

CANADA'S INNOVATION DEFICIT

Kevin Lynch

Canada ranks 14th among OECD countries in R&D expenditures as a percentage of GDP. The service sector of our economy accounts for 70 percent of GDP, but only 0.6 percent of it is spent on R&D. This amounts to what Kevin Lynch calls an "innovation deficit." The former Clerk of the Privy Council calls for a public dialogue to "address the potential results of innovation and their benefits for the economy and society."

Le Canada se classe au 14^e rang des pays de l'OCDE au chapitre du pourcentage du PIB consacré aux dépenses en recherche et développement. Le secteur tertiaire de notre économie représente 70 p. 100 de notre PIB, mais seulement 0,6 p. 100 de cette part va à la recherche et développement. Pour combler ce « déficit d'innovation », l'ancien greffier du Conseil privé Kevin Lynch propose de lancer un débat public sur « les résultats potentiels de l'innovation et ses avantages pour l'économie et l'ensemble de la société ».



After more than 10 years of balanced budgets and robust growth, Canadians are waking to a new decade faced with challenging fiscal deficits and competitiveness pressures constraining growth. Fortunately, public opinion in Canada recognizes the dangers of deficits and rising debt that plagued Canada from the 1970s to late 1990s, and now firmly rejects both, except in dire circumstances.

The public, unfortunately, has not had the benefit of extensive public discourse on the causes of Canada's competitiveness challenges. These are deep rooted and complex, and ultimately point to our prolonged weakness in productivity growth. As productivity and innovation go hand in hand, this suggests we are not an innovative economy. We need to be. It's time for Canadians to have a serious discussion about our innovation deficit, a dialogue that speaks directly to our future, our economic and social potential as a nation.

So what exactly is innovation and why does it matter? Innovation is the ability to create new products and services, to produce existing products in different ways, to develop new markets. It lies at the heart of modern competitiveness. It drives growth. It improves productivity and living standards. It gives consumers new choices. It is the BlackBerry, GPS, the iPod, digital photography, ATMs and on-line shopping. As *The Economist* observed, "America gets more than half its economic growth from industries that barely existed a decade ago — such is the power of innovation."

The OECD defines innovation in its own inimitable prose as "the implementation of a new or significantly

improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations." What this boils down to is that innovation increases the value of the output produced by a worker, and this improves a firm's competitiveness and increases what it can pay its workers and its profits. It is the answer to the often-posed question of how a higher-wage economy like Canada can compete with emerging countries with low costs of production. It is also an essential ingredient to rising living standards and to ensuring the robust economic growth we need to meet our priorities as a nation.

That is the good news. The less good news is that Canada is not an innovation leader, particularly in its business sector. Simply put, the private sector in Canada has not kept pace with many other countries when it comes to investing in innovation. While this was a hindrance in the past, it will increasingly constrain our choices in the future. The world economy is fundamentally restructuring. A number of emerging countries are moving rapidly up the value chain and investing in a growing innovation capacity. China and India, for example, are investing in world-class research capacity in targeted areas, but their scope and ambition and results will rise quickly. A number of industrial countries including Canada are adjusting to the shocks of the financial crisis and global recession, and looming demographic and debt burdens. The choice for Canadians, because everyone has a stake in the outcome, is whether our innovation approach needs some model restyling or a more complete model makeover.

To get a perspective on the innovation landscape in Canada, the usual starting point is investments in research and development (R&D). Both the public sector and private sector invest in R&D. What is surprising is that they have followed divergent investment paths throughout most of the last decade, with rising higher

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impacts on the Canadian economy and society, and in building stronger linkages between university research and business.

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education R&D spending as a proportion of the economy, a significant fall in private-sector R&D spending as a share of the economy after the dot-com boom ended in 2001 and a long-standing, gradual decline in R&D performed in government labs relative to the size of the economy. Given the predominant role of the private sector in economic activity and growth in Canada, these trends raise a number of red flags.

There was an epiphany in public-sector attitudes to innovation in the mid-1990s following a compelling public narrative about the risks to the nation from a perceived brain drain and clear evidence that the research capacity of our university system had seriously deteriorated and was not world class. This narrative led to a fundamental rethink of public policy toward higher education research — a focus on global excellence; a more strategic approach to research priorities by universities; more competition among research institutions; and a much greater financial investment by the government. It recognized the imperative of commercialization of research and the value of strong links between publicly funded research and the private sector.

This renewal went well beyond dollars and cents. Independent institutions, principally the Canada Foundation for Innovation, were cre-

ated at arm's length from government, their governing members drawn from the research community and the private sector, their purpose and strategic objectives established by government, their decisions about where to invest in research infrastructure made by the members following rigorous peer review. The Canada Research Chairs were created, two thousand of them, geared to attracting and retaining world-class researchers to our universities. Major new funding was provided for the Granting Councils and an indirect costs-of-research support program. Dynamic new engines of research such as the Canada Global Excellence Chairs, Centres of Excellence and Genome Canada were established. New national, excellence-based graduate scholarships (the Vanier Scholarships and the Canada Graduate Scholarships) were introduced. Major tax changes were implemented to put charitable giving to Canadian universities and research hospitals on a par with the US.

In just 10 years there has been much progress in rebuilding the higher-education research infrastructure in Canada. University research investments as a proportion of the economy (GDP) is now higher in Canada than in all OECD countries other than Sweden. This is a tremendous achievement, and the fruits of these efforts are showing up in the quality and quantity of research work coming out of our university labs. However, spending is certainly not the only measure of university research success. Clearly, much more progress is required in commercializing these research efforts to create new businesses and jobs, in establishing world-class centres of research excellence in key areas with broad

Private-sector innovation is another matter. The recent report of the Council of Canadian Academies ("Innovation and Business Strategy: Why Canada Falls Short") makes a compelling case that Canada has a substantial innovation problem in our business sector, stating: "The innovation performance of Canadian business is, on the whole, subpar by

the standards of Canada's peer group of industrially advanced countries."

One way to see this is through international comparisons (figure 1). In 2007, Canadian business as a whole ranked 14th among all OECD countries in their R&D expenditures as a percentage of the economy. Canadian business spending on R&D was only 1 percent of GDP, well below the OECD average of 1.6 percent of GDP, roughly half of what the US spends and barely a third of Sweden, Finland and Korea. And the R&D spending that Canadian business does is highly concentrated in a few sectors. For example, the overall service sector accounts for 70 percent of Canadian GDP but spends only 0.6 percent of its output on R&D while the natural resource, utilities and construction sectors as a group, which represent over 16 percent of Canadian GDP, spend barely 0.3 percent of their output on R&D. There are important regional variations as well, with Alberta business R&D spending as a share of the provincial economy half of the Canadian average.

While R&D spending is one perspective on the innovation focus of Canadian business, there are others. Leading-edge machinery and equipment embeds the R&D of others, and investing in it drives innovation through adaptation. Unfortunately, Canada imports most of the leading-edge machinery and equipment that

business employs. Worse still, Canadian business invests much less in leading-edge machinery and equipment per worker than US business, and this gap has been increasingly due to relatively less investment in information and communication technologies by Canadian business relative to their

in science, education, infrastructure and networking.

So where might this reasoning take us? It points to the importance of innovation, and its interconnection with productivity, for the economic welfare and security of Canadians. It

a compelling narrative to justify new public investments when other areas are being constrained. A similar dialogue about the importance of greater private-sector investment in innovation is needed within the business sector in Canada. Canadian business leaders should step forward and demonstrate leadership in helping to stimulate and frame such a national dialogue on this critical issue. It's time to be more innovative about innovation throughout the Canadian economy.

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US competitors. In short, there is a real and present innovation and productivity problem in the Canadian business sector, with too little focus on innovation as an integrated part of overall business strategies and not enough receptor capacity for innovation in the production process, compared to many of their competitors in other countries.

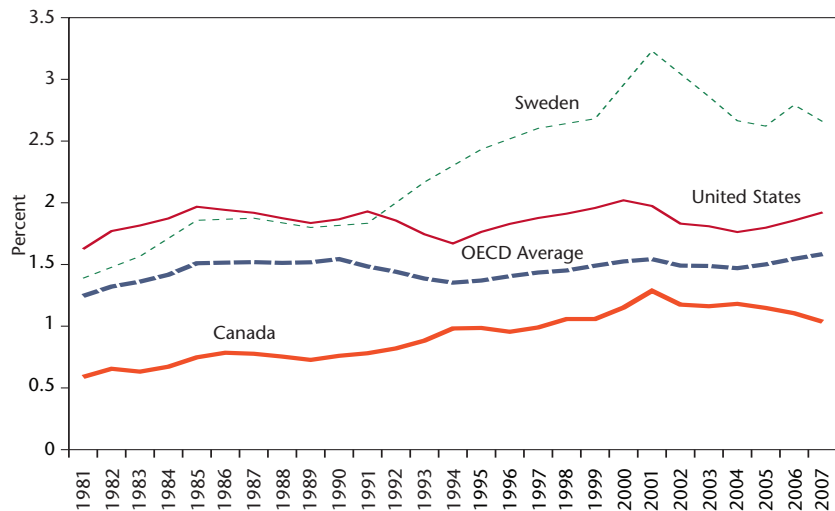
As challenging as this snapshot of innovation today is, the real question is what is necessary for the future and how do we create it. The global economy is changing fundamentally, driven by structural factors, by the global financial crisis and by the dynamic interaction between the two. In this new global dynamic, innovation becomes more important than ever to the future prosperity of Canada. Fareed Zakaria's "the rise of the rest" is altering where centres of technological advantage are being located and will begin to erode the present research advantage of industrial countries. As it does, the "brand advantage" of existing research leaders will be impacted, in terms of attracting the best students and retaining the best researchers from around the world. To paraphrase Tom Friedman, this conflux of events appears akin to the "Sputnik effect" of the late 1950s, where the risk of being a technology laggard propelled the US to make massive investments

does not point to a "business-as-usual" approach to innovation, nor does it suggest a narrow "change perspective" based on tweaking existing programs and incentives. It does highlight the need for a broader public discussion and engagement about the structural dynamics inherent in the global marketplace we inhabit today and what it will take to maintain competitiveness, strong growth and rising standards of living in the decades ahead.

This public dialogue, which needs to include business, should address the potential results of innovation and their benefits for the economy and society. In an era of fiscal restraint, there has to be

In the realm of being innovative about innovation, we might target a portion of new government R&D funding to purpose-driven research that helps governments, business and society solve specific, long-term challenges through world-class innovation. The oil sands, where yet-to-be-developed technologies have the potential to fundamentally redesign CO₂ emissions, energy intensity, water usage and soil remediation, is a case in point. So too may be the manufacturing sector. One could envisage having Canada at the leading edge of aspects of next-generation automobile research, turning our assembly and parts manufacturing capacity into an innovative auto cluster

FIGURE 1: BUSINESS EXPENDITURE ON R&D AS A PROPORTION OF GDP, 1981-2007



Source: Organization for Economic Co-operation and Development, Main Science and Technology Indicators.

in Canada. Or smart-energy technologies for existing energy sources such as coal-fired electrical generation and transmission systems, as well as alternative energy sources, creating a cluster of new Canadian businesses and jobs supplying energy companies around the world. This would be a logical extension of Canada's position as a pre-eminent global energy producer and exporter.

This underscores the need for new approaches to research partnerships. We need to consider new purpose-driven research partnerships with leading US research universities, building on our rel-

lary the application of information and communication technologies (ICT). A low value of the dollar, which serves to raise the purchase price of these largely imported technologies, is no longer a factor, nor is a high statutory corporate tax rate, which is now 12 percentage points lower than that of the United States. We need to re-examine our toolkit that supports business innovation.

With an industry structure that has relatively more small and medium-sized firms than the United States

es, but it is quite another to commercialize them, to create new start-ups and spinoffs and clusters and jobs. Here a stronger focus on the customer in the innovation system is important; what do consumers want and what will they pay for. Finally, the crucial role of finance, particularly venture capital. Canada lags the US and a number of other countries in the depth and sophistication and specialization of venture capital, to our detriment. We need focused venture-capital expertise to nurture clusters of focused technology innovation.

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ative strengths and challenges, and launch more bilateral research collaborations such as the stem cell initiative. We need the willingness to do the same with leading research institutions in emerging technology centres such as India. There need to be stronger research collaborations between business and university researchers, with better receptor capacity in business for research and innovation, and a better culture of problem solving and commercialization in universities. There are a number of best practices around the world, in countries such as Sweden and Finland, and much we can learn and adopt.

With a stronger dollar than we have had for decades and aggressive competitors in Asia and elsewhere emerging in new markets and new products and new services, the incentive for new business thinking about competitiveness and the role of innovation is certainly all around us. More competition should spur more focus on innovation by business. Why does Canadian business lag the US and elsewhere in the adaptation of existing leading edge technologies embedded in machinery and equipment, particu-

and a number of other industrialized countries, more collaborative pre-competitive research and development and more technology centres such as MaRS may be needed, provided there is a receptor capacity in firms and the research is solution oriented. Given the rapid obsolescence of new technologies, the treatment of depreciation in Canada has evolved in lockstep with the speed of the ICT innovation cycle. The mainstay of Canada's innovation support to business is tax based through the Scientific Research and Experimental Development tax incentive and, with a tax

Going forward, we need to make the question "what would it take for Canada to build an innovative economy for the 21st century" part of our public narrative. Not just because the innovation

deficit is a threat to our long-term competitiveness and living standards, but also because we can and should be a world leader in innovation. Part of being more innovative is aspirational. We should aspire to be a nation of innovators. We should aim to develop world-class researchers and create world-class technology entrepreneurs and commercialize excellent Canadian research to create jobs and prosperity in Canada. If innovation is to drive the economy of the future, being average is just not good enough. We should rebrand

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expenditure cost of \$4 billion annually for only \$16 billion in business-sector R&D spending, it is an open question whether as currently designed this is generating the maximum innovation leverage at the most effective cost.

And in all this, it is one thing to develop new technologies and process-

Canada as technologically savvy, entrepreneurial and creative.

Contributing Writer Kevin Lynch is the former Clerk of the Privy Council and head of the public service. Previously he was deputy minister of industry as well as finance.