. Extensive improvements are needed in the transparency, efficiency, predictability, and efficacy of the system.<sup>59</sup>

3. Introduce a refundable tax credit for workplace training in order to offset the impact of rising Employment Insurance premiums.

Increases in Employment Insurance premiums will discourage both workforce training and job growth by increasing the cost of employment. Companies that are investing in workplace training are already making an investment in the future of their employees as well as in innovation. Businesses that are making these investments should receive a credit to offset rising payroll taxes. This tax measure would aim to improve skills and competencies at the workplace, and therefore target the widely recognized challenge of boosting Canada's total factor productivity.<sup>60</sup>

4. Introduce a refundable tax credit for investments required for regulatory compliance purposes.

Government regulations redefine the market and operating rules for business. In order to comply and meet their legal obligations, companies usually need to invest in new technologies, information systems, and work practices. Frequently, however, there is no direct value-added, innovation or productivity gain, realized by businesses as a result of those investments. In these cases, an investment tax credit should be offered to enhance cash flow and the returns that firms can expect from such investments. By determining time limits for eligibility, such a tax credit would also be an incentive for speedier and verifiable compliance on the part of businesses.

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<sup>59</sup> CME supports the findings and recommendations outlined in the CATAAlliance, *Key Elements for the Success of the Scientific Research and Experimental Development (SR&ED) Program as an Incentive*, 2010

<sup>60</sup> See pages 12 and 19 above.

5. Follow through on commitments to reduce the federal corporate income tax rate to 15% and average combined federal and provincial tax rates to 25% by 2012.

Following through on these commitments is critical to providing Canada with a globally competitive tax rate on corporate income that will attract and retain business investment and product mandates, and at the same time maintain business confidence that returns on investment planned as a result of investments in Canada will be forthcoming.

6. Follow through on commitments to harmonize provincial sales taxes with the GST.

The Harmonized Sales Tax (HST) eliminates provincial sales taxes on business inputs, thereby lowering the cost of innovation and increasing returns on investment. Provinces that have recently adopted the HST should apply Input Tax Credits to all business inputs and make them available for all companies administering the HST.

These tax measures will encourage investment, innovation, and productivity improvement by increasing cash flow and providing businesses greater certainty that they will indeed be able to realize expected returns on their investments.

## **Other Policy Recommendations**

Tax measures to encourage business investment and innovation need to be supported by other policy initiatives as well.

- A) To help Canadian businesses find new customers and identify new opportunities to participate in technology development projects in Canada and around the world:
  - Develop a Canadian technology foresight initiative involving technology experts as well as business, government, academic, and other policy leaders from across Canada, aimed at identifying roadmaps for critical technologies, informing public policies, and guiding public and private R&D priorities.
  - Use public procurement policies to strengthen demand for innovative technologies within Canada and leverage opportunities for the participation of Canadian businesses in international technology development and procurement projects.

- Harmonize regulations and standards as much as possible across Canada and internationally.
- Conclude economic agreements that eliminate protective barriers to trade, investment, R&D partnerships, technology transfer, and labour mobility within Canada as well as with key international markets including the United States, European Union, China, India, Brazil, Russia, and other industrializing nations.
- Conclude agreements with the United States to open state and local procurement markets and remove restrictions on employing third-country nationals in the development and manufacture of defence-related technologies.
- Encourage connections between Canadian businesses and multinational supply chains and technology development projects.
- Strengthen the role of Canada's trade commissioners in identifying opportunities for Canadian companies to participate in international procurement and technology development projects, and improve the way those opportunities are communicated to business.
- Establish a Canadian Innovation and Development Fund to take long-term equity positions in international infrastructure and technology projects.
- Improve the availability of market and business intelligence provided by organizations like the Department of Foreign Affairs and International Trade, the Canadian International Development Agency, Canadian Commercial Corporation, Export Development Canada, other departments within federal and provincial governments, the Forum for International Trade Training, trade associations, and other trade promotion agencies.

B) To support the development, commercialization, and adoption of new and improved products and processes by Canadian business:

- Continue to provide direct financial support for companies investing in new products, processes, and technologies.
- Strengthen private and public sector investments in broadband and wireless infrastructure.

- Increase financial support for the National Research Council's Industrial Research Assistance Program (IRAP).
- Improve coordination and awareness about innovation infrastructure and business development services at the community level.

C) To strengthen technology transfer to Canadian business:

- Direct more funding for post-secondary and government research to applied and collaborative R&D initiatives with business.
- Fund more R&D projects at post-secondary institutions and government research organizations indirectly through businesses, with the objective of increasing collaborative research activities and improving the responsiveness of researchers to business needs.
- Adopt uniform criteria across granting organizations for assessing government-funded research projects and potential benefits to Canadian business.
- Expand the network of industrial technology advisors working to identify opportunities for collaborative research and development between business and post-secondary and government research organizations.
- Improve coordination and customer service across Canada's network of academic and government research organizations.
- Raise business awareness about the innovation services that are available from Canada's universities, colleges, and government research centres.

D) To maintain an innovative workforce:

- Ensure that Canada's young people and adult workforce have the basic literacy and numeracy skills they require to function in the workplace.
- Increase enrolment in mathematics, science, engineering and other technology-related fields of education.

- Improve Canada's apprenticeship system and increase support for applied skills, trades, and technology programs in Canada's school and college systems.
- Make it easier for business visitors and skilled immigrants to enter, work, and stay in Canada.
- Encourage and improve support for Canadian students studying abroad as well as for foreign students studying in Canada.
- Encourage the development of nationally and internationally recognized skills accreditation across industry.
- Help identify and communicate best practices in innovation management and workplace skills development.

E) To improve the availability of innovation financing:

- Increase the level of investment by the Business Development Bank of Canada and Export Development Canada in direct equity and in venture capital funds, thereby expanding the pool of risk capital available to support business start-ups, new product commercialization, and participation by Canadian companies in consortia to develop, integrate, and commercialize new technologies.
- Allow financial institutions to lend against accumulated SR&ED tax credits.
- Simplify and expedite funding approvals for government programs in support of business innovation.
- Launch a national expert review of Canada's innovation financing system and adopt recommendations for improvement.

F) To ensure a business environment that promotes innovation:

- Improve the protection of intellectual property and strengthen anti-counterfeit enforcement in Canada.

- Improve the patenting process in Canada by strengthening protection of intellectual property rights at the time of filing and streamlining patent application and dispute settlement procedures.
- Encourage the development of a clear and consistent framework for confidentiality and intellectual property agreements between businesses on one hand and post-secondary institutions, government research organizations, and granting councils on the other, with the aim of facilitating collaborative research, development, and technology commercialization.
- Ensure cost-competitive access to high-grade transportation, communication, and energy infrastructure.
- Streamline regulatory approval processes, simplify regulatory compliance costs, and eliminate unnecessary regulatory barriers to product and process innovation and commercialization across Canada.

**Above all, Canada requires a new nationally coordinated innovation strategy that more effectively aligns public policies and programs to what businesses need to compete and win in the global economy of the 21<sup>st</sup> century.**



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