



INSTITUT C.D. HOWE INSTITUTE

COMMENTARY

NO. 497

Innovation Policy in Canada: A Holistic Approach

Canada's reputation as an innovation under-achiever underlines the need for a broader consideration of the policies that create the right environment for innovation, recognize what makes innovators tick, and promote the transition of ideas from the lab to the marketplace.

Daniel Schwanen



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COMMENTARY No. 497
December 2017
INNOVATION AND BUSINESS
GROWTH

\$12.00

ISBN 978-1-987983-50-0

ISSN 0824-8001 (print);

ISSN 1703-0765 (online)



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THE STUDY IN BRIEF

Canada is widely considered to be an innovation under-achiever, despite decades-long attempts to address this gap. In light of this criticism, this *Commentary* reviews the range of policy tools that governments in advanced economies have at their disposal to foster innovation. It takes a holistic approach to innovation policy in that many of the policy areas covered in this report are not primarily designed to spur innovation per se, but nevertheless can have a significant impact on it.

Innovation policy is less likely to succeed if it does not carefully integrate measures affecting the four essential ingredients of talent and knowledge, entrepreneurship and business growth, innovation in government, and clarity of purpose for government support. This entails, but is not limited to, adopting government framework policies to encourage innovation, such as a pro-innovation tax system, trade policy, intellectual-property regime, competition policy, and approach to regulation, as well as fostering acceptance of innovation in civil society and the general public.

Key areas for potential improvement, ultimately contributing to raising Canadians' standards of living, include:

- a greater focus on research and educational excellence, and on deploying and attracting related talent and skills, including those beyond scientific and engineering skills, such as marketing and business;
- a suite of trade, fiscal, regulatory and other policies and approaches to: 1) foster entrepreneurship and economic activity based on existing talent, skills and this research; 2) facilitate the risk-taking – and acceptance of risk-taking – that such activities entail; and 3) remove unnecessary barriers to these activities;
- innovation in the delivery of public services themselves; and
- a more goals-oriented approach to government support for business innovation that nevertheless relies more on market and other arm's length mechanisms, as well as international collaboration in some areas, to achieve desired goals.

The ultimate motivation for wanting to improve Canada's innovation performance is simple: to improve Canadians' overall standards of living.

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An innovation is a new or improved solution to a need or problem.¹ Wide adoption of successful innovations by businesses and individuals help raise standards of living.

Canada is widely considered to be an innovation under-achiever, despite decades-long attempts to address this gap (Sulzenko 2016, Nicholson 2016). In light of this criticism, this *Commentary* reviews the range of policy tools that governments in advanced economies have at their disposal to foster innovation. It takes a holistic approach to innovation policy in that many of the policy areas covered here are not primarily designed to spur innovation per se, but nevertheless can have a significant impact on it.

The *Commentary*'s purpose is to help identify policy areas, approaches and specific tools that are reasonably within governments' reach but may not have received as much attention from the federal and other governments as they deserved.²

To that effect, I consider policies affecting the availability and use of knowledge as the necessary but not sufficient building blocks of strong innovation performance. I focus on how Canada can more successfully become a nation of innovators, taking a fresh look at framework economic and social policies that take into

account the behaviour of innovators and the spread of innovation. Finally, I review key aspects of government direct intervention in support of innovation in the business sector, emphasizing the pitfalls but also some of the potential benefits of policy support directed toward specific outcomes.

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The author thanks Benjamin Dachis, Philip Cross, Robert Dunlop, Andrew Sharpe, John Stackhouse and anonymous reviewers for comments on an earlier draft. The author retains responsibility for any errors and the views expressed.

- 1 This definition is derived from that of Christian Terwiesch, professor at the Wharton School at the University of Pennsylvania: "an innovation is a new match between a need and a solution so that value is created" as quoted here, for example: <https://www.ideaconnection.com/open-innovation-articles/00218-Innovation-Opportunities.html>.
- 2 While some of these potential responses are under the purview of provincial governments, the focus of this *Commentary* is on Canada's overall performance. In turn, the findings form the basis of a new annual innovation policy report card, published separately beginning in 2018 that will rank Canada's public innovation policies against those of other countries. The report card will help us further delineate the extent to which policy differences may be related to superior or inferior innovation outcomes and, hence, test the propositions here advanced.

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THE CENTRAL ROLE OF INNOVATION IN RAISING STANDARDS OF LIVING

The ultimate motivation for wanting to improve Canada's innovation performance is simple: to improve Canadians' overall standards of living. Standards of living encompass per capita incomes but can also be construed more widely to include other key elements of well-being, such as public and personal health and safety, which are susceptible to improvement through innovation.

There is no single accepted measure of innovation. However, there is a positive link between firms' innovation activities and their more efficient use of inputs to provide desired outputs, that is, their productivity (Mohnen and Hall 2013). This means that successful innovation directly contributes to growth in output (and hence incomes) beyond that which is attributable to growth in inputs such as physical capital. Having said this, some innovation is typically embodied in new capital investments and so, in practice, it is hard to distinguish the two.

However, innovation's positive impact on living standards often far exceeds that which can be conventionally measured by productivity growth (Gordon 2016).³ National accounting conventions that are used to track economic growth and, hence, productivity performance may not be able to capture the consumer surplus stemming from innovation (Feldstein 2017). This is especially true of innovations that are considered "radical" (Schumpeter 1934) or constitute new "general purpose technologies (as described in Lipsey 1996)," both of which contrast with Schumpeter's "incremental" innovations, whose impact on

measured changes in inputs and outputs can be more easily traced.

These difficulties in measuring the precise impact of innovation on standards of living have not stopped efforts to track countries' innovation performance and make international comparisons, using a wide range of potential proxies as developed by, for example, the OECD. These include: inputs into the innovation process (e.g., number of science and technology workers); indicators of innovation activities (e.g., research and development (R&D) expenditures); identifiable outputs from the innovation process (e.g., patents and scientific articles); and surveys of firms that have launched new products or technologies (e.g., percentage of newly introduced products in overall sales).

Using these and other indicators, analysts have concluded that Canada has a significant innovation problem.

CANADA'S INNOVATION PROBLEM

A number of organizations publish overall rankings of economies' innovation performance, using the type of indicators briefly categorized above, along with others. None rank Canada highly among peer countries (Table 1).

These performance rankings can yield clues as to where Canada's innovation problem lies. This, in turn, helps us understand how policy can help address the problem, the focus of this paper.

In the process, however, we need not accept at face value the reliability of existing, commonly used indicators of performance as guides to policy. For example, one popular indicator of innovation input – R&D expenditures in the business sector – has been criticized for its inaccuracy (Plant et al. 2016). In recent years, it has also not exhibited a strong relationship with patenting activity in Canada, a

3 The classic case demonstrating this gap is of lighting's contribution to living standards, which cannot be adduced from traditional productivity growth measurement (Nordhaus 1997).

Table 1: Canada's Rank in Surveys of Innovation Performance

Compilation by	Rank 2017	Out of
Global Innovation Index (Johnson, Cornell, World Intellectual Property Organization)	18	127
World Economic Forum Competitiveness Index (Innovation Pillar)	24	138
Bloomberg Innovation Index	20	78
Conference Board of Canada	13	16
Information Technology & Innovation Foundation (Impact on Global Innovation)	25	56

Source: Author's compilation.

common measure of the output of the innovation process (Greenspon and Rodrigues 2017).

And while patents, in turn, can encourage the spread of innovation (Gallini 2002), there is much innovation that is not patent based. As well, so-called patent thickets can actually pose barriers to innovation (Brander 2010). Therefore, the link between patenting and the spread of innovation is also not straightforward, at least across all industries.

One can also question another popular measure of innovation breadth – scientific articles – that have exploded almost in step with a deceleration in economic growth. In fact, citations of scientific articles, as opposed to the articles themselves, are a better indicator of a particular piece of research's influence.

In short, while we can accept that where there's smoke, there's also likely to be a fire, there is no simple, mechanistic relationship between many of the indicators used in these rankings and the goal of enhancing Canadians' standards of living.

How Important is this Problem for Canada?

How big a problem is Canada's mediocre innovation performance? After all, for all the angst displayed about our innovation record, Canada's overall standard of living remains enviable, particularly on such indicators as quality of life, while per capita income, although lower than that in the US and Nordic European countries, is on par with Germany and above that of other G7 countries.

In this context, Nicholson (2016) points out that Canadian businesses in aggregate seem to have rationally pursued a low-innovation strategy. That is, they may not have needed to be more innovative than they are now to be profitable. Indeed in the words of the Council of Canadian Academies (2013a, 6), Canadian businesses, shaped by a particular Canadian attitude to business risks, have been "as innovative as they need to be."

Two factors often cited as bringing about this complacent attitude are a plentiful endowment of natural resources and the ease with which Canadian businesses can imitate and integrate innovations

developed elsewhere, notably in the US. However, it would be incorrect to see these factors as necessarily thwarting innovation in Canada, rather than as advantages to build upon.

Canada's natural resource wealth does indeed contribute to keeping Canadians' living standards high. It may also have discouraged a business focus on developing attractive brands that might help sell Canadian products abroad (Mandel-Campbell 2007). After all, a significant portion of Canadians' income derives from the exploitation of commodities that are hard to differentiate from those produced by others.

But an abundance of resources need not be a harbinger of poor innovation performance (Wright and Czelusta 2004). Whether or not the famed "resource curse" plays out depends much on a country's institutions. When a country exhibits a comparative resource advantage, the extraction, harvesting, marketing, transportation, consumption and stewardship of these resources still provide much opportunity for innovation as demonstrated by the competitive challenges to Canada posed by Finnish and Swedish forest product industries (Yakabuski 2007). For another example, Canada's energy sector has a strong record of innovative activity (Brydon et al. 2014). In short, there is no inherent contradiction between intelligent use of resources to maximize well-being and the exploitation of what is between our ears.

Another often-mentioned Canadian innovation culprit is that Canadians can relatively easily increase their living standards by imitating what is being done elsewhere. Indeed, as long as knowledgeable and skilled people reside here, and the environment is favourable to investment and nudged by competition and the need to meet high global standards, Canadians can benefit from innovation indirectly through investments that replicate proven technology used elsewhere. Such imitative activities are part of the innovation continuum and, indeed, may be the most common innovation-related activities (Independent Panel,

pp. 2-3), keeping much of the economy close to the technological frontier. In short, with their resources and the right tools and economic environment – including proximity to the US – history has shown that Canadians can live comfortably without being innovation leaders, as long as they continue to save, invest, learn and work.

A successful Canadian innovation policy would, therefore, not ignore Canada's resource wealth or our ability to imitate others as potential sources of growth in well-being. In fact, it would build on the country's resources' advantage and its capacity to intelligently imitate by adapting best practices to Canada's own institutions and circumstances.

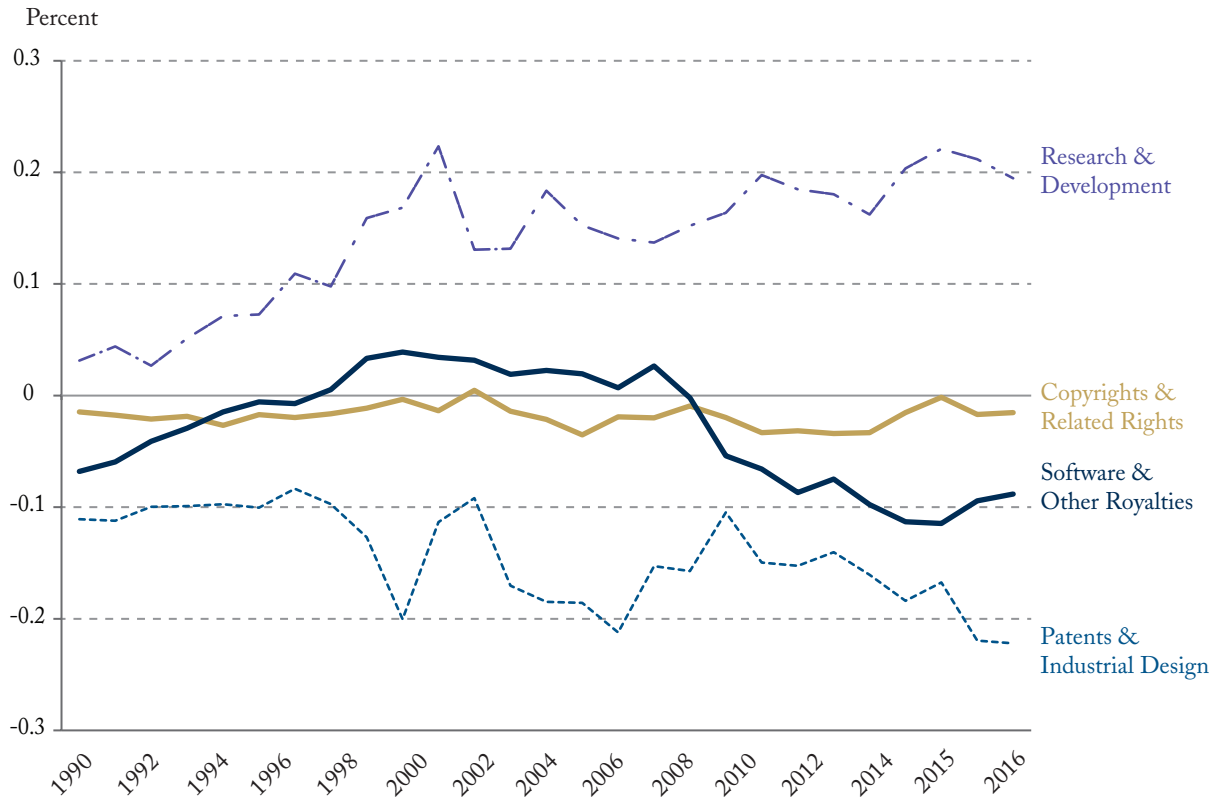
So, what is missing?

According to numerous studies and reports from advisory groups set up by the federal government (Canada 2006, Independent Panel on Federal Support on Research and Development 2011, Advisory Council on Economic Growth 2017), Canadians generate many practical, innovative ideas (see also Jenkins and Johnston 2017) but miss out on the significant benefits from exploiting those ideas globally. A striking juxtaposition highlighting the problem is that while Canada ranked eighth in the number of US patent grants in 2016 when calculated by the inventor's country of residence, 58 percent of these patents were owned by companies outside Canada, up from 45 percent in 2005 (Plant 2017).

The issue can also be illustrated by Figure 1, which shows a growing Canadian balance of payments net surplus on R&D activities (including those performed by foreign high-tech companies in Canada), along with a similar-sized deficit on payments for royalties, licences, copyright and other IP owned abroad. Canada is not unique in this respect, but the contrast is striking.

Innovation embodied in consumer products, machines, software, processes, designs and creative activities in general will dominate valuable

Figure 1: Canada's International Balances in R&D Services and Payments for Use of IP, Share of GDP



Source: Statistics Canada and author's calculations.

economic and social activities and the jobs associated with them (Howitt 2015, pp.7-8). As the statistics from the US patent office and Figure 1 show, many Canadians can and do participate in this trend by performing research and generating knowledge and ideas that are in demand globally.

However, stronger economic growth and higher standards of living would accrue to Canadians if we were also at the forefront of business growth and job creation based on such knowledge. Another related benefit to Canadians would be resilience in the face of rapid technological, demographic, social and environmental changes (ACEG 2017b).

Therefore, the key unmet challenge of Canadian innovation policy today is ensuring the best possible environment for commercializing ideas. According to the Expert Panel on Commercialization, commercialization means “everything a firm does that transforms knowledge and technology into new goods, processes or services to satisfy market demands.” Meeting this challenge would maximize the benefits of other policies such as those helping to attract talent or those supporting business R&D.

A NATION OF INNOVATORS

The section of the federal government’s 2017 budget specifically devoted to innovation policy

is entitled “Building a Nation of Innovators.” The focus on innovators, the people and organizations that perform innovation, is refreshing.⁴ It stands to reason that a policy aimed at spurring innovation and helping Canadians benefit from it will also seek to find ways to facilitate, or at least not discourage, innovators and their activities in Canada.

Asking who these innovators are, what makes them tick and what policies can encourage, or at least not discourage, their activities in Canada is therefore a good starting point for discussing innovation policy.

Individual Innovators

Individual innovators range from those engaged in advancing the general state of knowledge through fundamental research to the more prosaic but visionary inventors, designers, entrepreneurs and investors who initiate or facilitate a potential innovation’s emergence in the marketplace. They include, as well, artists and writers whose creative work has often had a marked influence on the public’s knowledge and preferences, spurring improved standards of living and economic activity.⁵

These types of innovators can overlap in a single person. More often, collaboration among different innovators will be required to bring a potential innovation to fruition, let alone to the broader marketplace. Furthermore, the personal and material circumstances under which each innovator contributes his or her innovation can differ wildly. But innovators, at least those who in retrospect are

seen as successful, tend to share a few traits.

First, they tend to be, or want to be, well-educated, skilled and well-read. They typically are constantly on the lookout for new ideas. Third, they are motivated by the success of their ideas. Fourth, they tend to care about getting recognition, monetary or otherwise, through patenting of inventions or obtaining copyright for their work. Finally, they tend to move to where the conditions for the above characteristics will be more favourable (Nicholson 2016, Khan and Sokoloff 1992 and Lamoreaux and Sokoloff 1999).

All told, this means that successful innovators tend to come from, or gravitate to, places where education, literacy and numeracy are high, where experimentation, collaboration and the dissemination of new ideas are not discouraged, and where innovation can be rewarded.

In addition, since there is a relatively high risk involved in making, testing and pushing out new ideas or new combinations of ideas, often through long obstacle-strewn periods before an innovation is accepted as promising or useful, innovators gravitate to where they are likely to find partners that can understand and shoulder some of the risks involved in bringing innovation to market.

The story of innovators shows that they very often have something else in common – their innovations have been crystallized, via entrepreneurship, into successful commercial brands, or have been disseminated or used successfully by public institutions. While innovators have sometimes helped found such firms or

4 The word “innovator” or “innovators” is mentioned just three times in the 2016 budget, as was the case in the 2015 budget, but 39 times in the 2017 budget.

5 A classic case of the latter is Upton Sinclair’s *The Jungle* on working and sanitary conditions in Chicago stockyards, which within months led to the passage of the *US Pure Food and Drug Act* (Gordon, 221). As well, Goldthwaite (1993) describes how exquisite arts and craftsmanship, often developed through works commissioned by churches competing for attractiveness in late medieval Italy, sparked demand for various forms and styles of household interiors and goods.

institutions,⁶ their legacy in other cases has been established by other companies and institutions that can best exploit them and grow as a result.⁷

This brings us to the crucial role of private entrepreneurship in helping innovations to emerge and their benefits to spread. Indeed, entrepreneurship itself is an inherently creative activity, which has an overall positive impact on economic growth (Kritikos 2014, 1).

Innovative Private Enterprise

Like the individual innovator, the innovative enterprise will seek a growth-friendly environment in which its innovations are more likely to be successful. In general, this is an environment that allows for a combination of cost or price advantage over competitors, access to new technologies, the introduction of new products or new brands, changes to the way the enterprise is run or financed, access to new markets and/or ease of exit if things do not pan out.

Innovative activities, firm productivity and growth go hand in hand (Crépon, Duguet, Mairesse 1998). Indeed, many large and/or growing firms now organize themselves strategically around R&D. They attempt to systematize the process of innovation and the reaping of its benefits, treating knowledge and intellectual property (IP) as key assets and directing their use and transmission both within and outside the firm with care. They seek to recoup R&D costs through access to larger markets and even to influence the broad regulatory environment in which their innovation can be used in the marketplace, displacing or destroying alternatives (OECD and Eurostat 2005, 28-33).

The managers of innovative firms are conscious of the access to knowledge and other benefits

they derive from a vibrant innovation ecosystem. According to Taylor (2016), the social networks involved in national science and technology success stories allow taking “. . . shortcuts around markets for access to high-quality STEM labor, technical knowledge, investment capital and even marketing expertise. Social networks provide vital information which neither free markets nor government institutions easily capture, but . . . are often ignored due to our preoccupation with domestic institutions and policies.”

Ease of access and communication within such networks reduces the cost of information and skills acquisition and is, accordingly, important to innovation and its diffusion. As a result, innovative firms, innovators, along with knowledge and other workers whose skills innovative firms need, tend to cluster geographically (Krugman 1991). However, international networks increasingly play important roles, as international division of labour in R&D, an activity previously associated mainly with head offices, grows apace. Not surprisingly, then, information and communications technology and transportation infrastructure are also strongly related to the growth of innovative firms⁸ and to productivity growth more generally.

There are three other characteristics of successful innovative organizations worth considering.

First, labour-force diversity, both in terms of white-collar specialization as well as cultural background and demographic characteristics, seems to have a positive impact on innovation (Parrotta et al. 2011). Even the firm’s style of employee relations can have an impact, depending on whether the firm is pursuing an incremental or more radical innovation strategy (OECD p. 87, Kleinknecht et al. 2014).

6 Such as with Henry Ford, Leo Fender or Louis Pasteur.

7 Such as with Charles Goodyear, himself unsuccessful in business.

8 As a recent example of widespread evidence on these points, see Agrawal and Galasso (2016) on roads.

Second, successful companies – the ones that create value for both their owners and customers – have a strong customer focus, including a flair for marketing and design. The Canadian entrepreneurial scene is littered with companies left behind by the competition not because of a lack of resources, technological know-how or solid products, but because foreign competitors developed products ultimately more useful, more attractive or accessible to a greater number of customers (Mandel-Campbell 2007, McNish and Silcoff 2015).

Finally, the innovative firm will seek partners willing to share costs, given that innovation often takes place under conditions of great uncertainty (Rosenberg 1994 cited in OECD and Eurostat 2005). Indeed, the innovative firm is inherently cash-constrained. For these reasons, the efficiency of a country's financial system as well as its corporate governance environment, along with government support that reduces uncertainty for the firm, can improve its financial basis and, hence, boost innovation performance (Egger and Keuschnigg 2010).

To the extent circumstances in Canada make it difficult to grow businesses, let alone innovative businesses – at the limit leading to Canadian innovators to move to where conditions are more auspicious for growth, or selling out to foreign competitors – the impact on Canadians' standards of living can be substantial. That is because larger businesses will be underrepresented in the economy, with negative implications for overall productivity. Statistics Canada reports, for example, that most of the Canada-US productivity gap can be accounted for by the relatively larger contribution of small businesses to Canada's economic output (Baldwin et al. 2014).

Innovative Public Sector

Government's role in innovation is typically discussed in terms of its involvement in building human capital, its more or less innovation-friendly

rules, its own R&D efforts or the support it gives to the innovation efforts of other sectors, notably business and academia. However, innovation in the public sector itself is often omitted from reviews of Canadian government innovation policy. The Jenkins panel Review of Federal Support to Research and Development, for example, was asked to report only on how governments can best support "business and commercially oriented R&D."

Given the importance of the public sector to the Canadian and other modern economies, any attempt to build a nation of innovators must encompass a discussion of whether public institutions pursue innovation. Indeed, governments should be actively looking for improved ways to deliver public services in light of evolving technologies and evidence on the effectiveness of different public policy tools or types of partnership with non-government entities.

These services almost universally encompass public security, education, health and transport infrastructure, as well as information and communications infrastructure, insofar as it is heavily influenced by government regulation. The latter two are crucial enablers of innovation networks and the types of connections and access to markets that facilitate innovation, as discussed above.

As a first approximation, a government that is more efficient at delivering these core public outcomes than comparable jurisdictions can also be deemed more innovative. Indeed, adopting best practices from one country to the next is not straightforward. They need to be adapted to existing institutions and local political realities. Therefore, adoption across jurisdictions requires innovation.

The healthcare system illustrates the link between government efficiency and overall economic innovation. Other countries, with access to similar skills, tools and tax bases, often produce more desirable health outcomes than Canada's. The health sector constitutes more than 11 percent of Canada's economy, and for that reason alone it is important to understand the barriers to better outcomes that this sector clearly could deliver.

Those who have studied this issue in depth point to a lack of innovation in the system itself as the key cause for the sub-optimal outcomes relative to costs (Blomqvist and Busby 2017). In addition, lack of focus on innovation in the public system can result in fewer opportunities for commercially viable innovation that could contribute to better health outcomes (Advisory Panel on Healthcare Innovation 2015).

FRAMEWORK CONDITIONS ALLOWING INNOVATION TO THRIVE

Framework policies likely to attract innovators and innovative activities, which would in turn support a rising standard of living, are not always taken into account in innovation studies. Yet, as mentioned by the Jenkins panel (Independent Panel, p. E-2), while such framework policies “are not within the scope of this review, we would emphasize that the impact of our advice depends ultimately on complementary efforts to strengthen those policies – especially as they relate to encouraging the competitive intensity that is a central motivator of innovation.”

To be clear, while some aspects of the innovation process can be systematized, its outcome is not linear or mechanically predictable (Council of Canadian Academies 2013b, 94). Although, as we will see, governments can play a direct, catalytic role in the emergence of important innovations, no government policy can guarantee that innovation will appear in or spread to the wider economy. Nevertheless, the broader policy framework set by governments affects the likelihood that useful innovation will emerge and be widely adopted.

Indeed, as suggested by the quote above from the Jenkins report, there could be very little point in devising an overarching innovation strategy if other policies make it difficult to actually innovate, to spread the benefits of innovation, or to attract or retain innovative talent.

We will review below seven important goals or types of government framework policies to encourage innovation:

- Ability to generate or use knowledge;
- Measures to foster large or expanding markets;
- A pro-innovation tax system;
- A pro-innovation, intellectual-property regime;
- A pro-innovation competition policy;
- Innovation-friendly approach to regulation; and
- Acceptance of innovation in civil society and the general public.

Ability to Generate or Use Knowledge

All innovation, and the ability to use and enjoy useful innovations, is based on knowledge. Therefore, education and skills are the foundation of an innovation strategy. Their important public impact means that, even when education and skills are not the strict purview of government, their provision is typically funded, directed or regulated to some extent by the public sector.

Science, technology, engineering and math, the so-called STEM subjects, are at the core of modern innovations. However, complementary knowledge and technical, design (Norman 2013), marketing, and business or administrative skills are also typically required to bring an innovation successfully to market. For example, and curiously, the US is widely seen as an innovation leader but is not doing well compared to other countries either on percentage of STEM graduates or in its students’ scores in the OECD Programme for International Student Assessment (PISA) tests, suggesting that educational achievements, even in advanced scientific or technological fields, are not by themselves drivers of innovation.

Recognizing this, certain jurisdictions such as Singapore have begun to plan for a more rounded skill set in younger students, such as athletic, arts and music skills, while maintaining its traditional

strengths in core subjects (OECD 2012, 127). As well, the degree of literacy among managers is correlated with more innovative economies, or at least with more productive ones (OECD 2013). Furthermore, as mentioned, a more diverse workforce generally correlates with innovation. And a more knowledgeable public is more likely to benefit from and accept the changes brought about by a knowledge-based economy.

Still, innovation is by definition about understanding that something can or needs to be done differently than how it is done now – which often requires state-of-the-art knowledge enabling a grasp of how a science, technique, art or industry can help solve problems. Therefore, excellence in research and education remains the fundamental building blocks for a nation of innovators.

Having said this, a large number of important innovations have emerged serendipitously, often stumbled upon by people across vastly different disciplines and endeavours who were able to perceive their potential (see Mukherjee 2011 for the connections from almost completely unrelated fields that led to chemotherapy). Accordingly, curiosity-based research, experimentation and cross-disciplinary fertilization should be encouraged when designing approaches to building research skills and the institutions supporting them.

Measures to Foster Large or Expanding Markets

Access to a large or rapidly expanding market motivates innovation, because it increases the likelihood of rewards. One of the key reasons is that, the scale of production enabled by foreign trade is an important avenue for amortizing R&D expenditures (Dinopoulos and Segerstrom 1999).

The policy implication is that if Canadian innovators cannot access larger markets, they will be more likely to move to where they can. Obtaining entry to international markets that is comparable or superior to that enjoyed by competitors in other

countries (as Canada did with the Canada-EU Comprehensive Economic and Trade Agreement and is seeking to do with the Trans-Pacific Partnership) is therefore an important component of a pro-innovation policy framework.

Simpler customs procedures and rules of origin, greater access for Canadian products to larger markets under various trade agreements, lower tariffs on innovation-intensive goods and services, easier passage across international borders for people required to market or operate them and, in general, trade agreements that facilitate Canadians' participation in cross-border innovation efforts (as described in detail in Curtis 2016) are particularly relevant to the success of innovators.

A recent Statistics Canada study concluded that, "Larger markets raise productivity by allowing firms to exploit economies of scale and/or product specialization, forcing firms to become more efficient in the face of more competitive pressure, and offering firms more incentives and possibilities to innovate and invest" (Baldwin and Yan, 6).

Its authors also note the empirical evidence suggesting that learning from foreign buyers leads to beneficial adoption of foreign technologies. Indeed, the link between innovation and exports is perceived to be so strong that some smaller countries such as Finland or Israel make export potential a condition for product innovation funding (Breznitz, cited in Senate of Canada 2017a).

Trade agreements also normally require opening up one's market to imports. Not every firm will respond in the same way to more competition in the domestic market (Crespo 2012). For example, Lileeva and Trefler (2010) have shown that the significant increase in Canadian average manufacturing productivity following the 1989 Canada-US free trade agreement was the result of weaker-productivity firms exiting the marketplace almost as much as higher-productivity firms expanding production in response to the new competitive environment.

Unfortunately, “innovation protectionism”⁹ is alive and well in many export markets targeted by Canadian firms, even those with which we have free trade agreements. Such protectionism may range from rules that, in effect, bar foreign products from government purchases, to requirements that technology be shared as a condition of doing business, to even tolerance of IP theft. These practices hurt firm development and production in the smaller markets by artificially skewing the benefits of innovation toward those in the larger markets. Canadian governments must make addressing these practices a key priority in trade negotiations.

At the same time, Canada needs to come to terms with its own restrictions, such as, barriers to foreign services firms operating in Canada, to strike meaningful deals to open up emerging markets for Canadian exports.

Trade agreements typically give Canada little recourse against judicial decisions in a foreign market that may, for example, be biased in favour of a local patent-assertion entity¹⁰ seeking to invalidate a Canadian-owned patent. As well, in many sectors such as communications, software and defence equipment, the use of innovative technologies may have implications for a larger client’s national security. In such cases, a Canadian-based innovator may have no choice but to shift production to the larger market¹¹ or to turn down suitors from one country deemed to pose threats to its client’s national security. This dynamic may act to limit the growth potential of such innovative industries in Canada.

For these reasons, the foreign trade element of a successful innovation strategy requires more than trade agreements. There may be merit in initiatives such as government-sponsored patent

pools, by which the government creates a more level international playing field for businesses wishing to expand from a Canadian base and in which the public would have made a significant investment (Balsillie, cited in Senate of Canada 2017a). Many countries, ranging from Taiwan and South Korea to France, use these pools. Even the US government partners in patent pools with the private sector (Miller and Sofio 2015). However, such a patent pool should operate at arm’s length from government to minimize the risk of wasting the public’s investment in R&D.

A more general approach might see the Canadian government spend more on military or other sensitive technologies that would benefit key allies and in procedures that mitigate the risk these allies may perceive from Canadian-based suppliers. In return, Canada should obtain concrete assurances that Canadian-based operations of firms involved in producing and operating sensitive technologies, will, after suitable vetting, be treated as trusted suppliers on an ongoing basis.

A Pro-Innovation Tax System

A pro-innovation tax system would not discourage human capital investment or risk-taking. Such a system would pay attention to the relation between capital taxes paid by individuals and businesses and the value of public services they receive. An imbalance in this respect can affect incentives for growth, for example when property tax burdens fall disproportionately on businesses or urban centres.

At another level, a pro-innovation tax system would not discourage income derived from talent, effort or investments in inherently risky business ventures that can potentially yield large rewards both

9 A term used in Miller and Sofio (2015).

10 Some of which are colloquially known as “patent trolls.”

11 Such as seems to have been the concern with satellite maker MacDonald Dettwiler and Associates, after it was purchased by a US firm.

to those who invest in them and to society at large. Specifically, it would be sensitive to the fact that steeply progressive income taxes and high payroll taxes discourage head offices to locate or expand in Canada (Egger, Radulescu and Strecker 2012).

Accordingly, a pro-innovative tax system would tilt toward taxing consumption (with suitable rebates for those below a certain level of income) in preference to income or payroll. An income-tax system could help approximate consumption taxation by sheltering most savings from taxes.

To encourage the investment and entrepreneurship required for innovation, investment and business income could also be taxed separately from and at a lower rate than labour earnings (Milligan 2014). Some Nordic countries follow this path, although Milligan's scheme requires higher marginal tax rates on labour incomes, which some contend discourage the accumulation of talent and effort. Alternatively, business income could be subject to taxation on a cash-flow basis, allowing immediate deduction of capital expenses, with taxes owed only on the realization of positive business cash flow (Boadway and Tremblay 2016).

An even better proposal to make the tax system more conducive to business growth is to allow businesses to deduct an "Allowance for Corporate Equity" from their otherwise taxable revenues, so that only above-normal profits are taxed. This would, among other features, redress the current imbalance between equity and debt financing, providing a more stable set of financing options for growing companies (Robson and Laurin 2017). It would support start-ups that build on human rather than physical capital.

In Canada, the low business tax rate and generous Scientific Research and Experimental Development (SR&ED) tax credits for businesses

below a certain size reward companies that remain small. However, an innovative economy requires business taxation that rewards growth more than it rewards staying small – with preferential treatment accruing to young firms rather than to small firms, *per se* (Howitt 2015).

More generally, a number of analysts and panels have pointed to the seeming inability of the SR&ED tax credit – widely regarded as one of the most generous in the world – to translate into innovation and, more importantly, into innovation-based economic growth. Some have recommended tightening the system. The Jenkins report, for one, called for making part of the SR&ED credit non-refundable. That is, the company could use the credit only if it became profitable. The Jenkins report also recommended reinvesting the sums thus saved into other, more active innovation programs.

Yet, R&D tax credits such as Canada's are spreading to a number of other jurisdictions, and there is strong and consistent evidence that they do stimulate R&D expenditures – albeit in a way that also encourages some gaming of the system depending on the types of expenditures that can be claimed.

The problem with SR&ED seems to be our almost unique reliance on this form of generic support for up-front R&D expenses (OECD 2010). Despite reductions in the rate of corporate income taxation between 2000 and 2012, Canada's tax rate on new investment, all federal and provincial taxes considered, has taken a turn for the worse since then and remains above the OECD average (Bazel and Mintz 2016).¹² The upshot is that, as noted in Parsons (2011) the rewards in Canada remain skewed toward R&D itself rather than commercialization and new product development.

12 This ranking does not take into account other harmful distortions in Canada's business taxation regime such as the tax differential between services and other activities, as pointed out by Bazel and Mintz, or the deleterious impact on investment of high business property tax rates (Found 2017).

Parsons recommends the use of a so-called “patent box” that would tax the income from IP and production at internationally competitive levels. However, patent boxes have been criticized for giving rise to international tax-arbitrage opportunities that distort the hoped-for link between the research and the resulting IP with the growth of new domestic economic activity. Under pressure from partner economies, former heavy users of the patent box – such as Ireland – are now switching to a “knowledge-box” approach that allows such special tax treatment but only for patentable knowledge initially developed within the home country. However, this is still not a panacea since innovation is not necessarily based on what can be patented.

In sum, a shift toward consumption taxation and lower business taxation, especially for firms making upfront investments (including in R&D) or for young and growing firms, while removing penalties on equity financing seems one promising way for tax policy to promote innovation.

A Pro-Innovation Intellectual Property Regime¹³

The ability of innovators to protect their innovation via patenting or other means has an important influence on innovation activity, since the costs of making innovations available to many users are typically low compared to their development costs (OECD and Eurostat 2005). Indeed, patent protection spurs corporate R&D spending (Blit and Zelaya 2015) although, the relationship between patent protection and actual innovation performance is less straightforward.

The key social reason to award patents, apart from any incentive they provide to invent or innovate, is that they reveal the innovator’s secrets. Patent holders are awarded a time-limited

monopoly over their inventions – a monopoly that in other respects might be considered economically inefficient – in exchange for this socially beneficial knowledge. In that sense, patent protection can also encourage the disclosure and spread of technology more generally (Gallini 2002).

In today’s world, firms combine inputs from many sources – including designs, data, scientific formulas and other R&D products – across borders to develop their ideas and products. A minimum level of protection for IP, or IP-intensive products as they cross borders, facilitates the beneficial international exchange of goods and services. Indeed, trade historically has tended to increase between countries that strengthen their IP protection (Akkoyunlu 2013). Harmonization of IP practices between countries also might reduce the compliance costs of firms engaged in trade.

Harmonization is the principal rationale for modern international trade agreements that typically require signatories to comply with standalone provisions concerning IP safeguards, including setting a minimum duration for patent or copyright protection and addressing cooperation and enforcement issues – the latter ideally focused on instances when infringement is on a commercial scale. These measures can set a useful minimum floor level protection across countries.

Clearly, the short-term interest of economies whose export structure is IP-intensive drives their push for stronger protection. Indeed, historically, the strength of an economy’s IP protection often follows its evolution from IP importer to exporter. Therefore, stronger protection for a smaller net IP importer like Canada is the (net) price to pay for entering into wider, beneficial agreements and for not being seen as a free rider on others’ innovation efforts.

13 Much of this section is from Schwanen and Jacobs (2017).

As with patents, the question of whether copyright spurs more creation than otherwise is debatable. By all accounts, the positive effects of extending copyright protection beyond its current length in Canada (life of the author plus 50 years) is marginal. Arguably, however, the fact that copyright is held by someone who has a commercial interest in the dissemination of the copyrighted product encourages its more economical availability (Landes and Posner 2002).

In short, the argument for stronger patent and copyright protection in Canada rests mostly on the benefits of international harmonization. These benefits are potentially at the expense of users who, in a different world, might have cheaper or quicker free access to patented or copyrighted products. But, there is much exaggeration about what these costs would be (Jacobs and Schwanen 2017, pp.7-12 and 14-15).

To minimize these costs, Schwanen and Jacobs (2017) explain that, Canada can implement a number of strategies. Regarding the impact of stronger copyright protection, defensive strategies might include the building of public domain with scientific and other papers based on government-subsidized work, extensive “fair-use” provisions for copyrighted material, and maintaining Canada’s “notice-and-notice” system to address on-line copyright infringement, against attempts in trade negotiations to move to a more aggressive “notice-and-takedown” system.

With respect to pharmaceuticals, cost-reducing measures may involve public purchasing strategies, additional resources to speedily approve safe drugs and other patented products, addressing costly discrepancies between federal approval and provincial purchasing policies, and ensuring vigorous competition in the sector.

The protection and use of proprietary data obtained from tests or directly from consumers, whether in rapidly evolving sectors such as biotechnology, or from on-line activity, should be carefully monitored and circumscribed as necessary to limit socially costly anti-competitive impacts.

At the same time, the federal government is working with reformist forces in partner countries and global forums to reduce patent thickets and the relative power of patent trolls to challenge successful Canadian operating companies.

A Pro-Innovation Competition Policy

As the Wilson report stated, “For **countries**,¹⁴ competition is the strongest spur to innovation and value creation.”

Competition is as much about flair for branding and for what customers want, as it is about volume produced or reducing costs. One observer attributes the fact that Canadians, as she sees it, don’t commonly have a flair for branding, partly because of a heavy regulatory hand such as that which maintains the beer store quasi-monopoly in Ontario (Mandel-Campbell 2007).

More broadly, lack of competition can stifle new ideas. Sectors that rely on governments to protect them from competition often, in turn, spend their resources on maintaining, controlling and distributing the above-normal profits derived from the absence of non-competition at the expense of the broader society (See, for example, Green 1983 on the effects of agricultural marketing boards).

In general, competition challenges the status quo by providing more choice, leading to improved outcomes. This includes competition between publicly owned entities, or between publicly and privately owned ones. Indeed, a private monopoly can be as inefficient as a public one, as shown by the

14 Their emphasis.

initially anti-competitive outcome when Mexican telecoms were privatized.

Almost by definition, innovation does not unfold in the context of the basic economic model that assumes perfect information and perfect competition. Innovation means firms seeking to gain an advantage over established competitors by offering new and hence differentiated products, or new ways of delivering products to consumers, in the hope of capturing returns of which market participants were previously unaware. In this dynamic setting, competition will spur innovation in businesses that are ahead of, or near, the technological frontier (Howitt 2015), while it may also induce businesses that have fewer options to drop out, as noted above in the trade policy discussion.

In this context, supporting innovation by promoting competition does not mean necessarily aiming for a world in which there is a high number of firms competing in a given market. In some sectors, technological considerations dictate a natural monopoly, which then should be regulated in a way that would approximate the outcomes of a competitive environment. In others, competition authorities can sometimes best facilitate innovation by allowing efficiency as a defence in merger and acquisition cases that appear to limit domestic competition but will likely drive costs and prices down, particularly when considered in the context of global markets or in light of technological change.

In general, however, sound competition policy means limiting the number of regulated sectors or activities exempt from normal competition policy rules via the so-called regulated-conduct doctrine. As well, a periodic review of new technologies' impact on competition and, more specifically, on consumers is warranted. All these considerations require sophisticated analysis and enforcement.

A complementary policy would remove unnecessary barriers to foreign direct investment (as proposed in Bergevin and Schwanen 2011, and Safarian 2015).

Innovation-Friendly Approach to Regulation

Innovation is inversely related to the difficulty of doing business (Kritikos 2014, 2). Therefore, regardless of a government regulation's objective (such as health, safety, consumer or environmental protection), it should ideally be no more burdensome than necessary to achieve it.

One obvious way to minimize any burden is to seek regulatory harmonization with established international standards. In certain situations, governments can also usefully encourage private actors to develop their own ways to meet regulatory objectives in the public interest. This might work well when governments may not have as good a handle on how a specific government-imposed standard or regulation may affect a particular activity. Indeed, private regulation is an emerging policy area in which governments' key role is to ensure that participants in standards-setting bodies do not engage in anti-competitive practices or otherwise collude to mislead the public (Herman 2012).

Self-regulation can also be an attractive model when there is a lack of regulatory coherence among different levels and areas of government, especially when different arms of government. Regulatory arms of government might be "captured" by private causes and act against the broader public interest.

One example concerns of lack of regulatory coherence is Ontario's management of Crown forests. From the perspective of environmentally sustainable economic development, it would be better to sell forestry companies longer leases, which would encourage them to manage the land more efficiently from the joint perspective of economic efficiency and environmental stewardship – as opposed to seeing these two goals as competing ones under different sets of rules. The idea would be to encourage forestry companies to become more like tree farmers and less like tree cutters (Cockwell 2012).

Another example when self-regulation might be a positive is in emerging or highly technical

areas where government, as well as the public, may have difficulty judging the risks posed by new technologies and products. The same applies to the potential impact of blockchain technology on financial stability. While such lack of authoritative information about risks to the public may play into the hands of unscrupulous private operators, it can also play into the hands of organizations that systematically sow fears about technological and economic developments, while washing their hands of job losses and other negative impacts that stopping innovation can have on communities.

One response to this uncertainty is to create a path for the introduction of the technology or product that allows for experimentation before new regulations are widely implemented, unless there are reasons to believe the innovation poses a risk of harm. This path can be coupled with careful, authoritative and public monitoring of an innovation's impact to ensure public-policy objectives remain transparently paramount.

For example, in areas where emerging technologies compete against established ones, regulatory sandboxes¹⁵ should be available for innovators to experiment with rules suited to the new technology. Rules regarding corporate governance, takeover and mergers, and the financial system will also affect the innovation environment. In general, they must encourage safety, integrity and sound decisionmaking from a social perspective, while not discouraging efficiencies and innovative change.

Acceptance of Innovation in Civil Society and the General Public

A major potential drag on innovation's spread

is the rational political reaction of those who feel threatened by its consequences – such as the disruption of one's job, the declining value of one's skills or business, or even disruption in personal arrangements. At the limit, innovation can generate a more widespread fear of massive economic redistribution or raise ethical issues that may affect social cohesion more broadly, raising the question of who benefits from innovation. After all, for the early thinkers behind the concept of artificial intelligence (AI), the end result would be innovation that simply feeds on itself without the need for humans.

Governments, institutions or cultures not ready to tackle these concerns risk a backlash against innovation. Conversely, addressing these concerns substantively and proactively may well help pave the way for a smoother acceptance of useful innovation. (For a review of the tension between innovation's social benefits and stresses and potential policy implications, see Murray 2016).

The state of opportunities for education and job skills upgrading, for entrepreneurship or for social amenities or temporary income support for those negatively affected by innovation can help mitigate tensions between those who are beneficiaries of such changes and others, potentially at the losing end, who may exert pressures for the status quo. Therefore, innovation policy should concern itself with both paving the way for the benefits from long-term growth created by useful innovation and with supporting those who do not benefit from those changes. This support might encompass policies that strengthen individuals' ability to partake of emerging opportunities in the labour market and provide a modern safety net for those

15 According to the Startup Nations Summit 2017 website (<http://summit.startupnations.co/regulatory-sandboxes-innovation-policy-making>): "A regulatory sandbox creates a 'safe space' in which businesses can test innovative products, services, business models and delivery mechanisms in the context of regulation, with regulators . . . The sandbox is intended for testing new solutions, in real life situations, where potential consumer or user needs need to be demonstrated, as well as the need to manage potential risks and to respect binding legal rules."

who can't or are in transition (such as the one discussed in Hicks 2017).

These policies are preferable to reacting to innovation change by legally requiring individual jobs to conform to a rigid ideal, or making it difficult for employers to adjust their workforce in down times. Such legally-imposed measures may be antithetical to innovation at least in some rapidly evolving industries. Where such legislation has been tried, it has limited new job openings (Busby and Muthukumaran 2016). Tax policies that are better calibrated to a work environment in flux include, for example, generous child-care tax credits (Laurin and Milligan 2017) or income-averaging for tax purposes (Gordon and Wen 2017).

GOVERNMENT POLICIES ACTIVELY SUPPORTING INNOVATION

In addition to being receptive to innovators, to being innovative itself and to establishing the right framework policies, government can also play a crucial role in actively supporting beneficial innovation in the broader economy.

Past public reports on innovation policy, such as those mentioned throughout this *Commentary*, have emphasized potential improvements in governments' direct funding of R&D – whether it is conducted in departments and agencies of government itself, in other publicly supported institutions or in the private sector. As well, recent reports have emphasized the potential for more activist procurement policies in support

of innovation and advocated for innovation “marketplaces.”

How can policymakers best leverage these tools and minimize their potential downside? I begin with a little discussed but historically very effective government role in spurring innovation: setting goals for the outcomes of publicly supported science and innovation efforts.

Articulating Public Needs

Governments that establish public policy goals requiring major innovative efforts should articulate the need for innovations necessary to attain welfare-enhancing public objectives and make available the technology they have developed. Historic examples of government's role as an innovation spark include the establishment of major prizes and institutions devoted to resolving important economic and political issues, such as launching the Royal Observatory at Greenwich in 1676 and instituting in 1714 the Longitude Prize (Sobel 1996).¹⁶ As well, governments have supported scientific and technical progress via war efforts or from the space race, while also supporting major innovations in agriculture. The human genome project, supported by the US National Institutes of Health and the Global Positioning System are other such examples.

What these examples have in common is the clear articulation of public needs or goals, which were not being addressed by private industry or by existing institutions, thus spurring public support toward meeting or achieving them.¹⁷ Yet Canadian

16 The prize was instituted because of the increasing economic costs and even deadly mistakes caused by the inability to determine longitude at sea. Spurred by this reward, an accurate “Sea Watch” was finally built and first tested in 1761.

17 To be clear, this does not mean that every such government effort leads to a useful innovation. Far from it. Nor would we argue that none of these innovations would have occurred if governments had not played a role. As noted elsewhere, governments in many ways can best support innovation by removing the barriers they impose on it. In practice, many innovations that are clearly valued by the private market today have been spurred by governments at some stage – the question is how to recognize and facilitate this kind of useful interaction between public goals and the marketplace. For an excellent overview of ways in which government innovation policy can seek to avoid crowding out private innovative activities, see de Rassenfosse et al. (2011).

innovation policy has in the past 40 years tended to be confined to accumulating the ingredients of innovation such as a strong university research capacity, subsidizing private-sector research and development or supporting privately led projects through the Industrial Research Assistance Program (IRAP) or concierge services of the National Research Council (NRC). At the same time, it has shied away from linking innovation policy more directly to important technical, economic or social needs still in search of solutions, or even to connecting government science programs more effectively to public needs.¹⁸

Of course there are many examples of governments spending funds in the name of innovation or economic development with little regard to their likelihood of creating something new or viable. As former University of Toronto president David Naylor (2012) wrote: “Canada’s innovation landscape is cluttered with brokers, buffer bodies, boutiques and regional boondoggles. Cleaning up this landscape would save hundreds of millions if not billions of dollars.”

Notwithstanding these instances of government waste, R&D directed to public goals has been, over time, one of the most important factors behind innovations subsequently adopted by the marketplace. Marshalling resources efficiently toward the pursuit of important public objectives should be a major concern of innovation policy. In cases where the Canadian economy is too small to gather the critical mass required to make an impact toward a particular goal, Canadian contribution to, or leadership of, international R&D efforts should be supported, provided the results are available to Canadian entrepreneurs.

Public Procurement

Public procurement, the purchase of goods and services by public entities, represents more than 10 percent of GDP in OECD countries and is seen as a key innovation driver in several of them – a view supported by empirical evidence from Germany and the US (Appelt and Galindo-Rueda 2016).

The Jenkins report identified the strategic use of public sector procurement to foster innovation as one of the three most significant gaps in Canada’s innovation system. Since that report, the Canadian government has rolled out the “Build in Canada Innovation Program (BCIP),” which helps individuals and emerging businesses move “their innovative goods and services from the final stages of research and development into the market” by “providing innovators with a successful use of their pre-commercial innovations.” The program helps young companies evaluate their product via the NRC, and provides them with a first buyer when their innovative product meets a military, health, environmental or other need of the federal government.

This program helps address one of the Jenkins report’s key concerns, namely the commercialization gap faced by emerging and innovative Canadian firms and, specifically, the ability of these firms to compete against those in other countries with access to similar programs, such as the US Small Business Innovation Research program.

One of the BCIP’s goals is to help improve government efficiency through the purchase of innovative products. Although this type of marriage between innovation and procurement goals is ideal, any program whose aim is to support business innovation through public procurement (that is,

18 See Doern et al. 2016 on the morphing of what used to be more goal-oriented science and technology policies into broader research and innovation policies, still based on science but with less technology and more of a business and social science foundation.

outside of R&D or commercialization support, per se) should be subject to strict requirements that it demonstrably leads over time to commercially sustainable activities. As emphasized by Jenkins, such a program should also support innovation “regardless of sector, technology or region.” In other words, programs that seek to support Canadian business innovators through government procurement practices should not play favourites – they should seek to support the general emergence of viable innovative firms that help fulfill underlying procurement goals.¹⁹

The word “program” evokes centralized or at least coordinated rules and efforts. However, innovation could also be spurred by more decentralized procurement decisions, or at least decisions less subject to inherently anti-innovation constraints in the broader public sector. For example, the current RFP process for Ontario hospitals describes not only needs and funding but also exact solutions and specifications of how needs are to be met, pushing Canadian innovators to seek their first purchasers abroad (White 2017).

Some government spending on goods and services must, by definition, be leading edge in order to effectively achieve its public-policy objectives, and thus form an integral part of countries’ innovation environment. In that light, the significant weaknesses in Canada’s defence procurement policy in relation to needs (Canada 2017b) is a major difference between Canada and virtually every comparable country.

Support for Research and Development and Risk-Taking

In tune with the recent review of fundamental science policy, known as the Naylor report (Canada

2015), there is no getting around the need for public support for world-leading researchers and their teams and for research infrastructure.

As prominent education researchers have noted, there is no contradiction between funding more fundamental, curiosity-based or, in the words of the Naylor Report, “investigator-driven” research and supporting the more goal-oriented, product-development efforts of businesses that may face scale or financing constraints (Usher 2017). At the same time, it is crucial not to confuse the two by requiring, as a condition of funding, that fundamental research be outcomes-oriented (Howitt 2013, Usher 2017). Some goal-oriented research will also feed the need for new fundamental research. However, these two research strands each have a distinct importance, as well as distinct risk and reward profiles, which must give rise to distinct types of support.

The Naylor Report does not address government’s own research institutions. On that topic, the Jenkins report endorsed the need to make available direct governmental support for the R&D efforts of small and medium-sized businesses, especially in core areas of public interest or that build on Canada’s comparative advantages, as IRAP now does. Crucially, IRAP also encompasses platforms for foreign collaboration.

Universities, colleges and polytechnics can also perform similar services, raising questions of potential duplication with federal government efforts or, for that matter, among federal and provincial government research organizations. On the latter front, the 2006 creation of Innoventures Canada seems a good step toward collaboration among different research organizations. However, Canada as a medium-sized, decentralized country, also needs a harmonizing mechanism between

19 A corollary of this principle is that programs that subsidize businesses in specific sectors, for specific technologies or through regional development efforts, should also be required to demonstrably lead to commercially viable operations.

federal and provincial regulators whose decisions affect the spread of innovative goods and services.

Policymakers should pay attention to the positive role that prizes recognizing individuals, organizations and firms that generate innovation from a domestic base could play in spurring innovation. As well, policymakers should recognize how philanthropy has spurred innovation in the past as an integral component of innovation policy (Godin 2017, 133-134).

While the availability of venture and growth capital is important, policies supporting them need to be more than just about liquidity. The goal is finding ways to build firms from a Canadian base – at the periphery of the world’s largest and most sophisticated market. In this context, legal advice and mentorship are just as important as liquidity. Another challenge of government support for venture and growth capital in Canada is not only delivering returns that have been sparse in the past, but doing so in a way that preserves the flexibility of investors and managers while remaining accountable to the public (Rémillard 2017). Truly, it is to create an ecosystem supporting growth of innovative firms from a Canadian base.

The Canadian venture capital (VC) challenge (and even that of funding subsequent stages of business growth) is likely related to different risk appetites evoked earlier in this *Commentary*. It seems important, in this context, to not only support the emergence of a home-grown VC industry, as Canadian governments have been doing through the Venture Capital Action Plan, but to also ensure the removal of barriers to startups competing with incumbents. This, in turn,

would involve implementing the pro-innovation framework policies described above.

In sum, public support for R&D and innovative business growth can and should be provided along a “continuum from ideas to commercially successful innovation (Jenkins report).” I have already noted, along with Jenkins and others such as the OECD, Canada’s particularly strong reliance on government support for innovation in the SR&ED tax credit. However, the way the credit is designed can incent firms to stay small, which is antithetical to ensuring that innovation leads to jobs and income growth. Having said this, direct government support does not always or even typically generate higher innovation activity or higher returns (Appelt et al. 2016). Here, again, what works best will depend on the suite of other factors that are conducive to innovation.²⁰

Indeed, it is one thing to point to the possibility of more direct support for innovation, relative to indirect support such as tax credits. It is another for governments to be disciplined in terms of how this support should best be directed.

Better Focusing Support without Attempting to Pick Winners

Theory and practice suggest that governments seeking to pick innovation winners on a regular basis will fail, because no one can really predict the drivers of economic growth ten or even five years ahead (Harberger 1998, Howitt 2015).

The so-called entrepreneurial state faces, this general issue – where to invest on behalf of taxpayers to spur economic growth? It is possible

20 Echoing some of the themes in these pages, Bernanke (2011) suggests that government support for innovation makes the most sense when it focuses on large-scale projects, as in the case of military or space projects; encourages diversity and competition among projects, while holding them to rigorous peer-review; avoids feast and famine funding cycles that may destroy the value of long-run investments; and occurs in the context of access to a sufficient pool of scientific and engineering resources, including through international scientific cooperation.

for governments to try to take measures to help shape an industry they see as a promising source of good jobs, and of broader economic development beyond that industry proper. But there are many pitfalls to these types of interventions. In particular, governments have not been historically successful when defying their country's existing comparative advantages – such as trying to build an auto industry when there is not already sufficient established business or technical expertise to help build it around. And any successful instance of such interventions cannot be easily replicated across countries or across time (Lin 2009).

For similar reasons, clusters are also not something governments can easily create where none exist. They can certainly focus on policies that remove roadblocks to growth in strategic industries, as the federal government seems to have done with its six Economic Strategy Tables in Budget 2017.

What to make, then of Ottawa's additional budget announcement of a "supercluster" strategy whereby it will select and financially support collaborative proposals by industry, financial, educational and other domestic players to develop and commercialize promising technologies? This approach is probably a lot better than the earlier excessive reliance on "spray and pray" approaches. And, superclusters can be built around technologies and not necessarily around specific industries, companies or regions. But while there are parallels between the superclusters and the innovation marketplaces that had been recommended by the Advisory Council on Economic Growth (2017b), the chosen approach may not fully exploit the potential of such marketplaces.

The Advisory Council (p.8) defines innovation marketplaces as bringing "together researchers and entrepreneurs with public and private customers around a common business challenge. These

marketplaces match innovation demand from corporations and governments with innovation supply from researchers and entrepreneurs. This matchmaking strengthens supply-chain relationships and the flow of information, thereby fueling further innovation."

Participants are typically linked through online platforms, although sometimes participants actually physically meet. A key benefit is to improve the information flow between potential users and providers of innovative solutions. This enables more potential providers (e.g., SMEs partnering with academic researchers) to support public, philanthropic or industry objectives. Examples include the innovation marketplace of the US defense department²¹ and USAid.

Such marketplaces have more specific, practical objectives than the goal of encouraging clusters, per se. In that sense, they are compatible with government exercising one of its key innovation policy roles – financially supporting vigorous experimentations around key challenges such as those in the health, security, social or environmental fields.

CONCLUSION

To generate desirable innovation and ensure Canadians benefit from innovation policies, it is not enough to simply gather together key ingredients necessary for innovation to take place, or even support activities correlated with innovation.

In this *Commentary*, I have tried to show that innovation policy should pay particular attention to who innovators are and to what makes them tick. In light of this, we have assessed the types of framework policies, as well as more active forms of government support, that are more likely to see innovators want to stay in, or come to, Canada to do research, develop products and build the

21 See <http://www.defenseinnovationmarketplace.mil/about.html>.

competitive businesses and institutions that will employ Canadians in the future.

Innovation is not likely to be mainly determined by government policies, and it certainly is not mechanistically driven by them. At the same time, even the intellectual and business cultures that are at the heart of how innovation actually works can, over time, be influenced by policy, including of course the rules that innovators face in the marketplace that encourage risk-taking and innovation in the public sector itself.

In this context, we discussed some core innovation challenges and a range of ways in which governments can positively influence innovation, including by ensuring that Canadians participate in and benefit more from it. The implicit plea is to not pull a given policy lever in isolation from the whole suite of policies affecting innovation – including those that constitute barriers to it. Such a holistic approach is more likely than a piecemeal one to successfully drive the goal of Canada becoming a nation of innovators.

REFERENCES

- Advisory Council on Economic Growth (AECG). 2017 a. *Positioning Canada as a Global Trading Hub*. Available at: <http://www.budget.gc.ca/aceg-ccce/pdf/trade-commerce-eng.pdf>.
- . 2017b. *Unlocking Innovation to Drive Scale and Growth*. Available at: <http://www.budget.gc.ca/aceg-ccce/pdf/innovation-2-eng.pdf>.
- Advisory Panel on Federal Support for Fundamental Science (C. David Naylor, Chair). 2017. *Investing in Canada's Future: Strengthening the Foundations of Canadian Research*.
- Aghion, Philippe, et al. 2017. *Living the American Dream in Finland: The Social Mobility of Inventors*. Draft Paper.
- Agrawal, Ajay, Alberto Galasso, and Alexander Oettl. 2017. "Roads and Innovation" in *Review of Economics and Statistics* 99(3). July.
- Appelt, Sylvia, et al. 2016. *R&D Tax Incentives: Evidence on Design, Incidence and Impacts*. OECD Science, Technology and Industry Policy Papers, No. 32, Paris: OECD Publishing.
- Appelt, Silvia, and Fernando Galindo-Rueda. 2016. *Measuring the Link between Public Procurement and Innovation*. OECD Science, Industry and Technology Working Papers 2016/03. Paris: OECD Publishing.
- Baldwin, John R., Dany Leung, and Luke Rispoli. 2014. "Canada-United States Labour Productivity Gap Across Firm Size Classes." Statistics Canada Research Paper, Catalogue 15-206-X – No. 033. January.
- Baldwin, John R., and Yan Beiling. 2015. *Empirical Evidence from Canadian Firm-level Data on the Relationship Between Trade and Productivity Performance*. Statistics Canada Economic Analysis (EA) Research Paper Series No. 97.
- Bazel, Philip, and Jack Mintz. 2016. *2015 Tax-Competitiveness Report: Canada is Losing its Attractiveness*. University of Calgary School of Public Policy Research Papers, Vol. 9, Issue 37, November.
- Bergevin, Philippe, and Daniel Schwanen. 2011. *Reforming the Investment Canada Act: Walk More Softly, Carry a Bigger Stick*. Commentary 337. Toronto: C.D. Howe Institute. December.
- Bernanke, Ben S. 2011. *Promoting Research and Development: The Government's Role*. Speech at the Conference on "New Building Blocks for Jobs and Economic Growth," Georgetown University, Washington, D.C., May 16.
- Blit, Joël, and Mauricio Zelaya. 2015. "Do Firms Respond to Stronger Patent Protection by Doing More R&D?" University of Waterloo Working Paper.
- Blomqvist, Åke, and Colin Busby. 2017. *The Paradox of Productivity, Technology, and Innovation in Canadian Healthcare*. Commentary 480. Toronto: C.D. Howe Institute. May.
- Boadway, Robin, and Jean-François Tremblay. 2016. *Modernizing Business Taxation*. Commentary 452. Toronto: C.D. Howe Institute. May.
- Brander, James A. 2010. "Presidential Address: Innovation in Retrospect and Prospect." *Canadian Journal of Economics* 43 (4). Initially presented at the Canadian Economics Association annual conference, May 2010.
- Brydon, Robbie, et al. 2014. "Measuring Innovation in Canada: The Tale Told by Patents Applications." E-Brief. Toronto: C.D. Howe Institute. November.
- Canada. 2006. *People and Excellence: The Heart of Successful Commercialization*. Volume I: Final Report of the Expert Panel on Commercialization.
- . 2008. *Compete to Win*. 2008. Competition Policy Review Panel. Final Report (Wilson Report). June.
- . 2015. *Unleashing Innovation: Excellent Healthcare for Canada*. Advisory Panel on Healthcare Innovation (David Naylor, Chair). Ottawa.
- . 2017. *Building a Strong Middle Class: Budget 2017*. Tabled in the House of Commons, Ottawa, March 22.

- . 2017b. Standing Senate Committee on National Security and Defence. *Military Underfunded: The Walk Must Match the Talk*. Report. April.
- Cockwell, Malcolm. 2012. *The Forests of Canada A Study of the Canadian Forestry Sector and Its Position in the Global Timber Trade*. Working Draft. Toronto: Limberlost Forest & Wildlife Reserve.
- Council of Canadian Academies. 2013a. *Paradox Lost: Explaining Canada's Research Strength and Innovation Weakness*.
- . 2013b. *Innovation Impacts: Measurement and Assessment*. Report of The Expert Panel on the Socio-economic Impacts of Innovation Investments.
- Crépon, Bruno, Emmanuel Duguet, and Jacques Mairesse. 1998. *Research, Innovation and Productivity: An Econometric Analysis at the Firm Level*. NBER Working Paper 6696. August.
- Crespo, Aranzazu. 2012. *Trade, Innovation and Productivity: A Quantitative Analysis for Europe*. European Firms in a Global Economy Project Working Paper 62. October.
- Curtis, John M. 2016. *Trade and Innovation: Policy Options for a New Innovation Landscape*. E15 Expert Group on Trade and Innovation – Policy Options Paper No. 13. Geneva: International Centre for Trade and Sustainable Development and World Economic Forum.
- Dachis, Benjamin. 2013. *Cars, Costs and Congestion: A New Approach to Evaluating Government Infrastructure Investment*. Commentary 385. Toronto: C.D. Howe Institute. July.
- Deloitte. 2015. “2015 Global Survey of R&D Incentives.”
- de Rassenfosse, Gaétan, Paul Jensen, and Elizabeth Webster. 2011. *Understanding Innovation: The Role of Policy Intervention: A Report for Victorian Department of Treasury and Finance*. Melbourne Institute of Applied Economic and Social Research.
- Dinopoulos, Elias, and Paul Segerstrom. 1999. “A Schumpeterian Model of Protection and Relative Wages.” *American Economic Review* 89 (3): 450–72.
- Doern, G. Bruce, David Castle, and Peter W.B. Phillips. 2016. *Canadian Science, Technology and Innovation Policy: The Innovation Economy and Society Nexus*. McGill-Queen's University Press.
- Egger, Peter, and Christian Keuschnigg. 2010. *Innovation, Trade and Finance*. Paper prepared for the conference on Trade and Finance, organized by GEP, University of Nottingham; CESifo, University of Munich; and the Murphy Institute, Tulane University; Munich April 21-22.
- Egger, Peter, Doin Radulescu and Nora Strecker. 2012. “Effective Labor Taxation and the International Location of Headquarters.” CESifo Working Paper No. 3822. May.
- Ezell, Stephen J., Adams B. Nager and Robert D. Atkinson. 2016. *Contributors and Detractors: Ranking Countries' Impact on Global Innovation*. Washington, DC: Information Technology and Innovation Foundation.
- Feldstein, Martin. 2017. “Underestimating the Real Growth of GDP, Personal Income, and Productivity.” *Journal of Economic Perspectives*, 31 (2): 145-164. Spring.
- Found, Adam. 2017. *Flying Below the Radar: The Harmful Impact of Ontario's Business Property Tax*. E-Brief. Toronto: C.D. Howe Institute.
- Gallini, Nancy T. 2002. “The Economics of Patents: Lessons from Recent U.S. Patent Reform.” *Journal of Economic Perspectives*. 16(2): 131-54.
- Global Competition Review. 2016: *Rating Enforcement*. London, Global Competition Review.
- Godin, Benoît. 2017. *Models of Innovation: The History of an Idea*. Cambridge, Massachusetts and London, England, The MIT Press.
- Goldthwaite, Richard A. 1993. *Wealth and the Demand for Art in Italy 1300-1600*. The Johns Hopkins University Press.
- Gordon, Daniel V., and Jean-François Wen. 2017. *A Question of Fairness: Time to Reconsider Income-Averaging Provisions*. Commentary 494. Toronto: C.D. Howe Institute. October.

- Gordon, Robert J. 2016. *The Rise and Fall of American Growth: The U.S. Standard of Living since the Civil War*. Princeton University Press.
- Green, Christopher. 1983. "Agricultural Marketing Boards in Canada: An Economic and Legal Analysis." *University of Toronto Law Journal* 33.
- Greenspon, Jacob, and Erika Rodrigues. 2017. *Are Trends in Patenting Reflective of Innovative Activity in Canada?* Ottawa: Centre for the Study of Living Standards Research Report 2017-02. April.
- Herman, Lawrence L. 2012. *The New Multilateralism: The Shift to Private Global Regulation*. Commentary 360. Toronto: C.D. Howe Institute. August.
- Hicks, Peter. 2017. *Toward a New Balance in Social Policy: The Future Role of Guaranteed Annual Income within the Safety Net*. Commentary 465. Toronto: C.D. Howe Institute. January.
- Howitt, Peter. 2013. *From Curiosity to Wealth Creation: How University Research Can Boost Economic Growth*. Commentary 383. Toronto: C.D. Howe Institute. June.
- . 2016. *Mushrooms and Yeast: The Implications of Technological Progress for Canada's Economic Growth*. Commentary 433. Toronto: C.D. Howe Institute. September.
- Independent Panel on Federal Support to Research and Development. 2011. *Innovation Canada: A Call to Action*. Report of the Panel ("Jenkins Report"), Public Work and Government Services Canada.
- Kerr, Sari Pekkala et al. *High-Skilled Migration and Agglomeration*. CESifo Working Paper No. 6241. December.
- Khan, Zorina B., and Kenneth L. Sokoloff. 1992. 'Schemes of Practical Utility': *Entrepreneurship and innovation Among 'Great Inventors' in the United States, 1790-1865*. NBER Working Paper on Historical Factors in Long Run Growth, Historical Paper No. 42
- Kritikos, Alexander S. "Entrepreneurs and their impact on jobs and economic growth." *World of Labour* 2014:8. Bonn: Institut zur Zukunft der Arbeit (IZA).
- Krugman, Paul. 1991. *Geography and Trade*. MIT Press.
- Lamoreaux, Naomi R., and Kenneth L. Sokoloff. 1999. "Inventors, Firms and the Market for Technology in the Late Nineteenth and early Twentieth Centuries," in Naomi R. Lamoreaux, Daniel M. G. Raff and Peter Temin, eds.: *Learning by Doing in Markets, Firms and Countries*. University of Chicago Press.
- Landes, William M., and Richard A. Posner. 2002. "Indefinitely Renewable Copyright." John M. Olin Law & Economics Working Paper 154. Chicago: University of Chicago Law School.
- Laurin, Alexandre, and Kevin Milligan. 2017. *Tax Options for Childcare that Encourage Work, Flexibility, Choice, Fairness and Quality*. Commentary 481. Toronto: C.D. Howe Institute. May.
- Lileeva, Alla, and Daniel Trefler. 2010. "Improved access to foreign markets raises plant-level productivity... for some plants." *The Quarterly Journal of Economics* 1025 (3): 1051-1099.
- Lin, Justin Yifu. 2009. *Economic Development and Transition: Thought, Strategy and Viability*. New York: Cambridge University Press.
- Lipsey, Richard G. 1996. *Economic Growth, Technological Change, and Canadian Economic Policy*. C.D. Howe Institute Benefactors Lecture. Vancouver. November 6.
- Mandel-Campbell, Andrea. 2007. *Why Mexicans don't drink Molson: Rescuing Canadian Business from the Suds of Global Obscurity*. Douglas & McIntyre.
- Milligan, Kevin. 2014. *Tax Policy for a New Era: Promoting Economic Growth and Fairness*. C.D. Howe Institute Benefactors' Lecture. Toronto. November 25.
- Mohnen, Pierre, and Bronwyn H. Hall. 2013. "Innovation and Productivity: An Update." *Eurasian Business Review* 3(1): 47-65.
- Mukherjee, Siddhartha. 2011. *The Emperor of All Maladies: A Biography of Cancer*. London: Fourth Estate.
- McNish, Jacquie, and Sean Silcoff. 2015. *Losing the Signal: The Untold Story Behind the Extraordinary Rise and Spectacular Fall of Blackberry*. New York: Flatiron Books.

- Miller, Scott, and Daniel G. Sofio. 2015. Government-Sponsored Patent Pools: Addressing “Innovation Mercantilism.” Washington, D.C. Center for Strategic & International Studies. Scholl Chair in International Business. December.
- Murray, Alexander. 2016. *Developing an Inclusive Innovation Agenda for Canada*. Centre for the Study of Living Standards paper prepared for Innovation, Science and Economic Development Canada. December.
- Mysicka, Robert, and Marty McKendry. 2013. *Beer, Butter, and Barristers: How Canadian Governments Put Cartels before Consumers*. Commentary 382. Toronto: C.D. Howe Institute. May.
- Naylor, David. 2012. “Innovation in Canada: Pitfalls and Potential.” *Policy Options Politiques*. August.
- Nicholson, Peter. 2016. “Canada’s Low-Innovation Equilibrium: Why It Has Been Sustained and How It Will Be Disrupted.” *Canadian Public Policy/Analyses de politiques*, November.
- Nordhaus, William D. 1997. “Do Real-Output and Real-Wage Measures Capture Reality? The History of Lighting Suggests Not,” in Bresnahan, Timothy F. and Robert J. Gordon, eds., *The Economics of New Goods. Studies in Income and Wealth*, vol. 58, Chicago: University of Chicago Press.
- Norman, Donald A. 2013. *The Design of Everyday Things*. New York. Basic Books.
- OECD and Eurostat. 2005. *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*. Third edition.
- OECD. 2010. *R&D Tax Incentives: Rationale, Design, Evaluation*. November. Available at: <https://www.oecd.org/sti/ind/46352862.pdf>.
- . 2012. *Lessons from PISA for Japan. Strong Performers and Successful Reformers in Education*. Paris: OECD Publishing.
- . 2013. *Supporting Investment in Knowledge Capital, Growth and Innovation*. Paris: OECD Publishing.
- . 2016. *OECD Science, Technology and Innovation Outlook 2016*. Paris: OECD Publishing.
- . 2017. *Public Procurement for Innovation: Good Practices and Strategies*. OECD Public Governance Reviews. Paris: OECD Publishing.
- Parsons, Mark. 2011. *Rewarding Innovations: Improving Federal Tax Support for Business R&D in Canada*. Commentary 34. Toronto: C.D. Howe Institute. September.
- Plant, Charles, et al. 2016. *Losing Count: Canada Has Been Underreporting Business Expenditures on Research and Development*. An Impact Brief, Impact Centre and University of Toronto. April.
- Plant, Charles. 2017. *Canada’s Patent Puzzle: Do We Have a Problem with Securing Patents or with the Commercialization of Them?* An Impact Brief, Impact Centre and University of Toronto. May.
- Rémillard, Richard. 2017. *Government Intervention in Venture Capital in Canada: Toward Greater Transparency and Accountability*. Commentary 466. Toronto: C.D. Howe Institute. January.
- Safarian, A.E. 2015. *Simplifying the Rule Book: a Proposal to Reform and Clarify Canada’s Policy on Inward Foreign Direct Investment*. Commentary 425. Toronto: C.D. Howe Institute. May.
- Schwanen, Daniel. 2010. “What’s Cooking in Canadian Innovation?” Op-ed in *The Globe and Mail*, February 2.
- . 2016. “At the Crossroads: Canada’s Trade Priorities for 2016.” E-Brief. Toronto: C.D. Howe Institute. March.
- Schwanen, Daniel, and Jacobs, Aaron. 2017. *Patents, Copyright and Competition: Assessing the Impact of Trade Deals on Canada*. Commentary 474. Toronto: C.D. Howe Institute. March.
- Senate of Canada. 2017a. *Free Trade Agreements: A Tool for Economic Prosperity*. Report of the Standing Senate Committee on Foreign Affairs and International Trade. February.
- . 2017b. *Military Underfunded: The Walk Must Match the Talk*. Report of the Standing Senate Committee on National Security and Defence. April.

-
- Sobel, Dava. 1996. *Longitude: The True Story of a Lone Genius Who Solved the Greatest Scientific Problem of His Time*. Penguin Books.
- Sulzenko, Andrei. 2016. "Canada's Innovation Conundrum: Five Years after the Jenkins Report." Montreal: Institute for Research on Public Policy.
- Taylor, Mark Zachary. 2016. *The Politics of Innovation: Why Some Countries Are Better than Others at Science and Technology*. Oxford University Press.
- The E15 Initiative. 2016. "Trade and Innovation: Policy Options for a New Innovation Landscape. Strengthening the Global Trade and Investment System for Sustainable Development." Synthesis of the Policy Options No. 13.
- Usher, Alex. 2017. "Making "Applied Research" Great Again." *One Thought to Start Your Day* blog, Higher Education Strategy Associates. June 6.
- White, Shelley. 2017. "Why can't our entrepreneurs sell their health innovations here?" *The Toronto Star*, April 13.
- Wright, Gavin, and Jesse Czelusta. 2004. "The Myth of the Resource Curse." *Challenge* 47(2): 6-38.
- Yakabuski, Konrad. 2007. "It Ain't Pretty: This Tree Could Save Canada." *Report on Business Magazine*. December.

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