Bridging Canadian Technology SMEs Over the Valley of Death

Jorge Niosi[1]
Université du Québec à Montréal

ABSTRACT

This comment analyses the Panel report and finds that its main diagnosis is correct: Canada's BERD is low. The Panel report is fairly silent about the necessary improvements to Canada's innovation system. This comment suggests that while Canada's tax credit for R&D and Industrial Research Assistance Program (IRAP) are useful programs, they need to be complemented by other direct incentives that may help small technology firms to cross the "valley of death", complete proof of concept and become eligible to venture capital. The US Small Business Innovation Research (SBIR) program, imitated by Japan, is the best model for such an incentive and Canada should consider its adoption.

THE STUDY *Innovation and Business Strategy: Why Canada Falls Short* produced by an expert panel under the auspices of the Council of Canadian Academies is a well-researched and well-presented report on innovation in the Canadian private sector. The authors were asked to examine the innovation performance of Canadian firms and the factors behind this performance. They conclude that Canadian business is characterized by a lacklustre innovative business-sector performance on many accounts.

The main diagnosis of the report is correct: Canadian business is lagging in terms of innovation and productivity. The gap or shortfall appears in business expenditure on R&D (BERD) which is low compared to other OECD countries and declining. It also shows itself in low levels of private investment on information and communication technologies as well as on machinery and equipment. It can also be seen in labour productivity figures, and in the limited number of large high-technology firms which are Canadian-owned and -controlled. In addition, foreign control and imported technology in important industries such as automobile and chemicals allow Canada to produce cars or basic petrochemicals with little R&D. The panel's conclusions are straightforward: Canada needs to increase its BERD in both total absolute terms and relative to sales or gross domestic product (GDP).

The report is well documented with excellent data and theoretical inputs from different currents without being excessively prone to jargon. It is easy to read for any person acquainted with the subject.

Commentary

It is impossible to analyse in a few pages the many different and relevant issues and topics covered in the report. I am thus going to concentrate on one, which appears to be one of the most important themes in the study: how to grow large Canadian-owned and controlled companies.

1 The author holds the Canada Research Chair on the Management of Technology in the Department of Management and Technology at the Université du Québec à Montréal. Email: jorge.niosi@uqam.ca

The report shows that Canadian-owned multinational corporations (MNC) are those with the highest BERD intensity (BERD/GDP), followed by foreign MNC. Canadian-owned local firms are in third place. It states "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." (p.60).[2] The question, thus, is how can Canada nurture its technology-based companies to grow MNC.

Canada's BERD intensity has declined since the peak attained in 2001 during the technology boom (Chart 4). At the same time, BERD intensity has increased in most other OECD countries including Australia, Austria, the Czech Republic, Finland, Germany, Italy, Japan, Korea, Spain, and Turkey, as well as in non-OECD countries such as China, Chinese Taipei and Singapore (OECD, 2007). And this is not all: the present economic and financial crisis, as well as the coming demise of Nortel, will accelerate the downward trend of Canadian BERD in the years to come. Meanwhile, Finland, Korea, Singapore and Sweden are pulling ahead of the pack.

Among the determinants of business innovation strategy, two deserve to be analysed: the climate for new ventures and public policy. The report finds that the Canadian climate for new ventures is good, but not outstanding; Canadian venture capital is confined mostly to seed stages, and is declining. Moreover, angel investment is reduced compared to US figures (p. 62). Canada has its share of new technology-based firms; yet these do not grow, but are instead either acquired by Canadian or foreign firms, or disappear fairly soon. Public policy is not helping either.

Using an institutional benchmark approach, a closer examination at some of our more dynamic competitors may allow us to find the appropriate solutions.

Policy Cures for Business Diseases

The Nordic (mainly Finland and Sweden) and Southeast Asian states (China, Chinese Taipei, Japan, Korea and Singapore) are very proactive in the field of science, technology and innovation (STI).[3] Since the 1990s, these governments have launched many STI initiatives that are bearing fruit in terms of new firms, new clusters, etc. Also, these governments invest more than the Canadian government on support for new firms (OECD, 2007). The more proactive orientation of some governments is briefly mentioned in the report. It is important to emphasize that the belief that business and markets know better than governments is being shaken these days, when so many large companies request public funds in order to survive; such a market-prone belief was never taken seriously in Northern Europe or Southeast Asia. Today one may say, under the light of the present crisis, that market foresight and wisdom have been much exaggerated, and the era of Keynesian governments is back. In order to catch up with Nordic and Southeast Asian leaders, and avoid being left behind in the productivity race, Canada's federal and provincial governments need to increase their direct funding for business R&D, which is too low, at present, and declining (Chart 8). In particular, direct funding of R&D has remained fairly stagnant in absolute terms.

An Accurate Diagnosis

The report is entirely accurate in asserting that our lacklustre business innovation perfor-

2 All chart, table and page numbers refer to the accompanying article by Peter Nicholson.

3 Among other studies see Ahlback (2005) for Finland, Chung (2002) for Korea, Parayil (2005) on Singapore, Casper and Whitley (2004) on Germany, Sweden and the UK, and Jan and Chen (2006) for Chinese Taipei. Also, see the Science and Technology Policy Council of Finland (2006).

mance is not primarily related to the production and attraction of human capital, or to a lack of scientific production (my figures in Niosi (2008) coincide with Chart 2). Canada is able to spin off many technology-based firms from academic institutions and public laboratories. A large part of the problem seems to be linked to the country's limited capacity to grow these new technology-based firms. These firms are either bought out in software but also in biotechnology, and their managers spend a good part of time looking for funds abroad (Veilleux, 2008), or simply collapse.[4] Market size and geographic fragmentation of the Canadian market are certainly an issue (p. 62), but this is not the extent of the problem. Canadian firms need more government support. Canadian government funding and government funding for innovation needs to increase, not only because of the small market size and fragmented domestic market in Canada, but also because governments in other countries (including the United States, Finland, Japan and Korea) are doing more and doing it better. US policy to support technology-oriented small and medium enterprises (SMEs) is discussed below as an illustration of what one major country is doing to foster business innovation.

A Useful U.S. Federal Program for Innovative SMEs

The report correctly points out that the public policy environment for innovation in Canada consists mainly of the Scientific Research and Experimental Development Tax Incentive. However, there are many other incentives in the United States that do not exist in Canada. In 1982, the Small Business Innovation Research Program (SBIR) was created in the United States through the Small Business Innovation Research Act. It is administered by eleven government agencies, but five federal departments represent 96 per cent of the program. The five agencies are the Department of Defence (DoD), the Department of Energy (DoE), the National Aeronautics and Space Agency (NASA), the National Institutes of Health (NIH), and the National Science Foundation (NSF). The smallest among the five big components of SBIR, the NSF SBIR annual budget is now US$100 million. SBIR has been evaluated several times and found extremely useful in generating knowledge, creating networks between small firms and universities, creating and disseminating intellectual capital, and moving technology from universities towards the market (Wessner, 2007). Also, a high proportion of SBIR projects resulted in new products and processes. Today, SBIR allocates US$2 billion per year to fund R&D projects by small and medium-sized enterprises (SME). By law, the eleven participating federal agencies contribute 2.5 per cent of their budgets to SBIR. SMEs can apply for a $750,000 non-reimbursable grant in two phases to examine the commercial feasibility of academic or public R&D technology. SBIR is considered a milestone program, as evidenced by Japan's copying of it in 1998 (Japan SBRI, 2008). SBIR is not the only program supporting small technology-based firms in the United States. Other similar programs include the Advanced Technology Research Program (ATP) (Wessner, 2001) and the Small Business Technology Transfer Program (STTR).

Successful State Programs for SMEs

It is not only federal programs that support technology-based SMEs in the United States. The state-based Pennsylvania's Ben Franklin

4 One third of the 100 largest Canadian software firms in the 1990s and early 2000s were acquired by foreign corporations (Chagnon, 2007). Alias Research (Toronto), Cognos (Ottawa) and Softimage of Montreal are among the most remarkable cases in software. Allelix (Toronto), Biochem Pharma (Montreal) and ID Biomedical (Vancouver) are among the biotechnology firms. One half of the 1,000 biotechnology firms that were once incorporated in Canada have disappeared since 1980.

Technology Partnerships Program, created in 1986, the Maryland Technology Transfer Fund, and others in different states are useful complements to the above-mentioned federal programs. The report accurately suggests that the poor performance of business services in Canada explains a great portion of the US-Canada BERD intensity gap (Table 1 and Chart 5). Computer software design and services, and scientific R&D services are among them and they represent the vast majority of SMEs. These firms would be among the main beneficiaries of a Canadian SBIR program, and Ben Franklin-type provincial programs.

Fund Starvation

I suggest that the major factor behind the poor growth performance of Canadian new technology-based firms is fund starvation. In order to have large Canadian-owned and -controlled multinational corporations, it would be necessary to financially support these SMEs. The solution may be the renewed engagement of Canada's federal and provincial governments in the backing of new technology-based firms. Compared to most OECD countries, and South East Asian emerging nations, the Canadian government spends too little on business innovation. In order to improve the innovative performance of our business system, the federal and provincial governments need to spend more in support of technology in Canadian smaller firms.

Conclusion

The report is a useful tool for our understanding of Canada's innovation system. It underlines the diminishing role of Canadian governments in the support of business innovation. However, it falls short in terms of public policy recommendations.

When confronted with the risk and uncertainty represented by R&D and innovation, the business sector tends to reduce its investments in such fuzzy areas. Business innovation thus needs to be given incentives from government, in the form of tax credits for R&D, direct subsidies, as well as technology transfer programs from universities and government laboratories. For several decades, Canada was at the forefront of the design and implementation of STI policy. Canada's tax credit for R&D is considered one of the world's most progressive and successful programs, as is the Industrial Research Assistance Program (IRAP), launched in 1962, and managed by the National Research Council (NRC). The last surge of such policies, mostly oriented to stimulate university R&D, took place around the year 2000, with the launching of the Canadian Foundation for Innovation, Genome Canada and the revamping of the Medical Research Council into the Canadian Institutes for Health Research. More recently, however, after the technology bubble, governments have reduced their investment in these key business areas, and the private sector has been left virtually unto itself. It has responded by curtailing BERD, and a significant number of Canadian technology-based SMEs have been acquired or went bankrupt.

In order to renew its set of STI policies for industrial R&D, Canada should examine successful incentives around the world. I suggest it examine such programs as ATP, STTR and SBIR, and contemplate launching a new program, similar to SBIR. This program might be run by Canada's most experienced public sector STI managers, namely those running NRC's IRAP. For that purpose, the federal government should increase NRC budget by 2.5 pr cent to build the first block of a SBIR program.[5] Then, after evaluation and fine-tuning, the program could be extended to other government departments, with the addition of new funds. The Canadian SBIR program should amount to

C$200 million (or one tenth of the US program). Eventually, the federal government should study the possibility of creating other national programs similar to the American ones. Provincial governments should study the Ben Franklin Technology Partnership Program and the several others inspired by Pennsylvania's initiative.

Building policy is slow and needs continuous evaluation and fine-tuning (Niosi, 2000, 2002, 2003 and 2005, Becher and Khulmann, 1994, Feldman and Link, 2001). Such an experimental program needs to be assessed and eventually enlarged in three to four years.

References

Ahlback, J. (2005) *The Finnish National Innovation System*, (Helsinki, Helsinki University Press)

Becher, G. and S. Khulmann, eds. (1994) *Evaluation of Technology Policies in Germany* (Boston: Kluwer).

Casper, S. and R. Whitley (2004) "Managing Competencies in Entrepreneurial Technology Firms: A Comparative Institutional Analysis of Germany, Sweden and the UK," *Research Policy* Vol. 33, pp. 89-106.

Chagnon, J. (2007) "Turbulence au Sommet," MBA thesis, (Montreal, UQAM).

Chung, S. (2002) "Building a National Innovation System Through Regional Innovation Systems," *Technovation*, No.. 22, pp. 485-491.

Feldman, M. and A. Link, eds. (2001) *Innovation Policy in the Knowledge-Based Economy* (Boston: Kluwer).

Jan, T.-S. and Y. Chen (2006) "The R&D system for industrial development in Taiwan," *Technological Forecasting and Social Change*, Vol. 73, pp. 559-574.

Japan Small Business Research Institute (2008) "White Paper on Small and Medium Enterprises in Japan," SME Agency, Ministry of Economy, Trade and Industry, Tokyo.

J. Niosi (2000) *Canada's National System of Innovation* (Montreal and Kingston: McGill-Queen's University Press).

Niosi, J. (2002) "National Systems of Innovation are X-Efficient (and x-effective): Why Some are Slow Learners," *Research Policy*, Vol. 31, No. 2, pp. 291-302.

Niosi, J. (2003) "Alliances Are Not Enough. Explaining Rapid Growth in Canadian Biotechnology," *Research Policy*, Vol. 32, No. 5, pp. 737-50.

Niosi, J. (2005) *Canada's Regional Innovation Systems: The Science-Based Industries*, (Montreal and Kingston: McGill-Queen's University Press).

Niosi, J. (2008) "Connecting the Dots Between University Research and Industrial Innovation," *Choices*, Vol. 14, No. 4, October. (Montreal: Institute for Research on Public Policy)

OECD (2007) *Main Science and Technology Indicators 2007*, Paris.

Parayil, G. (2005) "From Silicon Island to Biopolis of Asia: Innovation Policy and Shifting Competitive Strategy in Singapore," *California Management Review*, Vol. 47, No.2, pp. 50-74.

Science and Technology Policy Council of Finland (2006) *Science*, *Technology*, *Innovation* (Helsinki).

Veilleux, S. (2008) "L'internationalisation des Entreprises de Biotechnologie," PhD thesis in Administration (Montreal: UQAM).

Wessner, C., ed. (1999) *The Small Business Innovation Research Program: Challenges and Opportunities* (Washington, DC: National Academies Press).

Wessner, C. ed. (2001) *The Advanced Technology Program: Assessing the Outcomes* (Washington, DC: National Academies Press).

Wessner, C. ed. (2007) *An Assessment of the SBIR Program at the National Science Foundation* (Washington, DC: National Academies Press).

5 NRC budget for 2008-09 is C$478 million for R&D and C$222 million for industrial support, for a total of C$0.7 billion. Budgets will decline in 2009-10 and 2010-11. A first phase Canadian SBIR, under rules similar to the US program, would cost in 2008-9 C$175 million, and $150 million in 2010-11, if the trend towards federal government disengagement from science, technology and innovation programs continues.