

Innovation and Business Strategy: Why Canada Falls Short

Peter Nicholson¹
Council of Canadian Academies

ABSTRACT

This article summarizes the report of the Expert Panel on Business Innovation appointed by the Council of Canadian Academies. The report presents a fresh look at innovation as an economic process rather than primarily as a science and engineering activity. Noting that Canada's productivity has been falling further behind that of the United States and many other advanced countries for the past 25 years, the report argues that lagging productivity growth has been due to subpar innovation. Innovation is interpreted broadly to encompass the day-to-day activities of all kinds of businesses looking for new or more efficient ways to serve the needs of customers. The panel concludes that too many businesses in Canada are technology followers, not leaders, and that a fresh discussion on innovation in Canada is needed, one that focuses on the factors that influence adoption of innovation-based business strategies.

INNOVATION — NEW OR BETTER ways of doing valued things — is the creative capacity to transform the imagined into the real. Innovation matters for *businesses* because novel products and more efficient processes are the principal means of making businesses more competitive. It is through innovation that businesses find ways to generate more value from existing resources. Innovation is, directly or indirectly, the main driver of productivity growth and is thus the principal source of national prosperity. Canadians should therefore be concerned in the face of evidence suggesting that Canada's business sector on the whole, though with notable exceptions, is lagging in innovation relative to many of our peer group

of economically advanced countries.

The question is “why.” If innovation is good for business, why is Canadian business apparently less committed to innovation than analysts and policy-makers believe it should be? The question has been asked for decades, yet the situation has not changed much in relative terms. The causes of Canada's innovation deficiency must therefore run deep in the nature of the economy, and perhaps in Canadian society as well. To bring to bear a comprehensive contemporary analysis of the issue, the federal Minister of Industry asked the Council of Canadian Academies to appoint a panel of business, labour and academic experts (Box 1) to answer the following questions:

1 The author is President of the Council of Canadian Academies. This article is a highly condensed summary of the report of the Expert Panel on Business Innovation entitled *Innovation and Business Strategy: Why Canada Falls Short*. The panel was appointed and supported by the Council of Canadian Academies following a request by the federal Minister of Industry. The report can be accessed from the Council's website www.scienceadvice.ca. Email: peter.nicholson@scienceadvice.ca.

Box 1**Expert Panel on Business Innovation in Canada**

Robert Brown (Chair), President and Chief Executive Officer, CAE Inc.
(Montréal, QC)

Savvas Chamberlain, Chairman and Founder, DALSA Corporation
(Waterloo, ON)

Marcel Côté, Founding Partner, SECOR Inc (Montréal, QC)

Natalie Dakers, Chief Executive Officer, Centre for Drug Research and Development, University of British Columbia (Vancouver, BC)

Meric Gertler, Dean, Faculty of Arts and Science; Co-Director, Program on Globalization and Regional Innovation Systems, University of Toronto (Toronto, ON)

Bronwyn Hall, Professor of Economics of Technology and Innovation, University of Maastricht (Maastricht, The Netherlands); Professor of the Graduate School, University of California at Berkeley (Berkeley, CA)

André Marcheterre, Company Director, Former President and Chief Executive Officer, Merck-Frosst Canada (Lorraine, QC)

Arthur May, President Emeritus, Memorial University; Chairman of the Advisory Board, Atlantic Innovation Fund (St. John's, NL)

Brian McFadden, President and Chief Operating Officer, Prestige Telecom Inc. (Baie d'Urfé, QC)

Walter Mlynaryk, Executive Vice-President, Kruger Inc. (Montréal, QC)

David Pecaut, Senior Partner and Managing Director, Boston Consulting Group (Toronto, ON)

Jim Roche, Company Director, and Former President and Chief Executive Officer, CMC Microsystems (Ottawa, ON)

Charles Ruigrok, Former Chief Executive Officer, Syncrude Canada Ltd. (Calgary, AB)

Andrew Sharpe, Executive Director, Centre for the Study of Living Standards (Ottawa, ON)

Jim Stanford, Economist, Canadian Auto Workers (Toronto, ON)

Guthrie Stewart, Former Partner, Equity Fund, Edgestone Capital Partners (Montréal, QC)

Alexandre Taillefer, Co-Founder, Stingray Digital Group Inc (Montreal, QC)

John Thompson, Chairman, TD Bank Financial Group (Toronto, ON)

- How should the innovation performance of Canadian firms be assessed?
- How innovative are Canadian firms, and what do we know about their innovation performance at a national, regional and sector level?
- Why is business demand for innovation inputs (for example, research and development, machinery and equipment, and skilled workers) weaker in Canada than in many other OECD countries?
- What are the contributing factors, and what is the relative importance of these contributing factors?

The Context

The panel first met in November 2007, a time when the Toronto Stock Exchange index was nudging 14,000, oil was close to \$100 a barrel, the Canadian dollar was above par with the U.S. dollar, economic growth was solid and the unemployment rate was at a multi-decade low. But beneath the

bullish daily headline data were worrisome longer-term trends, particularly the persistently weak productivity growth in Canada. Investment in leading-edge technology — especially related to computers and communications — was lagging significantly behind not only that of the United States, but also many of the advanced countries with which Canada compares itself. Business spending on research and development as a share of the economy was down 20 per cent from its 2001 peak at the end of the technology boom.

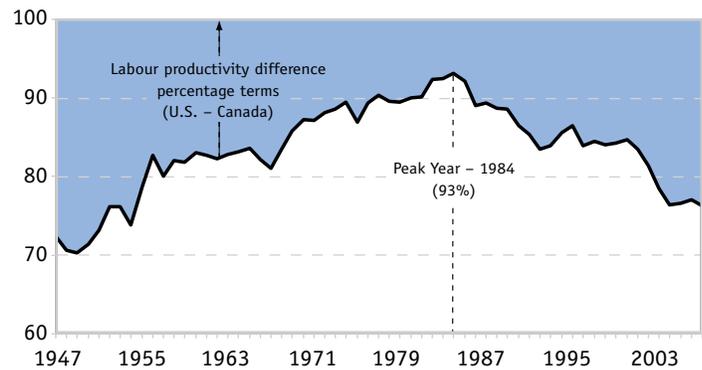
While the panel was completing its work in late 2008 and early 2009, the world changed dramatically. Because the extent of the global economic crisis, and its ultimate impact on Canada's economy and society, remains unknown, the panel did not attempt to factor the crisis prominently into its diagnosis of business innovation in Canada. A longer-term perspective is needed in any event since the symptoms of lagging innovation are of very long standing. The panel therefore focused its analysis primarily on long-run phenomena, stretching across several ups and downs of the economic cycle. Thus its findings remain relevant notwithstanding the severe contemporary shock to the global economy.

It is emphasized that the panel's report is primarily a diagnosis based on existing sources and not a policy prescription, though it provides a body of fact and informed opinion that is of policy relevance.

Innovation as an Economic Process

The panel approached innovation as an *economic* process rather than as a primarily science and engineering activity. The theme of its analysis is the link between business strategy and innovation activity, interpreted broadly. An “invention” is not an innovation until it has been implemented to a meaningful extent. Moreover, innovation is not limited to products but includes improved processes like

Chart 1
Relative Labour Productivity Levels in the Business Sector, 1947-2007
 (real GDP per hour Canada as per cent of U.S.)



Source: Centre for the Study of Living Standards (2008a).

the assembly line, and new business models like web-based commerce. Radical innovations like the steam engine and the transistor create entirely *new markets*. Much more prevalent is incremental innovation in *established markets* in which goods and services are continuously improved — a process that is responsible for the majority of labour productivity growth. These observations imply a much broader conception of innovation than the traditional R&D-centric views.

Canada has a serious productivity growth problem. Since 1984, relative labour productivity in the business sector has fallen from more than 90 per cent of the U.S. level to about 76 per cent in 2007, a trend (Chart 1) that continued in 2008. Over the 1985-2006 period, Canada's average labour productivity growth ranked 15th out of 18 of the larger and most advanced comparator countries in the OECD (OECD, 2008b).

Canada was rapidly closing the productivity gap with the United States until the early 1980s. The strength of U.S. productivity growth, since the mid-90s, is primarily associated with the production and use of information and communications technologies (ICT).

Chart 2
Accounting for Labour Productivity Growth in Canada,
1961-2006

(average annual growth rates, per cent)



Note: Labour productivity growth can be accounted for by increasing capital intensity, improvement in workforce skills, and a residual called multifactor productivity (MFP) — which broadly reflects the effectiveness with which labour and capital are used. Growth rates in the top panel are the sum of contributions of the factors in the bottom three panels. The time periods cover the total 45 year interval (leftmost bars) and two sub-periods when Canada was closing the productivity gap (roughly 1961 to 1980) and falling behind (roughly 1980-2006).

Source: Baldwin and Gu (2007).

Chart 2 is a growth accounting decomposition by Statistics Canada comparing labour productivity growth in the United States and Canada over a 45-year period, 1961-2006. Productivity growth is analyzed as a weighted sum of (i) improvement in the “quality” of the labour force (based primarily on higher educational attainment and more employment experience); (ii)

growth of capital services per hour worked (“capital deepening”) and (iii) the residual, multifactor productivity (MFP) growth, which broadly reflects the effectiveness with which labour and capital are combined in the economy. Chart 2 shows that Canada’s relative productivity growth weakness is not due to comparative shortcomings in its workforce. Neither, for the most part, does it reflect inadequate capital investment though, as will be described subsequently, business investment in information and communications technology has been especially weak. The decomposition demonstrates clearly that Canada’s poor productivity growth is due mainly to the weak growth of MFP. In fact, MFP growth in Canada has lagged behind that of the United States for as long as comparable measurements have been made. Studies by the OECD also show that Canada’s MFP growth, at least since the mid-1980s, has been among the weakest in its peer group of economically advanced countries.

The significance of multifactor productivity

Intuitively, changes in MFP measure that portion of labour productivity growth that can *not* be accounted for by measured growth of both capital intensity and the quality of the workforce. Most significant for this discussion is that *MFP growth contains the macroeconomic signature of aggregate business innovation* — the extraction of increasing value from inputs of capital and labour through inventive activity. Two examples will illustrate:

- Consider the addition of a drive-through window in a fast food outlet. A small amount of construction and one or two extra servers could substantially increase sales volume by expanding the effective “seating capacity” of the restaurant, and, more importantly, by increasing service convenience and thereby attracting more customers. After accounting for the modest capital cost of installing the

drive-through window and some extra labour, the remainder of the increased output is chalked up to MFP growth.

- Consider a sales force in the field before the advent of the cellphone or, better yet, the BlackBerry. Today's relatively inexpensive wireless capital equipment has amplified greatly the value of each field employee, not only through more efficient allocation of time but also through more timely and coordinated service for customers. While some of the added value comes from new investment in equipment, most is measured as an increase in MFP.

Micro-examples like these can be multiplied endlessly. In each case, we see an innovation that may be based on science and technology (e.g. the BlackBerry) or on some very simple engineering combined with entrepreneurial insight (e.g., the drive-through window). The economic impact of thousands upon thousands of such innovations, large and small, is huge.

There is an important interaction between new capital investment (which “embodies” innovation) and MFP since successive generations of capital induce complementary, and often highly innovative, changes in the organization of work and the training of employees — e.g. as the adoption of computer and communications technologies has done, or as the electric motor did in an earlier era. Thus the distinction between the component of productivity growth ascribed to more and better capital, and the component ascribed to MFP, can be somewhat artificial. The impact of innovation on productivity growth enters jointly through both channels (Rao, Tang and Wang, 2008).

Since MFP is the residual after improvements in labour quality and capital intensity have been accounted for, it reflects all other factors that affect labour productivity. So the innovation signal in MFP growth comes mixed with a lot of “noise”. These other confounding

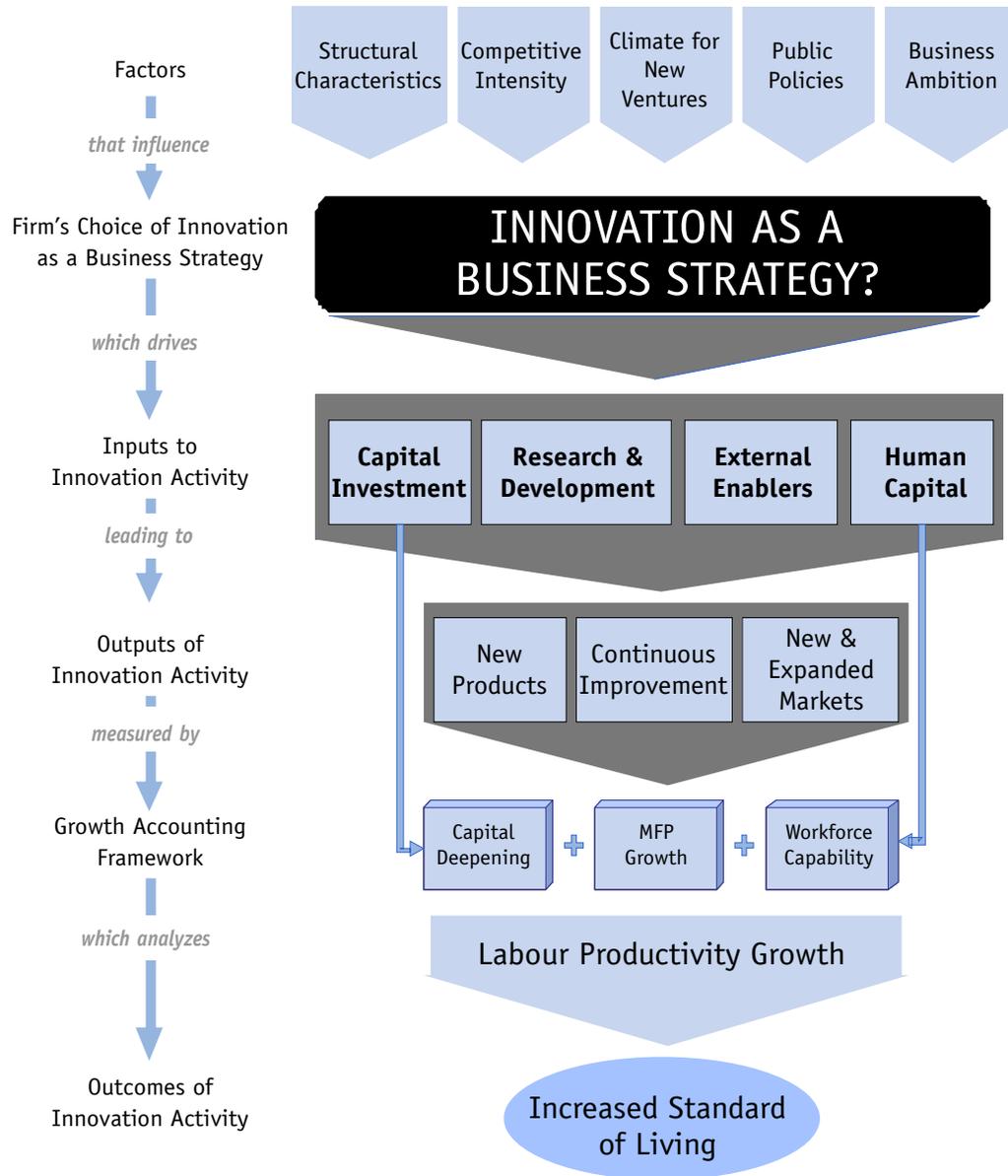
factors include, prominently, changes in capacity utilization caused by booms and recessions, and changes in economies of scale that might be due to opening up of big new markets. The business cycle effect averages out over sufficiently long time periods, as in Chart 2. MFP derived purely from scale effects might arise from growing markets, as would typically occur after trade liberalization (e.g. NAFTA). Canadian MFP should have benefited from this increased scale to a greater extent than the United States has since the 1980s. Thus changes in scale economies can not explain the *slower* MFP growth in Canada — in fact, the effect of scale economies since the 1980s would be expected to be the opposite. The analysis summarized in Chart 2 applies the same procedures to both Canadian and U.S. data, minimizing the effect (on estimates of differences in growth rates) of methodological differences or errors in model specification.

The panel concluded that the rate of MFP growth over suitably long periods is primarily due to business innovation — interpreted broadly to include better organization of work, improved business models, the efficient incorporation of new technology, the payoff from R&D and the insights of entrepreneurs. Since the long-term analyses by Statistics Canada (and also by the OECD) show that Canada's relatively poor productivity growth is due almost entirely to weak MFP growth, the panel concluded that *Canada's weak productivity growth is largely due to weak business innovation performance.*

The Central Role of Business Strategy

Business strategy drives innovative behaviour. Explaining business innovation performance in Canada therefore comes down to explaining the business strategy choices of Canadian firms. This requires a shift of perspective away from innovation

Chart 3
Logic Map of the Business Innovation Process



activities themselves — e.g. inputs like R&D and investment in M&E — to a focus instead on the factors that influence the choice of business strategy. This reframing of the innovation puzzle is the most important contribution of the panel’s analysis.

What are the factors that principally influence firms in Canada to choose, or not to choose, business strategies based around innovation?

The five factors that are, in the panel’s view, of greatest importance are those at the top of Chart 3 which serves as the conceptual framework for the panel’s analysis.

- *Structural characteristics* — For example, is the firm in a sector of the economy that typically does little in-house innovation, relying instead on technology embodied in

capital equipment and/or on production of relatively standard goods or services? Or is the firm foreign controlled with most innovation originating in the home country?

- *Competitive intensity* — Is the pressure from competitors so intense that innovation is needed to maintain profitability and/or market share? This would be the case in many export markets, and particularly in those where technology or customer requirements or tastes are changing.
- *Climate for new ventures* — Is sophisticated early-stage venture financing available? Are there research universities nearby to provide potential innovation partners and highly trained graduates? Is there a local “ecosystem” of supplier firms to help carry an innovation from concept to success in the market?
- *Public policies* — Are government policies in respect of tax, regulations, targeted assistance programs or public procurement favourable to innovation, or not?
- *Business ambition* — Is the business dedicated to market expansion and prepared to take the required risks? Business ambition, in this context, reflects the extent of entrepreneurship and drive.

Once a firm has decided on an innovation strategy, it assembles the enabling inputs. These include the appropriate mix of highly qualified employees; investment in the necessary capital equipment and training; an R&D program if needed; and retention of consultants and various external suppliers, including licensing arrangements and partnerships with other firms. While these inputs, and R&D spending in particular, can be regarded as indicators of innovation, they are actually the *consequences* of the degree of commitment to innovation as a business strategy.

To the extent that Canadian businesses lag in respect of innovation, the reasons lie primarily

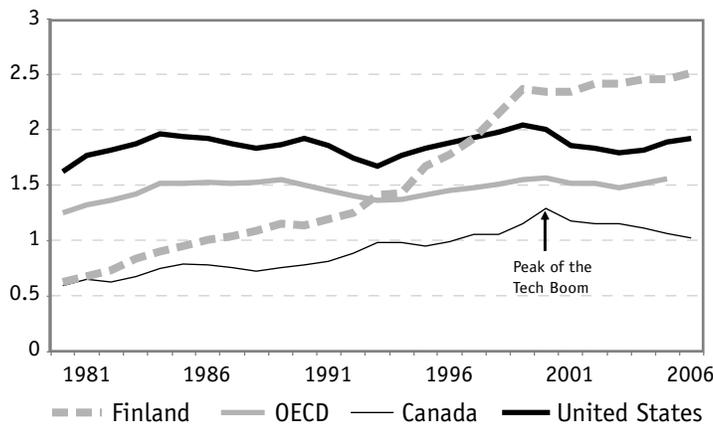
in some combination of the primary influencing factors outlined above. Business ambition will be a key factor in almost every case. For would-be radical innovators in new markets, the other significant influencing factors will be the climate for new ventures and perhaps some supportive public policies. For firms in established markets, the innovation strategy choice is likely to be most influenced by the state of competition, by specific features of public policy or by some industry characteristic such as the firm’s sector or its domicile of control.

For policy-makers, the concern is the extent to which the factors that influence the innovation strategies of businesses can be affected by public policy. Clearly some can be — taxes, regulations, procurement, assistance programs, foreign investment rules and certain aspects of competition. Policy has much less impact on factors such as industry structure and the ambition of business leaders, though business attitude can certainly be affected by competitive intensity, which is amenable to policy influence.

The five key influencing factors in Chart 3 are themselves influenced by certain long-standing features of Canada’s economy, of which the two most significant appear to be the following:

- **Canada is “upstream” in many North American industries.** This positioning is the result of the nation’s resource endowment and development history as a commodity supplier and technology adopter. Canada’s upstream position in many continentally integrated value chains limits contact with ultimate end-customers — who are a strong source of motivation and direction for innovation — and shapes the nature of business ambition in many sectors.
- **Canada’s domestic market is relatively small and geographically fragmented.** Small markets offer lower potential reward for undertaking the risk of innovation and tend to attract fewer competitors, thus pro-

Chart 4
Business Expenditure on Research and Development Intensity, 1981-2006
 (BERD as per cent of GDP)



Note: BERD intensity in Canada declined by 20 per cent between 2001 and 2007 reflecting the pull back in Canada's large telecom equipment sector. The commitment of Finland to innovation-led growth accelerated sharply in the wake of a severe banking crisis in 1991, exacerbated by weakness in Finland's traditional exports following the collapse of the USSR.

Source: OECD (2008a).

viding less incentive for a business to innovate in order to survive. Of course, the innovation success of countries like Finland and Sweden shows that the disadvantage of a small domestic market can be offset by a strong orientation toward innovation-intensive exports.

The following sections present a highly abridged account of the panel's analysis and commentary on the five factors considered to have the greatest influence on business innovation strategy.

Industry Structure Characteristics

The effect of structural factors (particularly sector mix and foreign ownership) on business strategy choice is most readily seen through analysis of the gaps between Canada and the United States in respect of R&D spending and ICT investment. Since the collapse of the tech-

nology boom in 2001, Canada's business expenditure on R&D (BERD), expressed as a percentage of GDP, has been declining (Chart 4). Although the gap between Canada and the United States narrowed significantly between the mid-1980s and the peak of the technology boom, it has since begun to open up again. Structural factors are part of the explanation of the gap, but only part.

Sector mix

A sector by sector analysis of the overall U.S.-Canada R&D gap (Table 1) shows that generally lower Canadian R&D spending within the *same* sectors in both the United States and Canada accounts for a greater portion of the gap (the precise share of which varies from year to year) than does Canada's adverse sector mix — i.e., the greater weight in Canada's economy of resource-related and other activities that have inherently low R&D spending. (Resource-based industries do invest heavily in innovation, though via the indirect route of its embodiment in advanced capital equipment.)

Chart 5 traces the evolution, by sector, of the U.S.-Canada BERD intensity gap over 16 years from 1987 through 2002 (the latest year for which a reasonably complete sector breakdown was available in the OECD data). The total gap diminished from about 1.7 percentage points in the 1988-91 period to about one percentage point in 2001-02, though it has increased somewhat since then. The most significant drivers of the long-run trend have been (i) a sharp reduction in the contribution of the manufacturing sector to the Canada-U.S. gap; versus (ii) an increasing gap in business services R&D (particularly wholesale and retail trade). The broad shift of output and employment toward services, and the application of ICT in service sectors, has been occurring more rapidly in the United States than in Canada.

Table 1

U.S.-Canada Business Expenditure on Research and Development Intensity Gap by Sector, 2002

	Sector Share of Nominal Business Sector GDP (%)		BERD Intensity (BI)		Contribution to BI Gap (U.S.-Can)
	Canada	U.S.	Canada	U.S.	GAP ⁽²⁾
BUSINESS SECTOR (1)	100.0	100.0	1.87	2.90	1.034
Manufacturing	27.0	21.9	4.16	8.03	0.634
Motor vehicles and parts	3.4	1.7	1.88	13.41	0.166
Pharmaceuticals	0.5	1.0	27.17	21.16	0.066
Chemicals (excl. pharmaceuticals)	1.5	1.5	2.01	6.45	0.066
Office accounting and computing machinery	0.1	0.4	65.01	32.80	0.053
Machinery and equipment n.e.c. ⁽³⁾	1.8	1.5	2.70	6.59	0.048
Food, beverages and tobacco	3.3	2.6	0.45	1.28	0.018
Aircraft and spacecraft	0.8	0.8	15.41	18.49	0.018
Rubber and plastics products	1.4	1.0	0.73	2.32	0.013
Other non-metallic mineral products	0.7	0.6	0.29	0.98	0.004
Electrical machinery & apparatus n.e.c.	0.4	0.6	7.20	5.46	(0.001)
Pulp & paper, paper products printing and publishing	4.1	3.2	1.29	1.52	(0.004)
Textiles, leather and footwear	0.9	0.7	1.44	0.53	(0.010)
Fabricated metal products	2.0	1.6	1.61	1.24	(0.011)
Basic metals	1.6	0.6	2.04	1.14	(0.025)
Radio, TV & communication equipment	0.7	1.1	53.67	29.52	(0.054)
Other manufacturing ⁽⁴⁾	3.8	3.0	1.88	11.80	0.288
Business services	53.4	66.2	1.26	1.71	0.457
Wholesale and retail trade	17.1	20.5	0.53	1.83	0.285
Other business services	19.0	28.9	2.85	2.49	0.181
Transport and storage	6.2	4.6	0.10	0.11	(0.001)
Financial intermediation	11.0	12.3	0.33	0.23	(0.007)
Mining and quarrying	7.5	1.6	0.64	0.68	(0.037)
Utilities	4.0	3.2	0.46	0.06	(0.016)
Construction	8.1	7.2	0.08	0.03	(0.004)

1) Excludes agriculture, primary forestry and fishing and real estate services (largely the imputed value of owner-occupied housing). The definition of Business GDP (\$715 billion in 2002) differs from the Statistics Canada breakout for that sector (\$873 billion in 2002) which the panel believes to be largely due to real estate services.

2) The contribution to the gap is calculated as: "Sector share of BERD intensity times sector share of GDP" for the United States, minus the analogous product for Canada. For example, for manufacturing the contribution is: $(8.03 \times .219) - (4.16 \times .27) = 0.634$. Negative contributions to the BI gap — i.e., those numbers in parentheses in the final column of the table — are associated with sectors where the ratio of Canada's BERD to total GDP exceeds that of the United States — i.e., sectors that reduce the gap.

3) n.e.c. = not elsewhere classified.

4) An omnibus group of subsectors (including precision instruments among others) that is not further broken down in the OECD database. Data Source: Panel calculations based on the OECD STAN Database.

Foreign control

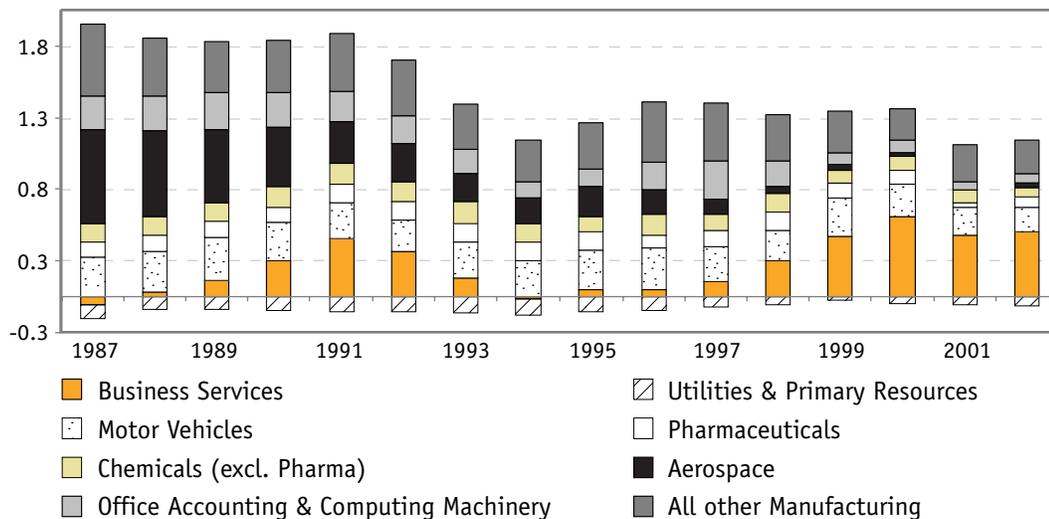
The extent of foreign control of several major Canadian sectors is well known to be part of the explanation for low R&D intensity — e.g.

accounting for very low Canadian R&D in the automotive and chemicals industries. This reflects the traditional tendency of global corporations to conduct most innovation activity near

Chart 5

Evolution of the U.S.-Canada BERD Intensity Gap, 1987-2002

(percentage point)



* BERD Intensity = Business Expenditure on R&D as a per cent of GDP.

Note: This chart traces the evolution of the most important sectoral components of the R&D intensity gap. The narrowing of the manufacturing gap (at least through 2002) has been due entirely to the aerospace sector as the U.S. industry down-sized after the Cold War and due to commercial competition from Airbus. The business services gap has meanwhile widened since the mid-90s. Much more work is needed to improve data on sub-sectors of business services.

Source: Panel calculations based on the OECD STAN database.

their headquarters. But foreign control does not automatically imply low R&D activity. In fact, foreign subsidiaries in several sectors — e.g. pharmaceuticals and computers — have been major contributors to Canadian R&D and have had R&D intensities that actually exceed the U.S. average for these sectors. Moreover, if the foreign-controlled facilities were not here, there is no guarantee that Canada would have developed a “replacement set” of domestically owned R&D performers. Analyses of individual firms, based on R&D spending data and innovation surveys, reveal a common pattern and produce a three-tiered structure (relative to ownership) of R&D and innovation behaviour in Canada (Baldwin and Gu, 2005):

- Canadian-owned multinationals are the most likely to engage in product innovation and R&D spending.

- Canadian subsidiaries of foreign multinationals are second, with generally lower R&D intensity than Canadian-owned multinationals, but higher than purely domestic Canadian firms.
- Canadian firms with only domestic operations have both the lowest incidence of R&D spending and the lowest BERD intensity.

This underlines the fact that Canada’s failure to develop a greater number of innovative Canadian-based multinationals has been a key contributor to the country’s overall R&D weakness.

Investment in machinery and equipment

Investment in machinery and equipment (M&E) is a principal channel through which

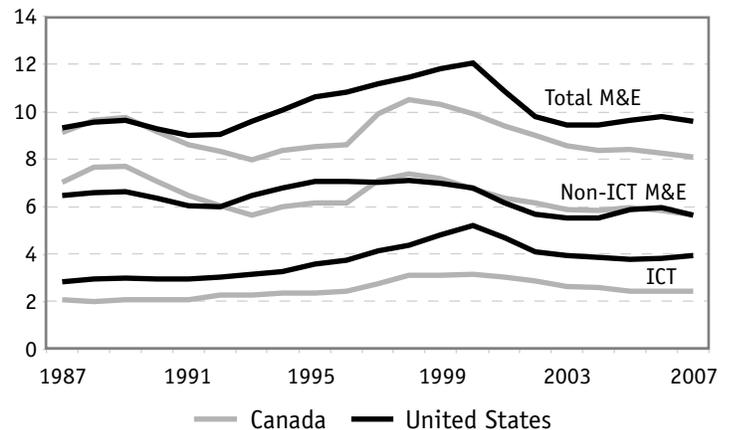
innovation drives productivity growth because such investment “embodies” the prior innovation of producers of capital goods, including software. M&E investment also stimulates innovative changes in processes and work organization to take best advantage of the new capital. (The productivity improvement resulting from such changes is captured statistically within MFP growth.) Investment in M&E (as a percentage of GDP) by Canadian business has not always lagged the United States as has been the case with R&D, though a gap has opened up since the early 1990s (Chart 6). The M&E investment gap has been mostly due to Canada’s persistently weaker investment in ICT. Average ICT investment per worker in Canada was only about 60 per cent of the U.S. level in 2007. This is a serious shortcoming since the production and application of ICT have been the key drivers of innovation and resulting productivity growth in the United States and several other countries.

Empirical studies suggest that only about 20 per cent of the U.S.-Canada gap in ICT investment can be explained by structural characteristics related to sector mix and firm-size distribution. Further study is needed to determine definitively the other factors that account for this perplexing gap. For now, it can only be said that relatively low ICT adoption is consistent with a view that Canadian businesses on the whole, but always with notable exceptions, are technology followers, not leaders (Sharpe, 2005).

Competitive Intensity

In the 1940s Joseph Schumpeter argued that large firms with market power were more likely to innovate than small firms. Almost all of the recent empirical analysis contradicts Schumpeter and shows that (i) too much concentration inhibits innovation by removing the incentive created by competitive rivalry, and (ii) small firms with specialized expertise can be the most innovative.

Chart 6
Business Sector M&E Investment Intensity, 1987-2007
 (per cent of nominal GDP)



Note: Since ICT prices per unit of performance have fallen substantially (especially for microelectronics and optical communications), the performance-adjusted “volume” of ICT investment would be much greater than the chart suggests. Note that Canada’s non-ICT investment ratio increased from 1993 to 1998, despite Canadian dollar weakness (which increased the cost of imported capital goods), and has been flat to declining since 2002 even as the dollar strengthened.

Source: Centre for the Study of Living Standards (2008b).

Is the state of competition in Canada a significant cause of the country’s weak productivity and innovation performance? The evidence does not permit a definitive answer in view of (i) the difficulty in measuring the intensity of competition; and (ii) the great variety of market situations throughout the economy, some of which are intensely competitive and others not. The following general observations are germane.

Export-oriented Sectors: For sectors where the market for the product is North American or global, the competitive intensity faced by Canadian firms is essentially identical to that faced by competitors in other countries, and most indicators suggest that Canadian firms achieve comparable levels of innovation and competitiveness. Assessments of innovation activity at the firm level demonstrate that exporting firms are more likely to invest in R&D and to manifest innovative behaviour (Baldwin and Gu, 2004).

Sectors Where Competition is Curtailed: There are some important sectors in Canada — e.g. telecommunications services, broadcasting, air transport and certain agri-foods — where regulations effectively curtail foreign entrants, thus limiting competition. Innovation tends to be dampened in those situations than might otherwise be the case because there is very little incentive for the well-established incumbents to compete for domestic market share via innovation.

Indirect Evidence of Competitive Intensity: There is a great deal of anecdotal evidence that the intensity of competition in the U.S. domestic market is far greater than in comparable sectors in Canada. For example, the generally lower level of business profit (relative to the size of the economy) in the United States as compared with Canada is indirect evidence of stiffer competition in the U.S. market.

The Effect of Canada's Market Size: The relatively small size of Canada's domestic market — made even smaller by regional fragmentation — tends to limit both competitive intensity and the returns to innovation in domestic sectors, which underlines the importance of increasing Canada's presence in global export markets for innovation-intensive goods and services. Innovation is needed to move from a domestic to a global growth strategy. Reciprocally, a heavy investment in innovation usually requires Canadian businesses to go for the scale of global markets. Canadian businesses, on the whole, have so far failed to aggressively grasp the opportunities created by globalization, a shortcoming that is demonstrated by the relative lack of innovation-oriented Canadian-based multinationals.

The Climate For New Ventures

New ventures are the “green shoots” of the innovation system, bringing new ideas to market and creating new competition. Despite some dynamic clusters — such as in Waterloo and in the largest Canadian cities — Canada needs to do

better in creating the conditions to enable more of the country's impressive number of startups to become viable, growing businesses still based in Canada. The following three key conditions determine the quality of the environment in Canada for the support of such businesses.

Financing new ventures

A vibrant “angel investor” community is the key to bridging the “valley of death” that separates a promising idea from a viable startup business. (Angels are produced when innovative entrepreneurs succeed and thus generate both the financial resources and the experienced mentors to stimulate or guide a new generation of innovators.) The limited data available on “informal” investment sources in Canada suggest that they are much less extensive, in relative terms, than comparable sources in the United States. Canadian governments have sought to address the early-stage gap in financing through various initiatives. For example, the Business Development Bank of Canada has been directing a growing share of its resources to seed-stage and startup companies. While helpful, such programs do not fill other critically important aspects of the role of angel investors — experience, contacts and mentorship. To address that gap, a number of incubation centres have been created to assist small companies in their earliest stages of growth — e.g., the Regional Economic Intervention Fund established by the Quebec government, the Centre for Drug Research and Development in British Columbia and the Accelerator Centre in Waterloo.

Venture capital (VC) is the post-angel stage of funding when the basics of the business proposition have already been developed and larger sums are needed to ramp up to commercial scale. There are reasons to be concerned about the state of venture capital in

Canada. Fundraising for Canadian VC firms has been falling — 2007 marked the fifth decline in the prior six years. By contrast, there were five consecutive years of growth in the United States. The generally weak performance of Canada’s VC industry (Chart 7) is due to the fact that the industry is still relatively young and thus has not yet developed sufficient depth of experience to select and mentor the best potential investment candidates. It is also the case that the VC activities of tax-advantaged Labour Sponsored Investment Funds (particularly outside Québec) have negatively affected incentives and performance in the industry.

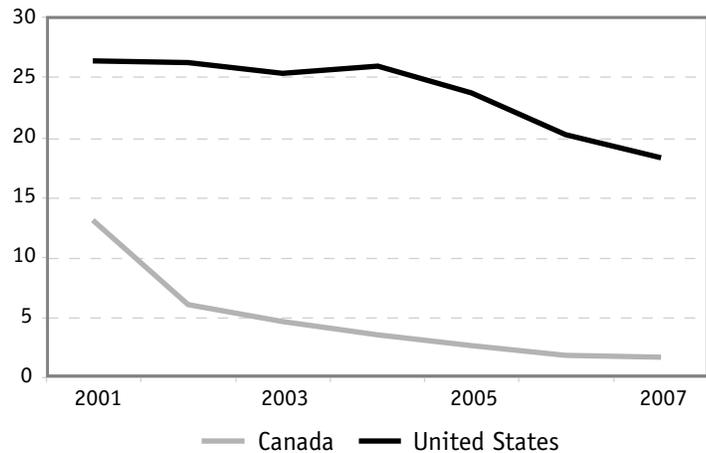
There is no quick or easy fix for the Canadian VC industry. Attracting sufficient capital to become self-sustaining will require VC firms to demonstrate they have the skills and experience to generate acceptable returns. The dilemma is that the industry requires access to sustainable pools of investment capital to develop a critical mass of investing skills. It is encouraging that recent government policy initiatives at both the provincial and federal levels have been designed to support the growth of market-based venture firms that will be judged, and will succeed or not, based solely on their performance.

Commercializing university research

Canada’s record of university-based research activity is strong and ranks among the best among OECD countries, but the commercialization of university research in Canada has been, on the whole, disappointing. The principal causes relate to:

- the shortage of commercial receptor capacity in Canada, due to the fact that relatively few established firms in this country are committed to research-based innovation (and would therefore be in a position to transact with universities)

Chart 7
Venture Capital Performance
 Net Return* on Previous 10 Years for 2001-07
 (per cent internal rate of return)



Note: The financial underperformance of aggregate VC investment in Canada is clear. (Some individual funds may of course perform well). There has been a decline in the 10-year rate of return for VC funds in both the United States and Canada following the end of the tech boom, but the fall-off was steeper in Canada and from a much lower level to begin with.

Source: Canadian Venture Capital Association (2007) and National Venture Capital Association (2008).

- the relative weakness of new venture financing in Canada at both the angel and later VC stages; and
- the inherent differences in the incentives and professional values of the university and the business firm, an issue not unique to Canada.

The situation could be helped through better infrastructure for identifying and mobilizing potentially commercializable knowledge as it emerges from university-based research. In many cases this will involve well-designed partnerships between universities and private-sector businesses or government labs. The implication is that commercialization of research-based ideas is more likely to occur if the surrounding business environment is rich in firms that are committed to science and technology-based innovation as a major business objective — i.e., more “market pull” is needed in Canada to complement “research push”.

Supporting innovation clusters

Innovation is fostered by the close personal and supplier linkages that occur in certain geographic concentrations, creating local innovation ecosystems. Public policies designed to create such clusters from scratch have yet to demonstrate much success in Canada or elsewhere, though continued learning from initiatives like MaRS in Toronto will aid the design of supportive policies. The Waterloo success story is one good example and shows that cluster development may require both considerable time to mature and the convergence of several favourable features that are typically specific to the locality.

The Public Policy Environment

Canada has provided a progressively more encouraging environment for business innovation, at least in respect of those factors over which public policy has *direct* influence — for example, prudent fiscal and monetary policies, a trend of lower tax rates and support for university research. But Canada's other benchmark competitors are not standing still and globalization and ICT are changing the way in which a great deal of business innovation is conducted. Most important, Canada's innovation performance is still far from where it needs to be so there is still much work to do.

International trade

The general liberalizing trend of trade policy, until very recently at least, has favoured innovation strategies both to counter import competition and to take advantage of new markets. The concern looking forward — particularly in view of the severe economic stress in most countries — is the risk of increased protectionism. This would reduce the size of the addressable market for many Canadian businesses and thus the potential return from an investment in innovation. As a relatively

small open economy, Canada is particularly exposed to the vicissitudes of global markets and especially to conditions in the United States. While Canada's prudent macroeconomic policy over the past 15 years has provided some capacity to absorb shocks, further insulation depends on building a base of export industries at the leading edge of innovation in order to be among the last to lose market share if customers retrench.

Human capital

Education and the quality of human capital is one of Canada's most significant strengths and therefore offers little by way of explanation for the long-term relative weakness in productivity growth or business innovation. The federal government's commitment to the support of university research has been strong since the mid-to-late 1990s, which has increased the supply of leading-edge skills and, other things being equal, made Canada a more attractive location for innovative business. The competition from China and India, among others, for knowledge-intensive activity has meanwhile increased sharply as those countries have also succeeded in rapidly expanding their production of skilled people. The accumulation of human capabilities is a race without a finish line.

Of particular significance for innovation performance is the fact that Canadian business managers are, on average, not as well trained as those in the United States. This education gap may leave many Canadian managers less aware than their U.S. counterparts of developments at the leading edge of technology and business practice, and thus less likely to choose business strategies that emphasize innovation.

Regulation

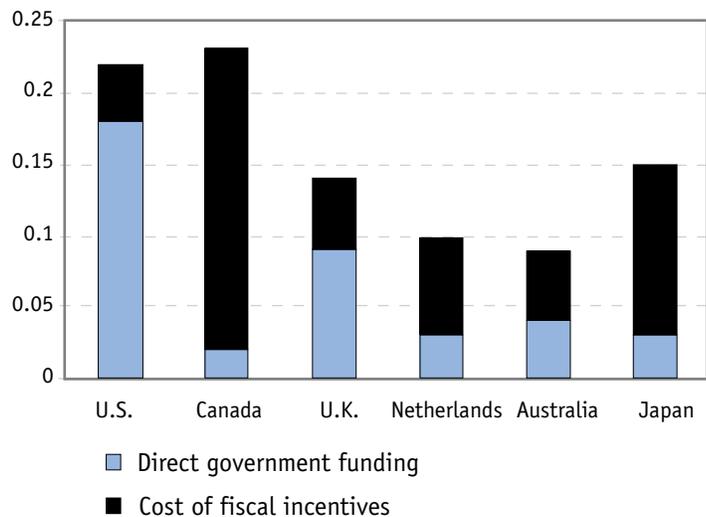
The impact of regulatory policies is usually sector-specific, thus few generalizations can be made. Moreover, the effect of regulation

on business innovation may either be stultifying or encouraging. Regulations often inspire innovation to meet the rules (e.g. auto emission limits and fuel efficiency standards) or to design around them (e.g. refrigerant substitutes for CFCs to avoid ozone depletion). The intensifying pressure on virtually all aspects of the natural environment due to population and economic growth in general, and energy use in particular, requires an unprecedented innovative response, elements of which will need to be encouraged by well-designed regulation in all countries. While Canada has some companies that have been successful innovators in various fields of environmental technology (e.g. fuel cells and wastewater treatment), it has not generally been an area of comparative global strength for Canada despite this country's outstanding research competence in many fields of environmental science (Committee on The State of Science & Technology in Canada, 2006).

Taxation

Many studies over the years have pointed to a relatively high rate of business taxation in Canada, particularly as it affects the after-tax cost of M&E investment. This reduced the incentive for firms to accumulate M&E and, because of the strong linkages among M&E, R&D and innovation generally, would explain some part of Canada's weak productivity performance. According to estimates by the C.D. Howe Institute, Canada's marginal effective tax rate (METR) for medium and large companies was the highest in the OECD in 2005 and 2006, though the comparable rate in the United States was only slightly lower (Mintz, Chen, Guillemette and Poschmann, 2005, Chen and Mintz, 2008). The federal government has meanwhile been steadily reducing corporate tax rates of various kinds, and in Budget 2009 committed to continue with measures projected to

Chart 8
Government Funding of Business R&D*
 (per cent of GDP)



* 2005 or last available year.
 Source: OECD (2008c).

give Canada the G7's lowest overall tax rate on new investment by 2010.

R&D incentives: The Scientific Research and Experimental Development (SR&ED) tax incentive provides by far the largest direct financial support for business innovation in Canada — representing about \$4 billion of federal tax foregone in 2007. Although there is good evidence that the tax credit has a positive net benefit (Parsons and Phillips, 2007), many business leaders believe that the program should be improved — e.g. by extending the “refundability” of the credit beyond small businesses to R&D performers of any size. While Canada's total government support for business R&D (tax and direct spending combined) is somewhat larger, relative to GDP, than that of the United States and the United Kingdom, it is noteworthy that Canada's reliance on the tax assistance channel to stimulate R&D is unusually heavy (Chart 8). Although most countries have been increasing the use of tax credits in their R&D

support programs, more evaluation is needed to determine the right mix.

Sector strategies

The ICT sector, among others such as aerospace, provides several examples of the government's catalytic role in enabling innovative activities to take root and build scale to the point where commercial viability emerges. This initiating influence has taken many forms — early procurement (for example, stimulating IBM's substantial presence in Canada); public-private commercial partnerships in support of a national mission (for example, creation of Telesat in 1969); and research support through targeted university funding and sector-oriented government R&D facilities and programs.

Business Ambition

The intangibles that make up Canada's business culture are believed by many to reduce the supply of entrepreneurial talent, the appetite for risk, the urge to grow and the propensity to innovate. This issue is frequently the subject of surveys and commentaries in which there are two contradictory threads. One is based on surveys of the general population and contends that Canadians are not that much different from Americans when it comes to attitudes regarding risk and entrepreneurship, and therefore any explanation of innovation shortcomings based on public attitude and "business culture" is a red herring (Institute for Competitiveness and Prosperity, 2003).

A contrary view, often voiced by members of the Canadian business community, usually based on personal experience, is that there is an inbred propensity among U.S. business people to maximize the economic heft of their enterprise — to always go for growth. In Canada and Europe, "good enough" appears more often to be reached at a lower level. Put another way, there appears to be a deficiency of business ambition

in Canada. Too many successful Canadian businesses would rather behave like an "income trust" than like a "venture capitalist". On the other hand, Canadians have been bold and entrepreneurial in domains where the country has had long experience and deep knowledge flowing from the particular opportunities and challenges the country has faced — mineral exploration and project engineering being good examples. Canadian business, on the whole, has acquired much less experience at the frontiers of science and technology, and has thus been less able to gauge the risks and opportunities in many of these domains. Fewer Canadian companies have therefore been prepared to adopt strategies based on technological innovation.

Related to this is a persistent concern that too many innovative startups fail to mature in Canada with the most promising often acquired and eventually relocated to the United States. The greater supply and sophistication of venture capital investors in the United States and immediate proximity to a larger market can be irresistible attractions for young, technology-based firms. This underlines the importance of improving the climate for new ventures as discussed earlier.

The key question is whether Canadian businesses are aggressive enough and sufficiently outward-looking to compete in global markets beyond the huge and accessible U.S. market? Clearly, the many Canadians who have built successful global businesses have what it takes. But the issue is whether there are enough of them to ensure the long-term prosperity of the entire economy. The panel's view is that today, there are not. This is not due to any lack of innate capacities of Canadian business people — it is not in the "DNA", so to speak, but rather comes down to the incentives embedded in the economic environment.

Canadian business as a whole has been profitable despite its mediocre innovation record

— pre-tax business profit in Canada, as a percentage of GDP, has exceeded that of the United States in most years since 1961. So the behaviour of Canadian business is unlikely to change unless its circumstances change. Those circumstances are, in fact, changing radically due not only to the current turmoil in the world economy but, more fundamentally in the long run, to a massive reallocation of the share of global economic activity as China and others become full participants in world commerce. The demographics of the Canadian business community are also changing as immigrants and a younger generation of entrepreneurs, unencumbered by traditional attitudes, expand their presence. So whether by necessity or inclination, there is reason to expect that Canadian business will become more ambitious and innovative.

Sectoral Perspectives on Innovation

No one industry is “average” and there is no one-size-fits-all explanation for Canada’s innovation shortcomings. Four sectors — automotive, life sciences, banking and ICT — were chosen by the panel for “mini-case studies” to illustrate the diversity of the innovation *problématique* in Canada and the variety of strategic responses to it. Innovation also occurs in Canada’s resource-based sectors though most involves process improvements, the adaptation of foreign-sourced M&E and techniques to Canadian circumstances, mineral exploration, and the financing and engineering of resource projects at all scales. With very few exceptions, Canadian firms have not been at the forefront of innovation in capital equipment for resource industries or in the development of the most sophisticated materials and products derived from the nation’s resources — further evidence of Canada’s characteristic upstream, commodity-oriented position in global value chains.

Following are summaries of the panel’s views as to some of the lessons for business innovation strategy in each of the four sectors.

The automotive industry — weak R&D but strong productivity

- The innovation strategies adopted by Canadian auto sector firms have been influenced heavily by structural characteristics — specifically the integration of the North American market and the role of foreign-controlled assemblers. But the global success of parts makers like Magna and Linamar proves that ambitious Canadian firms can expand from their base in a Canada-U.S. supply chain to serve the world market.
- Canada’s auto industry shows that it is possible to build a competitive industry without a strong base of domestic R&D. The structure of the sector in Canada has instead led to innovation strategies that focus on process efficiency and workplace practices. This raises the question as to whether public policies could be designed to foster more such gains in productivity, including in resource industries where process innovation is also the prominent strategy.
- Innovation policies in Canada should not be focused only on the more typical measures such as R&D spending. These do not adequately take into account the Canadian context with its unusually high reliance on sectors that are components of global supply chains and that may not rely on R&D spending to achieve greater productivity.
- Canada’s automotive policy will need to become more flexible and proactive. Fostering Canadian-based innovation by both vehicle assemblers and parts makers should be a goal of a new Canadian auto strategy that emerges from the industry’s crisis.

Life sciences — great promise but mixed results

- The strategies of life sciences companies are strongly science-based and thus are heavily influenced by public policies that support R&D as well as research and training in universities. Public policies in respect of health procurement and regulation are also of great importance, particularly for multinational pharmaceutical firms where there is fierce competition among national affiliates for innovation and product mandates. The strategies of the smaller, biotechnology-based companies are very heavily influenced both by the availability of patient early-stage finance and mentorship, and by their ability to strike collaborative arrangements with global pharmas.
- The experience of life sciences demonstrates what can and cannot be accomplished through a targeted government policy. The federal government set out to generate increased R&D spending in the life sciences in Canada and it worked, but it has not yet produced the expected follow-on benefits, either of a growing pharmaceutical sector or a clearly sustainable biotech industry.
- Additional protection of intellectual property (IP) could strengthen Canada's position as an R&D location. But, more important is the fact that, with the exception of Quebec, governments do not view life sciences as a genuinely high *economic* priority and thus have not ensured that procurement practices are harmonized with industry development objectives.
- Canada's single-payer health care system creates an opportunity to establish a leading role in using health innovation to improve the productivity and quality of the health care system. An exceptionally promising initiative is the partnership among the federal and provincial/territorial governments

through Canada Health Infoway to accelerate development of an electronic health record.

Banking services — trade-off between stability and radical innovation

- The innovation strategies of the major Canadian-owned banks strongly reflect the nature of domestic competition which has militated against a focus on product innovation leadership, being content instead with early adoption.
- The generally conservative banking and regulatory practices prevailing in Canada have kept Canadian banks off the “bleeding edge” of innovation in the design and distribution of the most sophisticated financial instruments. This has substantially insulated them from the global financial meltdown and made Canada's banks currently among the world's strongest (International Monetary Fund, 2008 and World Economic Forum, 2008).
- The success of Canadian banks over many years may have dulled their business ambition. With limited exceptions, Canadian banks were, until fairly recently, content to focus on the domestic market and to restrict their international activity primarily to commodity-type wholesale banking as parties to international lending consortia. Now Canada's banks have become more aggressively and creatively outward-looking with many examples of large investments to establish a substantive presence abroad.
- The recent turmoil in the banking industry globally has created a window of opportunity for Toronto to become one of the major North American, if not world-wide, innovation centres for the financial services industry. Canadian banks have economic and strategic decisions to make

as to where to locate their product and service development, software programming, data centres and other innovative activities going forward. With the right business climate, Toronto has the potential to emerge as a centre not only for these activities, but also to attract specialists from around the world to create financial industry products and services.

ICT — A Catalytic Role for Government

The ICT sector is a heterogeneous collection of industries encompassing many different innovation strategies as the following examples illustrate.

- The fact that several large players in the computer industry in Canada are foreign controlled has not stunted Canada-based product innovation activity, as has been the case, for example, in the automotive industry. The prospect of government procurement contracts for ICT firms that established a substantial presence in Canada provided — notably in the case of IBM — an initial attraction that grew into major activities with global product mandates. This shows that government's role as lead customer can, under the right conditions, provide the impetus to kick-start a new industry. The case of ICT procurement, which catalyzed substantial economic development, stands in contrast to the very different philosophy of health sector procurement that has prevailed for pharmaceutical products.
- Canada became an early leader in satellite and microwave communications technology in order to communicate across a vast geography, a mission that was initially supported by targeted government research and enterprise. For example, Telesat was founded in 1969 as a joint government-private-sector business.

- The climate for new ICT ventures (hardware, software, systems and services) in Canada has been quite favourable in view of (i) a strong base of research and training in universities and colleges, and in major players like Nortel, IBM and RIM; (ii) government supports such as the SR&ED tax credit and various laboratories and programs; and (iii) supportive clusters of ICT subsector activity in several centres across Canada. The many successes have produced numerous role models and angel investors, and bred confidence in young ICT entrepreneurs that they could succeed in Canada. Business ambition has been in ample supply although lack of a strong base of leading-edge ICT customers in Canada continues to be a significant drawback. Unfortunately, the sharp decline in the telecommunications technology sector since 2001 (now exacerbated by the global recession) has hit Canada particularly hard in view of this country's specialization in several of the most heavily affected market segments. Canada's hard-won advantages are now at risk.

A theme running strongly through the foregoing examples is the key influence of government, at least at the outset. The role of government in ICT sectors has typically been catalytic, enabling an innovative line of activity to take root and to build scale to the point where commercial viability has emerged.

Addressing Canada's Business Innovation Challenge

Canada has a serious productivity growth problem. The panel believes that Canadians should be concerned about the productivity of our export-oriented economy as competition from China and other emerging economies

intensifies. The panel also believes that Canadians should be concerned about the long-run consequences of continued weak productivity performance in the domestic economy as the population ages and competition intensifies among the mature economies for the best human skills, and particularly for entrepreneurial talent.

Because *Canada's productivity problem is actually a business innovation problem*, the discussion about what has to be done to improve productivity in Canada needs to focus on the factors that encourage, or discourage, the adoption of innovation-based business strategies. This is a complex challenge because the mix of relevant factors varies from sector to sector and requires a broader conception of innovation than the conventional R&D-centred view, which, while important, is far too limiting.

Because there is no single cause of the innovation problem in Canada, nor any one-size-fits-all remedy, public policy needs to be informed by a deep understanding of the factors that influence business decision makers, sector by sector. This clearly requires extensive consultation with business people themselves as well as the further development of innovation surveys and other forms of micro-analysis of the innovation process.

Overarching the sector-specific factors that influence innovation strategies are certain issues of pervasive influence identified in the panel's analysis that suggest the need for proactive public policies to:

- encourage investment in advanced M&E in general, and in ICT in particular (such incentives should be designed only in light of a more thorough understanding of the reasons for the relatively slow adoption of ICT in Canada to date);
- sharpen the incentive for innovation-oriented business strategies by increasing exposure to competition and by promoting a

stronger export orientation on the part of Canadian firms, particularly in goods and services that are downstream in the value chain and thus close to end-users;

- improve the climate for new ventures so as to better translate opportunities arising from Canada's university research excellence into viable Canadian-based growth businesses, bearing in mind that better early-stage financing and experienced mentorship hold the key; and
- support areas of particular Canadian strength and opportunity through focused, sector-oriented strategies, such as was done in the past in, for example, the automotive, aerospace and ICT industries.

Fortunately, the many successes of Canadian businesses in the hyper-competitive global marketplace show that there is nothing innate or inevitable in the national character that prevents Canada's businesses from being just as innovative and productive as those of other nations.

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