Revamping Private R&D in Canada

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Economists often, make the point to how Research and Development (R&D) relates to a nations economy and productivity. R&D allows for many societal benefits. Canada has fallen behind many countries in terms of private R&D recently, as it ranks in the middle or bottom of industrialized nations. Canada needs to have solid private R&D for future economic growth. This paper will analyze the importance of private R&D in Canada. It will take a look at what is R&D and the history, while analyzing what R&D can do for society and the economy. A critique of Canada's private R&D policies (comparison and criticism) and policy recommendations on how Canada can improve its private R&D rankings, and get back on track.

Defining Research and Development

R&D is business investing in science to create new and efficient products. According to *Investorygolossery.com* it's defined as "the activities associated with the creation or discovery of new processes, methods, products and/or services and using the newly discovered knowledge to fulfil a market need or demand. Techniques that involve science, technology and mathematics are used in research and development," (2011).

R&D occurs in universities, colleges, labs, and businesses. There are two types of R&D that occur. They are public R&D. This is when governments invest in their own R&D projects. For example, when Environment Canada, creates a more accurate weather system. Private R&D, occurs when the private sector looks at creating more efficient products. Research in Motion's BlackBerry is an example. There are some federal government agencies that support R&D. They are the National Research Council (NRC), and the National Sciences Engineering Research Council (NSERC). The mission of the NRC, according to their website focuses on five areas that include: "Life sciences, physical sciences, engineering, technology and industry support, and corporate Management," (2011). NSERC on the other hand, provides funding for universities, students, and institutions that do R&D in both natural sciences and engineering (2011). For the

purposes of this paper, the focus will be on the private side, which will now discuss a brief history surrounding it.

Research and Development History

R&D's history is rich. The Encyclopaedia of Britannica, traces of R&D back to 1790 (2011). France was battling Britain in a war and needed somehow to out manoeuvre them. Encyclopaedia Britannica noted such explosives like shells, and observation balloons helped them out in their battle. Scientific research for was used for consumer purposes for the first time, the article notes. These innovations helped build stronger artillery for militaries across the world. R&D has grown and evolved since the days of the 1790's, governments have invested more in R&D to develop newer technologies for commercial and military use. Good examples of this include the automobile, aircraft and medical research.

Canada has contributed greatly to the areas of R&D and has helped out the world. One of the greatest things to come out of research and development came from Canadian Eric Banting. According to the Nobel Prize website (2011), Banting, a military personal who served for the Canadian Army Medical along with Charles Best created Insulin, a drug that helps dictate blood sugar metabolism, which is critical in the fight in stopping diabetes. The Nobel Prize website, notes that the creation of insulin came after his Banting's interest in the topic.

The Internet and the World Wide Web (WWW) is a more global example of R&D. Created in 1969 in the United States of America, according to a British Broadcasting Corporation (BBC) article (Ward, 2009). The idea came across from the U.S. Defence departments Advanced Research Projects Agency (ARPA). The research was tested between the University of California Los Angeles (UCLA) and Stanford Research Institute. Ward points out in the article a transmission message was done between the two lines through a computer. The early creation of the Internet (ARPAnet) was in place.

The creation of ARPAnet was the forerunner of the World Wide Web, twenty two years

later. Tim Berners-Lee, who worked at the European Organization for Nuclear Research (CERN), created hypertext programming that would allow for more people to access and reach the Internet to more people then before (Computer History Museum, 2006). Berners-Lee created the first web page in 1991 (CERN, 2008).

Both the creation of insulin and the Internet/World Wide Web illustrate the historical societal importance of R&D. The next section will analyze further the impacts of what private R&D can have on society.

The impacts of Private R&D on society

Private R&D can create positive spin-offs for society. How this works is if someone invents a new product for commercial use, but somehow yet extends to society outside of commercial use to maximize the profits of a business, then this is called a positive externality, which spills into society. Clean technology/energy illustrates this example. In this case a business that creates wind turbines or solar panels, not only create profit for their businesses but also a benefit to society through the creation of decreasing pollution and limiting climate change. Negative externalities are the opposite.

Brander (2006) notes that market failure occurs through negative externalities caused by pollution. He points out that production would reach an inefficient outcome through market failure. By investing in private R&D, newer technologies through innovation science can limit pollution to the social efficient level. Carolyn Fischer (2009) note that potential spill over effects from clean technology can be at a global scale and help other countries besides Canada to limit their green house gas emissions (GHG). Fischer also points out that R&D at a broad level will help create good clean tech policy. This will help encourage the positive externalities not only here in Canada, but globally, as per Fischer.

Creating more efficient and cost effective products is another benefit of private R&D. The cellular phone showcases this. A BBC article by Tania Teixeira (2010) mentions Motorola

created a mobile phone not for car use. Invented by Martin Cooper, the first cellular phone was released in 1973 according to the BBC. The phone weighed 2.3 kilos and cost around $1 million. Teixeira, when interviewing Cooper for the article pointed that the cost for consumers was relatively high in the early days of cell phones, as the price was around $4,000 per phone back in 1983 or in today's cost at $10,000 a phone. The average citizen would not be able to afford it.

Besides expensive costs to consumers and clunky size, the early cell phone was inefficient. Limited reception, no texting, and no Internet connections made the product ineffective. Through private R&D, the cellular phone improved over time. This caused an increase in supply of inexpensive technology. The cost to produce cellular phones went down, while the economic efficiencies of cellular phones increased. The costs for cell phones now are around a few hundred or less. In 2007 the first iphone came out. The cost to consumers was around $399.00 (Kerris, N. 2007). Now a 4G iphone can cost in 2011 for a 16GB version $199 U.S., according to a *Huffington Post* article (Bosker, 2011). The iphone example shows how fast how private R&D can cause a rapid decrease in cost and create better products. More smart phones where bought in 2010 with 300 million more in the market (Talbot, 2011). Today's cell phones (smart phones) are more efficient. Not only can you talk but also text, check your email, surf the web, play video games, and conduct business. Talbot mentions, “they're providing new ways to socialize, receive news, and transact business”, mentioning the effect cell phones have on society.

As cell phones decrease in cost, world demand for cellular phones has increased. By 2008, according to the United Nations Educational, Scientific, and Cultural Organization (UNESCO), pinned it at 4 billion (2008), and just over sixty percent of the world's population. The article also pointed that emerging economic nations like Russia, Brazil, India and China are the force in increased cellular phone use. In 1990, there were approximately 12 million cellular phone users (Worldmapper, 2011), which represented less then a percentage of the world,

compared to now.

The increase in cell phone use has also caused a leapfrog of technology. This has created spill over effects into the developing world. Before cell phones, it was hard to receive telephone service, in rural areas of developing countries like Brazil and India, as there were no telephone poles. With cellular phones, people in remote areas can use them to communicate better and develop their economies to be more modern, with minimal environmental cost. Lester Brown, (2001) notes that developing countries can leapfrog technologies like wired lines and go straight to cell phones. This allows satellite towers to receive transmission, which causes less environmental damage, Brown points out.

Thanks to private R&D, technological efficiencies can occur, along with more jobs. As companies create more efficient products more companies will be able to lower their costs and more jobs can be created. One example is Germany with their green energy industry. Over 300,000 new jobs have been created (Schartz, 2011), thanks to policies that support green R&D and pricing of carbon through Feed in Tariff's (FIT).

While the benefits of private R&D have been shown (societal spill over effects, creating more efficient products, and creating jobs), Canada, is starting to fall behind the rest of the world in this area.

Canada and other Countries in Private R&D

Canada in recent years can't match up with other developed or developing countries in private R&D. Ashleigh Patterson mentioned numerous points in a *Reuter's* article (2009) that cause concern. The article points to Canada invested around 1.9 per cent of yearly Gross Domestic Product (GDP) to R&D from Organisation for Economic and Co-Operative Development (OECD) data in the article. However, despite this, the country is middle of the pack compared to other countries. Japan and The United States of America (U.S.A) are at the top of the pack in the OECD, while Italy ranks at the bottom, according to the article.

The article pointed out that the OECD, thinks Canada, could do better collaboration between business, government, and post secondary institutions. Canada was 24th of 26 countries in this area. The article also pointed that in the 2009 Canadian Federal Budget, the government allocated $750 million for the Canadian Foundation for Innovation. However, NSERC, The Social Sciences, and Humanities Research Council (SSHRC), and Canadian Institute of Health Research (CIHR) in, starting in 2009 trim their budgets by $148 million.

Policies that the current federal government are taking, as seen in the *Reuters* article does not show efficient support for private R&D. In a report put out by *Research Infosource Inc*, (2010) notes many of the largest private businesses and sectors in the country have decreased their spending in research. Research *Infosource* pointed out in 2009, that R&D spending for Canada's top 100 largest spenders on R&D fell from $10.40 billion to $10.22 billion, from 2008 to 2009, a decline of 1.8%. The report pointed out that the drop in 2009 was the fourth straight year that investment in research amongst Canada's largest R&D spenders decreased. *Research Infosource* noted that only 44 companies put more money into R&D in 2009, while 55 decreased R&D funding.

Amongst sectors decreasing R&D in 2009, according to the report was: Oil and Gas, Biotechnology/Pharmaceuticals, Automotive, Aerospace, Telecom Equipment/Communications and Electronic Parts. Sectors increasing investment were: Telecommunications, Software and Computer Services, Electrical Power and Engineering Services. Telecom Equipment/Communications, Pharmaceuticals, Telecommunications, Software, Aerospace, Energy, and Automotive are the largest supporting sectors of private R&D in Canada, based on their analysis.

The research conducted argued the Canadian government needs to do a better job of promoting private R&D and invest in it. They pointed that economic success had put it to the back burner in past years. Now, however, given that Canada is coming out of a recession, this

report exemplifies why the Federal government must adopt a strategy to compete on the world stage for being a competitive country.

Besides the largest R&D companies falling behind, Canada is also falling behind the clean technology R&D race (one of the hottest new private R&D sectors) with other countries. Tim Weiss and Leslie Malone (2010), mention the U.S.A outspends Canada 18 to 1 on renewable energy. Weiss and Malone also note that the U.S.A also puts more investment into energy efficiency initiatives by 2 to 1. Canada is also falling behind China in clean tech R&D, thanks to lower technology costs. According to a Pew Trusts report (2011), China now leads in clean tech investment with $54.4 billion. Germany was second with $41 billion and the United States was third with $34 billion. Canada finished seventh on the list with $5.6 billion on clean tech investment. Brazil appeared in the top ten, according to the report with $7.6 billion invested in 2010.

With new opportunities in clean tech, Information Technology, smart phones, and tablets, companies are now competing with developing countries for top economic dollar. It is imperative that Canada take big steps to enhance private R&D so the country can have a high tech economy this century. So why is Canada not investing in private R&D given that there are societal benefits, more efficient products and job creation? The next section will take a look at the critics of Canada's private R&D policy.

Criticisms of Canada's private R&D policy

Canada has been criticized in recent years on not investing more in private R&D. One concern is the government does not do enough to support innovation science. As mentioned in the Reuters article, The Federal government would start in 2009 trimming the NSERC, SSHRC, and CIHR by $148 million in total. Besides decreased support for government organizations that support private R&D like NSERC, the 2009 federal budget was a case of the government focusing on what many people considered “shovel ready” projects that focused on quick fix

economic solutions to unemployment (creating buildings and home renovations). One can point to the Home Renovation Tax Credit that allowed homeowners a tax credit on buying home renovations that included various things ranging from supplies to contract work. The cost of the renovations had to be over $1,000, while not over $10,000 for a maximized credit of $1350 (15% tax credit). The renovations had to occur between the end of January, 2009 and January, 2010 to be eligible for the 2009 income tax return (H&R Block, 2010). Simplistic ideas of tax credits for home renovations, rather then supporting R&D did not sit well with those in the R&D, and technology sectors. John Reid, the C.E.O of the Canadian Advanced Technology Alliance noted the 2009 budget had “lack vision” in supporting the technology industry (Jay, 2009).

Canada is near the bottom of private sector collaboration with government and post secondary institutions. Some University chairs have complained about this. The 2009 Patterson article mentions Peter MacKinnon, the University of Saskatchewan President and Vice-Chancellor in 2009 said that low collaboration between the Universities, government and private sector is bad for R&D and Canada needs to do a better job. So how can Canada' change its poor private R&D record?

Revamping Canada's Place in Private R&D

Canada needs to start taking those steps forward in gaining its competitive foothold in the global economy. The first order of business will be to look at the government of Canada to strategically invest more partnerships between the government of Canada, universities and business in incentives for collaboration between the three. The government could fund universities in supporting innovation science, while businesses could receive a larger tax incentive through credits or a tax deduction to support private R&D. Tax incentives would lower the opportunity costs for businesses to invest in R&D, while at the same time creating a positive spill over effect to society. For example partnerships could be created between high technology companies like International Business Machines (I.B.M.), The University of Winnipeg and the

federal government to create better smart grids for energy systems in Canada. Similar steps should be taken by provincial governments to better enhance the relationship between private sector and post secondary institutions in developing R&D. This would be similar to Innovation and Development Centers (I&D) in which Clark (2010) mentions as a flexible collaboration. These I&D centers Clark mentions allows for geographical representation regionally, while also allowing national government support.

One way that would get more efficiency for Canada's R&D dollar would be to phase out support for sunset industries in R&D, and put money into newer growth industries. The Canadian government should look at tax incentives for industries that have invested more and will continue to grow (Information Technology, clean energy, telecommunications), and the same time phase out R&D incentives to industries who are fading into the sunset (coal, oil, gas). By supporting those industries that are on the breaking edge of innovation, future jobs would be created in new industries. That would also require more investment into post secondary schools, as newer industries require more skilled labour.

While large scale private R&D is important, small business will need to play an important role in private R&D. Smart parks, similar to the one at the University of Manitoba, should be set up to support R&D entrepreneurship. Smart parks allow for collaboration between entrepreneurs, business experts and those in innovation science to develop products, marketing and financial assistance. This would satisfy some of the concerns that Mackinnon pointed to between the lack of collaboration between private, government and Universities for private R&D.

Conclusion

Canada has had a strong history in R&D. Banting's invention of insulin was one of the best creations of R&D use in Canadian history. The importance and impact of R&D in our society ranges from spill over benefits (clean technology-lowering carbon emissions), more efficient products and lowering the costs (cell phones) which can lead to more spill over effects

(leapfrogging technology of cell phones to developing countries), as well as job creation. Canada ranks near the middle of private R&D, while near the bottom of collaboration with government, the private sector and Universities. Canada also is falling behind in heavy rich R&D sectors like clean technology to countries including: U.S.A., China, and Brazil.

Canada has faced criticism on its private R&D policy as the government has cut funding to important government organizations like NSERC, who support R&D. Instead the government has focused on short term, shovel ready economic solutions like tax credits for home renovation. This has raised the ire of many in the university and technology communities. Canada needs better collaboration between private sector and universities through tax incentives and grants to support R&D.

The federal government also needs to be more efficient in R&D dollars spent by supporting up and coming industries rather then sunset industries. Smart parks would benefit those small businesses that want to get into the R&D field yet do not have the expertise or finances to do this. These ideas would better position Canada as a leader for years to come in private R&D.

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