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Book

New thinking on innovation

Centre for International
Governance Innovation

New Thinking on Innovation

Foreword by Nobel Laureate Michael Spence

Special Report

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Special Report

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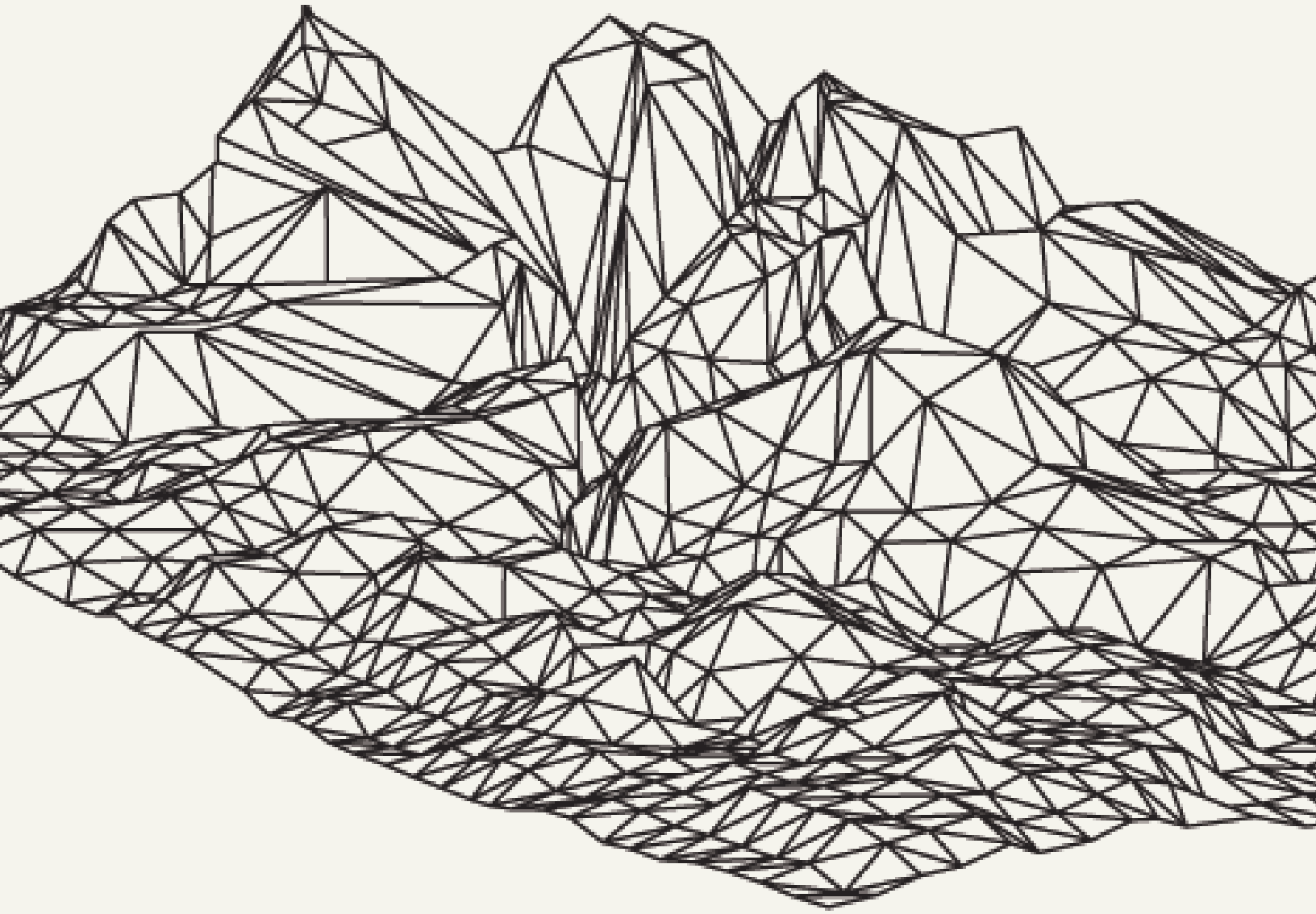
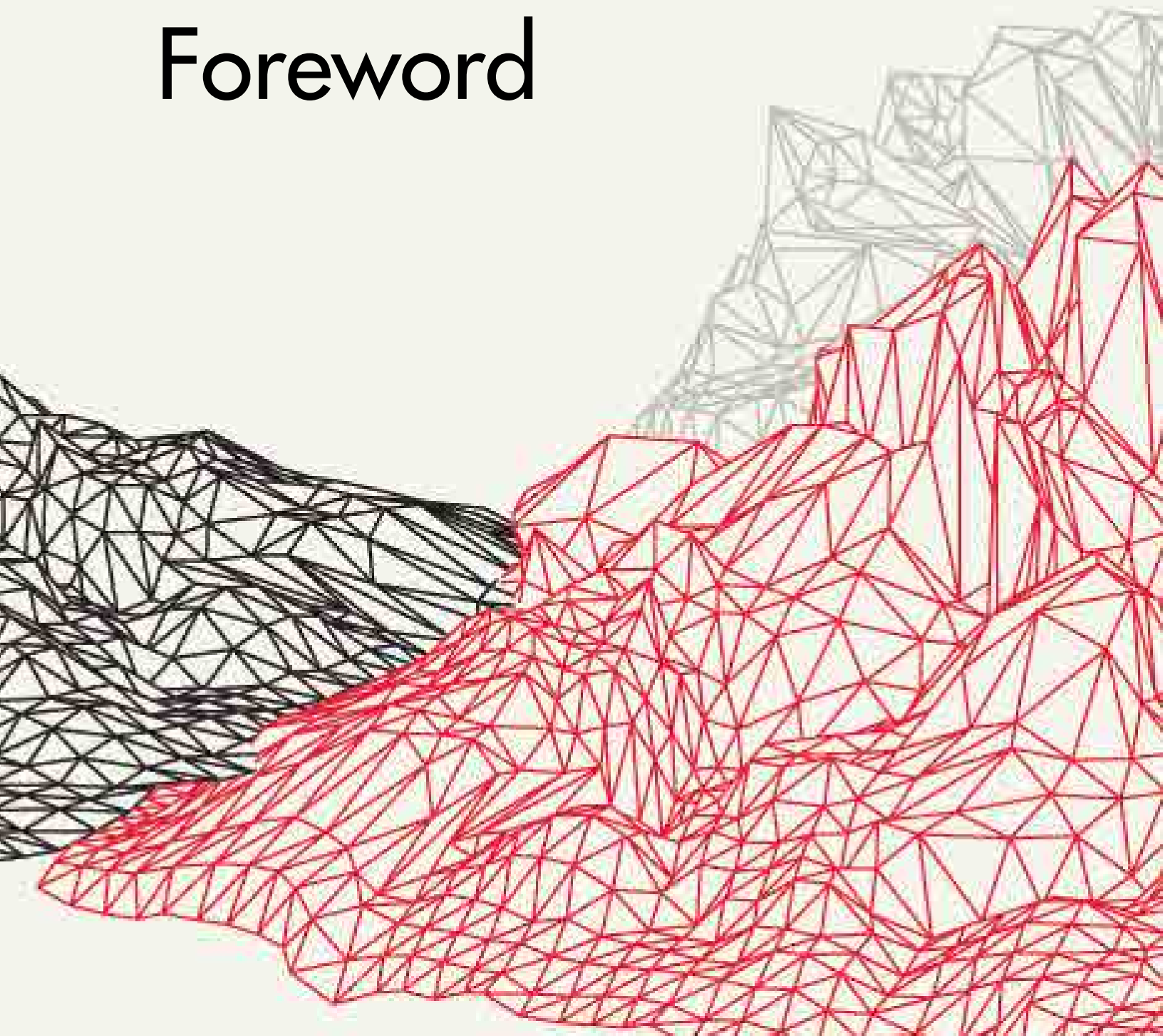
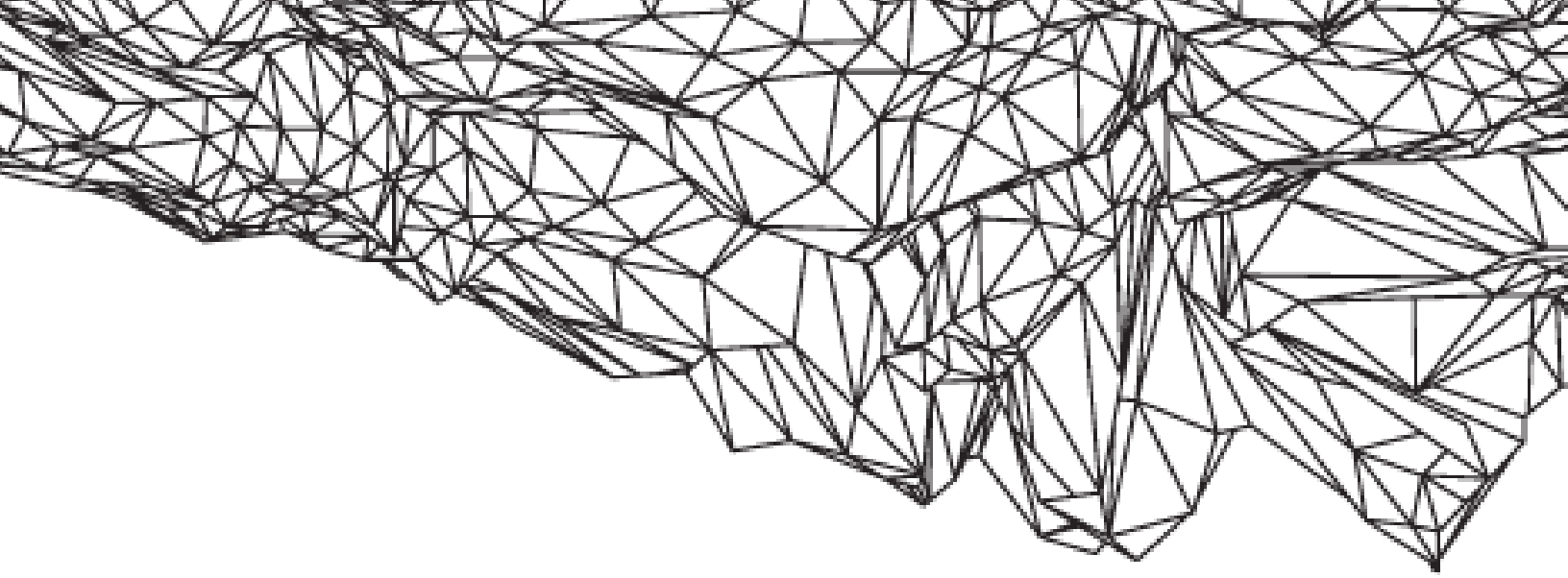


Foreword





Innovation and Prosperity in an Age of Transition

Michael Spence

The post-World War II period of unprecedented growth and prosperity has brought home lessons, many of which are relevant today and likely will be in the future. Several things stand out after studying the growth patterns and challenges in a wide range of developed and developing countries for the past 15 years.

The global economy has been a key enabler of growth, war recovery and, in particular, progress in developing countries. No one foresaw the scope of the potential for poverty and reduction and prosperity that actually occurred, when the architecture was put in place.

But, in the last few decades, that architecture has had difficulty keeping up with the realities. Previously small and relatively poor countries are now major players. Digital technology has vastly expanded the ability to manage complexity in global supply chains at low cost. Trade data, built on the assumption that something is produced in country A and consumed in country B, has very little to do with the reality in many sectors. And, perhaps most importantly, trade in services (broadly defined to include intangibles and intellectual property [IP]), initially a tiny fraction of global trade, may become the dominant part in the future.

While there are common ingredients across countries in successful growth recipes, there are also striking differences. Local conditions, history, governance and path dependence make each case to some extent idiosyncratic. Unfortunately, this valid proposition is sometimes taken as a rationale for not learning from the vast array of experience of other countries.

A subset of countries endowed with substantial natural resource wealth have struggled — to varying degrees of success — with the complex challenge of exploiting that wealth for the benefit of their citizens while creating a broad and diverse range of employment opportunities.

It is awfully easy to create a structure in which the tradable sector is dominated by natural resources and a disproportionate share of employment lies in the non-tradable service side of the economy.

Economic and social progress and well-being have been most pronounced in countries that viewed people as their most important investable resource. In the end, they are the source of innovation, creativity and dynamism. Of course complementary tangible and intangible assets are required to exploit this potential.

While trade in goods — and more recently and increasingly in services — has played a crucial role in postwar growth and prosperity and an extended period of productivity and income growth has been fuelled, in part, by specialization, there are reasons, related to convergence and digital technology, to suspect that while this engine of productivity growth will not disappear, it may not be as powerful in the future as it has been in the past 70 years. And, in any case, its contours and shape will likely change dramatically.

Downward trends in productivity growth are widespread across advanced economies, yet the press is full of daily stories of breakthroughs in various fields of science and technology. This juxtaposition presents a puzzle, at least in the minds of most concerned citizens. How can you have robots that can see, have fine motor skills and can assemble electronics, or machines that learn to do things that humans do, but do not know exactly how we do them (all breakthroughs of the past 10 years), and not see effects in productivity?

There are a number of factors, not mutually exclusive, that may help frame the issue.

One is time lags. It took more than 40 years in the "computer" age before anything plausible showed up in productivity data, and that was only after the internet became generally accessible in the 1990s. In the more distant past, science and mathematics was advancing nicely for several centuries before the Industrial Revolution in Britain.

A second perspective is what might be called the Robert Gordon view.[1] Modern technologies may just not be as powerful in driving productivity as those of the past. It is hard to think of an innovation that has the impact of electricity. It is worth taking seriously because you do not want to fight a battle you cannot win. My view is that at this stage, it is impossible to know whether digital technologies (given a long enough run measured in decades) will have impacts of comparable magnitude to those of the past. But there is nothing in economic theory or history that suggests that innovation produces a steady non-cyclical stream of productivity-enhancing technologies.

In addition, there is some evidence that productivity in research and development is declining. An interesting recent paper by Bloom et al. (2017) pursues this line of enquiry. For a brief glimpse, Moore's law[2] is still operating in the semi-conductor area, with enormous paradigm-changing effects, artificial intelligence being an example as it is reliant on huge databases, fast networks and large amounts of computing power. But the effort measured in engineering talent required to achieve each successive doubling is also increasing exponentially.

A third possibility, one that I have suggested, is that a substantial fraction of the creative talent in developed economies (where incomes are already high) has gone and continues to go into innovations that are not targeted primarily at enhancing productivity and income growth. By far the largest federal research budget in the United States is the National Institutes of Health (US$32 billion), whose target is advances in biomedical science. It funds the research of tens of thousands of the top research talent in the country. There may be secondary spillover effects on economic performance as conventionally measured, but it certainly is not the primary goal. There is nothing wrong with this. Society does not have a singular goal (something like income or wealth). Through market choices and government/collective choice mechanisms, we may have been busy doing something else. And there are many other examples, such as social media. Value creation is not the same thing as rising incomes, although they are not completely orthogonal.

In reviewing performance and opportunities going forward, it is important to devote some effort to clarifying economic and social goals and ways of measuring them. This is not at all to dismiss concerns about downward productivity trends and their effect on growth in incomes, but rather to put it in perspective. If, as seems likely, achieving inclusive growth patterns, improving

1 Gordon (2016) situates recent developments in information and communications technology in the larger cycle of economic progress and finds they do not match up to the impacts of five previous great inventions — electricity, urban sanitation, chemicals and pharmaceuticals, the internal combustion engine and modern communication.

2 The number of transistors in a dense integrated circuit doubles about every two years.

health and longevity, enhancing social interaction or evolving to more sustainable growth patterns are societal priorities, it is reasonable to expect that both talent and innovation will show up in multiple places in pursuit of multiple goals, and there may be some diminution in GDP growth as a result.

I do not have any doubt that if Canada somehow found a way to devote most of its vast creative talent to productivity enhancement in the conventional sense, it would yield impressive results. But not necessarily better ones. This dilemma should not proscribe a quest to understand productivity trends and their link to other outcomes, such as income and well-being in Canada, and, ideally, lead to strategies to improve productivity and welfare outcomes.

That said, it is useful to search for ways to unlock underutilized resources that can help expand the scope of innovation. Key among these is the policy environment, at home and abroad, within which innovation occurs. The central thesis of the essays collected in this report is that in Canada this environment can be improved.

There is, however, a major set of challenges, ones that have been at least two or three decades in the making. Growth patterns in developed economies have been characterized by job and income polarization. This pattern has been documented across most of the Organisation for Economic Co-operation and Development countries; the patterns are not identical country to country. Roughly, middle-income jobs have been declining and upper- and lower-income jobs have been increasing. As a result, in part, the income distributions have flattened out, declining in the middle and rising at both ends.

Although it is not the whole story, globalization (historically) and digital technology (both historically and prospectively) are correctly viewed as major contributing factors. Countries mitigated these forces and the trends to varying degrees via income redistribution and the provision of very high quality public services, including health, education and social security. Canada and the Nordic countries have done it better than, say, the United States and the United Kingdom. This shows in the income distributions, but also in differences in essential public services and social security systems.

But even these admirable mitigating policies and structures do not completely solve the problem. Perhaps the best way to put it is to ask the question, what is the future of work for various segments of the population — in the face of increasingly powerful digital technologies, in the automation and disintermediation of blue- and white-collar jobs, in additive manufacturing and in machine learning and artificial (terrible term) intelligence? It appears that our economies have been and still are in a pattern of rapid structural evolution. It is being called the fourth industrial revolution. I am not sure what the second and third are.

A subset of routine jobs is being removed from the economy, while other jobs are being created. Digital technologies are expanding the scope of what is "routine" — formerly "codifiable," and increasingly "machine learnable." People with jobs in this expanding "routine" category are being sideswiped by the economic and structural trends. Repositioning their skills and human capital to thrive in the "new" economy is an investment that may or may not have a positive return, and the private and social returns to these investments may be quite different.

Huge rents accrue to those who create and successfully commercialize the IP that drives the fourth industrial revolution, thus creating a nexus of issues around wealth accumulation and its distribution, and the quality of work.

These are major challenges. Innovative societies are going to meet them more effectively. Indeed, institutional and social innovation is going to be an essential ingredient in effective adaptation, a core implication of the many recommendations in this report.

Let me offer a few thoughts on trade, related again to digital technology. Globalization can be understood in terms of cross-border flows of goods and services, capital, information, technology and ideas, and people. Of these, the least mobile are people. In the postwar period, global supply chains have been organized with increasing efficiency and granularity, quite rationally around utilizing the least mobile resource, people or human capital. In some areas, such as manufacturing, this may change. Digital technologies are likely to reduce the labour content of many manufacturing processes enough that labour availability and cost will no longer be the decisive factor. That is in process now. As a result, manufacturing becomes mobile, and labour is no longer the decisive factor. What will happen as a result is that manufacturing will move either toward centres of innovation and excellence in the respective technologies and industries or toward the final market. Probably we will see both. The latter implies relocalization. But it is easy to see a likely trend in which centres of innovation become even more decisive factors in attracting economic activity and jobs.

Trade, except for trade in natural resources, will continue to be organized around finding and utilizing valuable pools of human capital, which is still relatively immobile, but it will be trade in services, in ideas, in IP and in brands and brand images. Some of those ideas and IP will be embedded in physical products. But what are being shipped around are really the embedded results of innovation.

These are major changes. No one can see the future in clear precise outline, especially out 10 years or more. Generally, I think there is a tendency to think that what is possible to imagine or foresee will happen faster than it actually does. But it seems reasonable to operate on the premise that societies that will navigate successfully through a period of profound structural change and thrive in terms of growth, quality of work and adaptability to change are those in which creativity is fully unleashed and innovation is deeply embedded in the culture.

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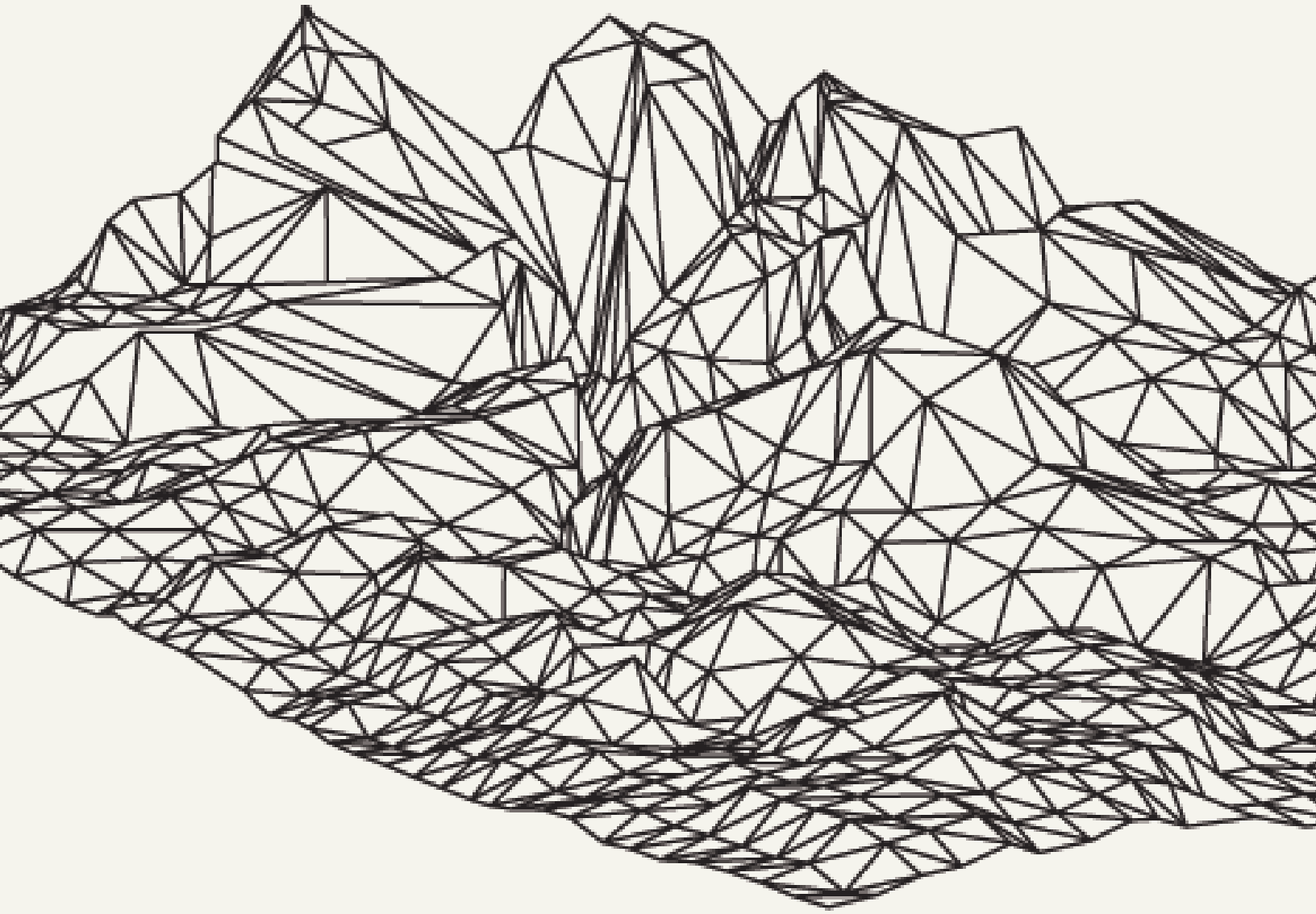
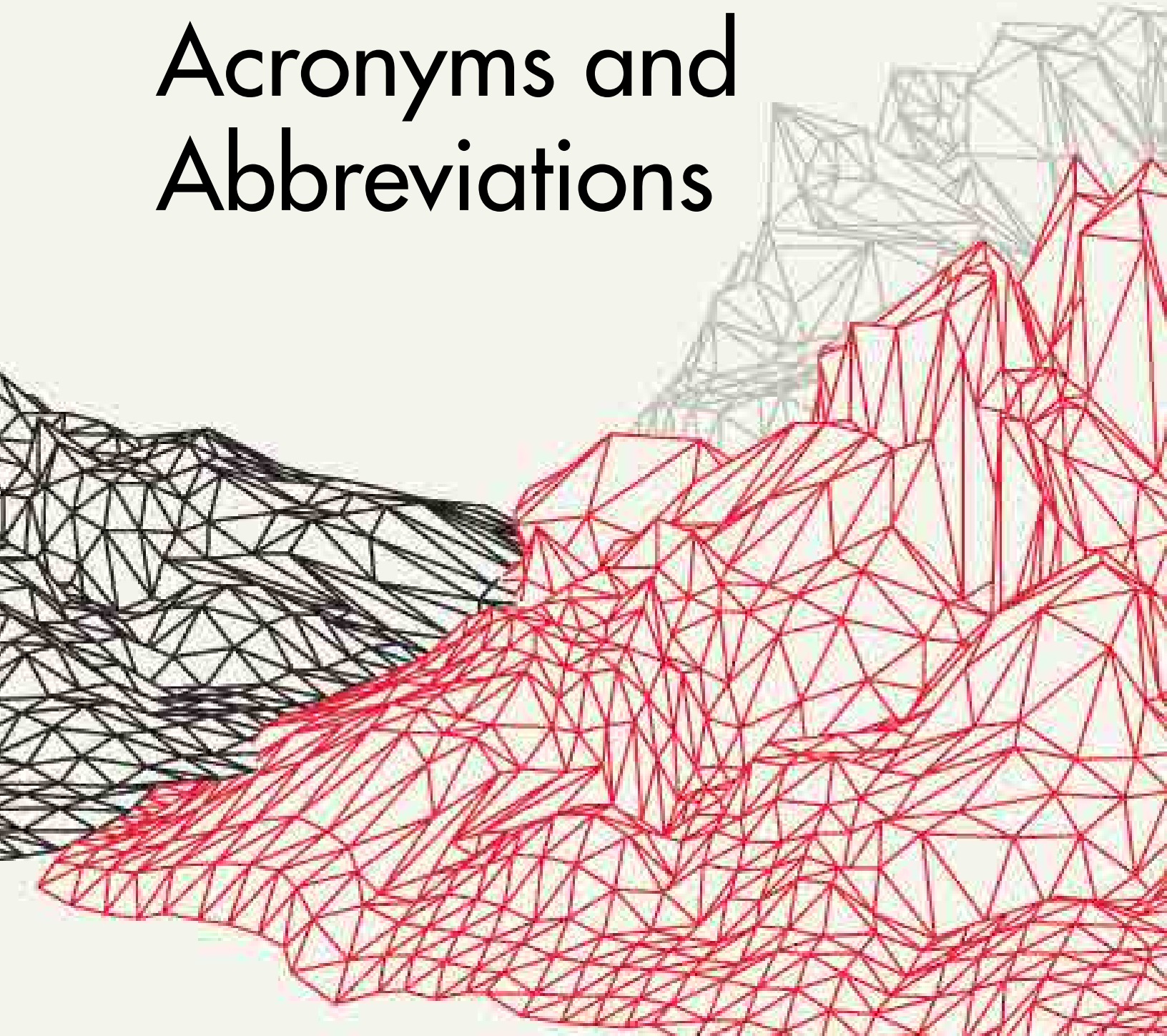
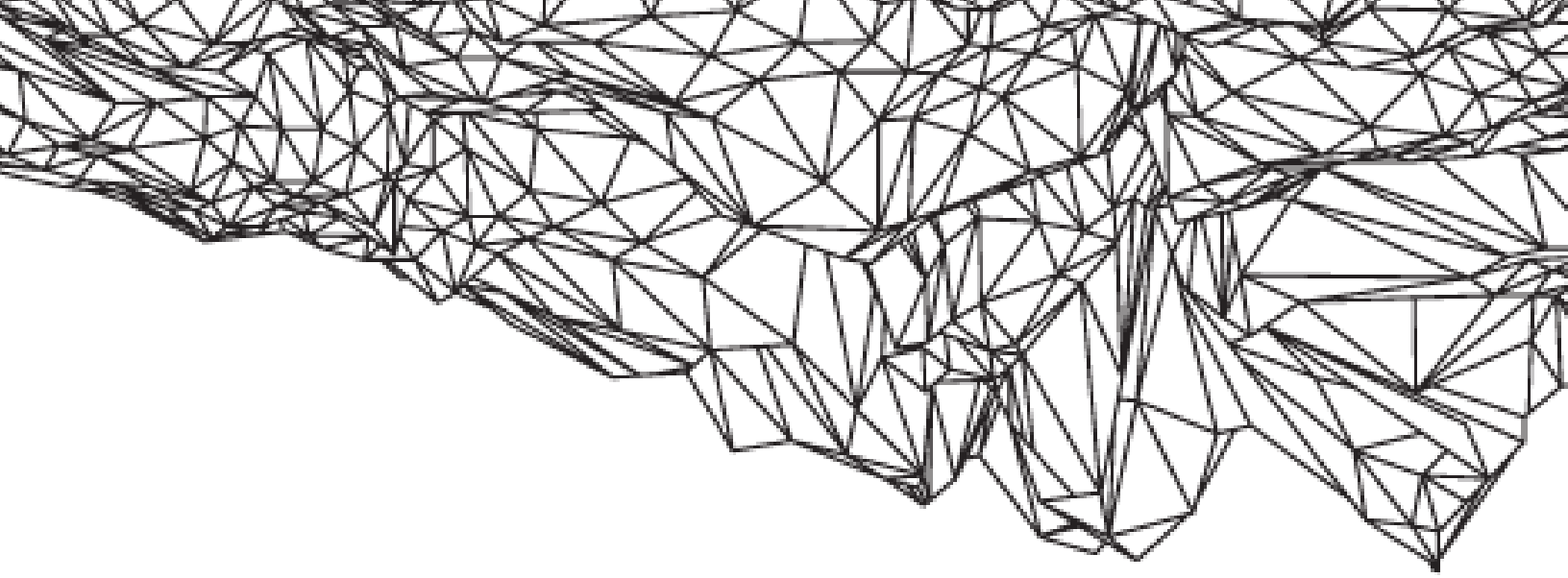
About the Author

Michael Spence, a Nobel laureate in economics, is professor of economics at New York University's Stern School of Business, a distinguished visiting fellow at the Council on Foreign Relations, a senior fellow at the Hoover Institution at Stanford University and advisory board co-chair of the Asia Global Institute in Hong Kong. He was the chairman of the Commission on Growth and Development, an independent international body that from 2006 to 2010 analyzed opportunities for global economic growth, and is the author of *The Next Convergence: The Future of Economic Growth in a Multispeed World*. He co-chairs, with Joseph Stiglitz, the Global Commission on Economic Transformation.



Acronyms and Abbreviations

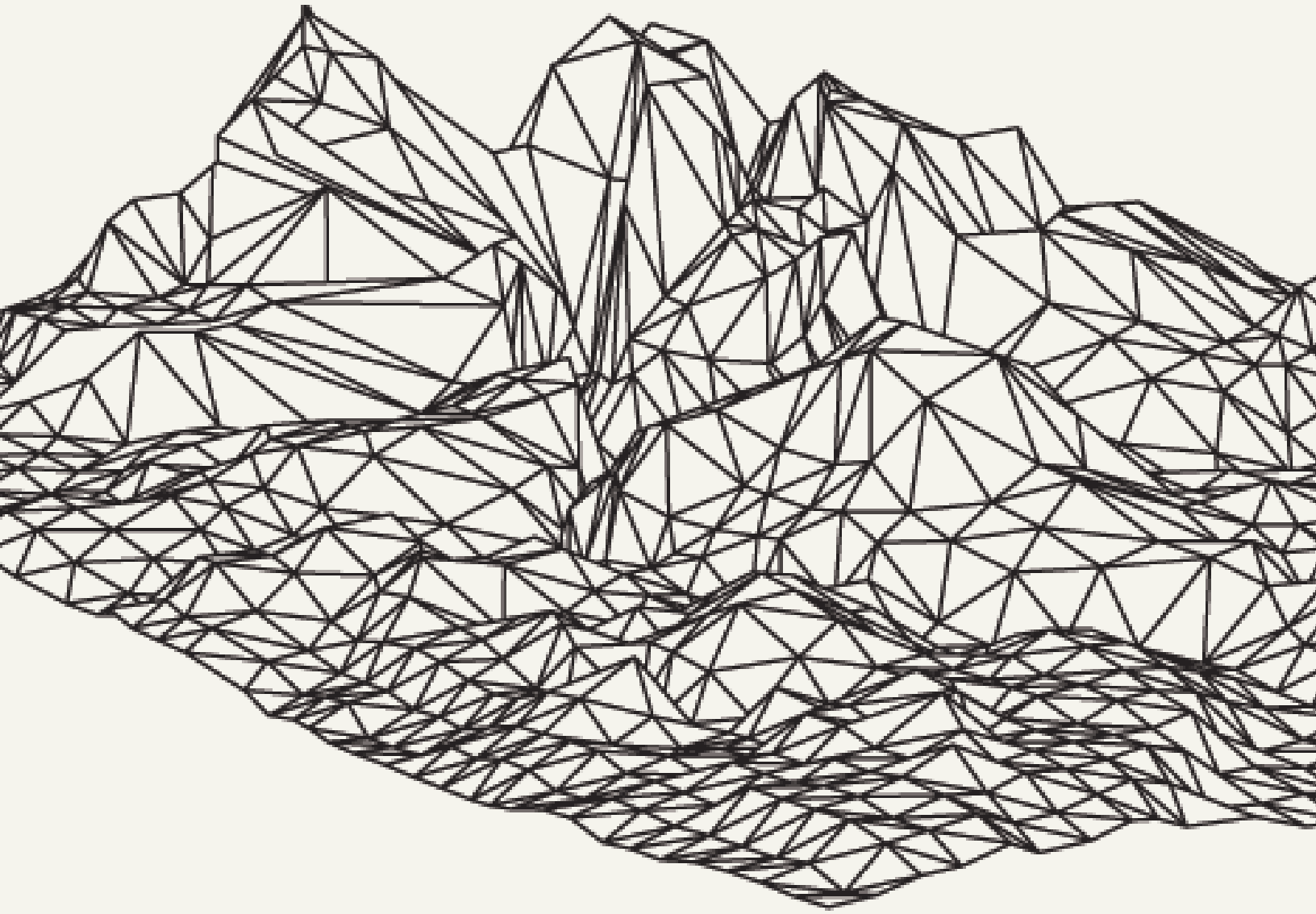




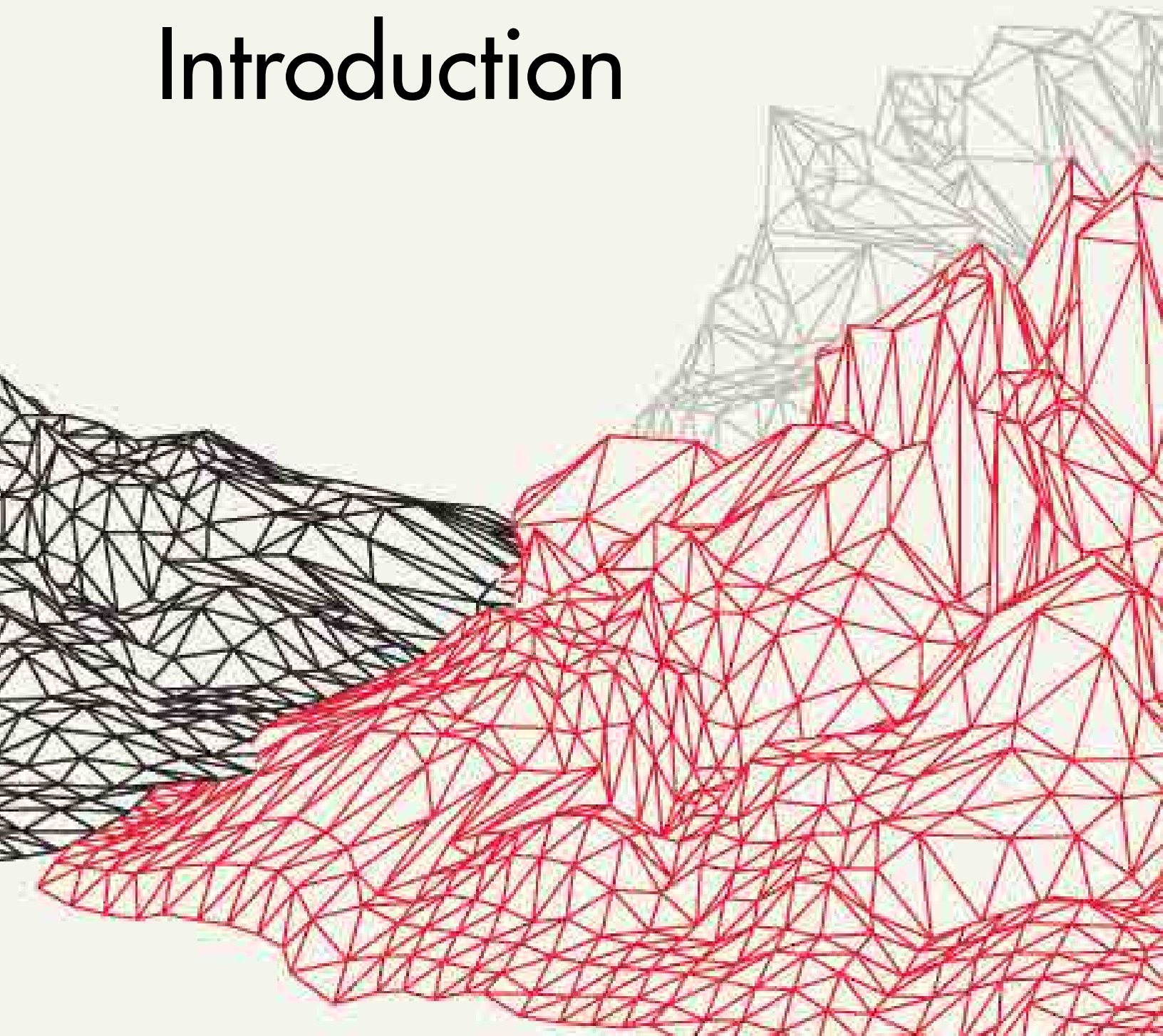
Acronyms and Abbreviations

AI	artificial intelligence
AVPA	asset value protection agreement
BERD	business expenditures on research and development
BCIP	Build in Canada Innovation Program
CCA	Council of Canadian Academies
CETA	Canada-EU Comprehensive Economic Trade Agreement
CIPO	Canadian Intellectual Property Office
CUSFTA	Canada-US Free Trade Agreement
DFAIT	Department of Foreign Affairs and International Trade
DWL	deadweight losses
EFF	Electronic Frontier Foundation
FDI	foreign direct investment
FSB	Financial Stability Board
FTAs	free trade agreements
FTO	freedom to operate
G20	Group of Twenty
GERD	gross domestic expenditure on research and development
GFC	global financial crisis
GFTO	generalized freedom to operate
GIs	geographical indicators
GM Canada	General Motors of Canada Company

GVCs	global value chains
ICSID	Centre for Settlement of Investment Disputes
IEEE	Electrical and Electronics Engineers Standards Association
IP	intellectual property
IPRs	intellectual property rights
ISDS	investor-state dispute settlement
ISPs	internet service providers
IT	information technology
M&A	merger and acquisition
MFN	most-favoured nation
MNE	multi-national enterprise
MOOCs	massive open online courses
MVP	minimal viable product
NAFTA	North American Free Trade Agreement
NIE	new institutional economics
OECD	Organisation for Economic Co-operation and Development
PCA	Permanent Court of Arbitration
PROs	public research organizations
R&D	research and development
RFI	requests for information
RFPs	requests for proposals
ROI	return on investment
S&P's	Standard and Poor's
SBIR	Small Business Innovation Research
SDTC	Sustainable Development Technology Canada
SEPS	standard-essential patents
SMEs	small and medium-sized enterprises
SPFs	sovereign patent funds
SSHRC	Social Sciences and Humanities Research Council
STEM	science, technology, engineering and math
STI	science, technology and innovation
TPP	Trans-Pacific Partnership
TRIPS	Trade-Related Aspects of Intellectual Property Rights
ULCs	unit labour costs
USITC	US International Trade Commission
USTR	US Trade Representative
VC	venture capital
WTO	World Trade Organization



1 Introduction




CONCEPT
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IDEAS
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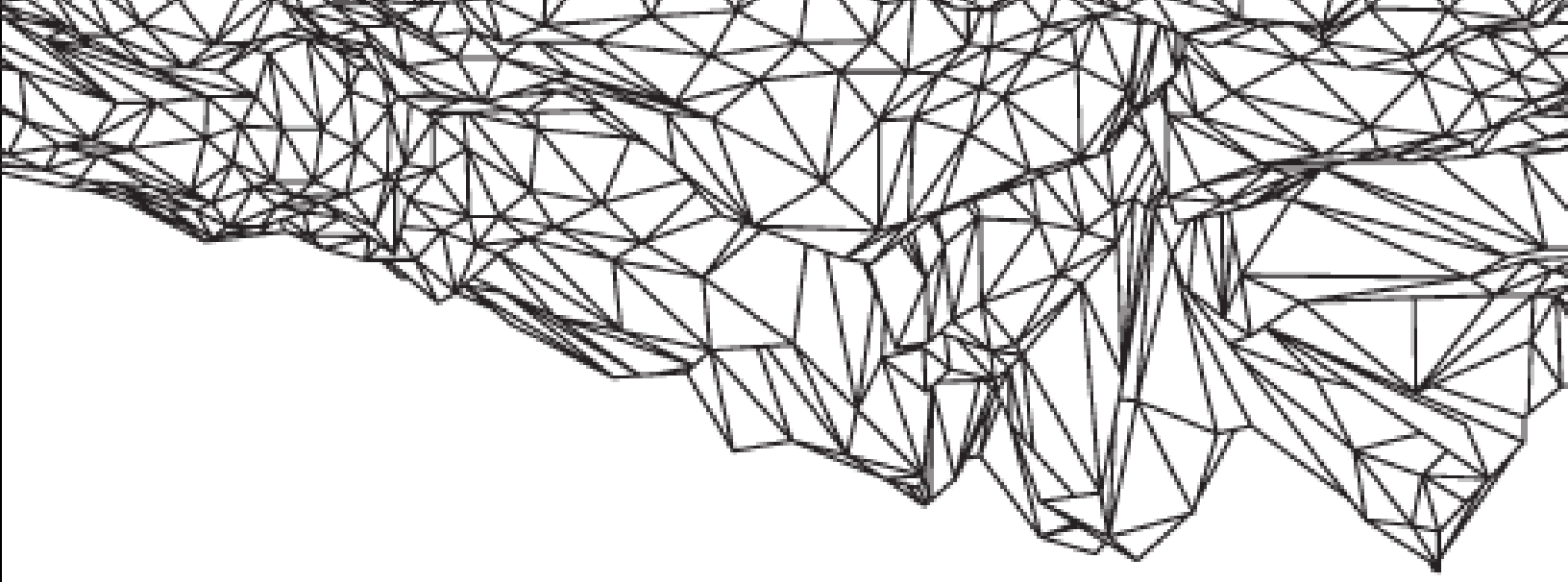


New Thinking on Innovation

Rohinton P. Medhora

Innovation is at the centre of the current economic policy discourse in Canada. Innovation drives productivity and with it, standards of living. Innovation is the process of using ideas, typically in the form of intellectual property (IP), to offer new or improved products or services for the same or lower overall cost of production.

The preoccupation with innovation is driven by a number of factors, of which two are most significant. First, productivity performance in Canada has been disappointing: in 2015, it stood almost exactly where it was 30 years earlier in 1985. Other indicators also suggest a malaise in innovation. Canadian inventors living outside the country appear to be more productive than those living in Canada, and Canada's emigration appears to be more innovation-rich than its immigration.[1] In recent years, the contribution of total factor productivity as the measure of innovation to Canada's economy has been zero or negative.[2]

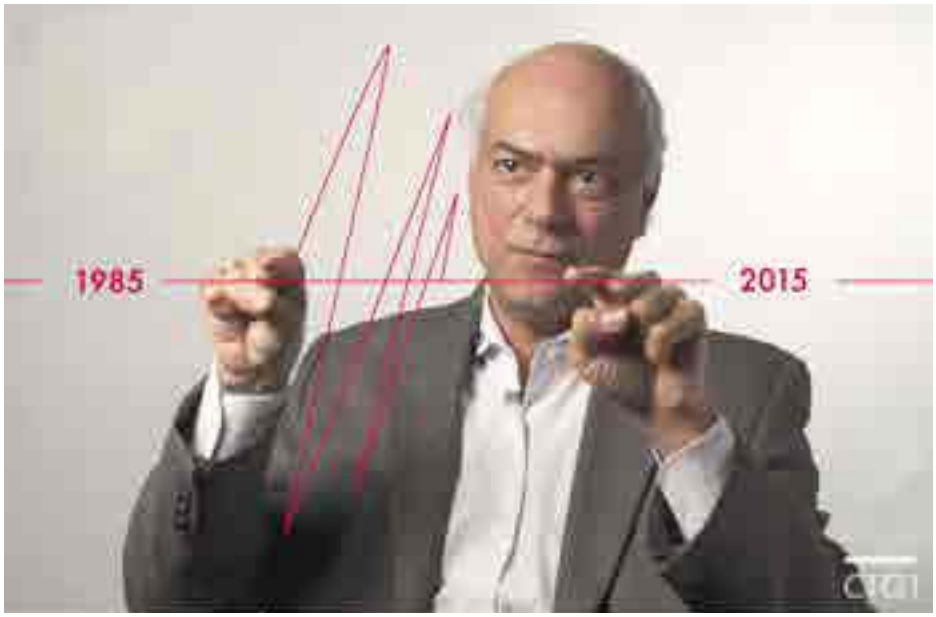
Second, the nature of value creation has changed, with intangibles and ideas gaining in importance. This, in turn, has implications for what drives competitiveness and trade — important for a country where international trade matters as much as it does in Canada.

With productivity trending flat and the nature of production changing, more of the same is not an option as Canada risks being left behind in the global knowledge economy. Canadians have an enviable standard of living, and economic policy has surely contributed to this state of affairs. The emphasis on

1 See Ivus (2016).

2 See Statistics Canada CANSIM Table 383-0021, www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=3830021&&pattern=&stByVal=1&p1=1&p2=-1&tabMode=dataTable&csid.

CIGI President Rohinton P. Medhora introduces CIGI's essay series, New Thinking on Innovation. https://youtu.be/s-QpV6AG-qg



trade agreements, a laissez-faire policy (in particular in what used to be called "industrial policy") and generous (by international standards) funding for science and technology and universities are key. But at the end of the day, productivity is what it is — flat over three decades. Periods of buoyant raw materials prices and a growing population fuelled by immigration have also played key roles in rising living standards, suggesting that the actual impact of policy on productivity has been modest.

> Innovation is the process of using ideas, typically in the form of IP, to offer new or improved products or services for the same or lower overall cost of production.

The collection of essays that this overview introduces marshalls new thinking on innovation, and brings together a community of scholars and practitioners who offer fresh approaches to innovation in Canada, and Canada's place in the world. The next two sections set out the key features of productivity performance and the ideas economy. The final section introduces the rest of the essays and proposes a framework for policy responses to the innovation conundrum — keeping in mind that it is early days in this new approach.

Productivity

Labour productivity is measured by real GDP per hour worked. It is a simple measure of productivity; it does not account for changes in capital deepening (capital per hour worked) or labour composition (percentage of the growth that comes from more highly skilled workers). Because of these omissions, growth in labour productivity will generally be larger than other measures of productivity.

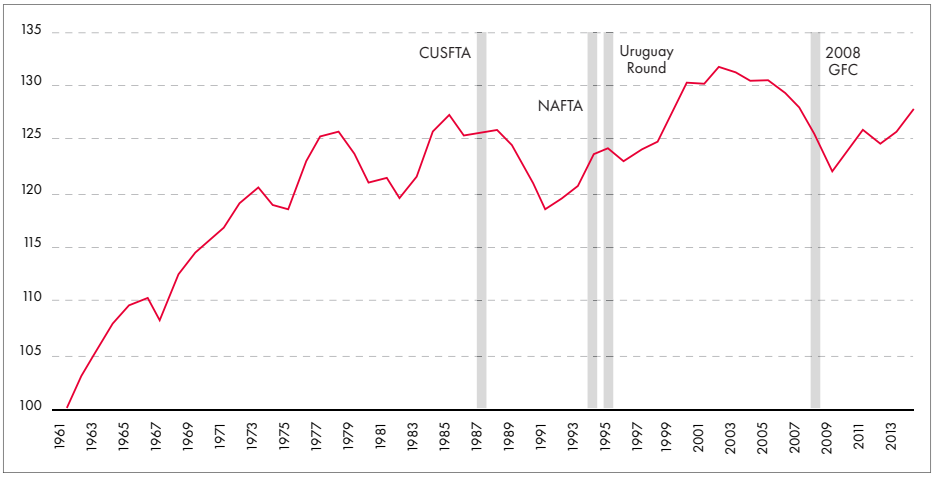
Capital deepening[3] is measured by the volume of capital input per hour worked; capital input is measured by the capital services provided by an asset multiplied by the cost per unit of an asset's capital service. It is a measure of the capital intensity of production; more capital deepening implies higher labour productivity. The measurement does not capture the impact of growth in capital services on output and it is subject to a wide margin of error due to aggregation of asset types and averaging of the cost of capital service.

3 Capital productivity is an alternative measure that could be used to measure the impact of capital on production processes. Capital productivity is measured by the ratio of capital input to GDP; this measurement does not account for changes in the use of labour input per unit of capital services. As such, capital productivity has generally been declining over the past several decades because of falling costs of capital relative to labour and decreasing use of labour input per unit of capital services. Capital deepening is used instead because the decline in use of labour per capital input may be understood as a positive contribution to productivity, as it suggests higher capital intensity of production.

Figure 1: Historical Growth in Canada's Multifactor Productivity (1961=100)

Data source: Statistics Canada, CANSIM Table 383-0021.

Notes: CUSFTA = Canada-United States Free Trade Agreement, agreed in 1987; NAFTA = North American Free Trade Agreement, effective 1994; Uruguay Round = Uruguay Round of the General Agreement on Tariffs and Trade, effective 1995; GFC = global financial crisis.



Multifactor productivity is the change in output that cannot be explained by changes in the quantities of capital and labour inputs used to generate output. It is the best measure there is for understanding changes in output caused by improvements in technology. In other words, multifactor productivity portrays innovation as the use of ideas to increase prosperity and standards of living.

This is the measure that has been so disappointing in recent years. As Figures 1 and 2 show, following a period of growth in the 1960s and 1970s, productivity has fluctuated, but in 2015 it was essentially the same as it was in 1985. Some sectors have done better than others (see Figure 3), but in the aggregate, the gainers have just balanced the losers. As Figures 4 and 5 show, this performance puts Canada in the bottom range of the pack internationally.

There are no empirical studies that measure the determining factors of Canada's multifactor productivity growth. Since multifactor productivity is treated as a residual in the growth accounting framework, its determinants cannot be easily identified. It captures technological advancement, organizational change, economies of scale and complementarities from the relative composition of usage of human, physical and technological capital (Baldwin and Gu 2007, 10).[4]

Studies that consider historical trends in multifactor productivity growth in Canada have analyzed its dynamics by industry, capital input, labour contribution (see, for example, Baldwin and Gu 2007) and province (see, for example, de Avillez and Ross 2011). These studies reveal that multifactor productivity was high in the 1960s, as the postwar period was associated with rapid capital formation, new technologies and increased international trade. Productivity growth subsequently declined from around 1973 to 1989, and then picked up in the 1990s as the information and communications technology revolution took hold. There has been a significant slowdown over the last 15 years. But for the most part, the drivers of multifactor productivity growth in Canada are largely unknown, so that appropriate policy responses to stimulate it are often conjecture.

The Ideas-driven Economy

For an indicator of the importance of ideas in today's economy, consider what has happened to companies comprising the Standard & Poor's (S&P's) 500. In 1975, one-sixth of the S&P 500 represented the value of intangibles; today the figure is five-sixths (see Figure 6). To be sure, intangibles and IP are not exactly the same thing — the former also comprises, for example, goodwill and brand recognition. But as an indicator of the relative decline of the value of physical assets and the rise of technological advances and organizational change, the magnitude of the shift is telling.

The process of innovation has three basic stages: (1) attracting and developing talented people; (2) creating knowledge through research; and (3) developing and marketing new products and services. In the first two stages of the innovation process, Canada's policies include a general objective of building a skilled workforce by boosting post-secondary education, and targeted funding aimed at attracting international talent

4 See Hall (2011) for a discussion on the empirical relationship between innovation and productivity.

Figure 2: Growth in Canada's Multifactor Productivity 1985–2014 (1985 =100)

Data source: Statistics Canada, CANSIM Table 383-0021.

Notes: CUSFTA = Canada-United States Free Trade Agreement, agreed in 1987; NAFTA = North American Free Trade Agreement, effective 1994; Uruguay Round = Uruguay Round of the General Agreement on Tariffs and Trade, effective 1995; GFC = global financial crisis.

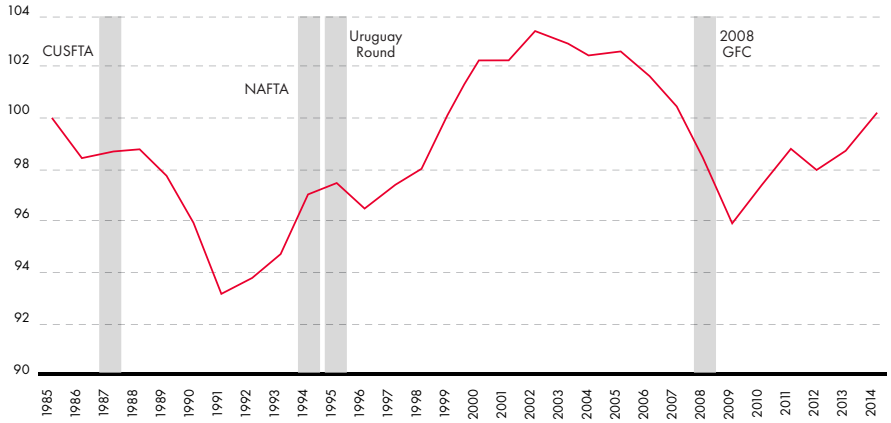


Figure 3: Historical Growth in Canada's Multifactor Productivity (1961=100)

Data source: Statistics Canada, CANSIM Table 383-0021.

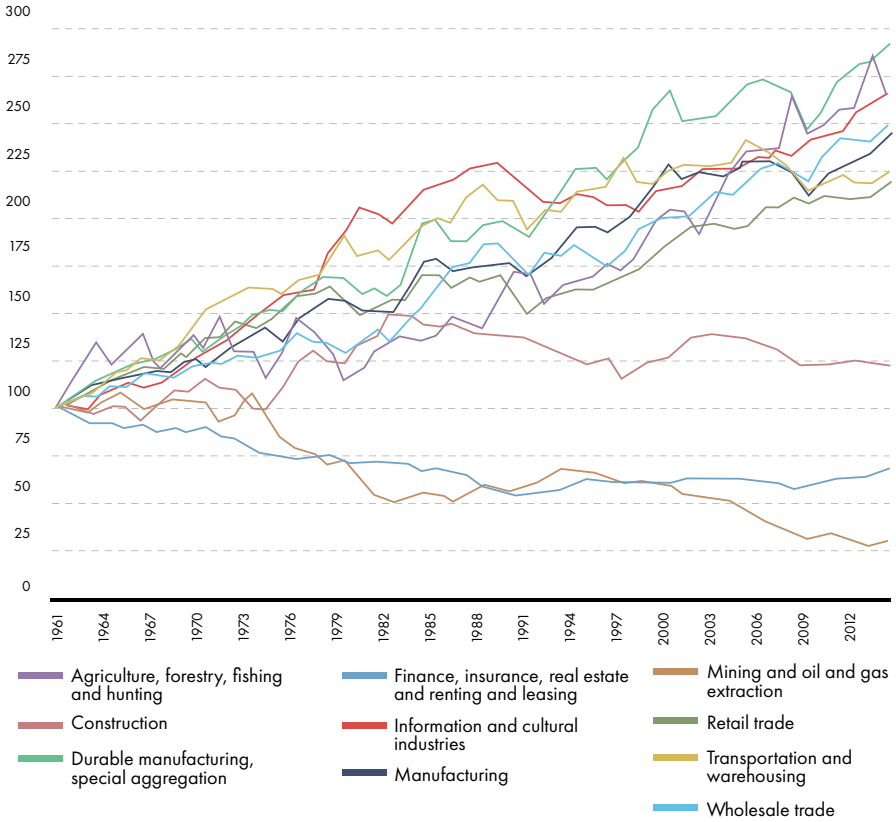


Figure 4: Multifactor Productivity Growth by Country

Data source: OECD.Stat, Growth in GDP per capita, productivity and unit labour cost (ULC).

Note: (1) Data for New Zealand begins in 1987.

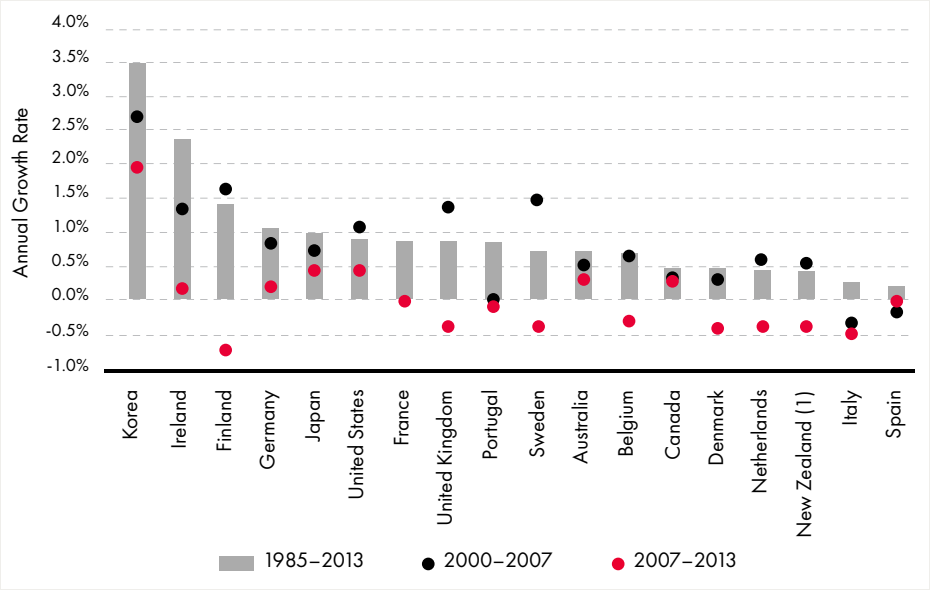


Figure 5: Multifactor Productivity Growth Trends by Country (1985=100)

Data source: OECD.Stat, Growth in GDP per capita, productivity and ULC.

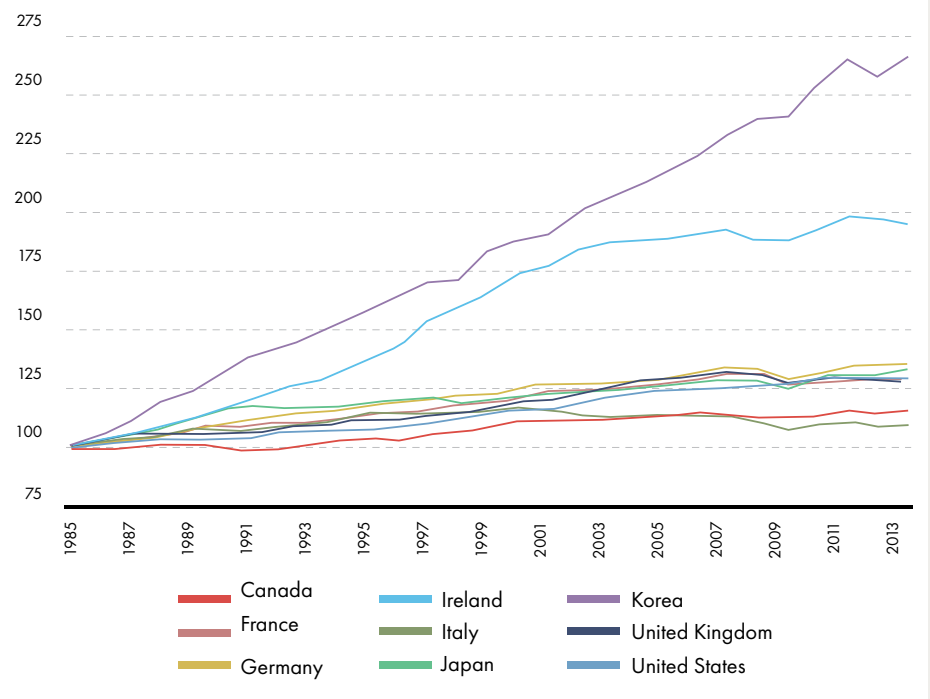
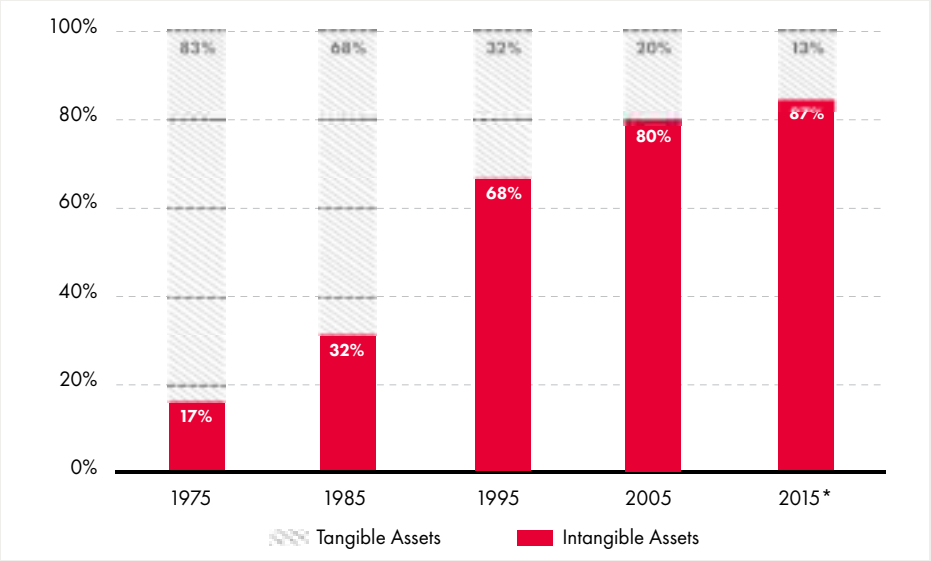


Figure 6: Shifting Tangible and Intangible Asset Ratios of S&P 500 Market Value 1975–2015

Source: Ocean Tomo (2015).

*January 1, 2015



> It is in the final stage of the innovation process — that is, the actual innovation — where Canada's performance suffers.

and developing scientific research capacity (scholarships and fellowships). In order to translate research into innovation, the government has focused on creating fiscal incentives (targeted grants, taxes and subsidies) and supporting institutional facilitators (granting institutions, and accelerators and incubators). External policies are also a central component of Canada's innovation strategy. Immigration programs have focused specifically on attracting talented people by minimizing the procedural requirements to immigrate to and work in Canada (for example, the Express Entry system for skilled workers, and Start-up Visa Program[5]), while free trade and investment accords aim to attract investment to Canada and to open up the global market for Canadian innovations.

In some respects, Canada's policies have been successful. Notwithstanding the results cited at the start of this essay, Canada has a strong record of attracting and developing talented individuals and conducting high-level research (Council of Canadian Academies 2013) and it scores well in access to funding, regulatory landscape, education and entrepreneurial culture (EY 2013). Measured by inputs (research and development expenditure, grants, subsidies and education), Canada is internationally competitive. However, measured by its outputs (revenues from the sale of new products or medium-term growth of start-ups), Canada falls flat. It is in the final stage of the innovation process — that is, the actual innovation — where Canada's performance suffers.

Canadians have made significant contributions to the advancement of new technologies, such as the internet search engine, the touch screen and the video/picture-sharing service, but the commercialization of these technologies has taken place elsewhere. Successful participation in the IP-driven economy means optimizing the commercial and other spinoff benefits of inventions that occur in Canada. The essays in the New Thinking on Innovation special report are meant to focus attention on a range and mix of practical public and private sector interventions that would help make this happen consistently and well. Many of these have to do with national strategy and action at the national level, rather than global cooperation. But there is also the global dimension, in areas such as norms and standards around sentient technologies, the global IP regime and international trade agreements. Canada played a central role in shaping the global order that created the current gamut of institutions in the trade, finance and security arenas — could it do the same for the global ideas economy?

5 See www.cic.gc.ca/english/express-entry/ and www.cic.gc.ca/english/immigrate/business/start-up/.

How Canada participates in the "rules of the game" for the internet, blockchain, biotech and sentient computing, for example, will set the course for Canada's prosperity in coming decades. This will involve a set of policy actions that focus on translating inputs into innovation. Such a strategy would recognize that the new economy places greater value on intangible assets than tangible assets.

Trade in ideas does not embody the same characteristics as trade in goods and services (see Breznitz 2016). It is characterized by high upfront costs, and very low reproduction costs. It conveys a great advantage to first movers, particularly if the technology becomes an industry standard. This also means that primacy in this matter is a global geopolitical game. And economies of agglomeration are inherent in the production of IP, so existing innovation clusters have a head start over others still in the formative stage.

International Trade, Domestic Policy and Global Processes

The essays in this collection are grouped into three blocks. The first block covers the role that international trade plays in stimulating innovation. The central points here are that "free trade" agreements are as much about managing trade (in goods and services) as they are about reducing barriers to it. More importantly, as the centre of gravity in international trade shifts from goods and services to ideas and the IP they embody, the nature of trade agreements, and how countries approach negotiating them, must change.

The second block of essays turns to domestic policy, exploring a series of issues such as the impact of patent regimes on innovation, the concept of a sovereign patent fund, using government procurement strategically, unlocking the IP currently residing mostly unexploited in universities, and an IP-centred curriculum in law and business schools, with particular attention to educating Canada's cleantech entrepreneurs, who are falling behind on commercialization. In addition, there is the suggestion that homegrown innovation clusters may do more to attract foreign multinational investment than direct subsidies ever could. Many of the proposals contained in these essays are untested, in particular in Canada, but there is enough evidence to suggest that they at least merit further attention.

The third block of essays returns to the international arena, examining how global processes such as the World Trade Organization and the Group of Twenty might foster a climate in which the innovation strategies of smaller countries might be accommodated. It harks back to a long-standing debate in global governance about "policy space," and the extent to which it can be created for individual member states while also supporting a credible set of norms and rules that might be applied across countries.

Finally, an epilogue maps the key themes to emerge from the preceding discussion and suggests a framework for an IP-centric innovation strategy.

At CIGI, we hope the ideas contained in these essays encourage a discussion, at home and abroad, on how the engine of prosperity in the twenty-first century — innovation — can best be stimulated to serve the widest set of needs possible, as well as a consideration of the public policy environment within which this might occur. This process will surely add up to more than we know about the subject presently, and lead to doing some things differently than we have to date. How much more and how differently remains an unknown, and will be the ultimate test of our endeavour.

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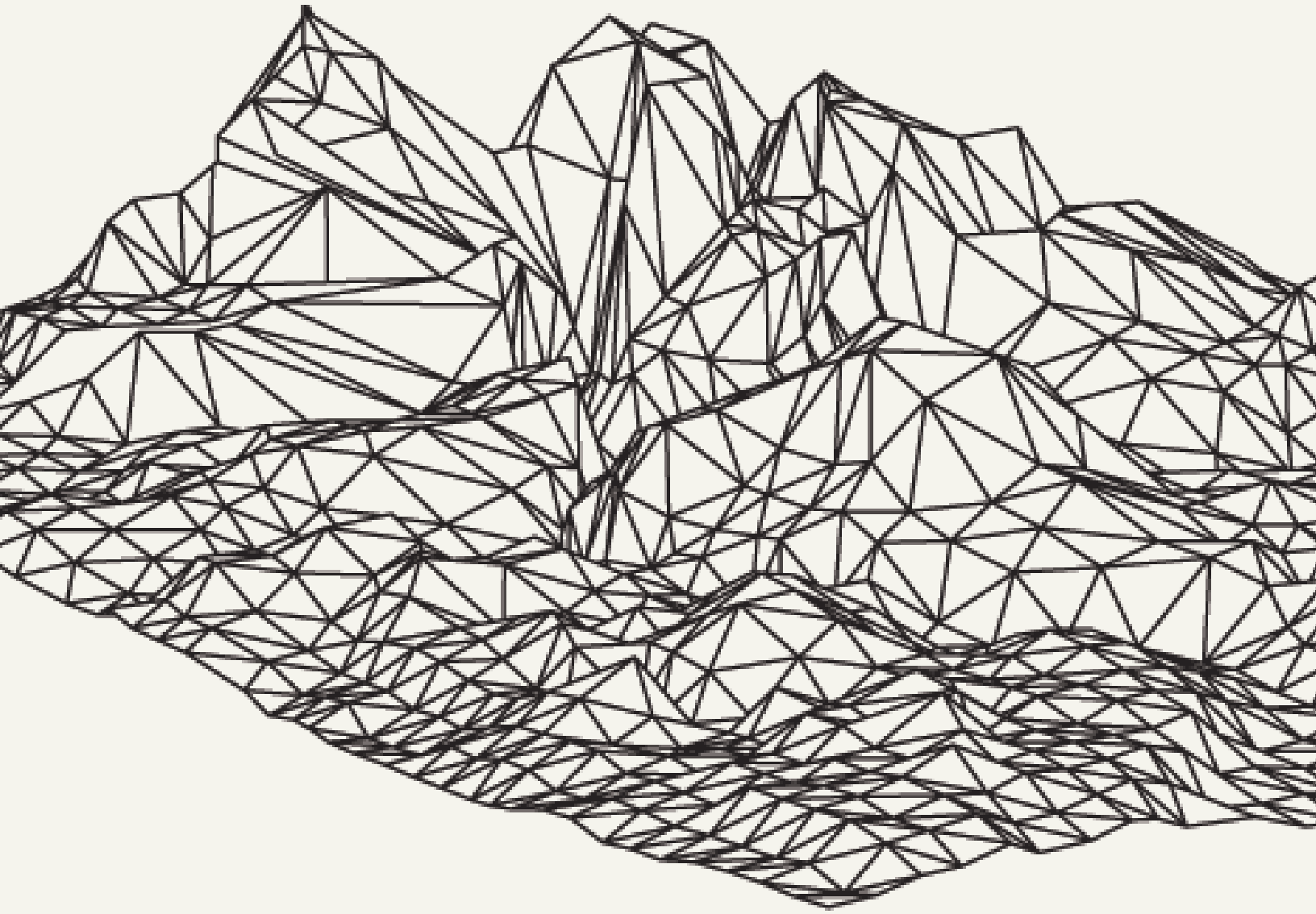
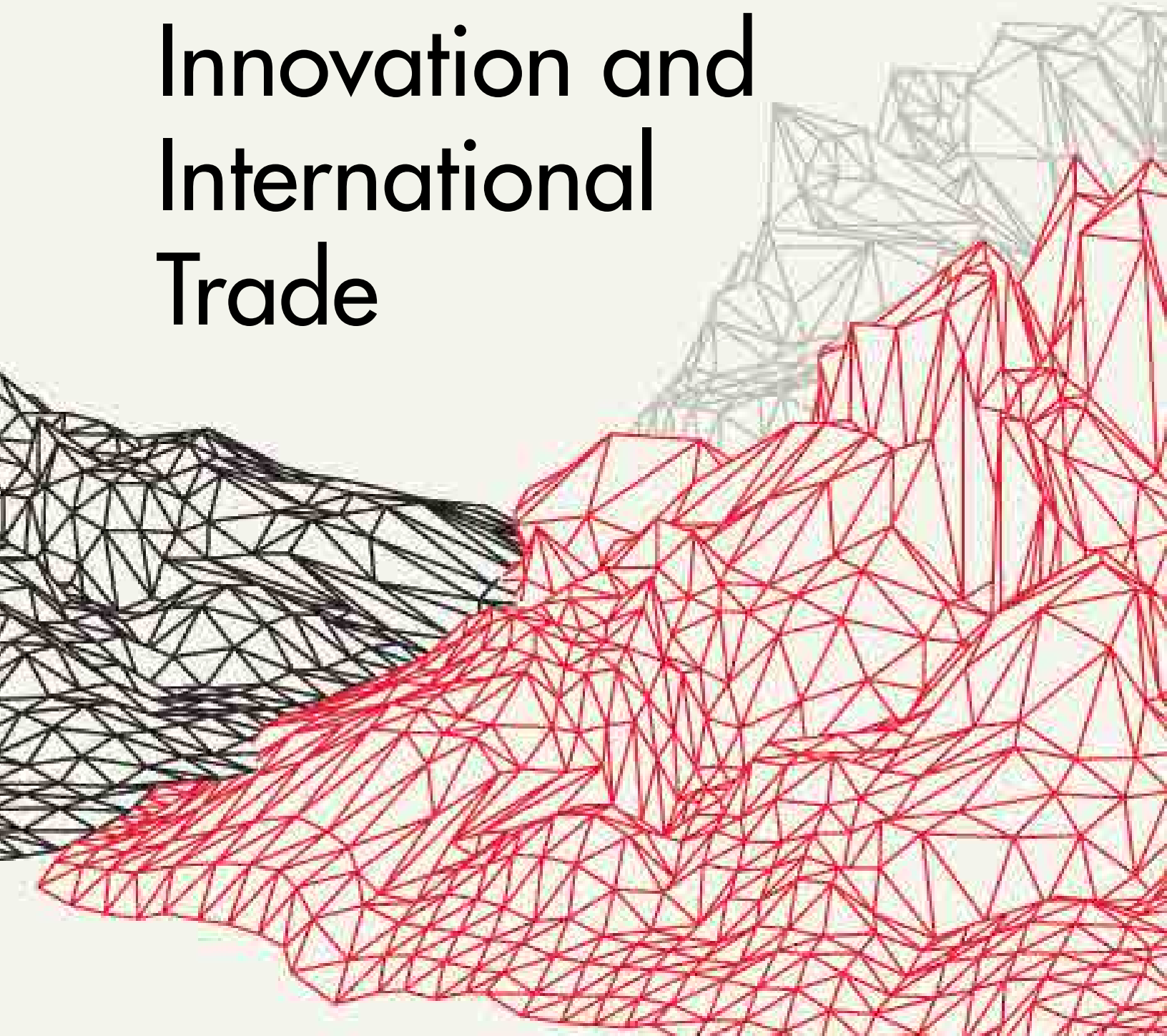
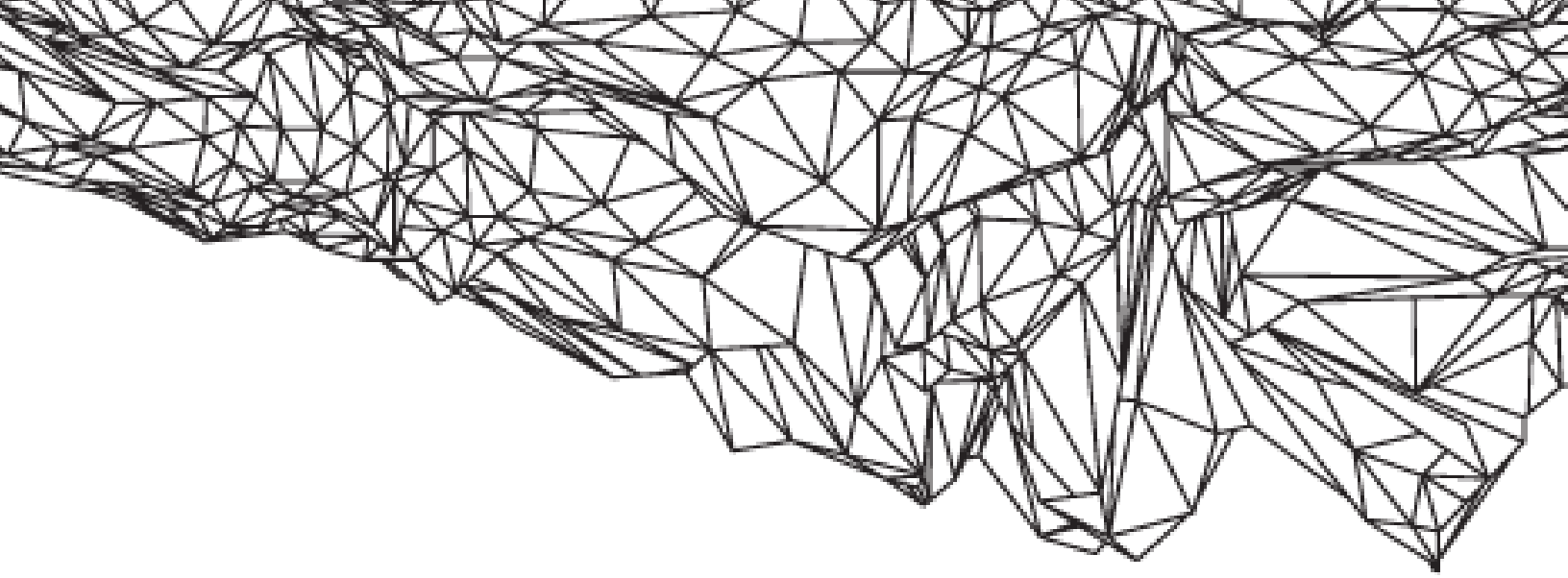


II

Innovation and International Trade



In a climate of government distrust, "innovation policy" is more palatable to many than "industrial policy," even though government policy is essential to the success of the economic policies that are implemented. (Photo: Felix Lipov / Shutterstock.com)



Modern Free Trade Agreements Are Not About Free Trade

Blayne Haggart

Of the many losers in the 2016 US presidential election — Bernie Sanders (Democratic primary), Hillary Clinton (electoral college), Donald Trump (popular vote) and the post-World War II international order — one of the most portentous was the Trans-Pacific Partnership (TPP). An ambitious agreement designed to embed the United States in Asia, counter a rising China and allow the United States to shape the global economic framework of the twenty-first century, the TPP was pilloried from the left by Sanders and the centre by Clinton (eventually). Trump, meanwhile, followed through on his promise to withdraw from the TPP on his first full day in office (*The Toronto Star* 2017).

Many of the contributors to this series — including this author — were highly critical of the TPP, citing problems with its undemocratic investor-state dispute settlement mechanism and its overly protectionist intellectual property (IP) provisions, for example. In the eyes of journalists and pundits, however, the TPP's defeat amounted to more than just the rejection of a flawed economic agreement. Rather, they saw in its downfall the rejection of free trade, arguably the dominant economic idea of the past three decades. And, indeed, if the Trump administration follows through on its stated system-destroying, protectionist sentiments, the international free trade system, based around the World Trade Organization (WTO), may not be long for this world.

It is, however, somewhat ironic that the TPP seems to have discredited free trade policy among its opponents while spurring supporters to reaffirm their commitment to free trade. The TPP's content has little to do with actual free trade as it has been understood traditionally, covering such issues as investor-state dispute settlement and — crucially for the purposes of this essay — IP.

This critique is more than pedantic nitpicking; it goes directly to the ability of a government to set sound innovation policies. International economic agreements — free trade agreements — are crucial to a government's innovation policy because they construct the economic framework within which businesses and governments operate. They allow certain economic strategies while taking others off the table. The words that we use to describe issues, events and policies determine, in large part, how we act. If we call illicit drug use a health problem, we will look to doctors and the medical system for solutions; a war on drugs frame, in contrast, sees drug use as a criminal matter for the police and justice systems to resolve. Our word choices make some options seem unavoidable and others unthinkable.

In this case, referring to the TPP and similar next-generation trade agreements improperly as free trade agreements can lead policy makers to ignore the ways in which the world has changed and to underplay the long-term importance of parts of the agreement — in particular, those related to IP — that do not fall neatly into the free trade world view. Over the past 30 years, we have moved from a world of international trade in goods (and some services) to a world of global value chains, in which control of knowledge, in the form of IP, can drive economic innovation and determine how value gets apportioned among these interconnected cross-border businesses (Reynolds and Sell 2012, 6). Technology has changed from being primarily an enabler of production to often itself being the final product (Breznitz 2007, 4).

Seeing international agreements that include major sections devoted to IP merely as free trade agreements has the potential to cause real harm to Canada's (and other countries') ability to pursue sound "innovation policy" — another term of art that is in danger of being overused[1] — appropriate to the twenty-first century global economy.

The Rhetoric of "Free Trade"

If you were to ask a layperson, journalist or politician to define free trade, chances are that person would say that it involves the free exchange of goods (and maybe services) across borders. As broad definitions go, this is relatively accurate. It is, however, incredibly misleading when it comes to talking about existing trade agreements and especially about next-generation trade agreements.

1 For clarity, I define innovation as the practical application of knowledge for economic and/or social gain.

These agreements, which include the Canada-EU Comprehensive Economic and Trade Agreement (CETA) and the apparently moribund (as of February 2017) TPP, differ from previous agreements to the extent that they go far beyond dealing with traditional trade issues such as tariff and non-tariff barriers to include non-traditional issues such as investment dispute, IP rights and internet governance.

The assumption that international trade agreements — or free trade — are economically beneficial is based on the economic theory of comparative advantage. As initially elaborated in 1817 by David Ricardo, comparative advantage means that under certain conditions, trade between two countries can benefit both countries. When leaders boast of having negotiated free trade agreements, they are appealing to the theory of comparative advantage.

International economic agreements — free trade agreements — are crucial to a government's innovation policy because they construct the economic framework within which businesses and governments operate.

Using the phrase "free trade" to describe international trade agreements causes two problems. The first is relatively less serious: any trade agreement is more properly thought of as a managed trade agreement. Although they may reduce tariff and non-tariff barriers, the sheer complexity of trade agreements should be a clear indicator that they impose many caveats and exceptions on countries' trading relationships. When agreements focus mainly on tariffs, calling them free trade agreements may be relatively harmless, even if the term does overstate the agreements' contents: the General Agreement on Tariffs and Trade and the 1988 Canada-US Free Trade Agreement would fall into this category.

The second, and more serious, issue relates to next-generation treaties, whose terms, as has already been noted, go far beyond traditional trade issues. These treaties set the limits of the possible in terms of economic policy for signatory states. Because innovation depends

Blayne Haggart explains how language impacts free trade perceptions. https://youtu.be/AXUocx5f9vI

on access to knowledge and because IP sets the terms on which knowledge can be accessed and used (and who gets paid), international trade agreements that include IP rules are de facto innovation agreements that similarly constrain the innovation possibilities available to a country.[2]

IP rights have been a central feature of international trade agreements since the 1990s, particularly the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which was the US price for creating the WTO (Sell 2003; Drahos and Braithwaite 2002). IP is now treated as a normal inclusion in any trade agreement negotiation. This reality, however, obscures the fact that IP rights are not a natural fit with trade liberalization policy. IP rights are a form of state-granted protection provided to ideas and knowledge. These rights necessarily restrict the exchange of ideas. Economically, they can only be justified to the extent that this grant of monopoly rights provides an economic incentive to creators to produce and disseminate new knowledge. While one could argue for or against strong IP rights of the type promoted by the TPP, for example, this argument would have to be made on IP's economic terms, not by referring to free trade/comparative advantage.

Next-generation agreements such as the TPP have relatively little to do with traditional trade issues because, as trade economist and Nobel laureate Paul Krugman remarks, the "battle" to liberalize the global trading regime "has been decisively won," with "import tariffs and other restrictions…reduced to the lowest levels the world has ever seen" (Rodrik 2011, 252). Between 1986 and 2010, the average all-country most-favoured nation (MFN) applied tariff rate fell from 26.4 percent to 8.1 percent; in high-income Organisation for Economic Co-operation and Development countries, the rate was a miniscule 2.8 percent (see Figure 1) (World Bank, n.d.). Similarly, Dani Rodrik argues that eliminating all remaining tariffs everywhere would raise world economic activity by only one-third of one percent (Rodrik 2011, 252).

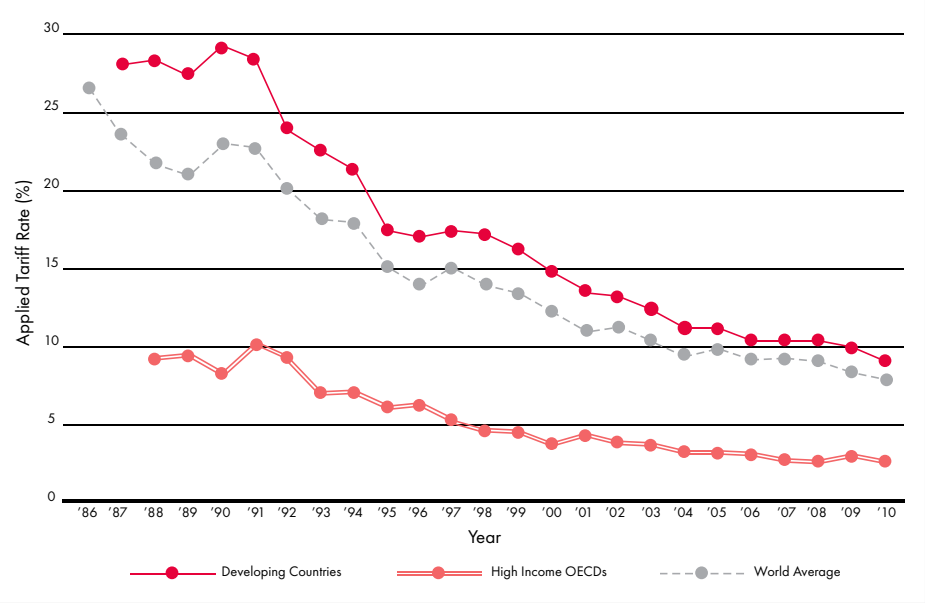
The traditional trade aspects of agreements such as the TPP are not the main point of these agreements. Instead, they are increasingly focused on (among other issues) IP rights, in keeping with their rising importance in the global economy. As the author and a colleague note elsewhere, "That the 2015 National Security Strategy of the United States elevated the protection and enforcement of IP law to a national security concern demonstrates the extent to which IP is no longer a niche issue: It lies at the very heart of the global order" (Haggart and Jablonski 2017; see also Halbert 2016).

Despite this fundamental change, these agreements continue to be referred to and legitimized (or critiqued) as free trade agreements. In practice, this means that IP provisions in the TPP and CETA are treated as relatively inconsequential add-ons, their effects not even costed out, either for their direct effects (such as on drug prices) or their long-term indirect consequences for innovation

2 This section is drawn from Haggart (2017).

Figure 1: Trends in Average MFN Applied Tariff Rates between 1986 and 2010

Source: World Bank Data on Trade and Import Barriers, http://siteresources.worldbank.org/INTRES Resources/ 469232-1107449512766/tar2010.xls.



policy. The World Bank's official report of the potential effects of the TPP, for example, completely excluded IP rights from its analysis (World Bank 2016). The joint 2008 Canada-EU study on the benefits of the CETA similarly ignored IP and seemed to assume that stronger IP would automatically be welfare enhancing (Global Affairs Canada 2008).

Treating IP rights as secondary to the trade liberalization parts of the agreement effectively legitimizes the IP provisions in terms of comparative advantage as free-trade free riders. This is a significant oversight, since the stronger IP rights found in agreements such as TRIPS, CETA and the TPP disproportionately benefit holders of existing IP, primarily companies located in the United States, the European Union and Japan. Because innovative economies and countries depend on access to already existing knowledge (it takes knowledge to create knowledge), this increased degree of control places other countries, including Canada, at a significant disadvantage.

An IP policy that is appropriate for an IP superpower such as the United States is not necessarily appropriate for a country such as Canada. Not costing out the short- or long-term costs of these agreements means that considering how these provisions affect the ability of Canadians to innovate and access knowledge becomes a secondary issue. The potential consequences of this lack of attention are dire, including, namely, deals that negatively affect the country's capacity to produce the innovative knowledge needed to ensure long-term economic prosperity.

Overcoming the Language Barrier

Free trade has always been more a political term of art to sell trade liberalization than a description of actual agreements. The same, in a way, is true of "innovation policy." Given its popularity, there is a temptation to label anything and everything as innovation policy. As with free trade, the injudicious use of the phrase can lead to the adoption of underexamined, potentially harmful policies.

In an era distrustful of government, innovation policy is also much more palatable to many than "industrial policy," even though government policy is the key to the success of whatever actual economic policies are carried out, and both necessarily (directly and/or indirectly) create winners and losers in the economy. Even here, the choice of language can influence policy makers toward different balances between state- or market-driven solutions.

While the problem with language can never be eliminated completely, it is possible to take steps to minimize the blind spots language can cause. In the case of international economic agreements, the first step is to consider the various parts of these agreements on their own terms, rather than subsuming them under a politically useful, but ultimately misleading, label. This involves empirical analysis of all parts of our economic agreements in the context of a global economy that can no longer be

understood in terms of countries simply trading products across borders. Paraphrasing George Orwell, to see the actually existing economy that is in front of one's nose needs a constant struggle.

At a time of significant uncertainty in the global economy, when innovation, global value chains and the control of knowledge are becoming central to economic prosperity and displacing old international trade models of the economy, a reliance on empirical evidence in judging policies is more crucial than ever. Moving beyond outdated language and thinking about the economic system in which we find ourselves is a necessary first step toward creating the foundations of an economy capable of taking advantage of the knowledge-driven twenty-first century economy.

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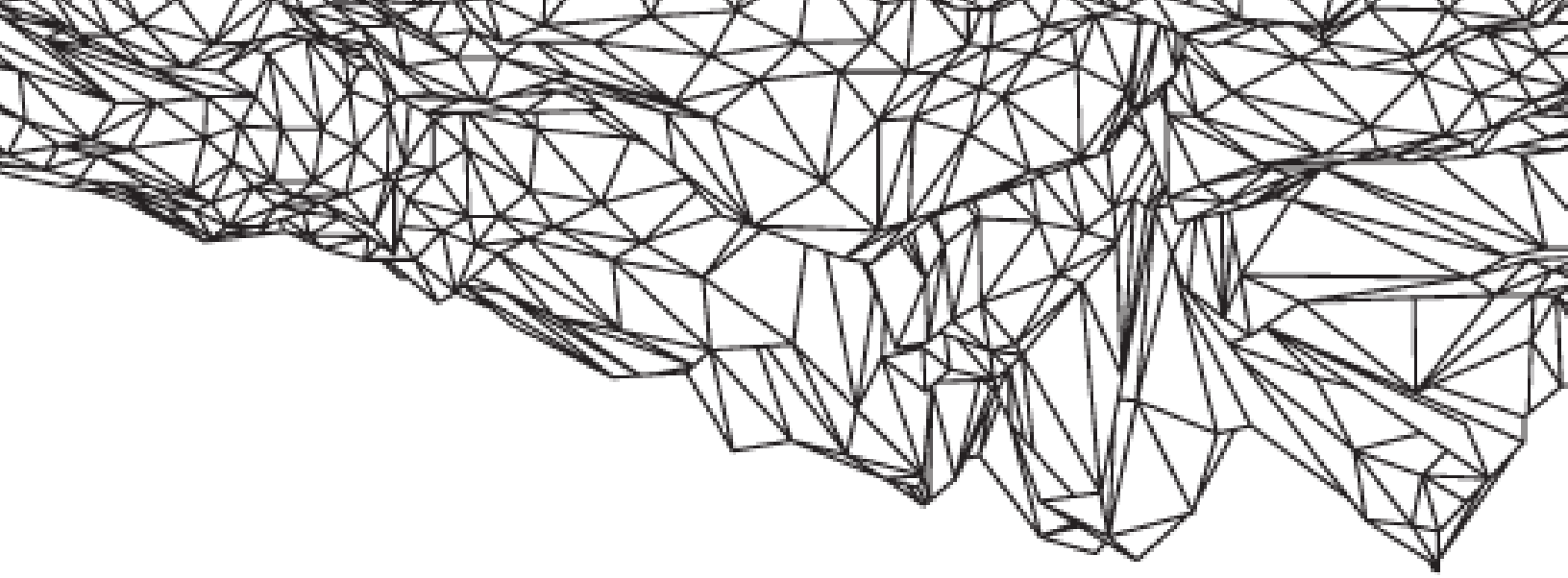
Former US President Barack Obama clearly articulated the intent of modern comprehensive economic partnership agreements.
(Photo: Everett Collection / Shutterstock.com)



A New Name for Modern Trade Deals: Asset Value Protection Agreements

Dan Ciuriak

Modern comprehensive economic partnership agreements devote much of their text to issues that have little to do with freeing trade and are better characterized as aiming to protect the value of corporate assets deployed in international commerce.

There is no secret about the intent of these agreements, as is evident from unequivocal policy statements from former US President Barack Obama (2010): "America's greatest asset is IP [intellectual property]... We're going to aggressively protect our intellectual property. IP is the cornerstone of innovation. It is essential to our prosperity and it will only become more so in this century...That's why the U.S. Trade Representative [USTR] is using the full arsenal of tools available to crack down on practices that blatantly harm our businesses, and that includes negotiating proper IP protections and enforcing our existing agreements, and moving forward on new agreements." These policies are unlikely to be affected by the change in administrations in the United States.

It helps to call a thing by its proper name. If the aim of these modern agreements is primarily to protect asset values, not to free trade, let's coin an appropriate label: meet the "asset value protection agreement" (AVPA).

It should go without saying that the evaluation of an agreement whose stated purpose is to protect asset values should be based on its impact on asset values, not on trade, GDP or jobs, which are the conventional measures of performance of free trade agreements (FTAs), whose primary aim is to generate trade and economic activity.

As Canada gears up to negotiate new agreements and renegotiate old ones, it is important that policy makers and analysts examine these agreements through this lens, and consider Canada's national interest with appropriate metrics.

Deconstructing the AVPA

How does an AVPA work? It is not simply about the IP chapter. Many elements in the agreement combine to lock in the value of IP and of the tangible and intangible assets of corporations more generally.

Corporations can deploy their IP in many ways: they can embody it in goods and services that are traded across borders; they can invest abroad and use the IP to serve a foreign market through foreign affiliate sales; and they can choose to enter into a joint venture or license the production to a foreign firm. The optimal deployment of the IP may, however, be constrained by the legal or institutional conditions prevailing in foreign markets: traded goods can be counterfeited or reverse-engineered, foreign direct investment (FDI) may be subject to technology transfer strings or result in leakage of trade secrets into the foreign market for utilization by competitors, and licensing or joint ventures may be problematic if it is difficult to write and enforce sufficiently iron-clad contracts.

AVPAs deal with all these issues comprehensively — addressing contracting, enforcement, government policy, potential leakages and litigation procedures — which can be characterized as creating a generalized form of the concept of "freedom to operate" (Ciuriak 2017).

Consider the United States' negotiating position in the Trans-Pacific Partnership (TPP) agreement under the Obama administration:

- The legal terminology and the framing of rules are based on US domestic law, thus facilitating the writing of contracts that can be interpreted and enforced according to US standards, practice and precedents.
- In the chapters dealing with customs procedures, the United States wants its partners' customs officials to be empowered to detain pirated and counterfeit goods moving in transit or being transshipped through their country, thereby reducing firms' concerns about using the cross-border trade mode to sell sophisticated products in foreign markets.
- The investment chapters require that no conditions be imposed on foreign corporations investing in a country. This requirement serves to prevent leakage — positive spillovers, from the perspective of the country in which the investment is being made — thus enhancing the returns to the investor while reducing the benefits to the investee. It also prevents restrictions on the ability of a corporation to engage in merger and acquisition (M&A) activity that absorbs potential competitors at the start-up stage. For example, the agreements set review limits very high

Concept Economics (2009) reports that increasing the term of copyright would cost New Zealand an estimated NZ$505 million in net present value terms. (Photo: ChameleonsEye / Shutterstock.com)

and limit grounds for action, save for concerns related to, for instance, national security.

- The investment chapters also provide for investor-state dispute settlement (ISDS) in order to safeguard the invested assets from government policy actions that may — de jure or de facto — amount to expropriation of assets generated by investment abroad.

- The IP chapters provide for recourse to legal action to enforce property rights in the forum of the complainant's choice — that is, in rights-holder-friendly US courts for US rights holders.[1]

- Country-specific "asks" abound, as in the following examples with respect to Canada:

  - In addition to having Canada empower customs officials to seize counterfeit goods in transit, the United States also wants Canada to take measures against online marketplaces "reportedly" engaging in commercial-scale piracy online, including sites hosted in, operated by or directed toward parties located in Canada.

  - The United States wants Canada to eliminate rights of appeal in Canada's administrative process for reviewing regulatory approval of pharmaceutical products and to restrict the minister of health's discretion in disclosing confidential business information.

  - To meet US stakeholder asks, the United States is pressing for a "clarification" of the Supreme Court of Canada's decision concerning heightened utility requirements for patents.

  - The United States wants to ensure that Canada's concessions to the European Union within the Canada-EU Comprehensive Economic and Trade Agreement to protect geographical indications (GIs) — names such as parmesan and feta — do not restrict US companies from using trademarks bearing these GIs in their exports to Canada. (This ask has nothing to do with defending one's own IP — it amounts to denying others the right to protect theirs!)

- The competition policy chapters focus on potential foreign state action that might raise the competitive bar for a multinational, requiring that states operate on the principle of "competitive neutrality" when they engage in commercial activities. Meanwhile, these same chapters studiously ignore the potentially competition-reducing elements of multinationals' M&A activity in taking out potentially competitive start-ups, covering their rear flank, so to speak.

- Sector-specific annexes address particular issues often not related to market access but concerned with maximizing the value of the market access to US corporations (and therefore affect the terms of international engagement).

For the most part, the impact of such measures cannot be characterized as a simple reduction of trade or investment costs that can be incorporated in a conventional quantitative trade model, which inevitably raises economic welfare for both parties when treated in such manner. Different metrics are needed.

Evaluating an AVPA's Economic Impact

The asset valuation impacts of international commercial agreements have heretofore never been assessed and there is no quantitative modelling convention for doing so.

One possible method is to estimate the impact on asset valuations using measured rates of return on capital stock. Standard capital asset valuation methods translate a change in the stream of future returns to capital into a change in the present value of capital. To give a conservative example of such a calculation, the US International Trade Commission (USITC) estimated that China observing American IP laws could raise the rate of return to US capital by 0.4 percent (USITC 2011). This method, applied to the Standard & Poor's (S&P's) 500 market capitalization of US$15 trillion, discounting at the historic weighted average cost of capital for the S&P 500 of 8.3 percent over the horizon to 2035 and ignoring terminal values, yields an implied improvement in financial market estimates of the value of US capital of US$345 billion. Including terminal values and applying this estimate to the whole US capital stock of US$23 trillion raises this estimate considerably.

1 Recent US Supreme Court decisions in *TC Heartland LLC v. Kraft Foods Group Brands LLC,* which impacts on the rules of venue for patent litigation in the United States, and in *Impression Products, Inc. v. Lexmark International, Inc.*, which impacts on exhaustion of patent rights through sale of a product in which IP rights are embedded, modify the US patent landscape against which the TPP was negotiated, with both decisions going in the direction of narrowing rather than expanding rights.

These back-of-the-envelope calculations suggest much larger gains for US stakeholders compared to any estimate of an FTA's impact on conventional measures of economic performance, such as GDP or economic welfare under a US-China FTA or, indeed, under the TPP.

> One possible method is to estimate the impact on asset valuations using measured rates of return on capital stock.

Trade agreements considered in conventional terms as FTAs also have a positive impact on rates of return to capital and generate implied improvements in market capitalization. In the case of trade-driven gains, these improvements in returns to capital will be broadly shared among the FTA partners, in line with the distribution of gains from trade.

However, the ownership of the stocks of IP is highly skewed, and the negotiated changes often work against the interest of some of the parties to a negotiation — as the negotiating dynamics in the TPP showed. One simple example is New Zealand's estimate that the increase in copyright term would cost it some NZ$505 million in net present value terms (Concept Economics 2009). This asymmetry means that AVPAs could have overall negative impacts on some countries' market cap values and positive impacts on those of others.

This asymmetry generates additional impacts.

First, there are wealth effects that trigger equally asymmetric knock-on effects on economic activity (increased investment and consumption in countries that benefit; decreased investment and consumption in countries that pay out).

Second, at the corporate level, the increase in market cap translates into an improved position in international M&A activity for those benefiting from the improved valuations. When M&A activity is predatory, the AVPA accordingly has a dynamic effect that intensifies the threat to local innovation networks, especially since the AVPA in effect requires disarmament of potential defences (in terms of FDI review and so on).

Third, markets also take into account the impact of implied income flows on valuation of the nation's assets as a whole, by repricing the currency. In the case of trade-driven exchange rate impacts, the effect tends to be equilibrating, since a lower exchange rate generates new-found trade competitiveness in traditional goods and services. In an AVPA context, the exchange rate valuation change is doubly damaging, since it diminishes the capacity of national firms to play in the international M&A game by reducing the valuation of their assets through currency depreciation, while enhancing their rivals' capacity through currency appreciation.

There is yet another and less-obvious danger inherent in the commercial framework locked in by AVPAs, which appears to be a factor in the dynamics that govern the transition of firms from "start-up" to "gazelle." In a context of patent proliferation, a vast amount of IP is created annually. Most of this stock of IP consists of low-value patents, from the perspective of actual productive exploitation. However, there is potentially greater value in these instruments in the hands of patent-enforcement entities, which acquire large portfolios. They wait patiently to allow enterprising firms to discover valuable new markets, then use their accumulated stock of IP to extract rent from the successful entities through claims of infringement.

> There is yet another and less-obvious danger inherent in the commercial framework locked in by AVPAs, which appears to be a factor in the dynamics that govern the transition of firms from "start-up" to "gazelle."

The very existence of this strategic practice is sufficient to generate a "glass ceiling" for start-ups, since an attempt to break through attracts attack (the US$200 million level of market cap has been bandied about as a threshold where a target moves on radar). The practice also necessarily reduces the value of the target at the M&A bargaining table, given the uncertainty about how the existing patent thicket might be exploited to attach returns if the IP remains in its own hands, but — and this is of critical importance — not if the IP is transferred to the hands

Markets take into account implied income flows' impact on valuation of the nation's assets as a whole by repricing the currency.
(Photo: studio 55 / Shutterstock.com)

of entities that have insured themselves against attack through extensive cross-licensing agreements.

Finally, given the skewed ownership of capital, AVPAs by definition work primarily to serve the interests of the already very well-off, widening, not narrowing, income and wealth disparities.

Policy Implications

AVPAs — as the word "protection" incorporated in the abbreviation underscores — are different from FTAs. This difference has profound implications for policy makers and those negotiating these types of agreements.

First, in an asymmetric world, AVPAs work in the interests of the major IP-owning and regulation-making economies and against the interests of the small, open and regulation-taking economies. In this sense, they work diametrically against the interests and mandates of government agencies charged with stimulating disruptive innovation in small, open, challenger economies, since disruptive innovation necessarily erodes the value of the existing franchises that AVPAs are designed to protect.

Second, this conceptualization of international commercial agreements highlights the tension between the imperative to protect the value of property — a cornerstone of a market economy — and the imperative to protect the competition that destroys the value of certain kinds of property. When such a tension is identified, policies that maximize one feature are suboptimal: the "sweet spot" is at the point where the competing policy objectives are finely balanced.

For example, allowing untrammelled access of inward FDI is optimal, if inward FDI is not potentially predatory. When it is potentially predatory, policy disciplines are required to filter out the predatory element. In this instance, the notion that there is a national interest only in takeovers of large corporations is shown to be mistaken: the key national interest may be in takeovers of start-ups, which thin out the local innovation ecology and pre-empt the emergence of new gazelles. Here, the asymmetry with FTAs is stark. Trade liberalization can be characterized as "creative destruction" because it removes the weakest competitors in an economy; AVPAs facilitate the removal of the best and brightest. The difference in impact on local innovation dynamics is profound.

Third, the income distributional effects of AVPAs need to be directly addressed. There are many indications of a "break point" being reached, from Brexit to the European Commission's decision on Apple's taxes owed from its tax avoidance scheme in Ireland and the associated Panama Papers uproar to the anti-globalization vitriol in the US 2016 election campaign and the radical policy statements of the new Trump administration (USTR 2017; Navarro 2017).

Finally, it is important to recognize that AVPAs are likely to be sclerotic in nature, as they dull the ability of new competition to erode the value of the existing stocks of

assets. They are not a solution to the stagnation/deflation ("stag-deflation") problem that has worked to undermine growth in Canada and elsewhere (Ciuriak 2015) and now threatens the established system of globalization.

To summarize, the AVPA is a new breed of agreement. This fact has long been recognized. However, the conventional characterization of AVPAs as "deep and comprehensive FTAs," or as agreements that facilitate global value chains or deep integration, misses their critical feature, which is to protect the value of existing commercial assets, in particular IP. When we confront this central feature, the policy implications take on sharply different contours.

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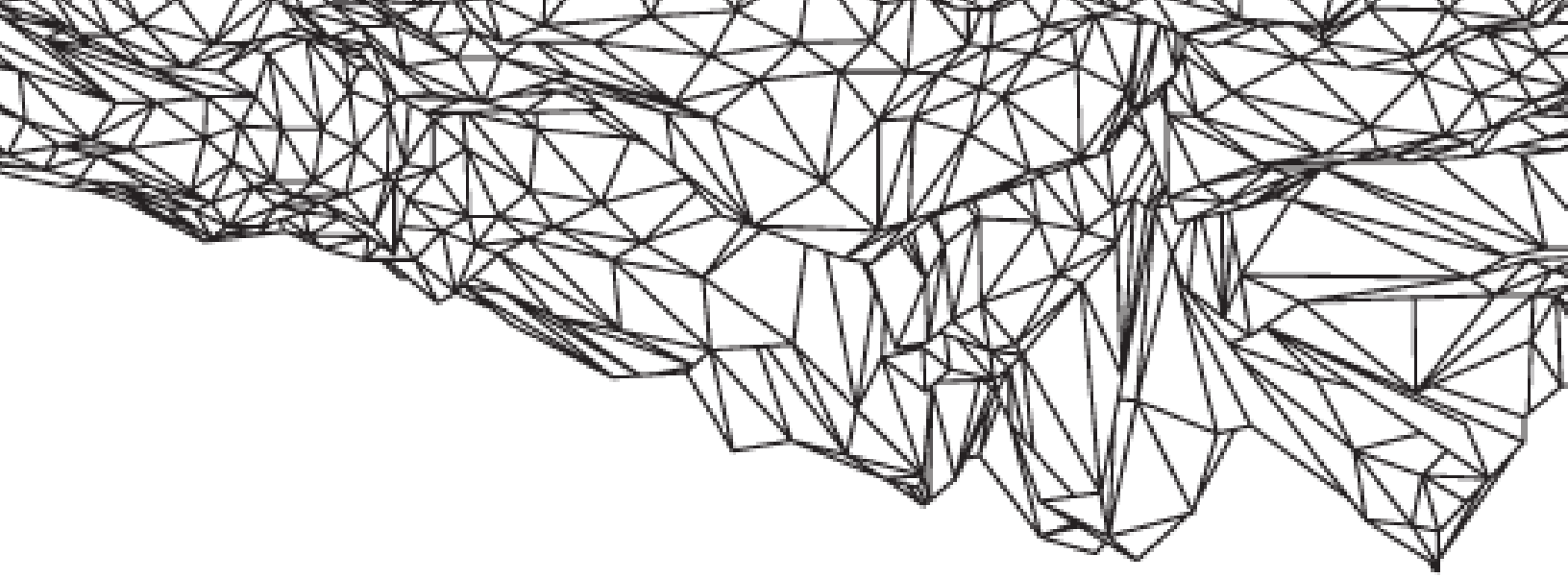
Senior Fellow Dan Ciuriak joined CIGI's Global Economy Program in April 2016, focusing on the innovation and trade research theme.

At CIGI, Dan is exploring the interface between Canada's domestic innovation and international trade and investment, including the development of better metrics to assess the impact of Canada's trade agreements on innovation outcomes.

Based in Ottawa, Dan is the director and principal of Ciuriak Consulting Inc. He is also a fellow in residence with the C.D. Howe Institute and an associate with BKP Development Research and Consulting GmbH of Munich, Germany.

Previously, he was deputy chief economist at Canada's Department of Foreign Affairs and International Trade (DFAIT) (now Global Affairs Canada), with responsibility for economic analysis in support of trade negotiations and trade litigation, and served as contributing editor of DFAIT's Trade Policy Research series (2001–2007 and 2010 editions). He has also held several other positions at DFAIT, including deputy to the chair of the Asia-Pacific Economic Cooperation Economic Committee and finance counsellor at Canada's embassy in Germany.

In the face of vehement public opposition to investor-state dispute settlement (ISDS), the European Union replaced ISDS with a multilateral investment court in the newest agreement, the Canada-EU Comprehensive Economic Trade Agreement (CETA). (Photo: anandoart / Shutterstock.com)



Is It Time to Redesign or Terminate Investor-State Arbitration?

Gus Van Harten

Investor-state dispute settlement (ISDS) or, more precisely, investment treaty arbitration is a controversial part of many trade and investment agreements. Political developments in Europe and the United States suggest that there are opportunities to address ISDS's deep flaws, by redesigning or terminating it.

A key benefit of redesign is that it could replace ISDS in numerous existing agreements. A benefit of termination is that it is a clear step, not easily contorted by lobbyists or trade negotiators into something meaningless. This essay offers a basis to evaluate the two options, focusing on criteria for redesign that, if not satisfied, would make the case for termination.

Redesign or Termination?

Prospects for redesign have emerged in large part from Europe. Faced with widespread public opposition to ISDS, the European Union launched an effort to replace ISDS with a multilateral investment court in new agreements such as the Canada-EU Comprehensive Economic and Trade Agreement (CETA) and, potentially, in existing agreements. This proposal is a welcome change, although it could go badly wrong if it ends up institutionalizing ISDS without addressing the key flaws, or if it relies on existing ISDS fora instead of establishing a fresh start.

Alternatively, as an example of potential termination, the Trump administration has targeted the North American Free Trade Agreement (NAFTA) for renegotiation, albeit without singling out ISDS. Former Canadian trade negotiator Gordon Ritchie reacted by saying it should be easy for Canada to agree that NAFTA's foreign investor rights and ISDS chapter — Chapter 11 — be "scrapped" (Ritchie 2017). Chapter 11, Ritchie said in an admirably candid way, was "ill-conceived and poorly drafted," and Canada's acceptance of it a case of "foolishness."

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How should those concerned with the ISDS threat to democracy and sovereignty approach these two paths? The choice should be guided by four criteria: independence, fairness, balance and respect for domestic courts. If a proposed ISDS makeover does not meet each criterion, then the notion of special rights for foreign investors, enforceable through international adjudication, should be rejected in favour of ISDS termination.

The Legitimate Controversy over ISDS

ISDS is an exceptionally powerful process to protect foreign investors. It gives generous rights to foreign investors (and no one else) without corresponding responsibilities. Foreign investors can bring ISDS claims against a country if they think that country — by its laws, regulations, court judgments or other decisions — acted unfairly or inequitably, betrayed foreign investors' expectations, over-regulated their business, put controls on transfers of money in and out of the economy, or tried to boost the local economy in ways that disadvantaged foreign investors.

If a foreign investor brings an ISDS claim, the sued country must submit to a probing review by a tribunal of three lawyers sitting as arbitrators. The arbitrators have the power to order the country to compensate the foreign investor, without a cap on the amount that can be awarded. Orders by ISDS tribunals are enforceable against the country's assets in other countries, making ISDS more enforceable than domestic court judgments or other international adjudicative decisions.

What's Wrong with ISDS?

ISDS favours foreign investors by giving them special rights that go well beyond private rights in domestic law and other areas of international law. Except for the national government responding to a foreign investor's claim, ISDS denies even the basic right of standing for others affected by the adjudication of the claim. With treaties that allow for ISDS, arbitrators have tended to interpret ambiguous language in ways that expand foreign investors' rights to compensation and the arbitrators' power to award it.

ISDS is not based on a judicial process. Instead, it uses for-profit arbitration to resolve one-way claims to public funds. The use of arbitration is inappropriate in this context, and operates to the systemic advantage

Foreign investor rights: Exhibit A in demonstrating "that international trade agreements are a way to let multinational companies get rich at the expense of ordinary people" (*The Economist* 2014). (Photo: arindambanerjee / Shutterstock.com)

of whoever brings the claims and to the disadvantage of those facing review and monetary penalty. The use of arbitration in this context also introduces myriad conflicts of interest, as ISDS arbitrators work on the side as ISDS lawyers and have an evident interest to encourage claims in order to grow ISDS as a business.

> ISDS is an exceptionally powerful process to protect foreign investors. It gives generous rights to foreign investors (and no one else) without corresponding responsibilities.

Loosely put, ISDS gives foreign investors an enclave legal status based on their power to invoke rights, and access to public money through a process that is open only to them. Foreign investor rights are Exhibit A, as *The Economist* put it, in demonstrating that "international trade agreements are a way to let multinational companies get rich at the expense of ordinary people" (*The Economist* 2014). Corporate giants and the super-rich, alongside the ISDS legal industry, have been the main beneficiaries of ISDS by far, at significant expense and opportunity cost to countries and to those who would have benefited from laws and regulations that were deterred by ISDS.

Four Criteria for a Redesign

The simplest approach to fixing these foreign investor rights is to leave them out of trade and investment agreements. That option was not taken in proposed agreements such as CETA, the Trans-Pacific Partnership Agreement or the Transatlantic Trade and Investment Partnership. For the first time since NAFTA, these agreements would apply ISDS to relations among developed countries that have court systems superior to ISDS, thus entrenching ISDS as a global institution. Such is the priority given by major governments to entrenching special rights for foreign investors and shifting judicial sovereignty to ISDS arbitrators.

Against this backdrop, it seems unlikely that the European Union or the United States will commit to a satisfactory redesign of ISDS. Even so, political winds are blowing unpredictably and it is important to offer guidance on how ISDS could be redesigned to make it independent, fair, balanced and respectful of domestic institutions.

Judicial Independence

To be independent, any process for resolving disputes involving foreign investors must incorporate classical safeguards of judicial independence: namely, secure tenure, set salaries, objective case assignment and bars on outside legal and arbitration work. These safeguards are integral to courts and, in turn, to public confidence in judicial decisions.

ISDS does not incorporate any of these classical safeguards, and is consequently open to reasonable concerns about bias arising from the private interests and entanglements of the arbitrators. In late-stage revisions of CETA, two of the safeguards — secure tenure and objective case assignments — were incorporated into an investment court system that would substitute for ISDS. Other safeguards may yet be added to a multilateral investment court. Without the classical safeguards, such a court would not deserve the name because it would lack institutional independence from executive officials and private actors.

> ISDS is not based on a judicial process. Instead, it uses for-profit arbitration to resolve one-way claims to public funds.

It is also important for public confidence that a multilateral investment court be a new entity, rather than one grafted onto an existing non-judicial ISDS forum such as the International Centre for Settlement of Investment Disputes (ICSID) or the Permanent Court of Arbitration (PCA). Since the late 1990s, foreign investor protections have been taken in highly expansive directions by ISDS arbitrators through, for example, their widespread allowance of claims using corporate seats of convenience, their liberal approach to the concept of investment, their flexible approach to parallel treaty claims in the face of contractual dispute settlement clauses, and their application of concepts of "indirect" expropriation and "legitimate" expectations of foreign investors in ways that easily overlap with good faith, non-discriminatory forms of general regulation (Van

In ISDS, foreign investors are not required to seek a resolution in a country's courts before bringing an investment claim to an international tribunal. (Photo: Shutterstock.com)

Harten 2013; 2016). The role of these arbitrators likewise has been managed in questionable ways by ICSID, the PCA and other arbitration houses, whose role arises primarily from their power to impose arbitrators on the disputing parties — at times even assigning the power to corporate organizations such as the International Chamber of Commerce or individual members of the ISDS industry — and their ability to influence and review decision making by ISDS tribunals.

> A clean break is needed from these arbitration houses to alleviate public concern.

A clean break is needed from these arbitration houses to alleviate public concern. A multilateral investment court should therefore have no association with organizations or individuals that have had a significant role in expanding ISDS during its 20-year boom. The court should have autonomous judges, not converted ISDS arbitrators; should have its own secretariat, not a reoriented ISDS administration; and should be free to interpret the treaties anew, against the backdrop of international law, unburdened by the tainted reasoning and conflicts of interest of ISDS arbitrators.

Procedural Fairness

A fair process of adjudication allows anyone whose rights or interests are affected by the proceedings to have standing in the process. If an affected party is denied the right of standing, the adjudicator cannot hear all sides and may not be able to consider relevant facts and arguments.

ISDS is unfair because it does not allow such standing for all affected parties, other than the claimant investor and the national government of the sued country. No one else whose rights or interests are affected can have standing, regardless of the extent of the potential impact on their rights or interests.

In its ISDS proposals of November 2015, the European Commission included a clause that went some way to addressing this flaw.[1] Yet the clause in question did not find its way into CETA, suggesting that there was awareness of the problem and a choice somewhere along the way not to address it.

At a multilateral investment court, this issue would need to be addressed by providing for public notice of claims

1 Transatlantic Trade and Investment Partnership, Trade in Services, Investment and E-Commerce, European Union Proposal, Chapter II — Investment, released 12 November 2015, online: <http://trade.ec.europa.eu/doclib/docs/2015/november/tradoc_153955.pdf> ("The Tribunal shall permit any natural or legal person which can establish a direct and present interest in the result of the dispute (the intervener) to intervene as a third party…" at art 23).

before the court and allowing time for all affected parties to apply for standing. The manner of implementing the principle could be left to the court itself, by giving it the power to determine its rules of procedure according to principles of fairness stipulated in the court's constituting document.

Balance between Rights and Responsibilities

In ISDS at present, foreign investors have elaborate rights, with corresponding responsibilities for countries. Yet ISDS lacks actionable responsibilities for foreign investors. The underlying logic is flawed. If foreign investors require special international protections because domestic institutions are insufficient, then equivalent protections should be available to victims of mistreatment by foreign investors where those victims are left unprotected by domestic institutions. That is, foreign investor rights and responsibilities, based on international standards, should be ensured through access to equivalently enforceable processes of international dispute resolution.

For ISDS to be made balanced, foreign investors must be required to respect international standards of appropriate conduct in their treatment of workers, consumers, shareholders or the environment, for example. A redesigned ISDS must also make foreign investor responsibilities actionable through the same process as foreign investor rights. A modest starting point would be to allow a country to bring a claim against a foreign investor or related company in response to a foreign investor claim against the country. More robust steps would give countries or victimized parties a right, alongside foreign investors, to initiate proceedings in the first place.

If a multilateral investment court does not incorporate foreign investor responsibilities, it will exacerbate a fundamental imbalance in ISDS. In such circumstances, it would be better to terminate these special rights for foreign investors in favour of the protections available to all market actors through contracts, contract-based arbitration, domestic courts, private or state-backed risk insurance, political processes and diplomacy.

Respect for Domestic Courts

For a variety of reasons, international adjudication should supplement more suitable venues for dispute resolution, not replace them. In turn, it is a standard feature of international law for a person to be obliged to resort to the domestic courts of a country, unless it can be shown that those courts do not offer justice, before bringing an international claim against the country.

Remarkably, in ISDS, foreign investors are not required to seek a resolution in a country's courts before bringing an international claim. They are not even asked to supply evidence that domestic courts cannot ensure effective protection before resorting to ISDS. In effect, it is assumed in ISDS that courts fail systematically to offer justice in all countries subject to ISDS, and that ISDS is independent and fair in the manner of a court which, as noted above, it is not.

A modest starting point would be to allow a country to bring a claim against a foreign investor or related company in response to a foreign investor claim against the country.

At a multilateral investment court, this lack of respect for domestic courts must be remedied by incorporating the duty to exhaust reasonably available local remedies into the court's constituting document. To preserve party autonomy and sanctity of contract, there should also be a duty of claimants to resort to any forum to which they have previously agreed to submit the relevant dispute. Why should foreign investors not be required to go to domestic courts or contractually agreed fora if they cannot show that the courts or other fora do not offer justice, ensure compensation for expropriation and so on?

Or Termination?

Without a compelling case for creating special rights for foreign investors, there is no reason for ISDS in any form. Granting special legal status and access to public money for any actor, let alone for the largest companies and wealthiest individuals in the world, calls for clear justification based on evidence of a public benefit to outweigh the major risks and costs to the public and other actors.

Otherwise, one would proceed with a major expansion of foreign investor protections by institutionalizing them at the multilateral level, incorporating existing investment treaties into the multilateral facility, and facilitating new agreements (such as CETA) among numerous developed countries that currently do not allow ISDS in their extensive foreign investment relations. Moreover, one would proceed in this way without accounting for the threat to public budgets, the constraints on regulatory decision making, the skewing of markets and the challenge to established structures of public accountability and the rule of law.

Any redesign of ISDS must therefore satisfy certain criteria for it to qualify as independent, fair, balanced and respectful of domestic institutions. If the criteria are not met, it is preferable to terminate ISDS and withdraw these special rights for foreign investors.

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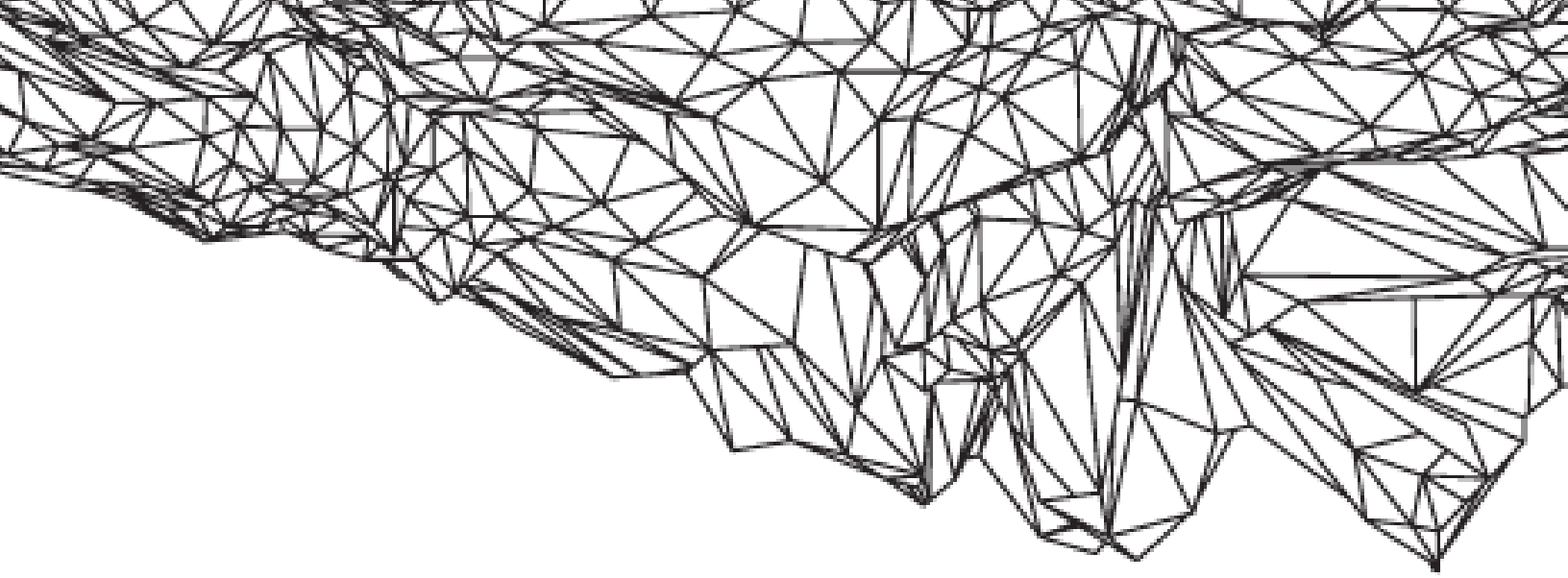
Within innovation-oriented firms, internal negotiations may be more complicated than for routine production; however, disagreements can be resolved by executive fiat. (Photo: Shutterstock.com)



Rethinking Trade and Innovation for the Digital Age

Brian Kahin

Economics is an imperial science: it has been aggressive in addressing central problems in a considerable number of neighboring social disciplines, and without any invitations.
— George Stigler (1984)

The principle that institutions matter is widely accepted, promoted by the Organisation for Economic Co-operation and Development, the World Bank and other international organizations. New institutional economics (NIE) has become a respected academic field, legitimized by Nobel Prize winners, and known for its leading methodology — transaction cost analysis.[1] NIE focuses on relationships and decision making at the level of the firm or organization, rather than the statistical aggregates of mainstream economics.

Transaction costs include the intangible costs of identifying needs, searching for solutions, evaluating products, and negotiating the deal — as well as the practical costs of delivery, reliability, risks and maintenance that follow. This can be a long, ongoing process, especially in the context of business relationships within a supply chain where there are uncertainties, both upstream and downstream. Such contracts are bound to be complex but incomplete. They are adjusted over time as external conditions, and new opportunities, are revealed. A good contract tries to anticipate change, but there are intangible elements in a business relationship, such as trust and evolving business interests, that cannot be specified in advance.[2]

1 Ronald Coase, "The Nature of the Firm" (Coase 1937) is the seminal work. Other Nobel winners associated with NIE include Oliver Williamson (*The Mechanisms of Governance*), Douglass North and Elinor Ostrom.

2 Moreover, the learning that comes with experience can strengthen and expand a business relationship — an example of "transaction benefits."

In the background, the classic binary decision persists: Should the firm make, or buy? Should it produce a necessary component itself, and save the costs of transacting? Or should it look to the market to find the best possible supply? Should the firm look for a better supplier or a second source, or solve problems by buying out the supplier?

National institutions, notably laws, govern and support transactions and the organization of economic activity. Conversely, the practical economics of transacting should inform the rules of commerce. The design of fixed institutions such as patents, competition law, tax, privacy, subsidies and trade shapes economic behaviour over the long term (as distinct from short-term measures such as monetary policies and public spending).

Transacting across Borders

The question of locating production inside or outside the firm is paired with the question of locating production inside or outside the country. Supply chains that cross national borders become global value chains. As globalization has progressed, the relatively "hard" transaction costs of tariffs, transportation and communications have been reduced. Less tangible barriers — national standards, legal and regulatory differences and language — have also diminished. Until the financial crisis, world trade and foreign direct investment grew substantially relative to GDP.

Trade is a well-developed branch of economics in which specialization, scale economies and comparative advantage play recognized roles. Unlike NIE, trade is highly visible and easy to measure. Borders are well-defined; cross-country comparisons are routine. Perceptions of legal systems, political stability, transparency, corruption and trust are sometimes surveyed, primarily by academic researchers and non-governmental organizations. All of these factors inform the make-or-buy, foreign-or-domestic decision matrix — alongside costs of production, benefits of specialization, investments required of the supplier, potential for learning and supply chain control. This is more a matter of orchestrating relationships and global strategy than it is tractable economics.

Transacting for Innovation

Analogous to global value chains in trade, the idea of "open innovation" maintains that innovation should be less restricted to in-house research and development (R&D) and should focus more on the acquisition of knowledge and technology from outside the firm (Chesbrough 2003).[3] As in trade, there are benefits to specialization and the ability to draw on the best information, knowledge and human capital from anywhere in world. As expressed by Bill Joy, co-founder of Sun Microsystems, "no matter who you are, most of the smartest people work for somebody else." Given the intangible resources needed for innovation, relationships can take many forms, including: non-exclusive licensing, acquisition of patents and/or trade secrets, cross-licensing, consulting arrangements, pooling of intellectual property, joint ventures, standards development, contracting for R&D and acquisition of start-ups.

Compared to mature industries with component supply chains, innovation-oriented firms must contend with higher levels of uncertainty, although uncertainty diminishes as ideas are tested, proven, refined, implemented and, eventually, face the market. Innovating within the firm has the advantage that everything within its boundaries is (at least in theory) under common ownership and control, and while internal negotiations may be more complicated than for routine production, disagreements can be resolved by executive fiat. The firm can also choose to acquire a company that has the desired technology and expertise, and so curtail further transacting (although there may be intangible costs in assimilating an enterprise that has a different culture).

Innovation can be complicated by the core institutional framework for innovation, patents, which offer a telling example of the relationship between institutions and transactions. Patents are negative rights to exclude others, and not, as is often assumed, a right to exploit the technology. Even in technology developed wholly within the firm, underlying rights may belong to someone else. When patenting is pervasive, as it is in digital technology, it becomes very costly to evaluate ownership and to negotiate licenses.[4]

Like neoclassical economics, the patent system does not acknowledge transaction costs. Moreover, it operates on the premise that one size fits all. While strong exclusion is well-fitted to the high costs of bringing valuable molecules to market, the rich functionality and high degree of

3 "Open innovation" commonly involves the acquisition or licensing of proprietary knowledge or technology, and is not to be confused with the essentially non-proprietary nature of open-source software.

4 In addition, there is a penalty for willful infringement, so engineers are commonly advised by counsel not to read patents — even though public disclosure is claimed to be an important objective of the patent system.

> Like neoclassical economics, the patent system does not acknowledge transaction costs. Moreover, it operates on the premise that one size fits all.

interdependence in information technology imposes heavy transaction costs. The problem is manifest in the estimate of 250,000 possibly patented functions related to smart phones,[5] a volume that imposes a heavy cognitive burden on innovators — especially relative to the diluted value of individual patents when there may be hundreds or thousands embodied in a single product. This drives demand for specialized lawyers as intermediaries, who, in turn, benefit from the transaction costs and the volume.

Through bilateral cross-licensing, incumbents are able to contract around both the transaction costs and the need for licenses. However, the environment has been further complicated by the rise of patent assertion specialists (or "trolls"), who do not need cross-licenses because the fact that they produce nothing makes them invulnerable to the patents of others. The largest companies fight back with overwhelming legal resources, which induces trolls to litigate against smaller firms that are less able to mount a vigorous defence. So the high cost of legal disputes — a major transaction cost in terms of direct outlays and risks — can become both a defensive and offensive weapon. Although individual patents can still be of value to small firms, the net effect is to tilt the playing field against small firms in favour of large firms. At an international level, the imbalance is worse because patents are territorial and must be secured (and enforced) in every jurisdiction where protection is sought. Small firms that try to operate internationally may find that they face unfamiliar patent owners with different patents, procedures, and all in a foreign language.

Digitization

Digital technology is not just a field of technological innovation; it permeates the entire economy as a general purpose technology. It has played a major role in reducing transaction costs such as searching, communications, documentation, advertising and maintaining economic and social relationships across time and space. The internet has provided a universal platform for globalization, which, in turn, has enabled economies of scale and specialization for digital technology, advanced miniaturization and led to exponential improvements in performance, network effects and low-cost access. Yet barriers based on territory persist, preserving transaction costs and inhibiting scaling. Patents, taxes, competition laws, consumer protection, privacy laws, regulation of services and so on, are all territorial, which mattered less in a pre-digital, less global environment.

Like transaction cost analysis and institutional economics, digitization and globalization push and pull at the conventional framework of firm-level microeconomics and nation-level macroeconomics. Digitization pushes from below, challenging the standard economic measures, and raising questions about what value is missed in official statistics. Digitization expands the significance of transaction costs by showing how a reduction in transaction costs works at the consumer level, leading to virtual stores with millions of apps, long-tail markets such as eBay, resource-sharing platforms such as Airbnb, and the extended ecosystems of Google and Amazon.

Digitization has created new innovation paradigms that are especially suited to environments where production costs and entry barriers are vanishingly low, where rapid and widespread adoption is possible, and where the technology enables further innovation, new uses and personal expression. Prominent examples include the internet, the World Wide Web, most software standards and open-source software. In these cases, public funding, academic collaboration, business models and/or volunteers enable "permissionless" innovation, in which the transaction costs of search, negotiation and distribution may be eliminated, along with any direct costs.

Diminishing costs of transacting, production and entry are mutually reinforcing. Evaluation costs are reduced by the comments of individual users in forums, mailing lists, wikis and blogs. Smartphone platforms have made it easy to develop apps using published APIs (applications programming interfaces) and SDKs (software development kits). Cloud services have lowered barriers for small businesses by eliminating the need to invest in hardware and software.[6] Advertising offers an alternative to conventional production and distribution models. "Free" becomes a more viable price as attention grows scarce

5 See www.nasdaq.com/markets/ipos/filing.ashx?filingid=7325067. There are several relevant transaction costs here: identifying relevant patents; assessing the validity of each patent; and determining whether the patent may be infringed.

6 For example, Facebook is used to host web pages for 60 million businesses worldwide.

and marketable. And there are transaction benefits: clicks and "likes" as signals of value; free trials that may lead to paid transactions; and successful transactions leading to long-term relationships.

New Institutional Economics

Digitization has played a major role in bringing down barriers, supporting transactions across borders and trivializing the cost of remote communications. The institutional environment is now determined less by the laws of the nation-state and more by the overarching political economy of globalization — not just formal institutions such as the World Trade Organization, the International Monetary Fund and trade agreements — but phenomena such as global value chains, visa-free travel, migration and the many networks — economic and social — riding on the internet. True, the advance of globalization has stalled relative to GDP, and it has evoked a populist reaction that aims to "take back control" and promote national interests with less appreciation for economic interconnectedness.

There is another change: internet platforms engaging millions of users have become institutions in their own right, managing markets, implementing policies and shaping economic exchange and social interaction. They have become the most valuable companies in the world, with an intimidating aura of invulnerability and permanence, while serving as essential infrastructure for individuals, start-ups and small and medium-sized enterprises (SMEs). Unlike globalization, digitization does not present an easy target for political reaction; however, foreign tech giants do. They have pushed envelopes on many fronts — copyright, privacy, tax, competition law and regulation of services — where they often meet resistance. This is especially the case in Europe, while China has effectively walled itself off.

How can a mid-sized country develop national strategy in this world of economic giants and diminished political leadership? How does it advance its domestic enterprises in this unfamiliar environment? Can it answer the conundrum of digital inequality, the distance between a Facebook business page and Facebook's own colossal infrastructure? The conventional wisdom is that cloud services, open-source software and niche opportunities provide a breeding ground for billion-dollar "unicorns" that will be snapped up by competition among the giants. How common or real are unicorns? Is Facebook, founded in 2004, the last of the giants? Is there still an organic path to the top?

There are a few options to consider:

- **Reducing transaction costs**: Cities, clusters and regional corridors help reduce the transaction costs of human interaction, especially the exchange of tacit knowledge. Education, training and learning by doing also help reduce knowledge-related transaction costs over the course of a lifetime. These benefits are often combined in strategies for regional development, but the positive externalities and feedback loops (often amplified by digitization) are hard to measure. Costs and benefits are too often calculated on direct revenue and expenditures, rather than long-term buildup of human capital and economies of agglomeration.

Digitization has contributed to breaking down barriers, supporting transactions across borders and trivializing the cost of remote communications.
(Photo: Orlok / Shutterstock.com)

Internet platforms engaging millions of users have become institutions in their own right, managing markets, implementing policies and shaping economic exchange and social interaction.

- **Exploiting opportunity**: There may be concrete niche opportunities in national policy/strategy, just as there are for SMEs. This is usually framed in terms of scientific research that may be pursued and commercialized anywhere in the world where human capital and resources are gathered in critical mass. It may make sense to focus on opportunities to break down institutionalized thinking by exploiting local culture, climate or political conditions. Research on cannabis may be a candidate, given the prejudice and political paralysis that exists in most places, including the largest markets. The inventor ownership policy of the University of Waterloo is unique in North America, demonstrably successful, especially for digital technology, and worthy of possible adaptation elsewhere (Kenney and Patton 2011). Too often, policy makers succumb to concepts of harmonization and best practice, but convergent groupthink may in fact create room for contrarian alternatives.

- **Experimentation**: Failure is a mark of experience in Silicon Valley, but a stigma in government. However, the risks involved in policy and programmatic initiatives are often accepted at the local level, where it is easier to develop consensus and there is less risk of entanglement with ideological politics and more opportunity to explore public-private partnering with due care. Digitization of publicly supported services is a relatively easy bet, and successes can often be amplified through sharing with other locations.

- **Rethinking trade and innovation policies**: The lesson of institutional/transactional economics is that there is space for original thinking both below and above the conventional micro-to-macro economy. Thanks to digitization, there are new "subtransactional" or nanoscopic levels of value-adding activity. On the upper end, invocations of popular will, and evidence-free policy making undermine past agreements and accommodations. In this expanded strategic space, perhaps policy should enjoy the excitement and creative thinking that digitization has brought to the private sector. Legacy assumptions might be reconsidered in light of digital empowerment, expansive digital ecosystems, and the deficiencies in conventional leadership.

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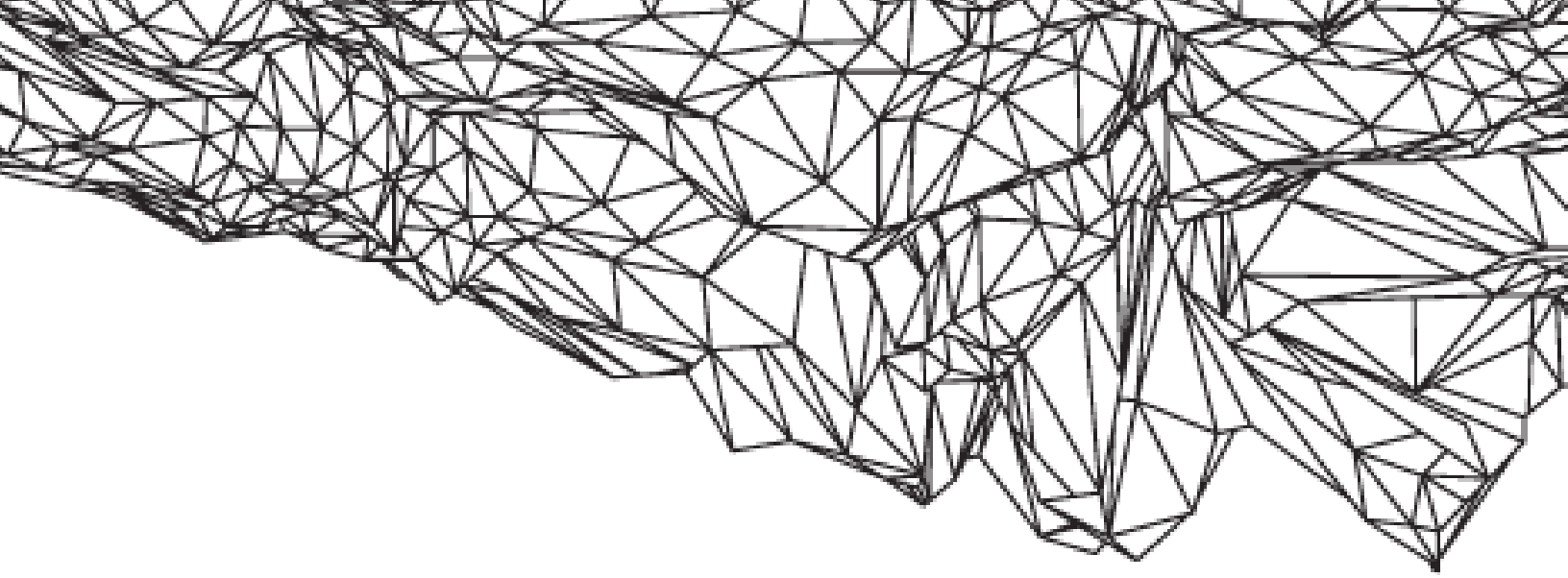
Brian was founding director of the Information Infrastructure Project at Harvard's Kennedy School of Government (1989–1997), the first academic program to address the economic and policy implications of the internet. From 1997 to 2000, he was senior policy analyst at the White House Office of Science and Technology Policy, where he chaired the Interagency Working Group on the Digital Economy on behalf of the National Economic Council. Brian has edited 10 books on the internet and the digital economy, including *Understanding the Digital Economy* (with Erik Brynjolfsson) and *Advancing Knowledge and the Knowledge Economy* (with Dominique Foray). A graduate of Harvard College and Harvard Law School, he has taught at Harvard, Maryland (College Park), Michigan (Ann Arbor), Colorado (Boulder) and, most recently, the University of Washington's Evans School of Public Policy and Governance.

The role and research and development activities of foreign enterprises in the Canadian economy have long been debated. (Photo: Nataliya Hora / Shutterstock.com)



Why Global Innovation Supply Chains Are Going Local

David Wolfe

There are increasing signs that large global companies may be shifting their innovation strategies away from a long-standing habit of centralizing their research and development (R&D) operations close to their home base, and starting to decentralize their innovation activities by tapping into regional sources of expertise in host countries, in the hope of gaining competitive advantage.

If it persists, this emerging trend toward creating a geographically diverse global network of research hubs — each embedded in its own local innovation clusters — has significant implications, not just for business strategy, but for the host countries and regions, such as Canada, that are attempting to accelerate their knowledge-based economies by attracting international investment in higher-value-added activities.

Evolving Perspectives on Policy and Performance

Canadian innovation policy has long been concerned with the impact of the multi-national enterprise (MNE) on Canadian R&D and its success or failure in innovative performance. A substantial body of research attributes Canada's innovation underperformance to the predominant role played by MNEs in the R&D-intensive sectors of the economy, especially manufacturing. This perspective was reflected in the work undertaken by the Science Council of Canada in the 1970s and 1980s, but has been more recently echoed in detailed assessments from the Council of Canadian Academies (CCA), notably in its path-breaking report *Innovation and Business Strategy: Why Canada Falls Short* (2009). However, current research on international business strategy suggests that the relationship between MNEs and the global production networks through which they coordinate

MNEs tend to maintain a strong home base and perform most R&D in their country of origin.
(Photo: Lilyana Vynogradova / Shutterstock.com)

activities may be changing the calculus by which MNEs view their investment strategies in host countries. MNEs appear to be restructuring their local operations in host countries, shifting their emphasis from customizing global products for local tastes to sourcing R&D globally. To better understand Canada's innovation performance, two critical questions must be considered: is this shift occurring in Canada, and if so, what are its implications for Canadian research and innovation policy?

Foreign Enterprise and Canadian R&D

For decades, the role of foreign enterprise in the Canadian economy has been a subject of contention, and its relevance for R&D activities is of particular significance. The ratio of R&D spending to GDP in Canada is lower than in other industrial nations, including the United States, Japan, Sweden, Belgium and the Netherlands. The impact of Canada's legacy of foreign control in manufacturing is still hotly debated in the literature on innovation and technological change. Much of the debate revolves around the effect exerted by foreign ownership on the innovative capability — both product and process — of Canadian manufacturing. Critics, such as the Science Council of Canada, hold that foreign-owned firms underperform R&D in their Canadian operations, relative to Canadian-owned firms in the same industry. They also claim that such firms focus on the production of relatively mature products in their Canadian plants. Other observers, such as Kristian Palda, take the position that foreign-owned firms have raised the technological standard of production processes in Canada by acting as important sources of advanced manufacturing technologies, which they have implemented in their Canadian operations (Palda 1993, 126).

> Despite the increasingly global nature of technological activities, national differences among the leading industrial countries remain significant, and the specific character of the national economy is crucial to the domestic firm's innovativeness.

The Canadian case fits well within the context of a broader debate over the globalization of technology, which centres on the questions of how specific national or regional contexts affect the process of innovation and technology diffusion, and what their implications for policy might be. Despite the increasingly global nature of technological activities, national differences among the leading industrial countries remain significant, and the specific character of the national economy is crucial to the domestic firm's innovativeness. Researchers have asserted that multinational firms, too, continue to maintain a strong home base — where they perform the bulk of their R&D — in their country of origin. In this scenario, the foreign operations of such firms might support innovative activity, but it is more likely to be

confined to the customization of existing technologies to suit the tastes or unique conditions of local markets. Accordingly, one would expect to find a heavy emphasis on marketing, close-to-market development (rather than full-fledged R&D) and strong local relationships with customers rather than with suppliers or potential research collaborators. The importance of linkages to science-intensive local or regional universities and public research labs would logically be less for such foreign-owned firms than for their domestically based counterparts. Overall, these studies suggest that the role of the home country and its individual policies is not reduced as a result of globalization (Gertler, Wolfe and Garkut 2000). Notwithstanding the globalization of markets and production, there remains a compelling reason why companies continue to concentrate their technological activities at home.

These themes in the international literature resonate with the analyses presented in a number of background studies carried out by the Science Council of Canada in the 1970s and 1980s. Particularly noteworthy was John Britton and James Gilmour's *The Weakest Link: A Technological Perspective on Canadian Industrial Underdevelopment* (1978). Britton and Gilmour showed that Canadian subsidiaries of foreign firms largely depended upon the transfer of mature industrial and product technologies from their parent companies. As a result, Canada was a recipient in the international technology transfer system and, for the most part, domestic firms depended on this imported technology or were imitative of it. Small domestic firms in the Canadian economy were constrained by their limited capacities and the lack of support they received from public purchasing or procurement and investment. An additional consequence of these factors was the overreliance of the Canadian economy on the production of manufactured goods that depended on mature product technologies.

Britton and Gilmour also suggested that Canada could improve its innovative performance by making greater investment in scientific R&D, but — given the limited incentives for technological development offered by the marketplace in Canada — this would be insufficient to overcome the technological deficit that the country faced. This innovation deficit implied the need for government action to regulate technology imports and to strengthen the bargaining power of Canadian firms when purchasing technology from abroad. The study concluded that technology policy in Canada needed to address both the demand and the supply side of "the Canadian innovation system," in contrast to the traditional Canadian policy approach that focused on the generation of new knowledge without considering the linkages required to stimulate demand for new products.

Gains realized through improvements in traded goods and services would generate increased prosperity throughout the provincial economy.

Growing at Home to Reach World Markets

The report of the Ontario Premier's Council, *Competing in the New Global Economy*, released in April 1988, introduced an important distinction into the debate over the performance of R&D in Ontario and Canada. The report distinguished between the roles played by indigenous and non-indigenous firms in Canada's innovation performance. It portrayed international competition as the key to a high-wage economic strategy and improved standards of living. This strategy could best be pursued by focusing economic policies on traded businesses — those exposed to world trade and competition. Gains realized through improvements in traded goods and services would generate increased prosperity throughout the provincial economy. To achieve this goal, Ontario (and Canada) needed to increase the number of indigenous companies capable of competing effectively in global markets. Indigenous firms could be either MNEs or domestically owned; the critical variable was the extent to which they performed a high level of R&D in Canada and viewed the national economy as an export platform for competition in global markets, rather than as merely a sales outlet for products and technologies developed elsewhere. From the Council's perspective, indigenous firms were more likely to provide higher-value-added jobs, generate indirect employment and create spin-off companies in the province. Ontario's challenge was to accelerate the growth of indigenous firms in the traded sectors that had the potential to reach world-scale levels of activity (Premier's Council 1988, 75).

Many of the issues hotly debated in the 1970s and 1980s seemed to fade into the background in the following two decades, after the adoption of the Canada-US Free Trade

Agreement in 1989. The integration of Canada into the North American Free Trade Agreement in 1994 signalled the triumph of the more market-oriented perspective, which favoured a laissez-faire approach to the role of MNEs, over the more interventionist strategy of the Science Council or the Ontario Premier's Council.

Over the past decade, however, as concern with Canada's weak innovation performance has re-emerged, the issue of foreign control has received renewed attention. The CCA's *Innovation and Business Strategy* report identified foreign control among Canada's large firms as a key factor in lower business expenditures on R&D (BERD), but said that measuring its direct impact is complicated by other factors, in particular the overall effect of firm size and the propensity to perform R&D across different industrial sectors (CCA 2009, 101). US multinationals operating in Canada tend to be large and in R&D-intensive sectors, both of which correlate positively with R&D on their own. Given the size and role of MNEs in these sectors, they could make a greater contribution to Canada's innovation performance if they behaved more like the indigenous firms described by the Premier's Council.

Striving for "Dynamic Connectedness"

While the preponderant role of MNEs in critical sectors of the Canadian economy remains challenging from an innovation policy perspective, recent research on trends in international business strategy suggests that global MNEs might be recasting their R&D activities in host countries in a manner that could be beneficial to Canada. Relationships between subsidiaries in host locations and their parent MNEs have been shifting in recent years as subsidiaries have been given broader mandates to pursue "asset-seeking" or "asset-augmenting" strategies. In this approach, subsidiaries are granted greater scope to pursue competence-creating investment strategies, in the belief that the host location is not just a market for the home country's products but also a potential source of competitive advantage for the MNE.

John Cantwell (2009) maintains that globalization and national specialization are complementary parts of the process and not conflicting trends. The trend toward organizing on a global basis is founded on the desire to tap into the locally specific and differentiated stream of innovation in each national centre. According to Cantwell, this view depicts "the MNE as an international network for geographically dispersed innovation" that stresses "the dynamic connectedness between local knowledge creation and exchange in each node of the network" (ibid., 36). This change involves a shift in the role of the MNE, from that of institutional mechanism for transferring new technologies across national boundaries to creator of new technologies in discrete national and regional jurisdictions.

> As MNEs shift their innovation strategy to one of networked technology creation, they become more interested in producing in locations that provide access to complementary innovation capabilities.

For this strategy to succeed, the local subsidiary must become embedded in its own local network of research activity and competence building. As MNEs shift their innovation strategy to one of networked technology creation, they become more interested in producing in locations that provide access to complementary innovation capabilities. From the perspective of the firm, the goal is to link a range of high-value-creating activities across a number of different nodes or centres of excellence that collectively form the international network of the MNE, which results in the construction of an integrated portfolio of locational assets across a range of host countries or regions in which the MNE is embedded. This changing rationale for MNE investment involves a new strategy for corporate diversification in which the MNE can create greater value by linking a series of interdependent subsidiaries and research centres into an evolving range of complementary activity. There may also be a competitive rationale for industry-leading MNEs not wanting to locate their technology development activities in the industrial home base of their major competitors. The strategy of differentiating their regional sources of research expertise might also create the opportunity for new innovation and development strategies for the host economies in which the MNE is based. This could be particularly true in the case of new or emerging technologies at the core of the current information and communications paradigm that are not an area of research excellence for the MNEs' home base (Cantwell 2017).

This emerging trend has significant implications for host economies, such as Canada, which have traditionally

been the locus of high levels of foreign investment. Regional economies able to leverage their research assets and talent base have the potential to attract new forms of investment by MNEs interested in accessing "asset-augmenting capabilities" as a core element of their evolving innovation strategies. The trend also has the potential to alter the historical pattern in Canada of underperforming on levels of BERD. Analysis of recent trends in the data on MNEs' performance of R&D in Canada suggests that just such a pattern may be emerging in this country. The data in Figure 1 provides initial evidence to support this view; there has been a noticeable increase in the foreign share of R&D performed in Canada over the past decade and a half.

More recent data might provide further confirmation of this trend. Recent announcements by several MNEs with a strong presence in Canada signal a continuing shift in the corporate approach to investments in the domestic economy, especially in the auto sector. This trend is notable because the sector was identified in the CCA report as one of the critical manufacturing sectors with relatively little domestic R&D being performed by the "Big Three" who dominate it, despite the substantial proportion of North American vehicle production accounted for by Ontario. According to the current president of General Motors of Canada Company (GM Canada), Steve Carlisle, the Canadian industry must stop relying on technology developed elsewhere for the cars assembled here: "The way I think of it in real simple terms is we need to be inventing things to manufacture, not relying on manufacturing things that have already been invented" (Owram 2016). Announcements by GM Canada and other leading manufacturers over the past several years suggest this pattern is beginning to change, as they reassess their investment strategies in the host region. This development is in keeping with a broader trend in the changing relationship between MNEs and host regions described by Cantwell. The data presented in Figure 2 provides a preliminary indication of an increasing trend of automotive R&D in Canada.

General Motors, with a strong historical base in Ontario dating back to the early twentieth century, has recently announced a dramatic shift in its investment strategy in the province. In June 2016, the company announced a major new investment in its Canadian regional engineering centre in Oshawa, which will expand its current employee base to more than 1,000 positions in the next few years. Research at the expanded centre will focus on autonomous vehicle software and controls development, active safety and vehicle dynamics technology, audio and video "infotainment" systems and connected vehicle technology — all critical areas of R&D for the next generation of automotive technology. The plans exceed the capacity of the current Oshawa tech centre and so GM Canada has opened a new automotive software development centre in Markham, Ontario. In the words of Mark Reuss, GM's vice president of global product development, Canada was selected as the site of this R&D expansion "because of its clear capacity for innovation, proven talent and strong ecosystem of great universities, startups and innovative suppliers" (GM Canada 2016).

Research suggests global MNEs might be recasting their R&D activities in ways that could benefit host countries such as Canada. (Photo: TRphotos / Shutterstock.com)

Figure 1: In-house Industrial R&D Expenditures by Country of Control, 2000–2013

Data source: Annual data compiled from Statistics Canada (2015).

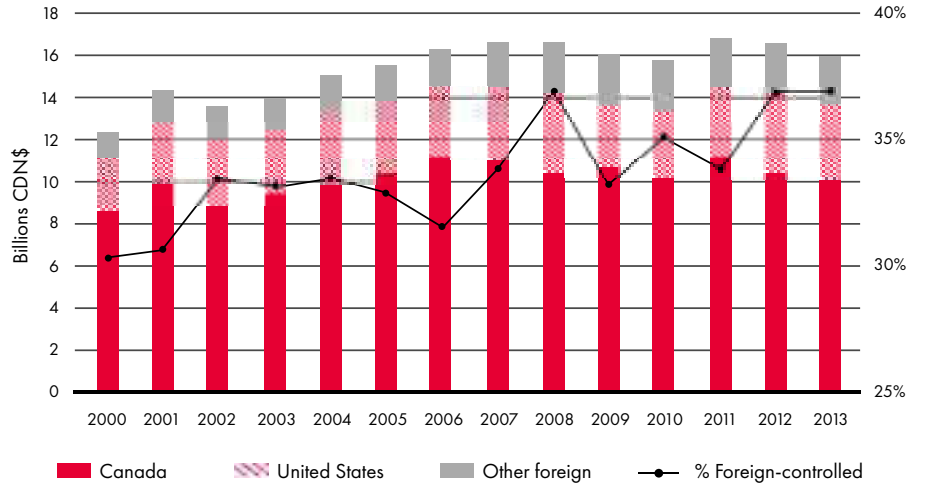
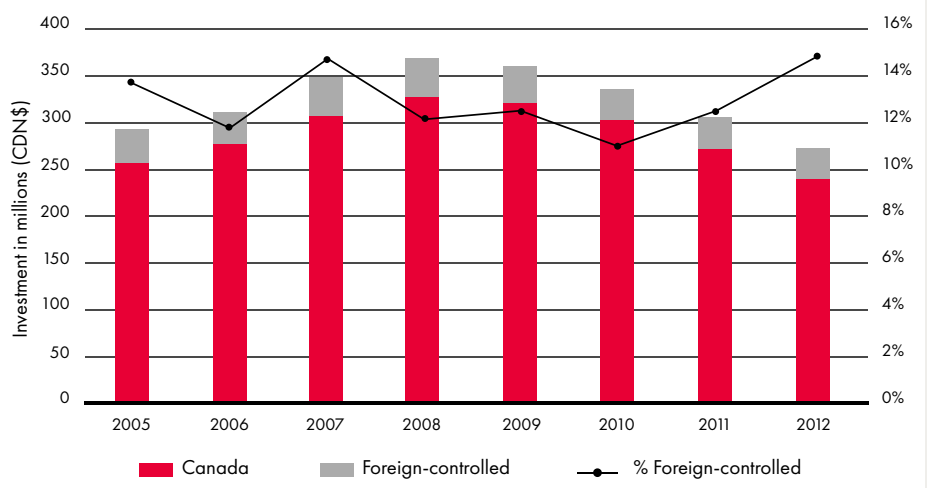


Figure 2: R&D Performers in the Automotive Industry in Canada

Data source: Annual data compiled from Statistics Canada (2015).



Conclusion: Expanding Canada's Innovative Capacity

The increased investment by automotive MNEs in Canada and Ontario's R&D capacity is a response to the growing integration of the automotive and information and communications technology sectors of the economy. The corporate decision by a leading MNE to focus a significant portion of its future research in Canada is a reflection of the established strengths of the research capacity in this part of the country. While it would be precipitous to build an overall strategy around one corporate announcement, this development suggests the need to rethink our innovation strategies at all three levels of government. In light of recent announcements by federal, provincial and municipal governments of the creation of new investment attraction agencies, such as Toronto Global, as well as the emphasis placed on the importance of attracting more foreign direct investment by the minister of finance's Advisory Council on Economic Growth (2016), this example contains critical lessons for the policy mandates of these new agencies. Looking at the outcomes of past strategies, evidence suggests that attracting MNEs to invest in Canada with substantial tax incentives or direct subsidies might be an inefficient use of scarce public resources. However, past investments in building the talent base and research capabilities of Canada's innovation infrastructure appear to have provide a stronger and more effective inducement to attract new investments by MNEs to Canada and to anchor existing MNEs in the national economy. A more judicious use of limited public funds might be to devote them to the support and growth of emerging indigenous Canadian firms that have the potential to compete in global markets. There is reason to believe that this focus, combined with the outstanding capabilities of Canada's research infrastructure, might prove to be the most efficient way to strengthen our domestic R&D base and future innovation potential.

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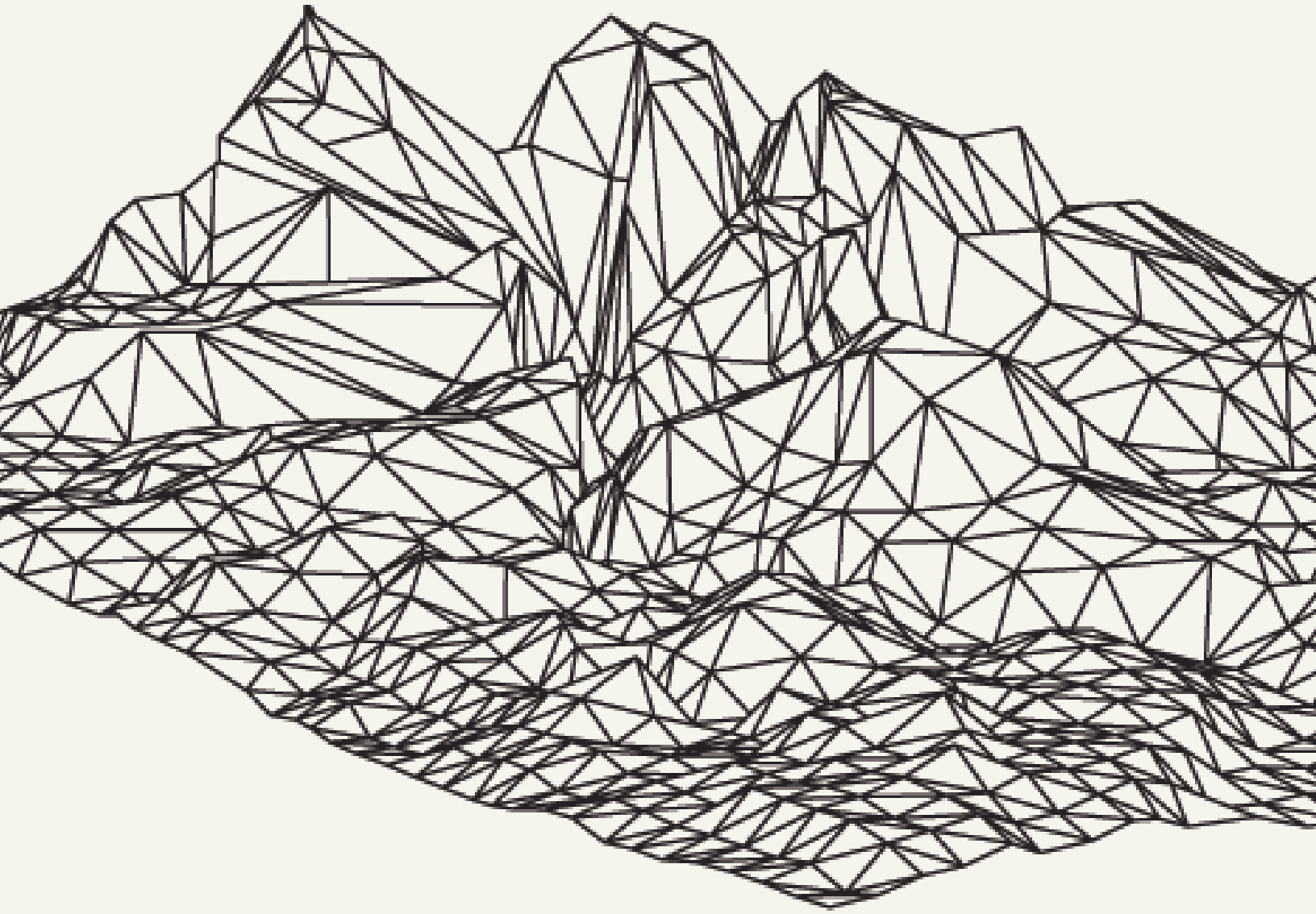
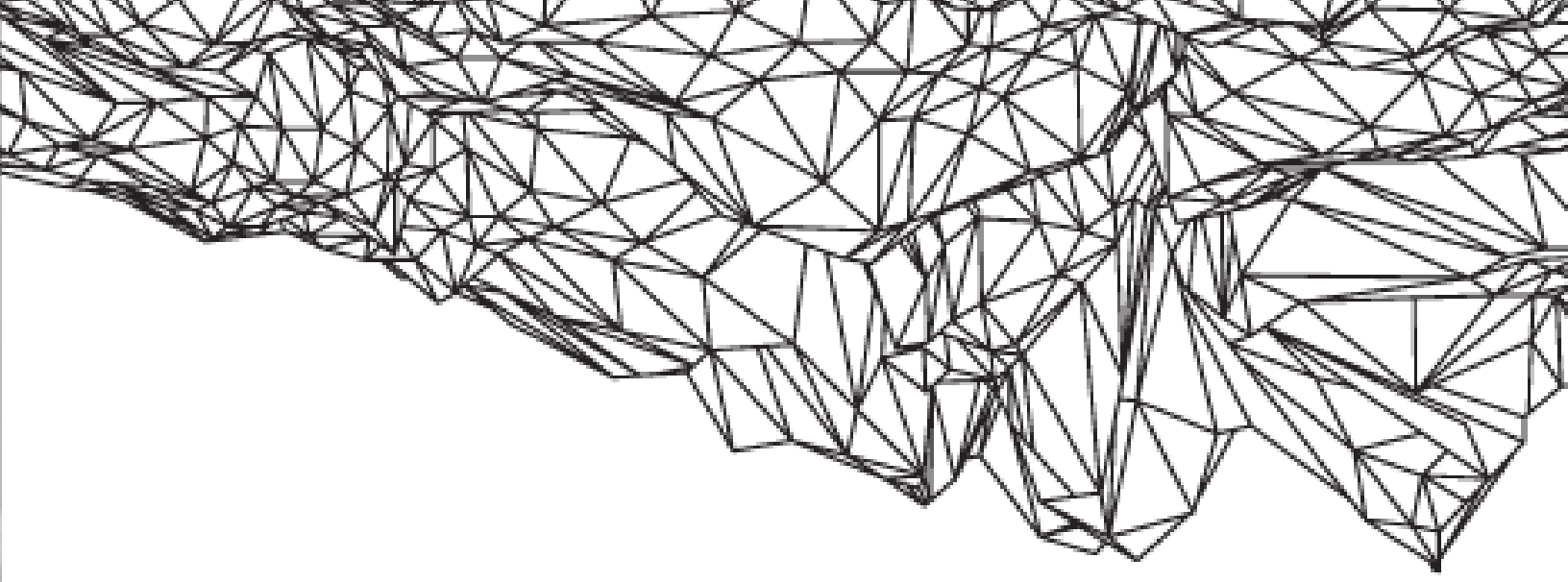


III

Domestic Policy

Once the cost of developing knowledge has been incurred, there is zero additional cost to having more parties use that knowledge. (Photo: Lilyana Vynogradova / Shutterstock.com)



Are Patents Really Necessary?

Joël Blit

The patent regime must be a central consideration of any modern innovation strategy. Patent rights influence, among other things, firms' incentives to innovate, knowledge diffusion, market organization, public access to technology, exports and foreign direct investment. They can either promote or inhibit innovation, depending on the strength of the patent rights and the specifics of the regime.

There are two principal and diametrically opposite moral philosophies on patent rights. First, the "natural rights view" sees an innovation as naturally belonging to its creator, the party that had the inspiration and invested in its development. Under this view, any action other than assigning full rights to the inventor constitutes theft. The opposite philosophy, the "public rights view," is that knowledge and ideas belong in the public domain, for all to discuss, use and build on, and that the assignation of private property rights constitutes an improper restriction on the rights of the public. This view is grounded in the fact that the laws of nature that govern our world exist separately from humans, and that just because an individual was first to discover something should not mean that the individual gains ownership over it. Between these extreme positions is room for a system that both recognizes some rights for inventors and affirms that information and ideas fundamentally belong to all. Thus, the approach that most legal systems have adopted in practice is a utilitarian one, where the need to incentivize innovation is traded off against the need for public access. Such a utilitarian approach is doubly important because of innovation's central role in driving improvement in our standard of living.

Patent rights can promote innovation in three main ways. First, they can facilitate knowledge diffusion because, as a condition of receiving a patent, inventors are required to describe the technology in sufficient detail so that someone skilled in the art can reproduce it. This requirement is long-standing. The first US patent act, passed by Congress in

1790, stipulated that a patent should "enable a workman or other person skilled in the art...to make, construct or use the same."[1] However, while facilitating diffusion may be a principal objective of patents, it does not seem to be an important mechanism in practice. Firms and their patent lawyers often obfuscate the workings of a technology in the patent's description, and patent examiners rarely effectively enforce the full disclosure requirement. Furthermore, managers in major technology companies routinely instruct their engineers not to search the prior art in a given technological field to mitigate the risk of a willful infringement court ruling and its associated larger damages (Boldrin and Levine 2013). Surveys of inventors, such as a report by Industry, Science and Technology Canada (1989), have confirmed that high-tech firms do not consider patents to be a particularly useful source of new information.

> There are two principal and diametrically opposite moral philosophies on patent rights.

The second way in which patent rights can promote innovation is by creating a market for ideas and innovation, thus facilitating transactions such as the licensing or sale of an innovation and enabling the efficient allocation of ideas and technology. Creative firms could focus on the development of technologies and allow other firms with comparatively better production, distribution or marketing capabilities to undertake the commercialization (Arrow 1962; Arora 1995; Gans and Stern 2003; Federal Trade Commission 2011). The extent to which patents foster innovation through this mechanism, while likely not negligible, remains an open question.

Third, and most importantly, they can increase the incentives for private agents to innovate by providing a higher return to innovation. This being the principal mechanism, it is examined in detail below.

Simple Model of Patents and Private Incentives to Innovate

Understanding why patents could be necessary to foster innovation by private agents begins with the recognition that knowledge is non-rivalrous. That is, the use of a given piece of knowledge by one party does not preclude another party from also using that same knowledge. Put differently, once the cost of developing knowledge has been incurred (perhaps by running experiments to discover the laws of nature or repeated trials to discover how to make a technology work), there is zero additional cost to having more parties use that knowledge. What's more, knowledge is largely non-excludable. Once created, it is difficult to keep others from learning about and using the knowledge. This non-rivalrous, non-excludable nature of knowledge makes it a public good that can drive large increases in welfare. But, paradoxically, for the same reasons that it is so valuable to the public, knowledge can be underprovided by the market, or even not provided at all.

The fundamental problem is that when an innovation can be quickly imitated by others, any profit generated by the innovation is quickly eroded. Figure 1, Panel A, shows the market for a product that is the result of an innovation. If the marginal cost of providing one additional unit of the knowledge good is zero, and the good is non-excludable so that there is imitation, competition will ensure that the equilibrium price is zero. This equilibrium is good for consumers because all consumers who value the good receive it, and they get it for free. However, because there are no profits to be had for the original innovator, the innovator would optimally choose not to invest in the development of his or her idea in the first place.

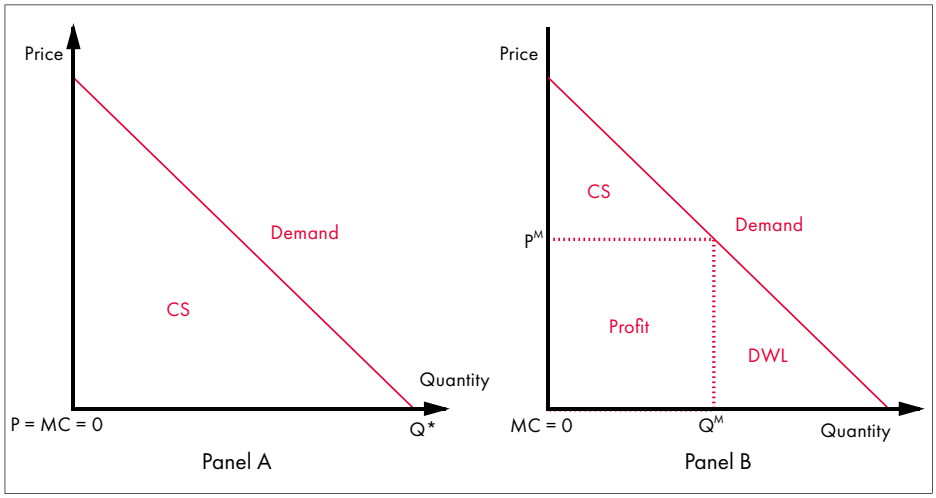
The solution to this problem is to make innovations excludable. This is done in practice by granting and enforcing patents that cover such innovations. Because inventors now possess a monopoly on the use of the innovation, they will choose to sell the knowledge good at the price *PM* and make profit *PMQM* (the square labelled "Profit" in Panel B). To the extent that these monopoly rents cover their development costs, the inventor will undertake the development of their idea. Of course, giving inventors patent rights comes at a cost. In the new equilibrium, consumers must now pay to consume the knowledge good and are thus worse off. For consumers who still choose to consume the good, there is no adverse impact to overall welfare because the higher price simply results in a transfer from consumers to the innovator. However, consumers who value the knowledge good at less than the monopoly price will choose *not* to consume the good, which leads to deadweight losses (DWL) for the economy and a lower welfare.

In summary, the simple model suggests that without patents there will be no innovation by private agents and

1 *Patent Act of 1790*, c 7, § 2, 1 Stat 109.

Figure 1: Market Equilibrium without Patents (Panel A) and with Patents (Panel B)

Source: Graphic provided by author.



Notes: In Panel A, due to competition from imitators, consumers receive the knowledge good at a price zero, and the entire area under the demand curve (which represents consumers' willingness to pay) is the consumers' surplus (labelled *CS*). In Panel B, consumers pay the monopoly price *PM*. This constitutes a transfer from consumers that choose to purchase the knowledge good to the innovator, who makes a profit. However, the economy in addition suffers DWL due to consumers that value the knowledge good at less than the monopoly price no longer consuming the good.

the entire welfare associated with an innovation will be lost. With patents, innovators will mark up the price of their innovation, which results in not everyone accessing the innovation and thus lower welfare.

Optimal Patent Length

The primary drawback of patents, the associated DWL, can be limited by making a patent's monopoly temporary. The trade-off is that limiting the term of patents weakens the incentives of inventors and that certain innovations, which from the point of view of social welfare should be undertaken, won't be. Conversely, lengthening the term of patents will increase DWL on all innovations, including those that would have been undertaken even with the shorter patent term. As a result, the optimal term is a function of the distribution of ideas that could be developed into innovations.

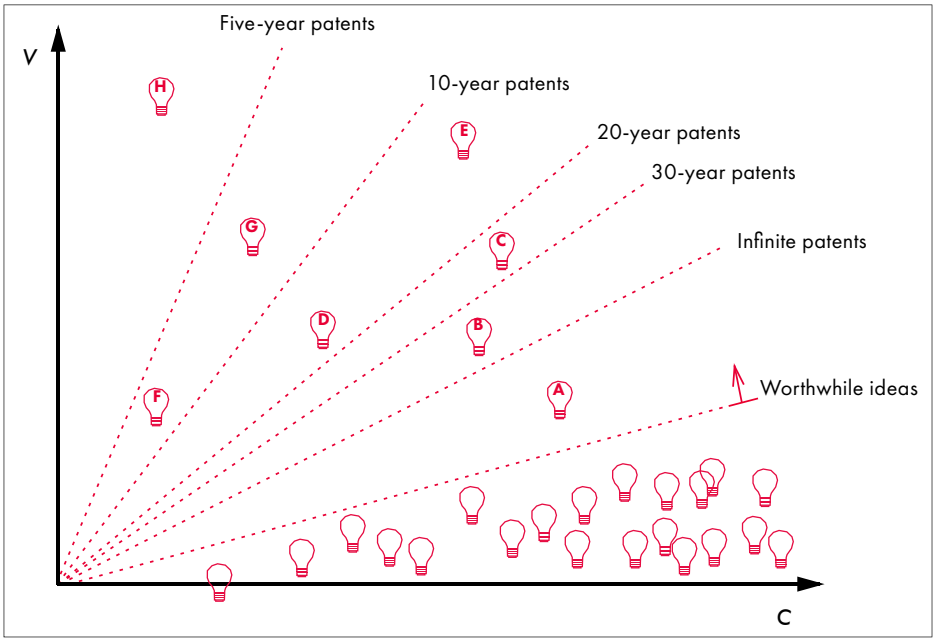
As Figure 2 shows, some ideas are better than others in that they may cost less (*C*) to develop into a useful innovation, or because the innovation may generate more value (*V*). Some ideas (for example, *H*) are very good in that they cost little and generate a lot of value. From the point of view of maximizing society's welfare, all innovations that generate (net present) values greater than their costs should be developed (at least in the absence of DWL). In the figure, these innovations fall above the "Worthwhile ideas" line (all the ones labelled with a letter). However, because patents decentralize the decision of whether to pursue an innovation, not all of these ideas are going to be developed. In fact, even if patents are infinite, idea *A* won't be developed because its cost will exceed the inventor's discounted stream of monopoly profits (as was shown in Figure 1, Panel B, even with a monopoly the inventor can only capture part of the value of the innovation). If patents are given a 20-year term, the net present value of an inventor's profit stream is further lowered, so that now ideas *B* and *C*, too, will not be developed. If the patent term is futher reduced to five years, only idea *H* will be developed.

The figure illustrates the basic trade-off between increasing the incentives of inventors so that more ideas are developed (by increasing the term) and decreasing the DWL associated with innovations that would have been developed regardless (by decreasing the term). In the figure, the optimality of a 10-year or 20-year term depends on whether the welfare gains generated by innovations *D* and *E* outweigh the larger welfare losses associated with a longer term on innovations *F*, *G* and *H*. It is therefore impossible to determine the optimal patent term unless one has perfect information on the cost and value of every idea. But the figure illustrates that as the term lengthens, each subsequent increase is likely to generate fewer and fewer additional innovations (the cone between the 10- and 20-year patent lines is larger than the cone between the 20- and 30-year patent lines).[2] Moreover, each subsequent increase of term raises the DWL on a larger number of patents. Therefore, one can expect significant welfare costs from increasing the patent term too much.

2 This will be true as long as the distribution of ideas is relatively uniform over the *C*/*V* space. However, it could be the case that a disproportionately large number of ideas reside between the 20- and 30-year lines.

Figure 2: Trade-off between Shorter and Longer Patent Terms

Source: Graphic provided by author.



Notes: The figure presents an illustrative distribution of ideas in terms of cost to develop the idea into an innovation (*C*) and the value of the innovation (*V*). Ideas with higher *V* and lower *C* are more valuable. From the point of view of society, all of the labelled ideas should be developed because their (net present) value exceeds their cost of development. However, inventors will compare their net present profit stream to their cost, in choosing whether to develop an idea. This leads to the fundamental trade-off. As patent term becomes shorter, fewer ideas will be developed. Conversely, increasing the patent term results in greater DWL on all innovations, including the ones that would have occurred anyway under the shorter patent term. The figure is drawn approximately to scale for a discount rate of r = 0.05.

Are Patents Really Necessary?

Importantly, the simple model assumes that innovations can be imitated quickly and at zero cost. In practice, it may take time for potential competitors to learn of the new innovation, let alone imitate it. This could give the original innovator a first-mover advantage that, even in the absence of patent rights, provides sufficient incentives for the inventor to develop his or her idea. Alternatively, if imitation costs are non-zero, the result would be limited entry, a positive equilibrium price and, potentially, sufficient profits for the inventor to cover development costs. Irrespective of the speed and cost of imitation, some markets may also have significant regulatory or other barriers to entry that limit competition and, thus, provide a profit for the innovator. Therefore, it may well be that, in practice, most innovation would occur even without the additional incentives of patents.

Patents are also not the only way to incentivize innovation. While patents have the advantage that they fully decentralize decision making and governments need not have knowledge of innovation opportunities or the value of innovations, and that under a patents regime the costs of development are ultimately borne by the innovation's users and not by the public, patents are in general less efficient in terms of overall welfare than many alternative mechanisms to incentivize innovation.

One alternative to patents, and a first-best from a welfare perspective, is for a sponsoring agency or government to offer the inventor a prize for producing the innovation. If the size of the prize is equal to the consumer surplus in Figure 1, Panel A, the prize has the added benefit that the inventor will choose to develop his or her idea into an innovation when it is socially optimal to do so (that is, when the cost of developing the innovation is less than the value that it generates) and will choose not to develop it otherwise. An additional benefit of this approach is that it can incentivize basic innovation and not just the applied variety, such as patents. Prizes are already being used effectively by groups such as the XPRIZE Foundation to spur innovation. And based on figures compiled by Dean Baker (2005), prizes or direct funding of research and development (R&D) could be more effective than patents to spur pharmaceutical innovation. Baker notes that, in 2005, the United States spent US$210 billion on prescription drugs and estimates that the cost would have been closer to US$50 billion in the absence of patents. And this additional US$160 billion expenditure generated, at most, US$25 billion of R&D spending (the total R&D spending of the US pharmaceutical industry in 2005).

In addition to prizes and direct funding of R&D, numerous related mechanisms for incentivizing innovation have been proposed, including buying out patents either

> Irrespective of the speed and cost of imitation, some markets may also have significant regulatory or other barriers to entry that limit competition and, thus, provide a profit for the innovator.

through direct negotiation with the innovators[3] or by determining the value of an innovation through a (shadow) auction of the innovation (Kremer 1998).

Conclusion

The model presented here makes the case that patents trade off DWL for increased innovation, and that there is an optimal patent term that achieves the best trade-off between them. However, patents are not the only way to incentivize innovation, nor are they necessary to obtain innovation in most practical cases. As a simplified model, it ignores the reality that innovation is cumulative and that firms respond not just to domestic intellectual property rights but also to the regimes in foreign countries. As another essay in this series will examine, in these more realistic scenarios, not only may patents not promote innovation, but they could even stifle it.

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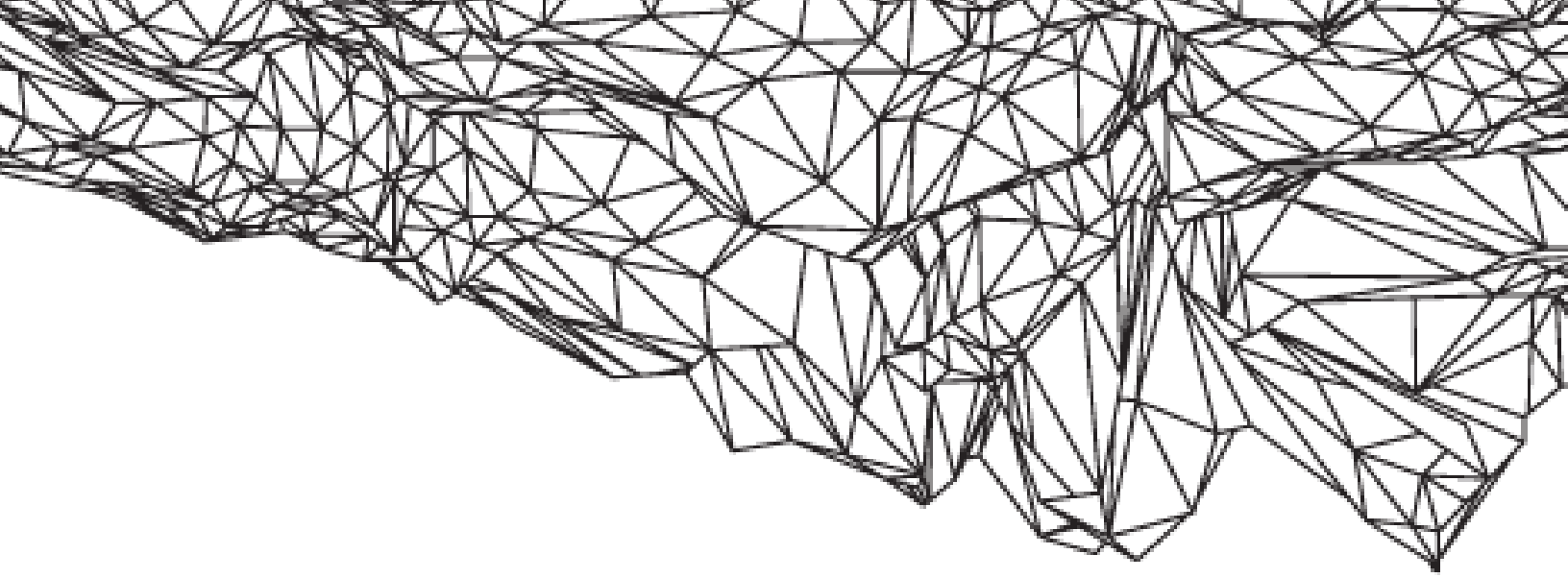
3 For example, in 1839 the inventors of photography sold the French government the rights to their innovation in an *ex post* negotiation, and the technology was placed in the public domain (Newhouse 1988).

A country that is rich and has a vibrant innovation system wants to lock in its lead. (Photo: Benny Marty / Shutterstock.com)



The Midas Conundrum

E. Richard Gold

One of the central credos of international discussions of intellectual property (IP) and development is as follows: countries that adopt higher levels of IP protection do better than those that do not. The problem is that there is no good evidence to support this. This has implications for how developing countries ought to think about IP.

To start with the creed, according to Kamil Idris, the former secretary general of the World Intellectual Property Organization, IP literally is Cinderella, "[a] drab but useful servant, consigned to the dusty and uneventful offices of corporate legal departments until the princes of globalization and technological innovation — revealing her true value — swept her to prominence and gave her an enticing new allure" (Idris 2003, 24). Similarly, the US Chamber of Commerce found, in a 2016 study, that countries that had higher (that is, more like those of the United States) levels of IP protection did better than those that did not in terms of access to finance, more trained researchers, more foreign investment, more inventive activity and better technology and access to streaming services (Global Intellectual Property Center 2016).

These, like too many other statements in the public discourse, are based on a careful weave of fiction and mendacity. They attempt to argue that because some IP protection in some countries is good, more IP protection everywhere is better.

The "more is better" story dates back at least to Ovid's *Metamorphoses* in which he describes King Midas — lusting for greater riches — receiving from Bacchus the ability to turn anything he touches into gold. Midas revels in his power that, through mere touch, he is able to obtain gold. That is, until he finds himself starving and thirsty because even his food and drink turn to inedible and undrinkable gold. While Bacchus relieves the foolish king of his wish, the real world is not so generous.

The facts are quite different from the fiction. This is particularly relevant to developing countries — the subject of this essay — because they too often lack the basic physical infrastructure and educational background to be able to compete actively in the innovation economy.

While many studies find that a certain amount of IP attracts foreign investment, they also agree that this amount is moderate and not at the levels that exist in the United States or other developed countries.[1] Further, the studies contradict one another on what the appropriate level of IP protection is for any particular country.[2] Moreover, in developing countries, the effect of the level of IP protection on economic and social performance is non-linear. That is, a small change in the level of IP protection may have a significant — positive or negative — effect on outcomes. Some background is necessary to see why this is a problem.

IP rights have two conflicting effects. First, the positive effect: they provide an incentive — in the form of the exclusive right that prevents others from doing the same — to bring a product or service to market. This is counterbalanced by the second effect: IP rights curtail the ability of people to use, improve on and mix ideas to create the next generation of product. The ideal IP system is one in which positive effects maximally outweigh the negative effects. This ideal is impossible for a number of reasons.

First, IP is just one — and far from the most significant — factor driving innovation. In many countries, the effects of IP are drowned out by factors such as education levels, political stability, absence of corruption, clarity of law, the administration of the IP system (how long it takes to get a patent and how much it costs), the rule of law, availability of capital, openness of markets, business cycles, the competitive nature of the markets and so on. Even determining the effects of IP within a single country is next to impossible.

Second, IP works quite differently in different sectors. Information technology has, for example, a generally short lifespan, but is relatively quick to develop. Pharmaceuticals, on the other hand, take much longer to develop, but have longer staying power. Even within a single industry, there may be significant differences. In the field of human genetics, diagnostic tests are different from kits, which are different from therapies. There is no one ideal IP system that handles each field and subfield optimally. All that one can hope for is a balance that gets things more or less right more often than not for the country's most significant innovation sectors.

IP is just one — and far from the most significant — factor driving innovation.

Third, there is no clear way to measure innovation nor its effects on the economy. Proxies are used for both, but these are broad and often misleading. For example, most studies use the number of patents issued as a measure of innovation. Unfortunately, the factors that control the number of patents issued, as often as not, have nothing to do with the levels of innovation. These include knowledge of the patent system, the cost of the system, delays in the system, corruption of the state or courts, and the design of the patent system. For example, when Japan changed its rules regarding patents in the 1980s, it saw a tremendous increase in the number of patents, but no underlying change in the level of innovation (Sakakibara and Branstetter 2001). Even if one could identify, on a country-by-country basis, which industries were most significant, there would be no way to measure the positive and negative effects of IP precisely enough to figure out what the appropriate balance ought to be.

Thus, both theory and evidence make it clear that, far from there being a single ideal IP system, there are a multitude of imperfect systems that interact with a complex set of factors that are often significantly more important than IP. Empirical and theoretical support for the credo is less than thin.

The meagreness of the evidence is mixed with the mendacity of statistics. As Mark Twain attributed to Benjamin Disreali: "There are three kinds of lies: lies, damned lies, and statistics." The US Chamber of Commerce claims that there is a correlation between higher levels of IP protection and higher levels of growth (although one must take this with a grain of salt as its measures are heavily biased) (Global Intellectual Property Center 2016). But this conclusion is meaningless on its own. First, what matters is not correlation but causation. Two things may go up and down together — and in a big enough world, random but unrelated things would — but one does not cause the other. For example,

1 See Kanwar and Evenson (2003), Chen and Puttitanun (2005), Furukawa (2010), Gangopadhyay and Mondal (2012), Hudson and Minea (2013), Lerner (2009) and Sweet and Eterovic Maggio (2015).

2 Compare Fink and Maskus (2005, 12), Kim et al. (2012, 374) and Falvey, Foster and Greenaway (2006, 701).

E. Richard Gold on the magic dust of intellectual property.
https://youtu.be/GpnjBR8y8WE

there is almost a 100 percent correlation (r=0.99789126) between US spending on science, space and technology and suicides by hanging, strangulation and suffocation (Vigen, n.d.). There is no reason to believe that the two phenomena are related. The fact is that this correlation is much stronger than the one put forward by the Chamber of Commerce between any of its indicators and IP. For example, the correlation between IP protection and the growth of high technology sectors is only 80 percent. Second, even if levels of IP protection and higher levels of growth have a causal relationship, the relationship may not be that higher levels of IP protection rights cause growth, but that growth causes higher levels of IP protection.

The operating credo is that countries get richer because they have higher levels of IP protection. The author's own findings contradict this. Countries that are richer tend to adopt IP laws that are more protective (Morin and Gold 2014). The argument is turned on its head. Countries that are richer find it in their interests to maintain higher levels of IP protection and to encourage other, less rich, countries to follow suit. The reasons why this may be so are not hard to discern. Once a country is rich and already has a vibrant innovation system (which, in countries such as the United States, were developed by having initially low levels of IP protection), it wants to lock in its lead. Thus, it adopts higher IP rules as protection against upstart companies from other jurisdictions doing the same. It is not enough that the high-income country adopts the rules, however; to fully lock in the benefits, other countries must follow suit. The effect is to hinder entry of developing countries into the club of innovators.

Countries that are richer find it in their interests to maintain higher levels of IP protection and to encourage other, less rich, countries to follow suit.

So far, this essay has focused on the lack of support for the governing credo operating in international debates surrounding IP. One should note, however, that international discourse is far from homogeneous. Most pointedly, the scholarly literature — at least that not funded by lobbies that benefit from higher IP — does not accept the credo and provides many reasons to disbelieve it, in whole or in part. This literature can be drawn on to examine how developing countries can best move forward to develop domestic innovation capacity.

First, simply because there is little empirical or theoretical support for the credo does not mean that developing countries can ignore it. Current studies provide empirical support for the suggestion that, to a modest degree, foreign firms do make investment decisions on the basis of their perceptions of the level of IP protection in a country. These investors do not seem to care as much about IP protection per se, given that they do not actually patent more when IP rights rise. Rather,

one possibility is that firms invest on the belief that a country that protects IP at a high level will grow faster than those that do not. Whether this belief is true — and, as argued above, there is no reason to think it is — is not relevant; what is relevant is that actors act on the belief.

There is a second reason not to ignore the credo. Jean-Frédéric Morin and E. Richard Gold (2016) suggest that developing country policy makers act as if the credo were true. These policy makers, in fact, lead their countries to adopt higher levels of IP protection. They do not seem to do so because they believe that higher levels of IP protection will lead to growth but, they hypothesize, because policy makers are either rewarded for following the credo or punished for not doing so. There is a gap between what policy makers personally believe and how they act on behalf of their countries.

This suggests a second path forward: developing countries ought to adopt non-IP rules that attract investment without imposing the costs of levels of IP protection that are too high. As long as domestic policy makers do not believe in the credo (despite their actions), they can be encouraged to develop alternative ways to signal to foreign firms that it is worth investing in the country. This can be accomplished, for example, through emphasis on the rule of law, better educating their citizens in science and technology, adopting immigration and tax policies that bring in talent or creating targeted programs that link local innovators with firms in developed countries.

In parallel, governments need to build local capacity to assist firms in understanding how to deploy IP internationally. Countries hoping that their firms scale up to world markets will need to assist those firms to develop international strategies — a core component of which is gaining IP rights elsewhere. This needs to be done early or the opportunity to acquire IP rights will be lost. Rather than focusing on domestic IP, more attention needs to be placed on obtaining IP rights in major markets.

By changing the focus from IP to a suite of domestic policies aimed at increasing domestic innovation capacity on the one hand, and at entering major markets on the other, developing countries will be best positioned to enter the innovators' club. There is no magic shortcut to club membership; these policies are complicated and will require investments and time.

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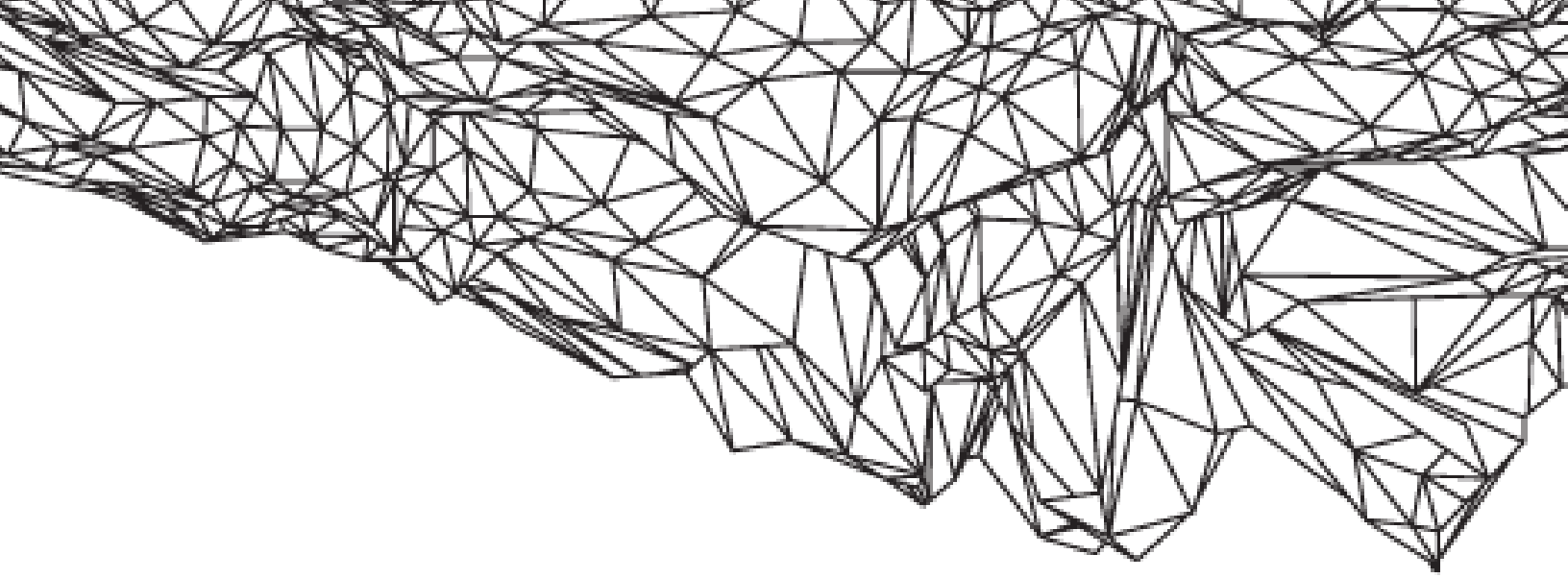
Distributors of set-top boxes that turn standard televisions into "smart TVs" were blocked by sweeping injuctions by the Federal Court of Canada in 2016. (Photo: BestPhotoPlus / Shutterstock.com)



How Trolls Are Stifling Innovators, Gamers and Netflix Junkies

Michael Geist

Claude Théberge, an internationally regarded Quebec painter, agreed in the 1990s to license posters featuring some of his works to Galerie d'Art du Petit Champlain Inc. The gallery proceeded to develop an innovative technology that allowed it to transfer the images from paper to canvas. The gallery's technology was state of the art: it used a process that lifted the ink off the poster and transferred it to the canvas. The gallery did not actually create any new images or reproductions of the work, since the poster paper was left blank after the process was complete. Théberge was nevertheless outraged — he believed he had licensed paper posters, not canvas-based reproductions — and he proceeded to sue in Quebec court, requesting an injunction to stop the transfers, as well as the seizure of the existing canvas-backed images.

Although the Quebec Court of Appeal ruled in favour of the seizure, the majority of the Supreme Court overturned that decision in 2002, finding that the images were merely transferred from one medium to another and were not reproduced contrary to the Copyright Act. In reaching its decision, the court emphasized the dangers of copyright law that veers too far toward copyright creators at the expense of both the public and the innovation process. The majority noted that "[e]xcessive control by holders of copyrights and other forms of intellectual property may unduly limit the ability of the public domain to incorporate and embellish creative innovation in the long-term interests of society as a whole, or create practical obstacles to proper utilization."[1]

The link between copyright and innovation raised by the Supreme Court of Canada has become increasingly clear in the years since the Théberge decision. While some have argued that innovation is best facilitated by more restrictive copyright rules, experience increasingly points

1 *Théberge v Galerie d'Art du Petit Champlain Inc*, [2002] 2 SCR 336, 2002 SCC 34, online: CanLII <http://canlii.ca/t/51tn>.

Michael Geist on the impact of copyright and fair use on innovation. https://youtu.be/dzyz48ycEAQ

to the need for greater flexibility in copyright to allow for innovation to flourish. Canada is now home to some of the toughest anti-piracy rules in the world, but the focus on infringement has come at a cost. Canadian copyright law is unquestionably supportive of cracking down on piracy, but it lacks the flexibility needed for new creativity and innovation.

As the Liberal government sends a clear signal that innovation is a top policy priority, Innovation, Science and Economic Development Minister Navdeep Bains and Canadian Heritage Minister Mélanie Joly should be working to tweak the law to address concerns involving misuse and restrictions on innovation. This essay identifies some of the key areas for copyright reform.

Intellectual Property Flexibility

While the specifics of the Canadian innovation policy have yet to be revealed, a recent Australian government-backed study provides a potential road map. The Productivity Commission, which functions as an independent think tank for the Australian government, released a 600-page report (Government of Australia 2016) that proposes myriad changes to its intellectual property (IP) system.

The Australian government tasked the commission with reporting on whether its current legal frameworks "ensure that the intellectual property system provides appropriate incentives for innovation, investment and the production of creative works while ensuring it does not unreasonably impede further innovation, competition, investment and access to goods and services" (ibid., iv). The result is a comprehensive report based on hundreds of submissions and consultations representing a broad range of views.

Canada and Australia may be geographically distant, but the similarities between the two countries on innovation and IP are unmistakable. Both countries are net importers of IP, meaning that current policies may benefit foreign companies and rights holders far more than domestic enterprises. With that in mind, the report recommends significant reforms to encourage innovation and strike a better balance.

For example, Australia faces the same problem as Canada with respect to patents and pharmaceutical drug innovation. The report notes that patent reforms designed to provide longer protections and encourage more innovation within the country have actually failed to increase investment in research and development (R&D). Canada has experienced much the same problem, with steadily declining R&D investment ratios, despite promises from the industry that legal reforms would do the opposite (Geist 2015).

In light of these results, the report recommends moving away from increased patent protections (as envisioned by trade agreements such as the now-stalled Trans-Pacific Partnership) and focusing instead on greater data sharing. The changes to pharmaceutical patents are just part of a wider series of proposed reforms designed to limit patents that may inhibit new innovations.

> While the specifics of the Canadian innovation policy have yet to be revealed, a recent Australian government-backed study provides a potential road map.

The report's copyright recommendations similarly find fault with overly restrictive rules that limit new innovation. It concludes that the term of copyright is too long, in particular since the commercial viability of most work largely ends years before copyright protection expires. It calls for a reduction in the term of copyright and the adoption of a "fair use" provision, similar to that found in the United States.

Many technology and internet companies rely on the flexibility of fair use to create new businesses, and the report expresses concern that Australian businesses are placed at a disadvantage with their country's fair dealing system. Canada's fair dealing approach is more flexible than the current Australian law, but remains more restrictive than the fair use model found in the United States and recommended in the report.

As Canada crafts its innovation strategy, the Australian report points to the benefits of evidence-based policies that move beyond conventional rhetoric. When combined with bold thinking — the commission did not feel constrained by established practices — the report highlights how Canada and Australia share a discouraging record of adopting restrictive laws that may ultimately hamper domestic innovation, and provides some innovative solutions to address the problems.

IP Abuse and Misuse

Given that Canada already meets or exceeds international standards on IP, one of the pressing links with innovation is to address the abuse of IP rights that may inhibit companies from innovating or discourage Canadians from taking advantage of the digital market. The Canadian government could address the issue through an innovative anti-IP abuse law that could touch on the three main branches of IP: patents, trademarks and copyright.

Leading technology companies have issued repeated warnings about patent trolling, which refers to instances when companies that had no involvement in the development of a patent seek payments from legitimate companies by relying on dubious patents. Patent trolls have a negative impact on economic growth and innovation, with millions spent on unnecessary litigation. Groups have urged the Canadian government to enact reforms to "limit the ability of non-practicing entities [a euphemism for patent trolls] of exploiting patents to make unreasonable demands of productive companies and prevent crippling damage awards" (Geist 2014b).

There is no shortage of policy possibilities, including a prohibition against legal demands that are intentionally ambiguous or designed to induce a settlement without considering the merits of the claim. Other reforms could include requiring public disclosure of the demand letters, reforming the Competition Act to give the Competition Bureau the power to target anti-competitive activity by patent trolls, and giving courts the power to issue injunctions to stop patent trolls from forum shopping.

> IP and innovation are often linked in policy discussions, but the abuse of IP rules has garnered less attention.

Canadian trademark rules would also benefit from anti-abuse provisions. In 2014, the government quietly overhauled the law by removing long-standing "use" requirements for trademark protection. Legal decisions dating back decades emphasized the importance of use in order to properly register a trademark, since trademark law is primarily designed to protect consumers from marketplace confusion. Without use, there is unlikely to be confusion.

The 2014 reforms dropped the strict requirement for use in a trademark, however, creating considerable concern within the legal community. Canada may see a spike in "trademark trolls," who could register unused trademarks with plans to pressure legitimate companies to pay up in order to release the trademarks for actual use. Anti-trademark troll rules would block efforts to register unused trademarks for the purposes of re-selling them to businesses seeking to innovate and use them (Geist 2014a).

Copyright law would also benefit from anti-troll safeguards. Canada's 2012 digital copyright reforms featured an innovative "notice-and-notice" system designed to balance the interests of copyright holders, the legal obligations of internet service providers (ISPs),

and the privacy rights of internet users. The law allows copyright owners to send infringement notices to ISPs, who must forward the notifications to their subscribers.

Despite the promise of the notice-and-notice system, it has been misused since it took effect, with copyright owners exploiting a loophole in the law by sending settlement demands within the notices. The fix is easy: implement anti-copyright troll regulations that ban the inclusion of settlement demands within the notices and create penalties for those companies that send notices with false or misleading information.

IP and innovation are often linked in policy discussions, but the abuse of IP rules has garnered less attention. As Bains and Joly consider potential policy reforms, a world-leading anti-IP abuse law would send a much-needed message that Canadian law will not support misuse of IP rights.

IP and Innovation

Canada last overhauled its copyright law in 2012, bringing to a conclusion more than a decade of failed bills and lobbying pressure. The public debate over the Copyright Modernization Act was often framed by disputed claims that Canada was weak on piracy, with critics arguing that updated laws were needed to crack down on copyright infringement. The law now reflects the enforcement priority, leaving the need to ensure that copyright does a better job of promoting innovation.

Recent Canadian cases illustrate the potential for copyright to be used to stifle innovation. In March 2017, the Federal Court of Canada ruled on a case involving the sale and distribution of "modchips," which can be used to circumvent digital controls on video game consoles.[2] Nintendo filed a lawsuit against a modchip retailer in 2016, arguing that the distribution of modchips violated the law, even without any evidence of actual copying.

The federal court agreed, pointing to the 2012 anti-circumvention rules that largely mirror legal restrictions on bypassing copy and access controls found in the United States in awarding US$12.7 million in damages. The court adopted an aggressive approach in interpreting the digital lock provisions, while also taking a narrow view of exceptions that were designed to safeguard legitimate reasons to circumvent such as interoperability of computer programs. If followed by other courts, the ruling could similarly restrict the applicability of privacy, security research and access for the blind exceptions found in the law.

The public debate over the Copyright Modernization Act was often framed by disputed claims that Canada was weak on piracy, with critics arguing that updated laws were needed to crack down on copyright infringement.

The decision was the latest in a growing line of cases in which Canadian courts have used the law to shut down cutting-edge technologies that have both infringing and non-infringing uses. In 2016, the federal court issued sweeping injunctions against multiple distributors of set-top boxes that turn standard televisions into "smart TVs" by enabling users to access a wide range of video content found online.[3] This includes authorized content such as YouTube, Netflix or other online video providers, as well as unauthorized streaming services that offer access to unlicensed content.

There are several easy steps that could be taken to restore the innovative potential of Canadian copyright law. For example, the absence of fair use may hamstring innovation as it leaves Canadian companies at a disadvantage when compared with innovative, fair use-based economies such as Israel, Singapore, South Korea and the United States. As noted above, the Australian government is currently considering similar reforms.

The restrictive digital lock rules that suffer from narrowly interpreted exceptions should also be addressed. The Conservative government established several narrow exceptions to the general prohibition on circumventing digital locks, but even they seemed to acknowledge that the exceptions are unnecessarily restrictive. In 2016, the government introduced a copyright bill to enhance access to materials for the blind, which loosened the language in the digital lock exception for the visually impaired. Similarly restrictive language can still be found in another exception for privacy protection.

2 *Nintendo of America Inc v King*, 2017 FC 246, online: CanLII <http://canlii.ca/t/h0r1j>.

3 *Bell Canada v 1326030 Ontario Inc* (iTVBox.net), 2016 FC 612, online: CanLII <http://canlii.ca/t/gv257>.

While the Canadian exceptions were narrowly constructed and limited to a handful of circumstances, the United States has actually been expanding its digital lock exceptions. It recently introduced exceptions for car security research, repairs and maintenance, archiving and preserving video games, and for remixing videos from DVDs and Blu-ray sources. In other words, the US digital lock rules now better facilitate innovation than those in Canada.

Canada has the power to introduce new digital lock exceptions, but has yet to do so. During the final stages of the copyright reform process in 2012, the Liberals supported an amendment to expand the digital lock exceptions to cover circumventions for all lawful purposes. As Liberal MP Geoff Regan, now Speaker of the House, noted when speaking in support of the change, "what the government seems to want to do is preserve old models and ignore the fact that we have moved into a digital world."[4] Regan cited comments from software developers, librarians and archivists who all warned of the dangers of overly restrictive digital lock rules.

If Canadian copyright law is to fulfill its potential to support innovation, the government should consider starting by adding much-needed flexibility to better support new creativity and innovation. A fair use provision, digital lock flexibility and reforms to IP misuse would combine with some of the world's toughest anti-piracy rules to create a legislative framework that facilitates innovation and cracks down on infringement.

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About the Author

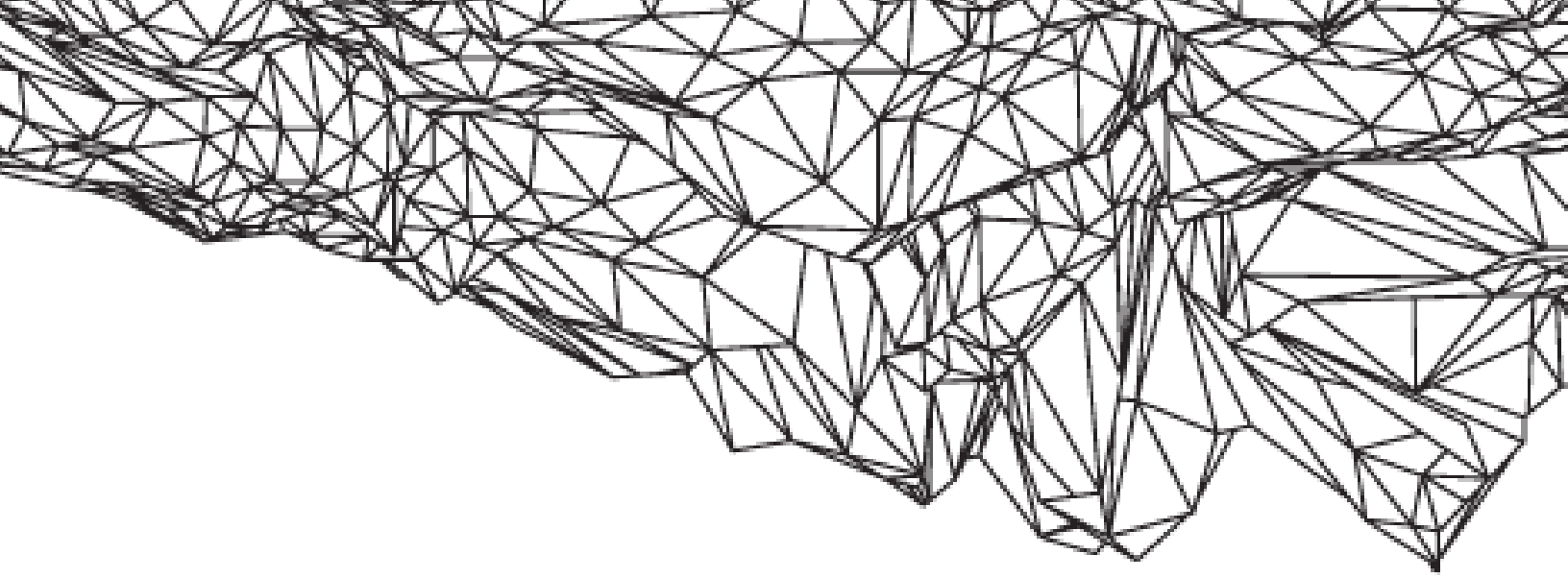
Michael Geist is a law professor at the University of Ottawa where he holds the Canada Research Chair in Internet and E-commerce Law. He has been a visiting professor at universities around the world, including the University of Haifa, Hong Kong University and Tel Aviv University. He obtained an LL.B. from Osgoode Hall Law School in Toronto, LL.M. degrees from Cambridge University in the United Kingdom and Columbia Law School in New York and a J.S.D. from Columbia Law School.

Michael is the editor of many books, including *Law, Privacy and Surveillance in Canada in the Post-Snowden Era* (University of Ottawa Press, 2015), *The Copyright Pentalogy: How the Supreme Court of Canada Shook the Foundations of Canadian Copyright Law* (University of Ottawa Press, 2013), *From "Radical Extremism" to "Balanced Copyright": Canadian Copyright and the Digital Agenda* (Irwin Law, 2010) and *In the Public Interest: The Future of Canadian Copyright Law* (Irwin Law, 2005). He is a regular columnist for *The Globe and Mail*, the editor of several monthly technology law publications and the author of a popular blog on internet and intellectual property law issues.

Serving on many boards, including the Canadian Internet Registry Authority, Internet Archive Canada and the advisory board of the Electronic Frontier Foundation (EFF), Michael has also received numerous awards for his work. These include the University of Ottawa Open Access Award in 2016, the Kroeger Award for Policy Leadership and the Public Knowledge IP3 Award in 2010, the Les Fowlie Award for Intellectual Freedom from the Ontario Library Association in 2009, the EFF's Pioneer Award in 2008, and Canarie's IWAY Public Leadership Award for his contribution to the development of the internet in Canada.

4 House of Commons, Legislative Committee on Bill C-11, 41st Parl, 1st Sess, No 11 (13 March 2012), online: <www.parl.gc.ca/HousePublications/Publication aspx ?Language=e&Mode=1&Parl=41&Ses=1&DocId=5448625>.

Entrepreneurs have expressed concerns about universities' onerous processes for the use of the universities' technologies or the licensing of their intellectual property. (Photo: EQRoy / Shutterstock.com)



After Failing to Commercialize, Universities Learn to Set Ideas Free

Karima Bawa

Canada continues to perform relatively well in terms of public spending for research and development (R&D), ranking eighth (Conference Board of Canada 2015) out of 16 peer countries[1] with more than CDN$12 billion being spent on research in various fields by Canadian universities and teaching hospitals. The scientific research that is produced by these institutions is well respected. For example, Canada ranked fifth (behind Switzerland, the United States, the Netherlands and the United Kingdom) for top-cited publications (Conference Board of Canada 2017) and, according to Canada's 2014 "State of the Nation" report (Science, Technology and Innovation Council 2015), Canada had 96 researchers among the most cited in their research fields and ranked sixth after the United States, the United Kingdom, China, Germany and Japan. Canadian universities also hold significant patent portfolios and are responsible for many groundbreaking inventions.

Despite these achievements, however, Canadian universities fail to optimally leverage their research output to advance productization of innovation and hence economic outcomes. This is, in part, because in Canada, as in many other countries, there is an expectation that universities, the producers of the research, will advance innovation by starting up companies and by filing and licensing patents. However, Canadian universities are not equipped to do this: "universities are lumbering beasts, ill adapted to the quick pivots and strategizing necessary to take an idea to market and scale it" (Gold 2016).

From an industry perspective, the outcome of the activities presently undertaken by universities is not effective. For example, a recent US study has shown that when companies took a patent licence from a university

1 The peer countries were Australia, Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Japan, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom and the United States.

as a result of a licensing request or a lawsuit, the licence typically did not include technology transfer, transfer of personnel or consulting arrangements or joint ventures, and the licence did not result in new inventions for the licensee (Feldman and Lemley 2015).

> In Canada, while universities make "licensing requests," they are less likely to sue companies for failing to take a license.

In Canada, while universities make "licensing requests," they are less likely to sue companies for failing to take a licence. This is because they, like many other universities, worry about "the potential to alienate donors, upset politicians with ties to defendants, and potentially cause universities to be seen as undermining their public service values" (Rooksby 2013). The result of this approach is that even if a company is infringing on a university's intellectual property (IP), if there is no fear of a lawsuit, then, unless there is some other related benefit to taking a licence, a company is going to be unlikely to want to enter into an arrangement requiring it to pay royalties. In addition, because Canadian universities are typically unwilling to sue companies that are infringing on their IP, they do not benefit from significant payouts from lawsuits, as have American universities that have won damage awards in the hundreds of millions of dollars.[2]

Yet another impediment to effective university commercialization is the engagement process between universities and industry. Entrepreneurs who have engaged with universities for the use of their technologies or the licensing of their IP have expressed concerns about the universities' onerous processes, which are protracted and costly. They further report that the universities' financial and contractual expectations are unrealistic.

In an interview conducted by the author, one Canadian company that manufactures and distributes a popular line of wearable lifestyle products and that frequently collaborates with Canadian universities for R&D expressed frustration over the fact that there was no consistency of agreements between universities, that there are unrealistic expectations in terms of IP ownership and licensing rights, that there are delays in trying to finalize agreements and that all of these factors result in significant legal costs that seem unjustified, given the level of R&D expenditure. Another Canadian company (with the pseudonym "MobilePhoto Company") licensed technology from two separate universities as the backbone for its commercial offering, and it too encountered challenges in its contractual arrangements with the universities. Some of the specific challenges it encountered were in terms of making sure that rights from all inventors were properly vested with the university, and that it received the necessary rights to be able to raise capital and commercialize its product as desired. MobilePhoto Company spent more than 10 percent of the venture capital it had raised on legal fees for transacting with the universities.

Another concern is the inability to locate and access academic research results having commercial potential. Specifically, the inability to uncover details about research projects makes it difficult to fully leverage the technology and IP for commercialization purposes. TandemLaunch is an organization that is in the business of commercializing university R&D and IP in the fields of consumer electronics and multimedia. In an interview conducted by the author, one of the specific concerns that its founder and staff raised was with respect to the challenges associated with accessing information that is relevant to the commercialization of university IP.

Finally, there is a concern that there should be more careful consideration about the stage of development at the time of licensing or spinoff. It is believed that when the technology/IP is spun out into a start-up, it is not sufficiently ready for commercialization and requires significant support from the founding researchers. Given their dedication to pure research, many of the researchers are often unwilling to engage with the commercial partner or are unwilling to do so on reasonable and fair terms. In an interview conducted by the author, one serial entrepreneur who has worked with university spinoffs commented on a challenge he experienced with one of the companies he worked with: "the technology was licensed to the company while it was still too underdeveloped and it was challenging to get the support of the researchers to develop the technology once it was seen to be outside of the university setting."

Some Canadian universities now acknowledge the aforementioned impediments to the effective commercialization of their research and are seeking to address these by embracing other models of engaging

2 For example, Carnegie Mellon University and Marvell Technology Group entered into a US$750-million settlement in 2016 after Carnegie Mellon successfully sued Marvell (CMU Media Relations 2016). Also the University of Wisconsin-Madison won a US$234-million damage award against Apple in 2015 (Sottek 2015).

McGill University's neurological institute has recently embarked on an open science initiative. (Photo: EQRoy / Shutterstock.com)

with industry. For example, the University of Ottawa and École de Technologie Supérieure have joined an international collective of universities that is "committed to transferring as much IP into commercial use" as possible by making it available for free and based on simplified and balanced agreements.[3] This approach has been adopted on the premise that these types of arrangements will facilitate more collaborative relationships with industry in order to lead to stronger partnerships. Often, the IP that is made available for free is in its early stages and hence would be difficult to commercialize without support from originating researchers.

In a similar vein, McGill University has recently embarked on an open science initiative in its neurological institute. This initiative is premised on the open sharing of research data and materials so that they can move freely between researchers in all disciplines with the end goal of spurring innovation. This approach is expected to have great impact within and outside of academia. From an industry perspective, the research can be more easily accessed and can stimulate the creation of new products and solutions that can be commercialized.

Also, based on a recognition that universities are not well equipped to engage in commercialization activities, independent entities outside of the university setting are beginning to engage in the commercialization of university-generated IP. Two Canadian examples of an independent approach to commercialization of university research and IP are TandemLaunch and TEC Edmonton.

TEC Edmonton is a partnership between the University of Alberta and the Edmonton Economic Development Corporation (which represents the City of Edmonton). In entering into this partnership, the University of Alberta is focused on regional economic development instead of on licensing revenues, given that such revenues tend to be "fickle" and insubstantial, in particular after taking

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3 The international collective is called Easy Access IP (Easy Access IP, n.d.). It enjoys participation from universities in Australia, Canada (as referenced above), China, Denmark, Germany, Sweden, Switzerland and the United Kingdom.

into account the cost of running a university-based technology transfer office. TEC Edmonton has seen considerable success in terms of its commercialization activities, and it attributes this success to an approach that is balanced and takes into account the interests and concerns of industry.

TandemLaunch is a truly independent commercial organization that is not tied to any particular university or region. Instead, it is an organization that works with universities in various geographic regions to transfer desirable technology to newly formed entities. The approach entails having a sophisticated commercial and technology-savvy team identifying market demand for a commercial product, identifying the universities that are involved in leading-edge research for such technologies, securing rights in respect of such university research and IP for commercialization purposes, putting together the right team to commercialize the product, and then spinning off a viable company with an appropriate management team and a reasonable amount of financing. TandemLaunch effectively creates "synthetic companies" around university-generated ideas and patents that have immediate relevance in the market place. TandemLaunch, in turn, takes an ownership interest in these new companies.

However, while these sorts of initiatives certainly facilitate the more effective use of university-generated IP to support innovation, they do not really support industry in terms of one of the most significant challenges that Canadian companies experience when they are seeking to scale up and compete globally: the challenges associated with their own weak IP portfolios.

Many Canadian technology companies that have sought to expand into foreign markets are confronted by IP litigation once they reach a certain size and scale. When this occurs, they are generally ill equipped to defend themselves due to weak IP portfolios and strategies. Also, when Canadian companies introduce their products and services into foreign markets, their products and services are "copied" by others with little recourse. Canadian companies are often not poised to assert IP to counteract the copying because of their own weak IP portfolios and strategies. The activities engaged in by technology transfer offices at universities do not tend to support making IP accessible to Canadian companies, either for defensive or offensive purposes, to help them counteract issues surrounding assertion or copying activities that these companies encounter when they scale up and enter global markets.

In Canada, universities should be encouraged to help Canadian companies overcome their IP challenges by facilitating the use of university IP to "augment" their own IP portfolios for both offensive and defensive purposes. Offensive purposes would include the university, or other entity, enforcing against certain foreign competitors for patent infringement at the request of a licensee, or allowing an exclusive licensee to enforce against a competitor for patent infringement for sales in foreign markets.[4]

Many Canadian technology companies that have sought to expand into foreign markets are confronted by IP litigation once they reach a certain size and scale.

Defensive purposes would include allowing licensees to assert university IP against a company once the other company asserts its IP. This sort of defensive strategy of counter-asserting patents is quite common in many industries, and serves as a deterrent to lawsuits between competitors. Because of a lack of sophistication, however, companies may not have a portfolio of patents that they can use for counter-assertion purposes, and, hence, they must acquire rights to third-party patents that they can use for this defensive strategy. Often these patents are acquired in the private sector from a "defensive patent aggregator."

Universities or a third-party aggregator set up for this purpose could act like defensive patent aggregators (following the model that is used in the private sector[5]) by aggregating university patents and making them available to members for defensive purposes. For example, patents that are otherwise not being commercially exploited could be aggregated from various universities and made available to Canadian

4 In the United States, it is not uncommon for universities to enter into agreements with licensees or research partners that allow the licensee or research partner to commence a lawsuit with the licensed IP, or that require the university to commence a lawsuit against a third party for IP infringement should certain circumstances exist.

5 One of the most prominent defensive patent aggregation companies is RPX Corporation, which is a holding company that protects its members against patent trolls by acquiring patents that are on the market. RPX members are required to pay an annual membership fee that is based upon their operating income. These members then have a licence to these patents.

companies that become members of the university-based aggregator for countersuit, should they be sued by a foreign operating company. The model, once tested, might even expand to allowing member companies, under certain conditions, to be able to license patents for offensive purposes to assert them against foreign operators when the activities of such foreign operators are having a significant detrimental impact on the operations of the member company.

> While an SPF-type model of creating an independent entity may not be as attractive from a revenue-generating perspective for universities, it may better serve the interests of industry.

Under such a model, the university would be facilitating the interests of Canadian companies in a positive way by helping them to defend themselves in litigation. The program would also generate revenues for universities by virtue of annual membership fees and potential incremental fees when a company sought rights to a specific patent to be able to have it asserted against a foreign company. Specifically, the university patent aggregator could charge incremental fees if it were asked to assert IP against such a foreign party. Finally, this type of an initiative may provide the additional benefit of fostering dialogue between the universities and member organizations.

Another option available to Canadian policy makers is to follow the lead of countries that have developed sovereign patent funds (SPFs), whereby public funding has been used to acquire patents with the goal of supporting national economic objectives. Specifically, SPFs have been established in South Korea, France, Taiwan and Japan. These SPFs are intended to support the growth of domestic firms and may use patents against foreign companies that have asserted their patents against a domestic company (Clarke and Hinton 2016). Also, the SPF's patents can be used offensively to strike out against competitors that are having a detrimental impact on the business prospects of a domestic company. In Canada's case, instead of or in addition to using public funds, it may be viable to encourage the transfer of university patents into an appropriately structured entity for the purposes of helping Canadian companies address their IP challenges. This approach was, in fact, used by the Korean SPF Intellectual Discovery, which acquired 269 patents from the Electronics and Telecommunications Research Institute, a Korean government-funded research institute (ibid.).

While an SPF-type model of creating an independent entity may not be as attractive from a revenue-generating perspective for universities, it may better serve the interests of industry. Such an independent body could be better suited to engaging in assertion and enforcement activities. If appropriately structured, such an independent entity could also facilitate access to independent strategic advice for Canadian companies facing assertion claims. In fact, one of the purported advantages of the French SPF, Brevets, is that it provides "high-level professional expertise to SMEs [small and medium-sized enterprises] that would not otherwise be

Canada could follow the lead of countries that have developed sovereign patent funds to use public funding to acquire patents with the goal of supporting national economic objectives. (Photo: Shutterstock.com)

able to access such resources" (ibid.). Another benefit of having an independent entity being able to assert these patents is that this would help to alleviate concerns expressed by universities about negative public sentiment associated with suing companies for patent infringement.

In addition, if the entity were to assert patents against a foreign entity, it could generate a return for the public investment that had been made to generate the IP, and creative licensing strategies could ensure that this return would not be at the expense of Canadian taxpayers. If patents were to be asserted against a foreign company, that company could be excused from paying royalties for sales within Canada so that taxpayers that had funded the R&D would not have to "pay twice" for the technology. This approach has been adopted by at least one foreign university that has asserted its patents on a global basis. In that case, the foreign university exempted licensees from royalties for sales within its own country. Finally, an ancillary benefit of transferring patents to a third party entity is that such a practice may incentivize companies to transact and collaborate with universities for fear that, if they fail to engage with these universities, they may be on the receiving end of a lawsuit if and when the patent is transferred to the independent entity.

The approaches described above may be worth exploring if, at a policy level, the goal is to maximize the impact that universities have on the growth of Canadian industry and on the innovation economy, as these approaches may enable the results of research and IP to be more easily leveraged by industry, and they offer a number of benefits. These approaches take the commercialization process out of the hands of ill-equipped universities and put it into the hands of more independent expert bodies, or they make the results of research and IP available for free to Canadian companies. Most importantly, these approaches take into account the real challenges experienced by industry as companies seek to grow and scale up internationally, and they explore ways in which university-generated IP can be leveraged to address the challenges experienced by Canadian companies as a result of their own weak IP portfolios and strategies.

Given the value of IP in today's innovation economy, federal and provincial policy makers should explore the various avenues that facilitate the use of university-generated IP by industry, including those described above, and encourage universities to embrace them.

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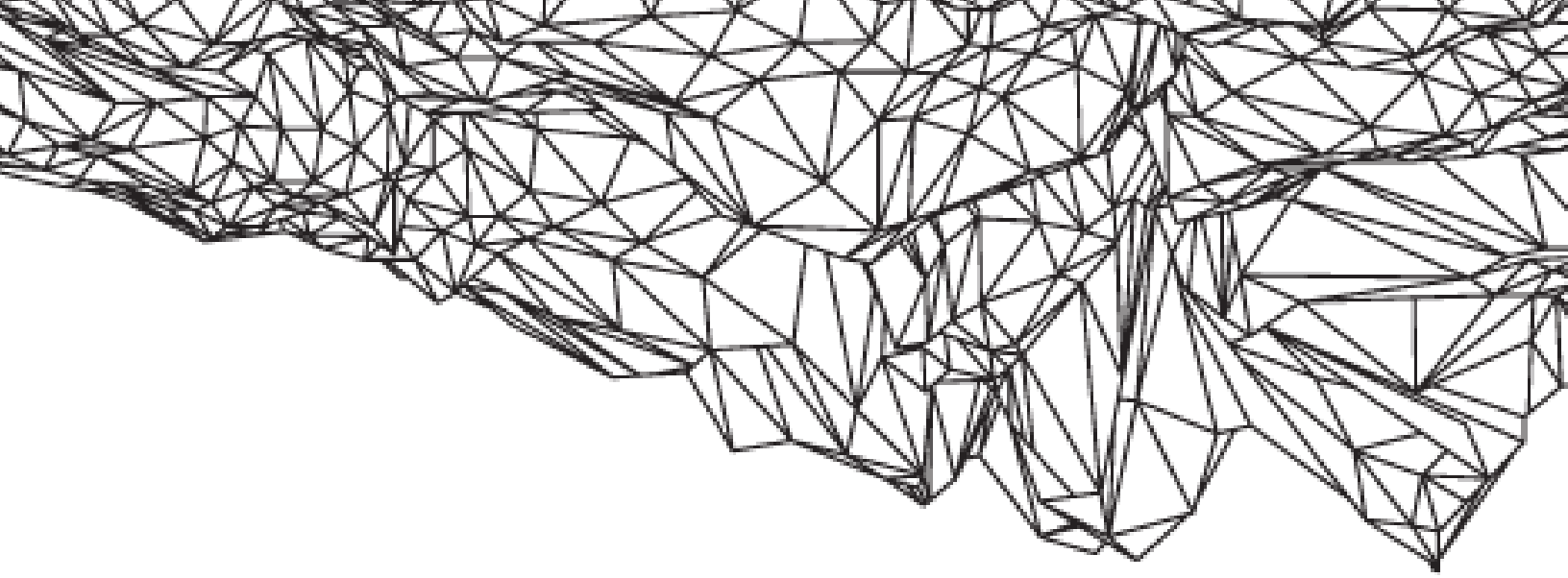
About the Author

Karima Bawa is a CIGI senior fellow. At CIGI, she has undertaken research related to the commercialization of university research and development and intellectual property. As well, along with her CIGI colleague Myra Tawfik, she has developed a massive open online course titled Foundations of IP Strategy. Prior to her role at CIGI, Karima was the chief legal officer and general counsel at Research In Motion (BlackBerry). Karima is a graduate of Simon Fraser University's executive M.B.A. program and bachelor of science program. She also attained a law degree from the University of British Columbia and is certified by the Institute of Corporate Directors. Karima is actively engaged with various boards, including as the chair of Algolux, the vice-chair of the Vancouver Public Library Foundation Board, a member of the British Columbia Health Professions Review Board and a member of the advisory board for Springboard Enterprises. Karima is also involved in advising and supporting technology start-ups.

The Government of Canada has signalled an intention to create a demand-driven technology procurement program, modelled on the United States' Small Business Innovation Research program.
(Photo: Art Babych / Shutterstock.com)



Why the $125-billion Stimulus Fund Must Include Digital Infrastructure

Neil Desai

Governments from the advanced industrialized world are struggling with a common challenge: anemic economic growth rates with limited monetary, fiscal and other policy levers left in their tool kits to kick-start meaningful growth. The glacial pace of these rates of growth is exacerbated by a common demographic reality. Most Western societies are propped up economically by the aging baby boomer generation. With declining natural population growth and political limits on economic immigration, productivity gains from the labour market alone likely cannot create the growth required for rich countries to maintain their current standards of living for the long term.

Further, the impact of general labour inputs in creating scalable and sustainable economic growth in the contemporary global economy is waning. There have been tectonic shifts in value creation in the global economy. Tangible assets, such as natural resources and manufactured goods, have taken a back seat to non-tangible, digital assets, such as software and other forms of intellectual property (IP).

These realities are especially glaring in Canada. The country's aging population, coupled with a significant level of public expenditure in social programming, specifically health care, and relative economic reliance on tangible goods industries, such as natural resources and the manufacturing sector, leaves stagnation as a relatively optimal scenario in the long term, should the country's macroeconomic trend lines maintain their current trajectory. While a focus on economic immigration could have a positive impact, doubling or tripling annual intakes would be riddled with practical and political challenges.

The Government of Canada has seemingly recognized these realities and taken the unprecedented step of committing to inject significant fiscal stimulus

Neil Desai on infrastructure and procurement challenges in Canada. https://youtu.be/WPyekXLhm6Y

(*The Economist* 2016), to the tune of CDN$125 billion in infrastructure spending, into an economy that is growing, albeit at modest rates. Both the World Bank and the International Monetary Fund applauded this unconventional economic move being made, while many other advanced industrialized economies focus on fiscal consolidation coming out of stimulus programs run through the 2008 financial crisis.

> Tangible assets, such as natural resources and manufactured goods, have taken a back seat to non-tangible, digital assets, such as software and other forms of IP.

While the endorsement from international financial institutions is welcomed by the Government of Canada, government officials know it is a long way from a guarantee that these multi-billion-dollar investments will, in fact, pay a dividend in the form of a considerable level of sustainable economic growth in Canada's future. The magnitude of an economic stimulus is an important factor in jolting large economic systems. But the multiplier going forward will rely more on the strategic nature of the investments, as opposed to their size alone.

Bridges, Sewers and (Digital) Highways — Defining the Infrastructure Canada Needs

The Canadian government has long had a narrow definition of the country's economic infrastructure, focusing on large-scale investments in things such as roads, bridges, ports and waterways. These were sage investments throughout the last generation of Canada's economy, as much of Canada's economic activity was generated through the export of tangible goods to foreign markets. The large-scale investments were supplemented with social infrastructure, including hospitals, schools and community centres, which helps maintain citizens' quality of life.

With increased urbanization in Vancouver, Calgary, Toronto and other centres, the definition of infrastructure has expanded to include mass transit. The Government of Canada has also made a foray into digital infrastructure in recent years, financing rural broadband internet access for some of the country's most remote communities. But these investments, as with social infrastructure, simply maintain a quality of life and do little to provide a multiplier for Canada's long-term economic growth.

Given that the global economy has taken a sharp turn toward non-tangible assets — commercialized IP — as the greatest driver of wealth creation, the government must take a long look at its definition of infrastructure if it wants to achieve material and sustainable economic

growth for generations to come through its fiscal stimulus gamble.

Within a review of the definition of infrastructure, there is an opportunity to update all levels of the government's own infrastructure as a means of generating both economic efficiencies and long-term, sustainable prosperity. Beyond putting up, and fixing up, the walls of hospitals, schools, police stations and other physical places, a significant portion of Canada's infrastructure should go to reimagining the services provided to Canadians by government and how they can be tangibly improved with purpose-built technologies.

Improvement should be clearly defined in terms of delivering quantifiable efficiencies, government jargon for long-term fiscal savings as a result of upfront productivity investments. Public sectors, such as health, education and policing, are ripe for thoughtful review processes as to how technology could redefine their organizational workflows, empowering front line personnel to focus on where they can have the most valuable intervention in the delivery of essential public services, while leveraging technology to focus on mundane, repeatable tasks with both speed and precision.

Government Procurement of Technology — A Purpose-driven, Risk-managed Exercise

Suggesting the government utilize technology to improve the delivery of essential public services it provides to Canadians every day is easier said than done. The Canadian government has struggled with procuring technology, specifically software, in recent years, to modernize its internal work and interactions with Canadians. The Phoenix pay system (Austen 2016) and the renewal of the Government of Canada website projects (Roman 2016) are two contemporary examples of the pitfalls the government has faced in procuring solutions to relatively straightforward technology challenges.

If the Government of Canada truly wants to procure modern technology to improve public services, it must first step back and examine its procurement processes.

Governments at all levels in Canada have often gotten into trouble with technology procurement in the software realm because they have adopted an approach similar to traditional infrastructure procurement with a narrow focus on lowest bids. This has empowered large, often multinational, software-as-a-service technology companies. These entities tactically approach public sector technology procurement opportunities with strategically low bids. Should they win, they try first to leverage existing software assets where possible. These assets are supplemented with piecemeal additions. The results have been less than desirable, leading to cost overruns, delays, products with gaping holes or various combinations of these challenges.

If the Government of Canada truly wants to procure modern technology to improve public services, it must first step back and examine its procurement processes.

Software specifically aimed at creating organizational efficiencies should be a highly iterative process that brings together both the developer and procurer. A minimal viable product (MVP) should be defined early in the procurement and off-the-shelf technologies or configurable software should be considered first, against the specific needs. If such straightforward solutions do not exist, flexibility in traditional procurement processes must be introduced. Access to internal users of a proposed technology solution should be provided early and often in the procurement process for all potential bidders. A selected company must continue to have access to end users through an "Agile" development process (Rigby, Sutherland and Takeuchi 2016) to learn, iterate and pivot as required. This approach is often referred to as a co-development approach in public sector technology development, in which risk and responsibility are co-managed.

The economics of such deals should also follow the same principles, whereby the vendor is incentivized to deliver toward the MVP incrementally. Under traditional procurement methods, vendors, especially those who underbid, are actually incentivized to fail in delivering the MVP on time as agencies have amended or expanded contracts with hopes of getting projects on track.

While the co-development approach is contrary to the government's traditional approach to infrastructure and procurement generally, there is a need for two-way validation in the procurement of technology: both to define what success looks like, with a high degree of

specificity, and to evaluate whether a potential bidding agency has the internal capability to deliver a working prototype.

This approach falls somewhere between traditional requests for proposals (RFPs) and requests for information (RFI) in government procurement terms. The RFI/RFP approaches, which allowed for separation between end users and suppliers, were set up to maintain transparency and accountability. These are two important features of Canadian public procurement and should be principles woven into any technology procurement program. However, this should not be to the detriment of the intended outcome. Interaction that allows for common understanding and iteration can embody transparency and accountability if government is willing to innovate in its procurement processes.

A Uniquely Canadian Approach to Balancing Prosperity and Efficiency

If the Government of Canada intends to both improve public services and drive long-term prosperity through technology, it will have to be clear about that dual purpose in developing and executing its technology infrastructure procurement.

The government already has a supply-side technology procurement program, known as the Build in Canada Innovation Program (BCIP) (Government of Canada 2017), managed by Public Services and Procurement Canada. This program is intended to support Canadian industry by allowing federal departments and agencies to utilize prototypes of Canadian companies' technologies. This program has delivered minimal results in terms of sustainable economic growth of any magnitude, largely due to its design.

Companies wishing to access and utilize the BCIP must have a working prototype that has never been sold. Government departments and agencies can then purchase these prototypes and work with the Canadian company to commercialize the technology. While this late-stage development may be useful if the prototype meets the majority of the customer's specific needs, it is a long way from a co-development approach.

In the 2017 budget, the government signalled an intention to create a demand-driven technology procurement program, modelled on the United States' Small Business Innovation Research (SBIR) (United States, n.d.) program. That program allows for public sector agencies to define their most pressing internal challenges and for small businesses in the United States to bid on solving these challenges through the co-development of technology solutions. Similar approaches have been adopted in other countries, such as Japan, the Netherlands and the United Kingdom.

While it seems the Government of Canada would like to separate its economic growth creation programming from its efforts to improve public services, the reality is the optimal policy prescription to achieve both mandates — public sector efficiencies and prosperity — sits squarely between the supply and demand approaches (see Figure 1).

The United States, unlike Canada, has a large and diverse technology sector that includes a robust small business sector of technology companies focused on public sector technologies. Demand pull under those circumstances can drive prosperity through the development of public-sector-focused technologies with US public sector entities across the service spectrum that can then be exported globally.

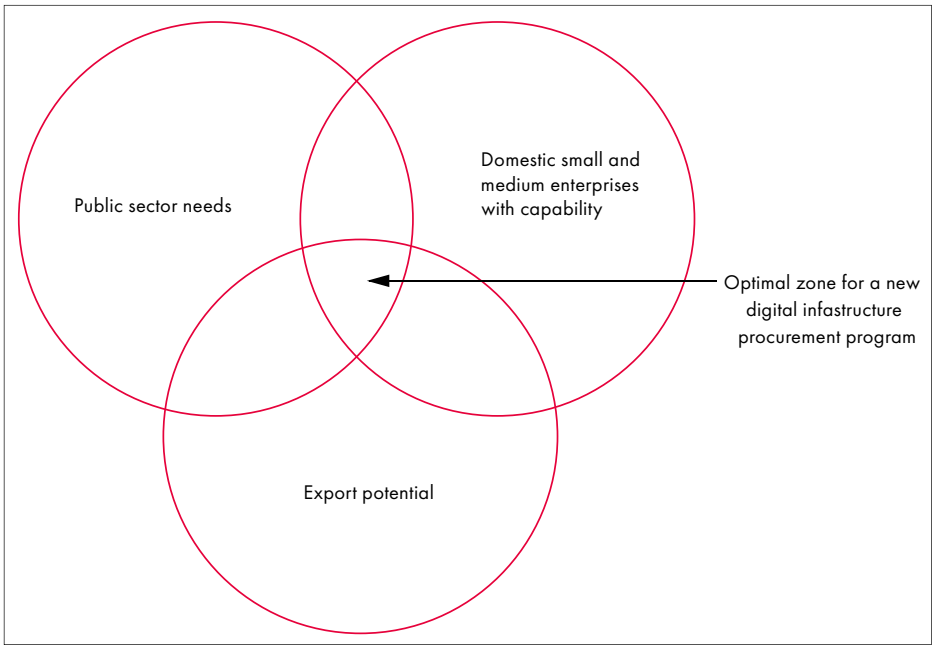
Canada, on the other hand, has a nascent technology industry. Firms specializing in public-sector-related technology also reduce the viable pool of companies that could both deliver government efficiency and create economy growth.

If the Government of Canada wants to maximize the efficiency it wishes to achieve through its investments in technology and see economic growth driven through the non-tangible assets it will have a hand in creating, it will have to take a uniquely Canadian approach: conducting independent exercises to define the greatest needs across the public sector and identifying emerging domestic technology companies that can drive tangible efficiencies in these areas.

A final and equally important litmus test should be utilized to shortlist projects: export potential. While Canada's public sector is relatively large per capita, it will be impossible to drive prosperity, at a firm or national level, through domestic procurement alone. By focusing on technologies and companies that have the greatest export potential as a mitigating factor in a strategic procurement program, the Government of Canada could reduce its long-term costs to service such technologies

Figure 1: The Optimal Zone for a New Digital Infrastructure Procurement Program

Source: Author.



and see a greater multiplier on its investments. The government could also serve as a reference customer and standard setter for these new technologies geared toward global public sector reform.

Utilizing this approach would also protect the government from potential bilateral or multilateral trade disputes. The United States' SBIR program is insulated from national treatment clauses in trade deals such as the North American Free Trade Agreement and at the World Trade Organization, as small business programming benefiting US firms was grandfathered into these agreements.

By focusing procurement of Canada's new digital infrastructure on areas of need in which only small and medium-sized Canadian companies have the ability to deliver upon the specific outcome, the Government of Canada would remain in compliance with international trade obligations, as foreign firms would not explicitly be ruled out from participating. The Ontario government, via the Ontario Centres of Excellence, has taken this approach through its Small Business Innovation Challenge program (Ontario Centres of Excellence 2017).

Meaningful Challenges, Co-developed Solutions and Global Market Applications Need Impactful Investment

The Government of Canada has shown itself to be willing to buck conventional economic thinking by committing to a multi-billion-dollar stimulus program via infrastructure investments during this period of slowed economic growth. Spending on traditional infrastructure for spending's sake, despite slowed demand for tangible goods, is not a viable economic strategy.

The Canadian government has a compelling opportunity to make strategic investments in technologies that address real public sector pain points and to co-develop with young and growing Canadian technology companies that have export potential. However, taking advantage of this opportunity will require meaningful investment and thoughtful program design. The government already spends CDN$5 billion on information technology (IT) and another CDN$3 billion annually on applications, devices and IT program management (Government of Canada 2016, Appendix B). Between these funds and the increased infrastructure spending, there is an opportunity to find funds to invest in technology that will drive better services, create internal efficiencies and grow Canadian companies of global magnitude.

With any investment that has a high return potential, there is greater risk. In evaluating such a program, the government should both take a portfolio approach, aiming to get more right than wrong, and instill patience in its evaluation process.

Getting a public sector technology infrastructure program right will require a strategic approach that challenges conventional thinking. That alone will not solve Canada's economic challenge. However, the return for getting such a program right would be hardening Canada's technology sector into global public sector supply chains that pay critical dividends in the form of growing Canadian-founded and operated technology companies that employ thousands with quality jobs for decades to come.

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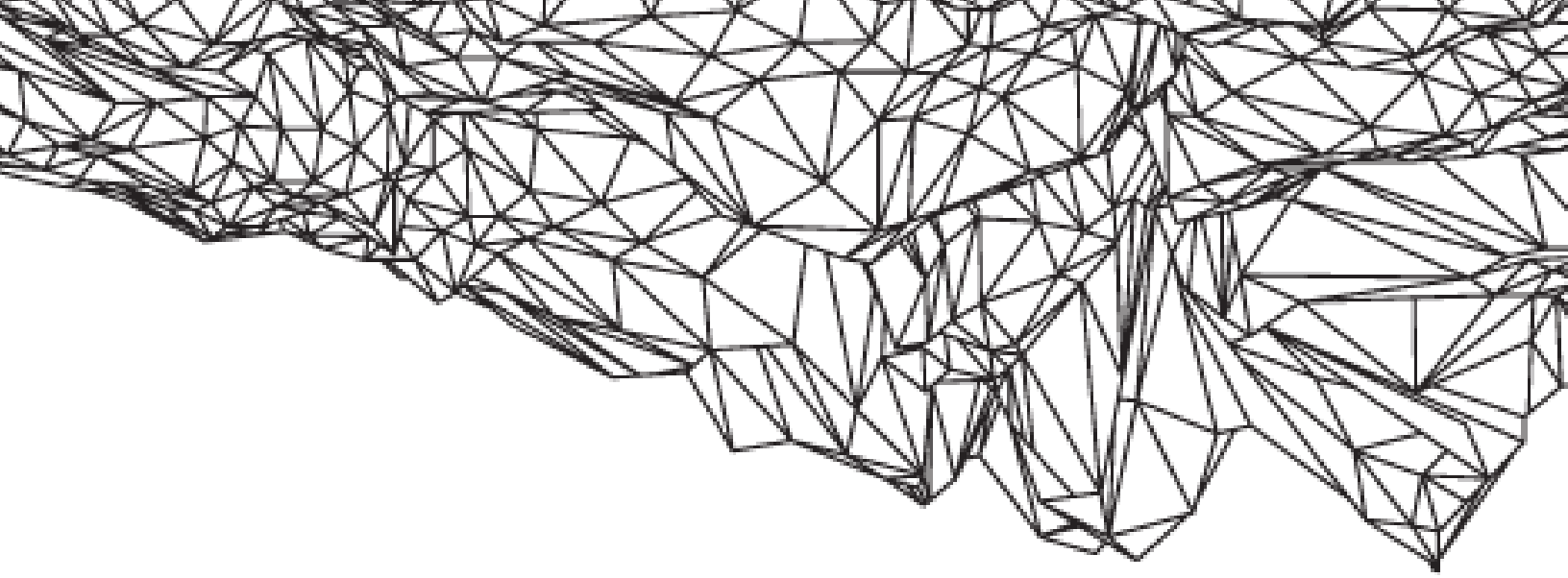
Eli Lilly's use of the North American Free Trade Agreement's investor-state dispute resolution process in respect of its patents is emblematic of the new construction of IP as an investment. (Photo: Jonathan Weiss / Shutterstock.com)



Universities Are Failing to Equip Entrepreneurs for Patent Battles

Myra Tawfik

Principles for the Development of a Complete Mind: Study the science of art. Study the art of science. Develop your senses — especially learn how to see. Realize that everything connects to everything else.

— Leonardo da Vinci

Over the past 30 years, while Canada's policy makers, business leaders and the legal profession were not watching closely enough, the nature of intellectual property (IP) shifted from incentive to commodity to investment (Dreyfuss and Frankel 2015). At its inception, the IP system was incentive-based. It encouraged innovators to bring their creativity and their ideas to market by providing them with a period of exclusivity, free from copycats or free riders. Once that period of exclusivity expired, however, the IP became free for all to use. IP rights were, therefore, created in order to achieve the socio-economic policy goal of encouraging the wide dissemination of new ideas to enable others to learn from them and build upon them.

IP as a commodity is a more recent phenomenon, and has transformed the way in which IP is dealt with in the global marketplace. Starting in the late 1980s, as industrialized countries retooled themselves into innovation economies, IP became a tradable commodity, subject to the normative framework of the international trade system. IP is now big business on a global scale and its importance within the global innovation economy should not be underestimated. As one expert characterized it, "[t]he IP system plays a significant role in helping a business to gain and retain its innovation-based advantage" (Kalanje, n.d., 3).

This commodification of IP has led to the strengthening and deepening of IP rights at both domestic and international levels, as IP rights holders have sought to maximize their exclusive rights in order to gain competitive advantage. It has also resulted in the uncoupling of the intangible aspect of IP from the tangible manifestation underlying the IP right itself. IP

rights holders are now more commonly extracting value from their IP as independent business assets, separate and apart from the profits they derive from the exclusive right to produce and sell their innovative products.

> The commodification of IP is a more recent phenomenon, which has transformed the way in which IP is dealt with in the global marketplace.

As IP rights holders pursue even more aggressive ways of protecting their global interests, IP has pivoted once again — from commodity to investment, to be protected by international investor-state dispute arbitration mechanisms. Eli Lilly's use of the North American Free Trade Agreement's (NAFTA's) investor-state dispute resolution process in respect of its patents is emblematic of this new construction of IP (Okediji 2014). After some of its patents were invalidated by the Canadian courts, the US-based pharmaceutical giant turned to NAFTA to challenge Canada's patent law as constituting an indirect expropriation of its patent rights.[1] Although Eli Lilly did not prevail in its claim, the case demonstrates just how far the trajectory has moved in terms of the strategic value of IP as a business asset.

It is certainly an open question as to whether this commodification and "assetization" of IP is a positive development in the larger scheme of things, but it cannot be denied that this paradigm shift has occurred and that it has had a significant impact on the way in which the business of IP is carried out. This is the new IP environment within which Canadian innovators must operate. Unfortunately, they remain ill-equipped to manage this new state of play, largely because they, along with policy makers and educators, have remained rooted in an incentives-based understanding of IP.

Canadian innovators need to develop mastery of the new rules of engagement. They must be able to anticipate the ways in which their competitors operationalize their IP to strategic advantage. They must develop greater skills in seizing the new opportunities that present themselves within this global landscape while, at the same time, being adept at navigating around the geopolitical threats arising from the new IP reality.

As Jim Balsillie, former co-CEO of BlackBerry, has expressed the concern: "We need to reorient both our domestic and our geopolitical engagements to ideas commercialization, particularly in the complex, predatory and evolving realm of intellectual property rights management.... Sophisticated capacity here will increasingly be needed.... The academy needs to research it and our schools need to teach it, the courts need a strategy to advance it, industrial programs need to encourage it, and public sector-private sector structures need to ensure it's addressed on a priority basis" (Pohlmann 2014). The question is how best to ensure greater sophistication among Canadian innovators for them to succeed in the "complex, predatory and evolving realm" (ibid.) of IP.

The majority of Canadian start-ups simply don't know what they are doing when it comes to IP strategy and IP management...partly because Canada's education system is not grooming IP coaches to help them map out a strategy — and some of the blame rests with universities.

— Canadian International Council (2011, 66)

An IP Curriculum for the Innovation Economy

Although Canadian institutions of higher learning offer workshops and other informational sessions on IP, the content has tended toward the basics of patents, copyright or trademarks. While this IP 101 programming is an important first step, what is more urgently required is a curriculum that provides more sophisticated knowledge of the strategic role that IP can play as a business asset, for example, as a means of generating revenue through licensing. An IP curriculum for the innovation economy must recognize the ways in which different IP rights are protected and enforced across borders. It must also raise the level of understanding about the larger geopolitical context within which international and transnational IP rights operate. IP systems are not neutral. The way in which the law is interpreted, implemented and practiced in different jurisdictions can be skewed in favour of some stakeholders over others. An appropriate twenty-first-century IP curriculum must ensure that Canadian innovators and their expert advisers are fully cognizant of all of these tactical realities. This means moving

1 *Eli Lilly v Canada*, Notification of Intent, 13 June 2013. Claim rejected by NAFTA panel on March 16, 2017. *Eli Lilly v Canada*, Final Award, 16 March 2017, Case No UNCT/14/2, online: <www.italaw.com/sites/default/files/case-documents/italaw8546.pdf>.

beyond the IP 101 curriculum toward the development and implementation of IP 2.0 learning objectives.

IP 2.0 Learning Objectives

Sophisticated skill in IP strategy is not highly developed in Canada and teaching it remains a challenge. In order to build an effective educational program, the question that must be addressed is how best to harness the skills that currently exist, encourage the development of more sophisticated expertise and deliver that expert knowledge throughout the innovation ecosystem.

Problem solving in the current innovation landscape requires nimbleness of thought and action. Post-secondary institutions need to train the polymath who is adept at seizing opportunities as they present themselves. Unfortunately, scholarly and professional disciplines have become too siloed to be able to effectively encourage the necessary versatility of thought. Regardless of the entry point, whether through business schools, STEAM (science, technology, engineering, arts/humanities and math) programs or law schools, an integrated pedagogy is essential, one that fully engages with the multidisciplinary context within which more sophisticated and robust IP strategic decisions can be made.

Two operating principles should guide this effort. First, IP strategic knowledge and skills must be taught in a multidisciplinary way and, second, knowledge dissemination in this area should be asymmetrical, targeted to the individual needs of each specific stakeholder within the innovation ecosystem.

Knowledge Synthesis — Building a Multidisciplinary IP Strategy Hub

Because IP strategy expertise is only at an embryonic stage in this country, a more comprehensive and sophisticated knowledge base must be developed. Consideration should be given to establishing an IP strategy hub consisting of individuals with discrete but complementary expertise. The idea would be to harness different disciplinary proficiencies and combine them with the practical expertise of those with lived experience. This IP strategy hub would advance best practices, provide mentoring and coaching, and develop educational tools and programs. Further, as a result of their collaboration, the members of the hub would hone their own, more integrated, expertise to feed back into the knowledge base. Finally, this IP knowledge collective would provide critical insights to policy makers to better inform domestic and international IP and innovation policy.

Those who should be at the table include the following:

- Lawyers — but this recognizes that not every IP lawyer will pass muster. Instead, one needs to convene those lawyers who have actual experience helping innovative companies succeed by exploiting or navigating around IP, including experience with the geopolitics that influence the way in which the law is practiced in different jurisdictions. This would include general counsel and in-house counsel who have acquired highly relevant expertise by having worked in integrated groups to strategically manage their companies' IP portfolios. Finally, these lawyers must participate outside of their role as service providers when their vested interests might influence the outcomes. Instead, they should come to the table as subject-matter experts, problem solvers, thought leaders and educators. They need to be able to provide disinterested advice on IP strategy.

- Business leaders and key business strategists who have built companies around IP or who have the experience of defending against or working around third-party IP.

- Start-ups and small and medium-sized enterprises (SMEs) that have been nimble and responsive in developing their individual IP strategies or have learned from their failures to properly correct IP missteps.

- Technical advisers with specific expertise in working around third-party IP or defending against IP assertions.

- Business development professionals and technology transfer officers who work with innovators to meet commercialization challenges and who can identify the gaps and weaknesses in the current system.

- Academics drawn from business, law and other cognate disciplines to test new multidisciplinary, experiential pedagogical methods, to study IP strategy from a multidisciplinary perspective and to provide empirical and evidence-based research that tests and models efficacious strategic approaches to IP.

Knowledge Dissemination across the System

Mechanisms should be put in place to ensure that the knowledge generated through this IP strategy hub can be effectively disseminated throughout the innovation ecosystem and become firmly rooted in curricular outcomes. Educational vehicles such as e-learning tools,[2] live workshops or webinars, certificate or graduate programs, and integrated, multidisciplinary experiential learning projects should all be considered. Finally, knowledge mobilization in IP strategy must also recognize that not every key player within the innovation ecosystem needs to have the same level of knowledge. Asymmetry should govern, with content tailored to meet the specific educational requirements of each key stakeholder group, namely, the innovators themselves, the various non-lawyer intermediaries who support them[3] and, finally, IP lawyers.

> Transaction costs inform the classic strategic question: should the firm undertake component production itself or should it look to the market for suppliers? Should it make or buy?

In the case of the innovators and non-lawyer intermediaries, the overarching learning objective would be to equip them to spot the IP legal issues in the same way that first year law students are taught. This skill enables individuals to distill the relevant legal considerations from a large set of factual circumstances. Innovators and non-lawyer intermediaries must be taught to spot the IP issues even as they recognize that they cannot arrive at the legal answers themselves. This basic skill would allow them to flag a relevant legal concern for further action, and would serve as the starting point for the development of other essential strategic skills, such as, knowing how the different forms of IP interact and understanding how to layer them for competitive advantage. The ultimate goal would be to enable these groups to recognize various strategic choices regarding the kinds of IP to pursue domestically and internationally. This more sophisticated knowledge would, in turn, allow them to engage in more informed discussions with their legal advisers and to become better policy advocates for their own interests.

For their part, lawyers must be encouraged to develop the skills of the IP legal strategist. At minimum, they should have in-depth expertise about the different forms of IP, both in substance and in the process for obtaining protection domestically and internationally. They should also have sophistication in how the various forms of IP can be used concurrently and how they are mutually exclusive. Lawyers must be able to assist the client in assessing the legal risks involved in making one strategic IP choice over another in each of the markets into which the client seeks to enter. Legal professionals must be active and tactical problem solvers for their clients. This is not to suggest that lawyers begin to offer business advice, but strategic IP legal advice can be advanced in ways that can assist innovators in arriving at their own informed business decisions. In the IP 2.0 world, there is an area in which IP legal advice and business outcomes overlap. What must be determined is how lawyers and business advisers can operate within that intersecting space without compromising the integrity and ethical responsibilities of each group of professionals.

Pulling the Pieces Together: The Nimble Innovation Project

An experiment is currently under way at the University of Windsor to train a cohort of more nimble innovators, non-lawyer intermediaries and lawyers. The EPICentre (Entrepreneurship Practice Innovation Centre) Odette Nimble Innovation Project has assembled a team of engineering, business and law students to work together to determine the technical, business and legal viability of an idea for an improvement on an existing product for market entry in Canada, the United States and the United Kingdom. The project was designed to pool the talents of the students from the diverse disciplines to develop collective knowledge through peer learning. It recognizes the asymmetrical nature of the necessary IP knowledge that students from each discipline should attain. Finally, it encourages these future professionals to think about the ways in which new ideas and innovations can be developed in an incremental and strategic way.

2 CIGI's Foundations of IP Strategy massive open online course is the first of its kind to offer basic IP strategy skills to innovators and non-lawyer intermediaries.

3 This group is, in itself, a diverse one and includes business development professionals, post-secondary technology transfer professionals and non-lawyer patent agents — those specifically tasked with supporting the business success of start-ups and SMEs.

Lawyers must be encouraged to develop the skills of the IP legal strategist. (Photo: Shutterstock.com)

These future leaders in engineering, business and law have acquired a new appreciation for what the others bring to the table. By working with the business students, the engineering students gained a better understanding of how to develop products that appeal to consumers. Working closely with the law students, the engineers learned to design products in tandem with determinations of patentability, in real time, as the technical ideas were evolving. In a similar vein, the business students collaborated with the law students from the outset in order to ensure that their branding and marketing strategies fully complied with the legal requirements of trademark law in multiple jurisdictions. These innovators and expert intermediaries are now better able to spot the IP issues and are more cognizant of the need to seek expert legal advice before they fully commit to a particular course of action.

This kind of integrated learning has deepened these students' understanding of the legal landscape around which they must operate in order to successfully commercialize their ideas, including the geopolitics of operating in a transnational context. For their part, the law students learned to relate their findings to the overall strategic goals of the business. They recognized the dividing line between strategic IP legal advice and business advice, and worked collaboratively to integrate their legal expertise with the disciplinary expertise of their business and engineering counterparts. They are now better able to tailor their IP legal knowledge to advance the strategic objectives of the venture and to offer legal solutions that meet appropriate technical, business and legal parameters. This is the kind of integrated, multidisciplinary and asymmetric expertise that is required throughout the innovation system in Canada.

Conclusion

As policy makers assist Canadian innovators in scaling their companies, they must simultaneously recognize the need to scale the collective expertise in IP strategy. The inherently integrated and multidisciplinary nature of that essential knowledge requires educational and skills-training strategies that challenge the current highly compartmentalized structures of our educational institutions and our disciplinary specializations. The ideal IP curriculum for an innovation economy must be agile and polymathic. Its goal must be to encourage the development of sophisticated approaches to solving complex IP challenges. It should foster nimbleness across the system to enable innovators to successfully exploit the new strategic opportunities that arise from the commodification of IP. Developing the expertise and the optimal dissemination tools to train Canada's IP-savvy innovators and their cadre of IP strategists must become a top priority for policy makers and educators alike.

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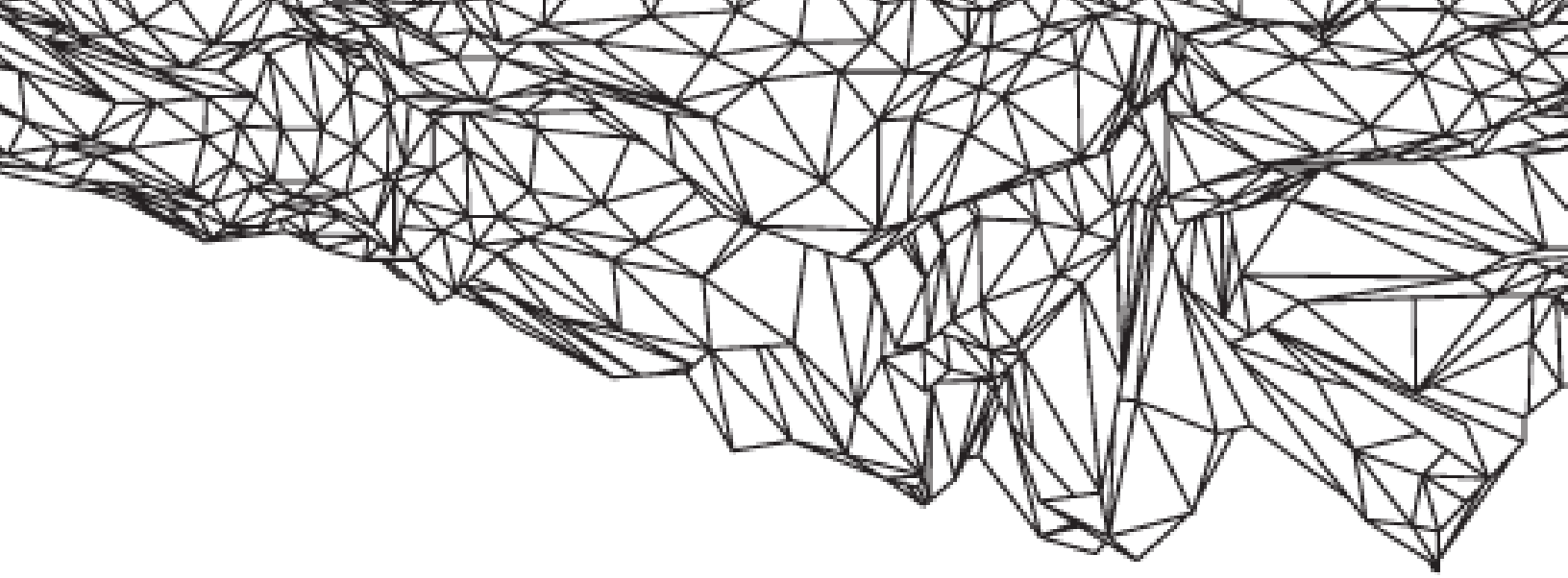
Myra J. Tawfik has been a CIGI senior fellow since 2014. She leads a project that explores strategies for capacity building in IP for the Canadian start-up and entrepreneurial communities. Her CIGI special report, *Addressing a Gap in Canada's Global Innovation Strategy: Capacity Building in IP Literacy, IP Strategy and Access to Affordable IP Legal Services*, was published in 2016. She is also the co-author, with CIGI Senior Fellow Karima Bawa, of a massive open online course titled Foundations of IP Strategy. In addition to her role at CIGI, Myra is professor of law at the University of Windsor. Her area of expertise is IP law, including comparative and international aspects. She was the founder of the Law, Technology and Entrepreneurship Clinic at the Faculty of Law, University of Windsor. She was also the co-director of the Centre for Enterprise and Law at the University of Windsor, which provided student-led business consulting and legal support to local start-ups and entrepreneurs. In 2016, she was appointed EPICentre Professor of IP Commercialization and Strategy at the University of Windsor to continue her research and outreach initiatives in IP education and IP strategy across the innovation ecosystem.

Large firms may set up patent pools to deal with patent thickets. In a patent pool, firms cross-license all the patents to other members of the pool; smaller players are frozen out. (Photo: Shutterstock.com)



Toward an Optimal Patent Regime for Canada

Joël Blit

The traditional view on patents is that they trade off static welfare losses for dynamic welfare gains (Arrow 1962; Nordhaus 1969). On the one hand, the higher monopoly prices generate deadweight losses. On the other hand, patents incentivize innovation, which can drive welfare gains. Under this view, establishing the optimal patent policy is tantamount to determining the ideal trade-off between these. Yet, the premise that patents promote innovation is increasingly being challenged (Boldrin and Levine 2013). In particular, the possibility that patents do not promote innovation — and even that they may stifle it — arises when one accounts for the cumulative nature of innovation and the fact that national patent regimes do not exist in isolation, but rather are embedded in the global intellectual property (IP) framework. This essay discusses these topics and their implications for Canada.

Cumulative Innovation

Innovations do not happen in isolation. Rather, they typically build on previous innovations. Cars were not possible before the invention of the combustion engine and computers required the Shockley transistor. It is, therefore, important to account for the cumulative nature of innovation in examining the effects of patents on innovation.

When one patent builds on the innovation of another, both the initial and follow-on innovators have blocking rights on the use of the new innovation. That is, the new innovation cannot be commercialized without the consent of both parties. To the extent that the follow-on innovator can bargain ex ante (before investing to develop the idea) to acquire a license to use the initial innovation, the follow-on innovation will be pursued whenever it is value generating (that is, when the profit that it generates is larger than its cost to develop). However,

when bargaining can only occur after the development of the follow-on innovation, the follow-on innovator will sometimes not pursue profitable innovations because they will be held up for their investment. Consider, for example, the case where the follow-on innovator has to invest $3 million to develop an innovation that generates $4 million in profits. Prima facie, the inventor would be foolish not to develop since the innovation generates a net profit of $1 million. However, the inventor knows that following development, the initial innovator would demand half of the $4 million since both innovators hold equal blocking rights on the use of the follow-on innovation. Fundamentally, the net $1 million value of the innovation will be split as $2 million to the initial innovator and –$1 million to the follow-on innovator, so the latter would choose not to pursue it. From society's point of view, a welfare-increasing innovation was not pursued because of patents and the inability to bargain *ex ante*.

When are we likely to see less follow-on innovation due to an inability to bargain *ex ante*? First, this is likely to occur in situations where the follow-on innovator is not aware of previous patents that they may be infringing on. Engineers have incentives not to conduct a thorough review of the prior art so as to avoid the larger potential damages awarded for willful infringement. And, even if they do conduct such a review, in the case of complex innovations with multiple technological inputs, they know they are likely to miss at least some of the previous patents on which they may be infringing. To further complicate matters, patents are often open to interpretation as to what they cover and even whether they are valid. As reported by Mark Lemley and Carl Shapiro (2005), nearly half of fully litigated patents are declared invalid. Given the real possibility of being held up for their investment after they develop their idea, inventors may rationally choose to forego innovation altogether.

Second, *ex ante* bargaining can also break down if the two parties do not agree on the value of the follow-on innovation and they therefore cannot agree on a fair split of the surplus. A third situation where it may, in practice, be impossible to bargain *ex ante* is when the technology is so complex that there are too many patents on which the new innovation would infringe, and too many parties to negotiate with. Trying to work out licensing agreements *ex ante* with each of the parties could delay development to the point where, once developed, the innovation would be obsolete. Alternatively, if the follow-on innovator cannot coordinate bargaining among all the parties, it could lead to a stacking of the royalties, potentially reducing their profit to the point of blocking development altogether (Heller and Eisenberg 1998).

> Cars were not possible before the invention of the combustion engine and computers required the Shockley transistor.

One way that large firms deal with such patent thickets is by setting up patent pools, where firms cross-license all the patents to other members of the pool. Of course, smaller players are frozen out since they do not have the patents to contribute to such pools. Thus, patent rights could severely impact follow-on innovation by all parties, but the effect could be especially felt by smaller firms.

Since the TRIPS agreement has an MFN clause, any concession made to another country within the context of a bilateral trade agreement presumably applies to all other WTO member countries. (Photo: EQRoy / Shutterstock.com)

Overall, different theoretical models on cumulative innovation provide different predictions on whether patents promote or hinder cumulative innovation. It is, therefore, perhaps most productive to turn to the emerging empirical literature on the topic. Here the evidence, while still inconclusive, suggests that patents stifle follow-on innovation. Fiona Murray and Scott Stern (2007) find that when the science in a journal article gets patented, those articles see a 10–20 percent decline in citation rates. Heidi Williams (2013) finds that genes that are subject to IP spur 20–30 percent less follow-on research and development. Alberto Galasso and Mark Schankerman (2015) find that when a patent is invalidated by the courts, it leads to a 50 percent increase in citation rates, in particular, in the sectors of computers, electronics and medical instruments. They further find that the effect is driven primarily by the invalidation of large-firm patents and the subsequent increase in citations to those patents by small firms. In contrast to these results, a recent paper finds that the patenting of human genes has no effect on follow-on scientific research and commercial investments (Sampat and Williams 2015).

Overall, while the existing evidence remains inconclusive, it seems entirely plausible that patents could stifle innovation when the cumulative nature of innovation is taken into account. This is particularly true for innovation by smaller firms and in complex sectors of the economy where products combine many different inputs.

Patents in a Globalized World

To better understand the impact of a national patent regime on domestic innovation, it is also important to consider the international context. The 1883 Paris Convention for the Protection of Industrial Property enshrined the principle that inventors should receive "national treatment" for intellectual property rights (IPRs) in all signatory countries. This same principle was subsequently embedded in the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), ensuring that inventors can protect their IP in all major markets around the world. Inventors therefore derive increased incentives to innovate not just from the prospect of a patent monopoly in their home country, but also from the prospect of receiving a patent in foreign markets (Park 2012; Blit and Zelaya 2015). When deciding whether to develop an idea into an innovation, private agents therefore weigh the cost of development against the total profit that they would derive across all countries from the innovation.

In the case of a smaller economy, then, it is not clear that its national patent regime will have much impact on the incentives of domestic (or foreign) inventors.[1] In fact, under national treatment, all countries have strong incentives to free ride on the patent protection of other countries, since these can give inventors sufficient incentives to innovate while not generating deadweight losses domestically. Partly in response to this, numerous international agreements have been put in place to ensure minimum harmonized standards for patent protection, with TRIPS being the most notable. But such agreements are controversial. In particular, countries will not, in general, agree on the optimal harmonized level of patent protection, with more innovative countries preferring stronger protection than less innovative countries. In fact, more innovative countries would choose a level of protection that would exceed that which maximizes joint welfare. It is not surprising, then, that the TRIPS agreement, which was championed by the more innovative countries, is seen by many as benefiting the more innovative countries at the expense of the poorer, less innovative ones. In fact, it may even be that, as a result of extensive lobbying by the US copyright and patent lobby, the level of patent protection enshrined in the TRIPS agreement is beyond what is optimal, even for the highly innovative United States.

When deciding whether to develop an idea into an innovation, private agents therefore weigh the cost of development against the total profit that they would derive across all countries from the innovation.

We should, therefore, be gravely concerned that IPRs continue to be ratcheted up through bilateral trade agreements that contain "TRIPS-plus" standards, called this because they establish higher standards than those mandated by TRIPS. For example, such agreements have extended patent terms to longer than 20 years,[2] implemented more stringent restrictions on the

1 With the possible exception of innovations that are specific to the country.

2 For example, the Trans-Pacific Partnership (TPP) Agreement stipulated that signatories had the obligation to adjust the term of a patent to compensate for any unreasonable delays in the granting of the patent.

compulsory licensing of patents, extended IP protection to more subject matter and mandated stronger enforcement mechanisms.

Moreover, because the TRIPS agreement has a most-favoured nation (MFN) clause,[3] presumably any concession made to another country within the context of a bilateral trade agreement (such as stronger restrictions on compulsory licensing) applies to all other WTO member countries. The MFN clause makes sense within the context of removing trade barriers, because economic theory says that overall welfare is highest with zero barriers. However, the same is not true for patent protection, where there is an optimal level and any increases beyond that are welfare destroying. In spite of an emerging consensus that patents are likely already too strong, they continue to be increased through bilateral trade agreements and multilateral agreements such as the now-defunct TPP agreement.

The Canadian Context

Many studies have looked at the impact of patent protection on innovation for the United States (Jaffe 1999) and Japan (Sakakibara and Branstetter 1999), and across a panel of countries (Kanwar and Evenson 2003; Allred and Park 2007; Qian 2007; Kyle and McGahan 2012; Blit and Zelaya 2015). While some of these studies find a positive relationship between patents and innovation, others find no relationship. To the best of the author's knowledge, no studies have effectively addressed this question for Canada. This is a clear gap that must be addressed if Canada is to develop an effective national patent rights policy.

Fortunately, some inferences can be drawn from the theory. While the simplest models suggest a causal relationship between patents and innovation, the prediction becomes less clear when assumptions are relaxed and the cumulative nature of innovation is explicitly modelled. To minimize the risk of patents stifling follow-on innovation, patents should be as transparent as possible so follow-on innovators can acquire any licenses before they invest in their innovation. Patents should be both easy to search and understand. They should also be narrower and more clearly demarcated so future innovators have a clearer understanding of what prior patents they are likely to infringe on. The minimum usefulness, novelty and non-obviousness criteria for obtaining a patent should also be strengthened to minimize the number of marginal patents that themselves contributed little real innovation, but can clog the system and inhibit future innovation.

A further prescription arising from the theory is that as a relatively small economy, there is little benefit for Canada to implement strong patent rights, beyond the requirements to meet its international obligations. The theory suggests that a strong Canadian patent regime would generate significant domestic deadweight losses and higher prices for all Canadians, while contributing little to promote Canadian innovation. What little empirical evidence there is for Canada seems to support this conclusion. As of 2014, fewer than 12 percent of the patents granted by the Canadian Intellectual Property Office (CIPO) were to Canadian inventors. And, Canadian inventors are unlikely to be swayed by the strength of domestic patent protection. Indeed, statistics presented by Joël Blit (2017) suggest that for Canadian inventors, patenting domestically is likely an afterthought. Canadian inventors take out between three and four times more US patents than Canadian patents, and the large majority of innovations that they patent in Canada are also patented in the United States. The latter finding, however, is based on the examination of a small sample of patents. Further research is warranted to better understand what role, if any, CIPO plays in promoting domestic innovation and, hence, whether a reform might be beneficial.

The patent regime must be a central consideration of any modern innovation strategy because patent rights influence knowledge diffusion, access to innovations and firms' incentives to innovate. In the case of Canada, it does not appear that stronger patent protection would foster increased innovation and, at least for follow-on innovations, there is every possibility that they would hinder them. As such, Canada should be cautious about signing trade agreements that further ratchet up patent protection. The adoption of ever-stronger patent regimes runs counter to Canada's historical emphasis on balancing the interests of inventors and users.

3 At this point, it is not clear whether the MFN clause does indeed imply that any such increases in standards will need to apply to all World Trade Organization (WTO) members (Farley 2014, 104).

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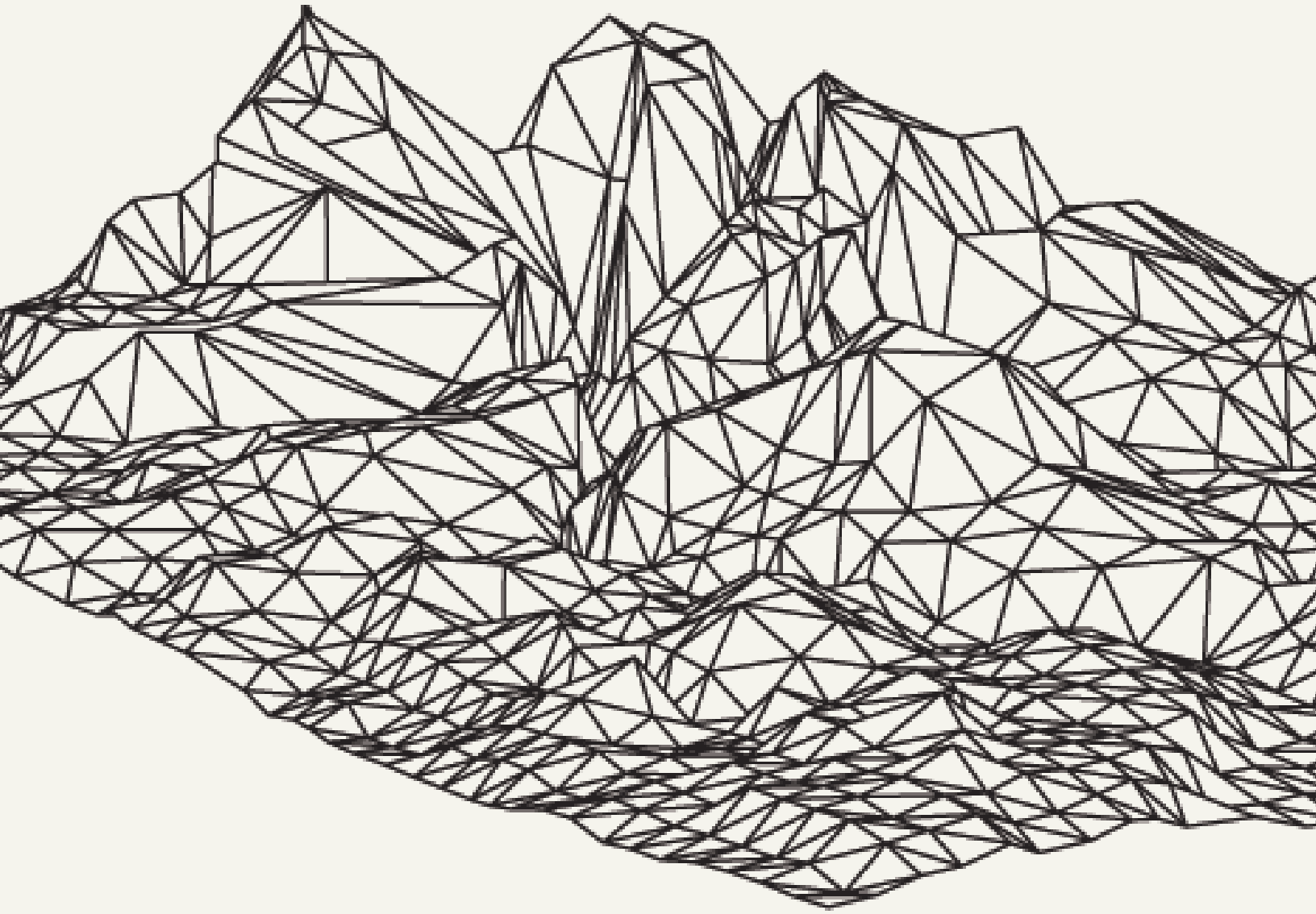
About the Author

Joël Blit is a CIGI senior fellow researching the topic of innovation, including exploring intellectual property rights, closing Canada's innovation gap, and the link between Canadian immigration and innovation. Joël is assistant professor of economics at the University of Waterloo, with expertise in the economics of innovation, technology clusters, intellectual property, entrepreneurship, international trade and multinational corporations.



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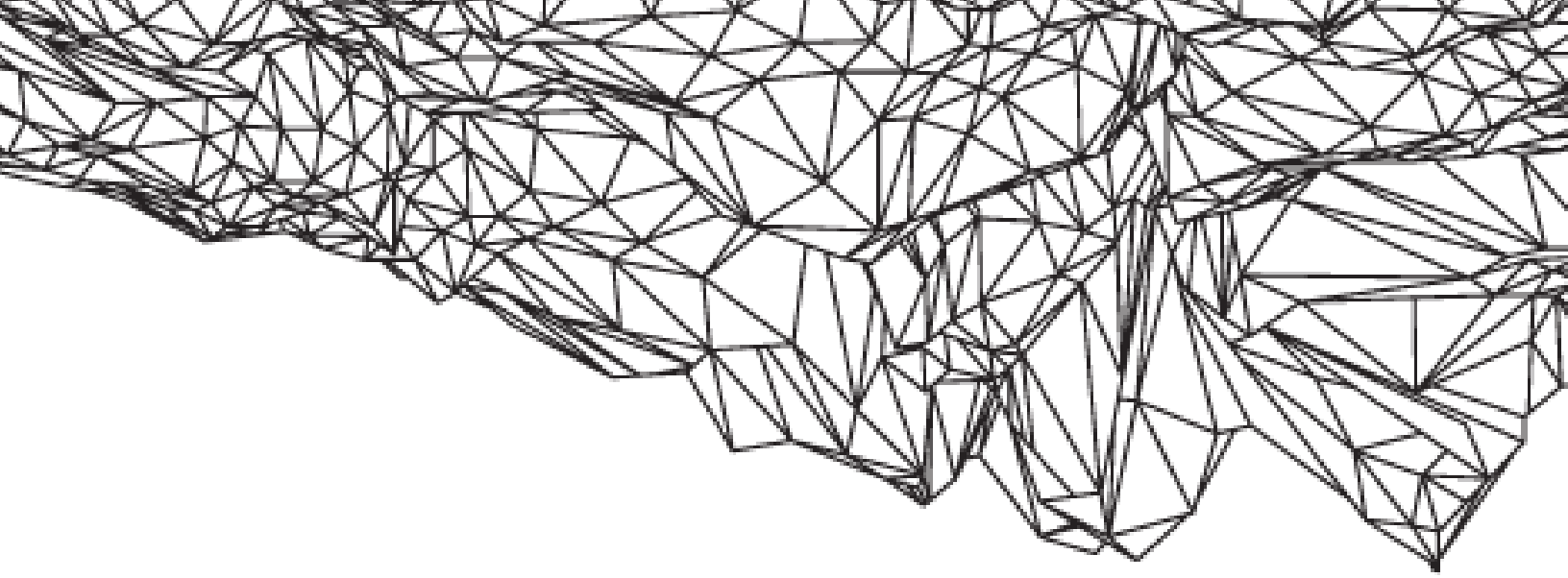
Views from Industry

Canadians are very good at cleantech research but their rate of transforming it into patents is low compared to their global peers.
(Photo: humphery / Shutterstock.com)



Cleantech and the Competitive Advantage of Nations

Leah Lawrence

To borrow from Hillary Clinton's famous line, "It takes a community to raise an innovation." Innovation requires a coming together of people with entrepreneurial, financial and public policy talent, a shared vison for the future, and the means and desire to overcome the many and often seemingly intractable hurdles in the path toward realizing that vision.

The scope of these challenges, and the need for innovation in overcoming them, is immense. For example, consider clean technology alone: How might we rethink the way roads are made in order to halve the greenhouse gas emissions from materials used to build them, and from the cars that will drive on them? Or, what if we envision transportation in a new way altogether, like the California-based company Hyperloop is doing, with its proposal to transport people and freight in pod-like vehicles, in near-vacuum tubes, faster than an airplane? Or, given that 200,000 new humans are added to the planet each day, how do we tackle challenges related to climate, water, biodiversity, food supply and geography? There is a lot to do.

Communities that envision solutions to challenges such as these create future competitive advantage. Canada certainly has the desire and the potential to solve these challenges. To secure our competitive advantage we need to translate this potential into commercially viable solutions with the potential to scale globally.

Given that 200,000 new humans are added to the planet each day, how do we tackle challenges related to climate, water, biodiversity, food supply and geography?

Leah Lawrence discusses cleantech innvation in Canada.
https://youtu.be/enyWcqTfmOM

For the context of this discussion, it is important to distinguish invention from innovation. *Invention* is the traditional realm of research and development and pre-commercial demonstration. *Innovation* is the commercialization of these ideas: the point when companies invest in technology scale-up, and when revenue becomes profit.

Economist Joseph Schumpeter (1950) believed that the driving force behind capitalism is innovation and that the agents of innovation are entrepreneurs. Entrepreneurs drive innovation through creative disruption.

But Schumpeter had a distinct view of entrepreneurs, distinguishing between "replicative" entrepreneurs, who set up small businesses similar to other small businesses, and "innovative" entrepreneurs, who introduce new ideas — based on good science and technology — that result in high-growth businesses that disrupt the status quo.

Innovative entrepreneurs might start small, but over time they learn how to out-compete their peers, and then outdistance them through organic growth or mergers and acquisitions, or both. In short, these entrepreneurs turn their small businesses into large ones through innovation and ambition (A.W. 2014). And their disruption of the status quo is essential in overcoming the challenges mentioned earlier.

Scarcity of Entrepreneurs

Regardless of the kind of entrepreneur, Canada's problem is that there just aren't enough of them. Worse, they are becoming an increasingly rare breed: entrepreneurship, and in particular *first-time* entrepreneurship, has been in decline for decades (Cao et al. 2015). So forget scale-ups: in Canada, we are not even maintaining our start-up performance. Given that entrepreneurs are necessary to meet the innovation challenge in general, and the cleantech challenge in particular, the situation is worrisome.

Potential Solutions Lie Both at Home and Abroad

One domestic sector that bucked the trend of entrepreneurial decline since 2000 (at least until the 2014 commodity price crash) is oil and gas. This sector has many examples of entrepreneurs, including both replicative and innovative types. While horizontal well and fracturing technologies hardly fall under the rubric of cleantech and have additional environmental externalities, these disruptive technologies were enthusiastically adopted in the production of shale oil and natural gas, even as other technologies languished — due to the time it takes to bring new technology into use, the risk of new technology reducing returns during introduction, "in-house" technical staff's lack of understanding of the new technology and economics

that do not warrant deployment on existing assets. In sectors as capital-intensive as this one, sometimes things just take time.[1]

Of importance to the current problem, the sector's innovative entrepreneurs have scale-up experience and big-capital financial know-how, two things that are lacking across the broader Canadian economy and, in particular, in cleantech. If their scale-up and big-capital know-how could be transferred from oil and gas to cleantech, the effects would be transformative.

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Since this might be a long shot, Canada must also look to draw on potential solutions abroad. For this reason, organizations such as the Canadian Council of Innovators, whose membership is comprised of scale-up Canadian entrepreneurs focused on organic growth, have gotten behind public policy that encourages talented international entrepreneurs and professionals to come to Canada (Silcoff 2015). The idea is to accelerate the ability of all Canadian firms within leading, emerging and traditional sectors to not just create but to *deploy* innovation.

Cleantech and the Competitive Advantage of Nations

Forty years after Schumpeter, economist Michael Porter hypothesized in *The Competitive Advantage of Nations* (1990) that traditional factors of production (labour, land, natural resources, capital and infrastructure) were less relevant in a modern economy. Rather, a nation's competitive advantage depended on its ability to innovate and upgrade. In particular, a strong scientific and intellectual property (IP) base was key. Moreover, Porter argued that the economic stock of these factors was less important than the rate and efficiency with which a nation creates, upgrades and deploys them in its leading industries.

A few years after the publication of *The Competitive Advantage of Nations*, Porter and Claas van der Linde (1995) argued that properly designed environmental standards could trigger innovations that reduced a firm's costs while improving the environment. By extension, a firm that adopted such environmental technologies early would gain a first-mover advantage, through learning effects and IP ownership, relative to those firms that waited. The "Porter Hypothesis," as their theory became known, was and remains controversial (Ambec et al. 2013).

Regardless, in recent years, governments and firms have prioritized investment in clean technologies the world over, in particular in China, South Korea, the United States and Germany. In 2015, clean energy attracted a record US$329 billion in global investment (Bloomberg New Energy Finance 2016). This compares to the US$810 billion invested in the oil and gas industry in the same year (International Energy Agency 2016).

Canada's clean technology entrepreneurs are riding this wave, but they are falling behind their global peers. Canadian revenues for clean technologies were roughly CDN$12 billion in 2014, with a majority coming from energy-related technologies (Analytica Advisors 2016). The compound annual growth rate for clean technologies is 3.5 percent.[2] Using current rates, one can project that revenues in the cleantech sector will be CDN$40 billion by 2050. By comparison, revenues for the oil and gas sector were CDN$150 billion in 2014 — a historic high (Tertzakian and Jakeman 2016). In 2016, revenues are estimated to be CDN$73 billion (ibid.). This country's share of the global market for manufactured environmental goods fell by 41 percent between 2005 and 2013 (Analytica Advisors 2016).

The rest of the world is hotly pursuing such a competitive advantage in cleantech. Canada has the ability to lead, but time is limited.

Sustainable Development Technology Canada (SDTC) is an organization that works closely with Canada's cleantech entrepreneurs. SDTC has invested close to CDN$1 billion on behalf of the Government of Canada in some 300 companies over 15 years. By comparison, all Canadian venture capital invested in clean technologies over this time period was about CDN$1.6 billion (Duruflé and Carbonneau 2016). Besides SDTC, other public sector cleantech funders include the federal Department

1 A study by McKinsey & Co. (Stuart 2015) suggests that even production-enhancing technologies can take more than 20 years to go from idea to widespread market penetration. See also Hester and Lawrence (2010).

2 For energy-related technologies it is eight percent (Analytica Advisors 2016).

of Innovation, Science and Economic Development, Natural Resources Canada, the National Research Council's Industrial Research Assistance Program, Export Development Canada and the Business Development Bank of Canada (to name but a few). Historically, these bodies' collective mandates have focused on research, development and pre-commercial technology demonstration — typically the precursor stage to the start-up of firms — but the picture is starting to change.

In recent years, public sector funders have begun to focus more on areas of considerable Canadian expertise and high-growth firms — in short, on areas of potential Canadian advantage.

Accordingly, SDTC and Cycle Capital, a venture capital firm, commissioned a study to gain a deeper understanding of areas where Canada might have the potential to lead. In particular, the study looked at the number of publications and patents by Canadians in key clean technology segments (ibid.).

> At current rates, revenues in the cleantech sector will be CDN$40 billion by 2050. By comparison, revenues for the oil and gas sector were CDN$150 billion in 2014 — a historic high.

The study shows that Canadians are very good at cleantech research. That is, the ratio of Canadian-authored scientific papers exceeds that which might be expected on a per capita basis relative to other global players, and has remained relatively stable year after year. From a research perspective, Canada is holding its own.

However, the transformation of that research into patents is very low compared to global peers, in particular China. The study shows that Chinese universities hold more than half of the worldwide patents in almost every cleantech segment — and in some segments, more than 90 percent.

Rates of industrial patent filing are similar to that of academic patents, with the most visible industrial players being foreign multinationals. Of the Canadian domestic leaders in patent filing, many are small companies, often developing pre-commercial technologies, and often years away from significant revenues and profitability.

Patents are, of course, not a perfect proxy for commercialization, but they are a necessary pre-condition, especially in a globalized world, where free trade is a priority for Canada. In such a world, ideas are the currency of economic growth and prosperity, and ideas can only be commercialized if they have strong intellectual property protections.

Why do Canadian researchers and companies not patent more often? The answer is unclear, but the experiences and views of the entrepreneurs that lead SDTC's portfolio companies provide some clues.

Some clean technologies — for example, fuel cell catalysts and membrane chemistries for water treatment — are more typically protected by trade secrets and know-how rather than by patents. That being said, new cleantech entrepreneurs are sometimes unaware of, or unclear on, the benefits of and the need for strategic management of their intellectual property, be it patenting or freedom-to-operate analyses (which would indicate the potential for infringement of existing patents). They may also not feel they have the cash, either for filing a patent in multiple countries or to enforce their patent rights if challenged.

The good news is that there is an increasing level of awareness among entrepreneurs of the importance of intellectual property management, in no small part because of the efforts of the Canadian Intellectual Property Office (CIPO). In 2011, CIPO initiated the Green Technology Initiative, which accelerates the processing of cleantech patent applications.[3] Nonetheless, more needs to be done, given the intense focus of other nations in this area.

It Takes a Community

Canada, in cleantech and many others sectors, has a strong base of expertise, experience and vision. Canada has a strong scientific and technology foundation. These resources are the building blocks on which to build the competitive advantage for a nation focused on innovation.

3 See www.cipo.ic.gc.ca/eic/site/cipointernet-internetopic.nsf/eng/wr02462.html.

The next step is to focus on commercialization and firm growth, and to look to the future when the community will be characterized by:

- an expanding rather than a dwindling base of innovative entrepreneurs, with more of these shifting into the cleantech sector in particular;
- a vibrant business environment that supports start-up companies;
- an established set of mid-sized and large independent and multinational anchor companies that are organically growing, developing their own innovations and also buying up foreign and domestic start-ups to expand their technology portfolios; and
- a financial sector that has the products to finance every stage of the firm.

Canadians must look to a future where solving our most intractable challenges has become routine. To get there, cleantech will need these many constituents to form the community necessary for innovation: a community that looks beyond the short term, that sees the future as something different from the status quo and that has the ambition and the expertise to make it so.

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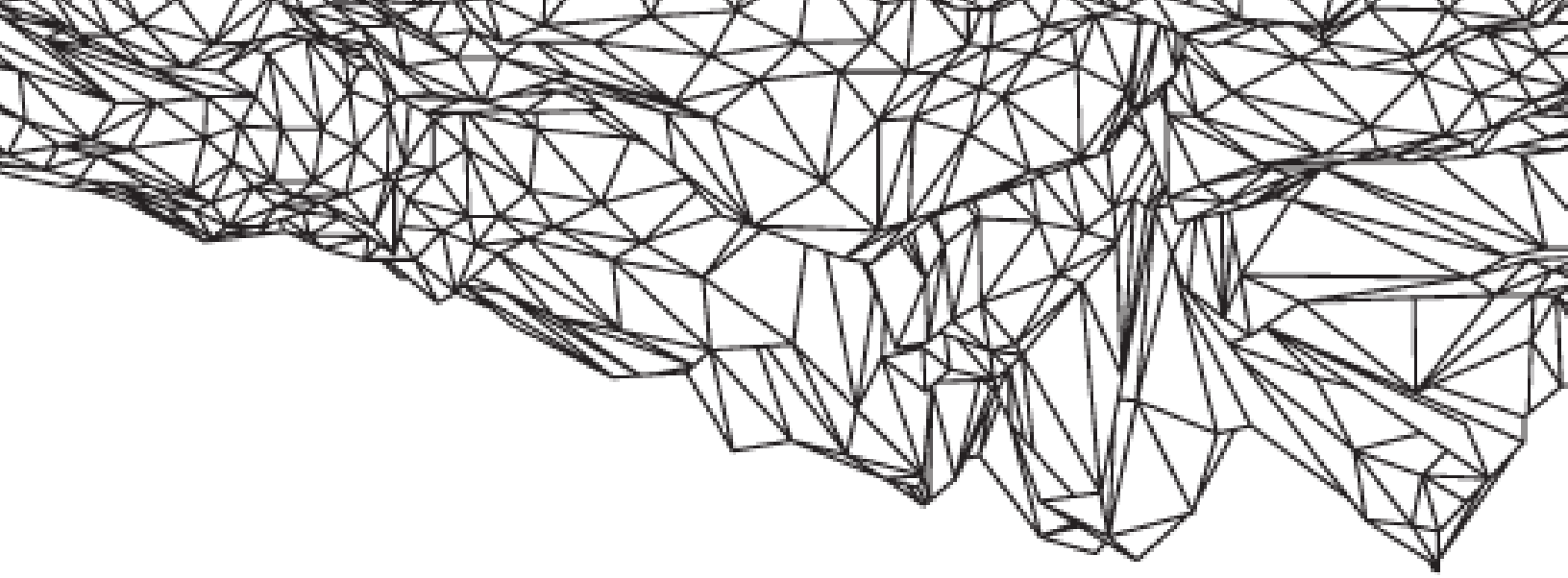
With more than two decades of business experience, Leah is known for her leadership and passion for business and sustainable innovation. Prior to joining SDTC, Leah led a variety of entrepreneurial ventures, including starting an independent newspaper and operating Clean Energy Capitalists (a cleantech consulting company). She has significant public and private board experience, including serving on the boards and as the chair of the Calgary Chamber of Commerce and the Association of Professional Engineers and Geoscientists of Alberta.

Leah is a frequently published author, with her features and columns appearing regularly in *Alberta Oil* and *Oilweek* magazines and several Canadian newspapers. One such feature about her global energy tour won her a Kenneth R. Wilson Award for Canadian journalism.

Leah has a bachelor's degree in applied science from the University of Regina and a master's degree in economics from the University of Calgary. She is also a fellow of the Canadian Academy of Engineering and a fellow of Engineers Canada.

South Korea's robust economy is built upon technological innovations and sustained by a highly skilled workforce. (Photo: kateko / Shutterstock.com)



Canada Has a Scale-up Problem, Not a Start-up Problem

Benjamin Bergen

In the twenty-first-century global economy, the countries that work hand in glove with their innovative companies are seeing the greatest economic returns for their efforts. The new knowledge economy is based on intangible goods (ideas) and the entire system is built, managed and regulated by the government and its various agencies. Intellectual property (IP) is the currency of the innovation economy; it is a government-granted temporary monopoly that restricts others from using an intangible good (idea) and forces them to pay for it. Countries that are successfully building their economies in the twenty-first century all have one thing in common: they are employing a sophisticated public-private framework that is capturing wealth from the ideas that are being generated within their borders. These countries are the United States, South Korea, Israel, Germany, Sweden and others.

Countries with large assets of valuable IP are prospering at a stunning rate. Social media networks located in the United States are now worth more than the GDP of 95 percent of countries around the globe (Bilton 2016). Governments that understand the way wealth and value are extracted from IP are the most prosperous; they understand that in the knowledge economy, new wealth is generated not by export of a country's natural resources, but instead by generating valuable IP and assisting the companies commercializing it to scale globally. In the age of innovation, IP is the new oil or gold — the countries that have IP are wealthy, and the countries that lack it are seeing their prosperity erode.

In 2017, Canada finds itself at a crossroads: because the performance of Canada's traditional economic drivers is waning, the need to find new revenues has never been more pressing. Canada is looking for economic growth in the right direction. The Liberal government has appropriately turned its attention to creating innovation policies, aiming to catch up to the countries that lead in ideas commercialization. The government is also starting

to engage with Canada's most successful innovators, and work collaboratively to build the much needed public-private framework that would allow Canada's domestic companies to scale globally.

> In the twenty-first-century global economy, the countries that work hand in glove with their innovative companies are seeing the greatest economic returns for their efforts.

Countries that focus their efforts on helping high-growth, IP-generating companies scale up, by assisting in their efforts to access more highly skilled talent, more capital and more domestic and international customers, will see greater returns in the forms of tax revenue and job creation within their borders. By working to advance their industries' growth and innovation outputs, some countries that were hardly participants in the industrialized, commodified economy of the past 50 years have skipped an economic generation and have become leaders in the innovation economy.

South Korea is an example. Within a generation, the East Asian nation went from being one of the poorest countries in the world, reliant on the export of rice and agriculture, to one with a robust economy, built upon technological innovations and sustained by a highly skilled workforce. Recently, South Korea was named by the Bloomberg Innovation Index as the most innovative economy in the world, outperforming the United States, Israel and Sweden; Canada, on the other hand, failed to rank within the top 10 (Jamrisko and Lu 2017).

Countries such as Canada are slowly coming around to the fact that governments are key players in the creation of wealth in the innovation economy. Already, what is beginning to be seen is the adoption of a strikingly different approach to economic development by government, compared to how governments of the previous century approached new and emerging industry sectors. This uptake in government intervention in the emerging fields of cyber security, health technology, clean and green technologies, financial technologies, and information and communications technology signals a progressive shift toward creating policies with industry that help domestic innovators thrive.

How can the Canadian government build a sophisticated strategy that helps domestic technology companies scale from $10 million in revenue to $1 billion and beyond? It starts with government and CEOs working together to address the challenges that impede their ability to grow and scale. When Canada works with its business entrepreneurs to address issues regarding their access to customers, capital and talent, the opportunities for greater public and private wealth to be generated grow rapidly.

Access to Talent

In the global innovation race, highly skilled talent is critical for a company to soar and reach new heights. Without it, the company cannot grow, and no amount of capital or customers can lift it off the launch pad. Canadian companies were struggling to acquire talent fast enough, as the wait times to process a worker for a permit or visa averaged at around 11 months. Domestic companies were forced to either wait out this timeline or contemplate packing up completely and moving their business to a location where highly skilled talent is easier to come by.

Years of brain drain, made more extreme by the limited language and cultural barriers that exist between the United States and Canada, have made finding the highly skilled and unique talent scaling companies need challenging. In 2016, after hearing directly from CEOs about their need for a faster way to attract, acquire and process the type of workers that the current domestic pool of talent lacks, Canada responded with a new strategy aimed at shrinking wait times and installing a new two-week standard for processing work permits. The Global Skills Strategy, with its reforms to Canada's Temporary Foreign Worker Program, was launched in June 2017, and, if implemented effectively, will provide Canadian CEOs with a government service that will help them scale domestically and compete globally.

Access to Customers

A second new policy — referred to as the Innovative Solutions Canada fund — being rolled out by the government is modelled closely on the United States' Small Business Innovation Research (SBIR) program, which is designed to help scaling companies in the United States access the US government as a customer. In the new globalized world, being able to sell globally to foreign entities, including foreign governments, can be

difficult when domestic policies have made it impossible for a company's own government to procure its services.

The SBIR program and Canada's proposed Innovative Solutions Canada fund aim to make it easier for government to procure services produced by domestic companies. When companies from South Korea or the United States bid on a service, they have the weight and support of their national governments behind them; Canada's adoption of a similar procurement model positions domestic companies well for the ever-competitive global market.

Access to Capital

Access to research and development dollars to enable growth and new hires are often on the minds of Canadian scale-up CEOs who are looking to expand their operations. In Canada, programs such as the Venture Capital Action Plan, which was introduced under the previous Conservative government, recognize a need for government to partner with investors to incentivize participation and share the risk that comes with supporting new and emerging innovative companies.

Canada signalled a further leap toward taking risks with its renewal of this successful program, which in its years of existence between 2013 and 2016 raised more than CDN$1.3 billion in venture capital (VC) funding for start-ups and scale-ups in Canada. The new Venture Capital Catalyst Initiative, which is set to launch in 2017, seeks to leverage CDN$400 million in government funding to attract an additional CDN$1.1 billion in private sector investment. This funding would be earmarked as late-stage VC, targeted toward scale-ups — more established businesses with sales and revenue — instead of new companies that are starting up.

> Years of brain drain, made more extreme by the limited language and cultural barriers that exist between the United States and Canada, have made finding the highly skilled and unique talent scaling companies need challenging.

These are some examples of the preliminary steps taken in Canada to build a solid public-private framework that could grow new revenues for the country. These measures were designed with Canadian innovators in mind; as Canada builds out its innovation agenda, this type of collaborative approach, in which industry presents a concern and works with government to address it, should be maintained.

The role of government in helping companies scale up in the innovation sector should not be misunderstood as one of the government giving handouts to companies that could simply go it alone. In the innovation economy, the presence of a corporate backer as large and powerful as a national government creates conditions and rules that give the advantage to entrepreneurs who can bring big private and public wealth to their economies.

As a corporate backer, a national government can create conditions and rules that give the advantage to entrepreneurs who bring big private and public wealth to their economies.
(Photo: BalkansCat / Shutterstock.com)

Too often in Canada, public discourse is dominated by proponents of traditional economies who argue that government has to get out of the way of business. This view is both perilous and inadequate for the twenty-first-century economy driven by innovation. While the hands-off approach has worked well for traditional governments, it does nothing for entrepreneurs creating and extracting wealth from IP.

Companies attempting to scale up globally can only do it with the help of public policies that allow for stealth growth around the world. CEOs leading high-tech companies must navigate complex freedom-to-operate issues, such as standards and regulations strategies, IP rights strategies and harmonization strategies that establish common architecture, policies and other critical processes for industry. A single decision by a government agency can make the difference between a $10-million company and a $1-billion company. All of these decisions are made by legislators, judges, regulators and agency heads.

Companies attempting to scale up globally can only do it with the help of public policies that allow for stealth growth around the world.

Indeed, in the United States, the role of government in helping its technology companies is being questioned by some of the most accomplished and progressive economists. In 2015, economist Robert Reich wrote in *The New York Times* (Reich 2015) about the growing influence America's largest technology firms were having on public-policy makers in Washington.

Warning of the inherent risks of a well-funded lobby having the ear and attention of the US government, Reich outlined how the largest multinational companies — Google, Apple, Microsoft and so on — were lobbying lawmakers to rewrite the rules and regulations that govern their industries, effectively helping the companies secure monopolies, both domestically and internationally.

Given the winner-take-all nature of high-tech growth and Canada's proximity to a large concentration of IP heavyweights south of the border, for Canada to succeed in the innovation economy it needs the government to implement an approach similar to that of the United States in order to help grow and protect Canada's homegrown innovative sectors. Canadian technology firms have long struggled to scale up globally without the kind of strong relationship with government that is needed to build a dynamic environment for domestic technology companies to thrive. Canada does not have a start-up problem, but rather a global scale-up problem.

When CEOs have a direct line to public officials, they can work with the public officials to remove roadblocks and advance the interests of scaling companies. When public officials have direct and unfettered access to data from the front lines of Canadian industry, they can devise strategies that help — not hurt — Canadian high-growth companies.

Building a sophisticated public-private partnership focused on scaling Canadian companies is easier said than done. Navigating the complexities is not easy, for the CEOs or for the public-sector leaders. Canada's public officials did not have the benefit of direct feedback from Canadian scale-up CEOs until late 2015, when the Council of Canadian Innovators was founded.

Finally, it is important to come back to Canada's scale-up ecosystem and the challenges both the sector and its leaders face: a report commissioned by the Centre for Digital Entrepreneurship and Economic Performance recently pointed out that the Canadian technology ecosystem lacks a quality network of mentors who can help current CEOs manage freedom-to-operate issues, while providing advice on growth strategies (Williams, Herman and Clarke 2014). The number of Canadians who know how to navigate strategic regulations, harmonization, technology standards and IP regimes, and how to take a technology company from $10 million in sales to billions, can be counted on one hand. Among them, most are currently outside Canada. That is a significant challenge facing Canadian innovators and the economy as a whole.

Addressing this is of paramount urgency, but rushing through a strategy would be as disastrous as treating the innovation economy similarly to the automotive one. All Canadians have a vested interest in the outcome of growth of the technology sector: the dividends of a successful company in Canada are received through the payment of corporate and personal income taxes, which, in turn, support important public priorities such as health care, education and critical infrastructure.

The solutions to the talent gap, the scale-up knowledge gap, the access to new customers gap and the capital gap all exist in the dialogue and conversations that must

take place between government and the business leaders who are building innovative companies through their everyday operations.

At 150 years strong, Canada is poised to secure its place in the global innovation economy. To get this right, Canada must continue working with its technology leaders who are working hard to commercialize Canadian IP within Canada's borders. If Canada can become not only home to a diverse population and a majestic landscape, but also a rich pool of strong innovative companies, the country will remain a prosperous land for many generations to come.

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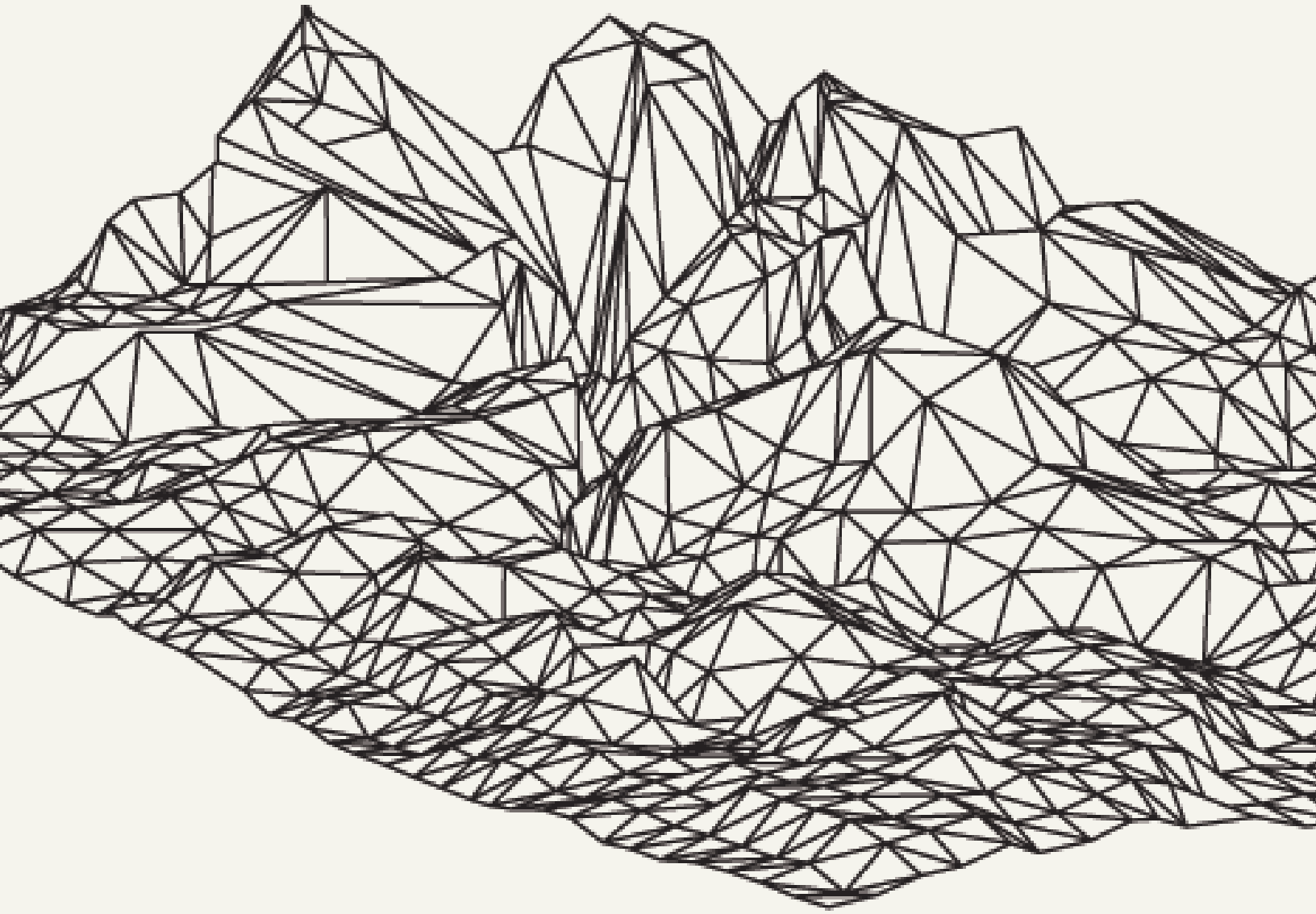
About the Author

Benjamin Bergen is the executive director of the Council of Canadian Innovators, the twenty-first-century business council of Canadian-based high-growth technology companies that is focused on optimizing the growth of Canada's innovation-based sector. Shortly after his appointment to the role in 2016, he spearheaded a national advocacy effort to address Canada's shortage of highly skilled workers. Within months, Canada unveiled the Global Skills Strategy, which included a landmark decision to expedite the processing times for highly skilled global workers. Prior to his appointment, Benjamin was the Toronto attaché for a federal and a provincial cabinet minister and worked extensively on issues of immigration, transportation and urban development. Born in Winnipeg, Manitoba, and raised in Vancouver, British Columbia, Benjamin obtained a B.A. from the University of Toronto, where he studied economics and political science. An advocate for community health, Benjamin cycled from Toronto to Montreal in 2014 to raise donations for and awareness of people living with HIV/AIDS.



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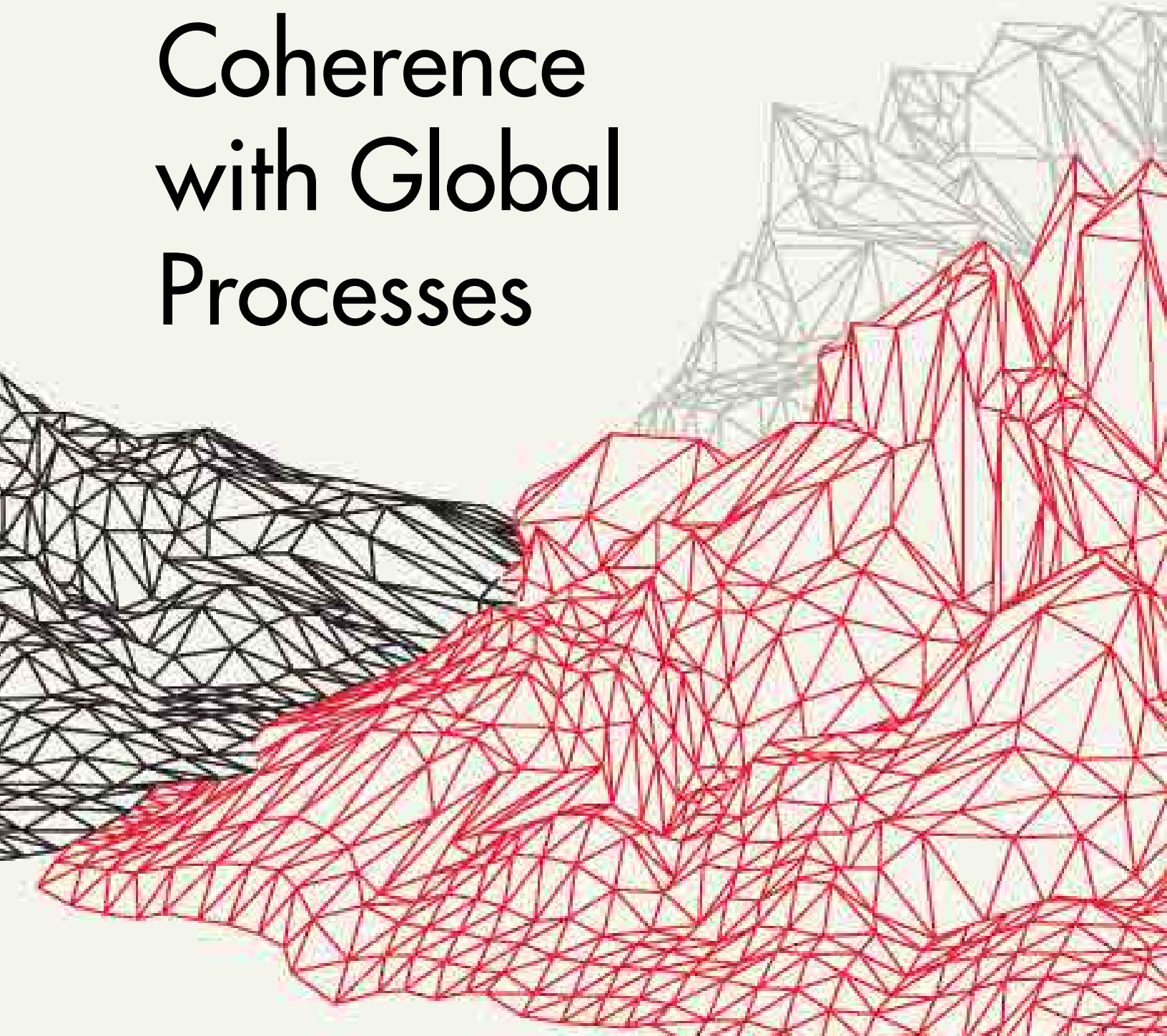
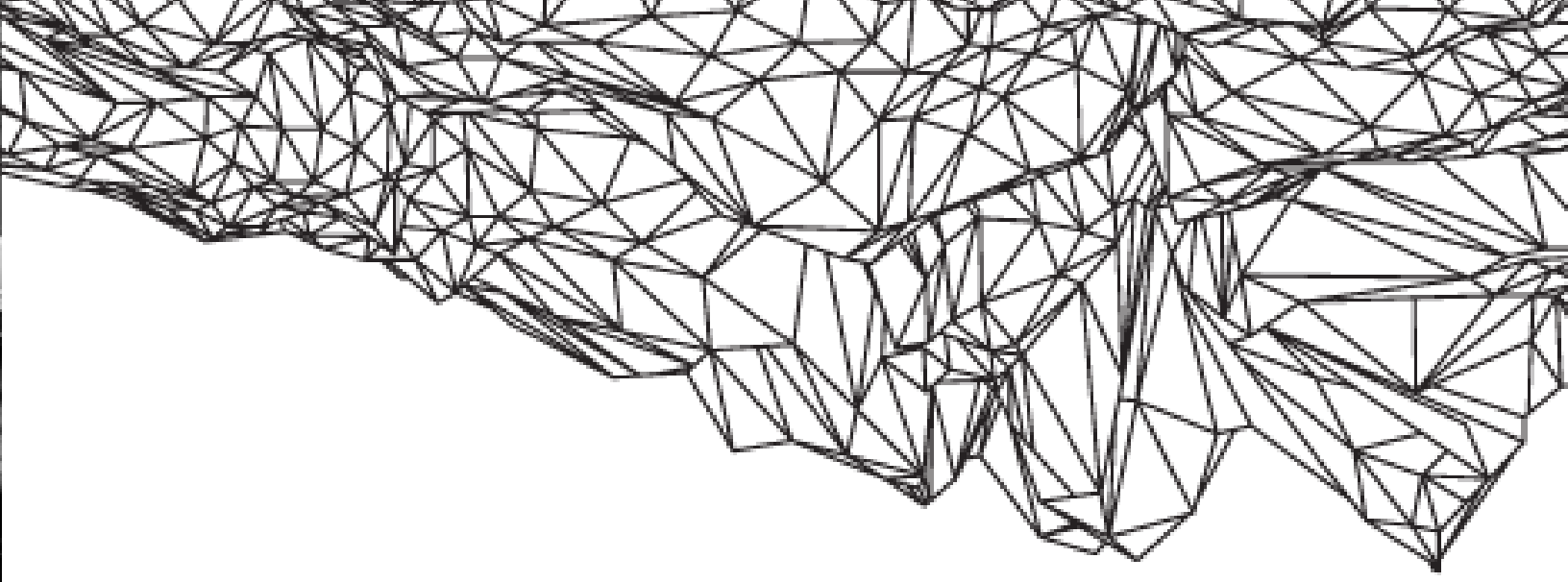
Coherence with Global Processes



Trade agreements that focus on perfecting generalized freedom to operate for multinationals while paying little attention to supporting small and medium enterprise competitors, tend to exacerbate imbalances in the economic system. (Photo: Efired / Shutterstock.com)



How Small Open Economies Can Leverage the Trade in Ideas

Dan Ciuriak

As Canada prepares to negotiate, or renegotiate, trade arrangements in a new post-Trans-Pacific Partnership (TPP), possibly post-North American Free Trade Agreement and — if it dare be imagined — post-World Trade Organization world, it becomes vital to understand what it was about the established model of globalization, and the trade agreements that helped to generate it, worked for small, open economies such as Canada. Equally important is to understand what worked against their interests and, more generally, what it was about this model that sowed the seeds for the potentially paradigm-wrenching changes now asserting themselves on the global stage.

While apprehension about what devil comes next runs high, it must be acknowledged that the established model — the devil we know — was flawed. This is evidenced by numerous economic indicators literally going off the charts — ranging from zero-bound-breaking nominal interest rates, to a socially destructive widening of income disparities, to soaring and destabilizing financialization — and by the persistence of a general economic malaise, reflected in disappointing performance on business dynamism, labour markets and innovation.

This essay examines one feature of the existing model, namely the imbalance in the conditions of competition it establishes between labour and capital and between established and upstart capital. Whereas labour's ability to compete on the global market is sharply curtailed by immigration laws — and stands to be even more constrained in future — capital is free to flow across borders with virtually no restrictions and receives extraordinary protection in its destination economies. This regime was established by an accretion of laws over decades, but were being perfected in modern deep and comprehensive economic partnership agreements, such as the TPP, which provide multinational firms with an unparalleled degree of freedom to operate

Dan Ciuriak on the asymmetries of freedom to operate.
https://youtu.be/DzraC4VHARM

internationally, in whatever mode of international commerce they choose.

A new concept — generalized freedom to operate (GFTO) — is useful in developing this argument. The following sections develop this concept, describe how modern deep and comprehensive economic partnership agreements create the GFTO, and discuss the impacts of this regime on the dynamism of the global economy and the relative interests of small, open economies.

Generalizing the Concept of Freedom to Operate

Freedom to operate (FTO) refers to the ability of a company to develop, produce and market products without legal liabilities for infringement on intellectual property rights (IPRs) held by third parties. Establishing FTO is an integral part of the process of innovation in today's IPR-rich environment. Prior to committing funds to develop a product, a firm must identify valid third-party IPRs, any infringement-related risk that proceeding with the development of the product entails, and strategies to manage the risk. In current practice, firms establish FTO through an opinion based on patent search (an activity for which an industry has been called into existence, because of patent proliferation); through a cross-licensing agreement between parties holding patent portfolios that might trigger infringement, depending on the precise nature of a prospective commercial undertaking; by acquiring patent rights; or through a similar but less costly stratagem of defensive publishing (which, in theory, prevents others from acquiring patents).

The risk of being sued for infringement of intellectual property (IP) is, however, only one of many risks faced by firms whose value depends on their intangible assets when they introduce products into domestic and international markets. For the modern multinational enterprise, the ability to protect intangible assets and to recoup investments when entering foreign markets influences decisions as to *how* to operate in various countries.

> FTO refers to the ability of a company to develop, produce and market products without legal liabilities for infringement on IPRs held by third parties.

In their production decisions, firms choose whether to conduct specific activities in-house, to outsource domestically or offshore at arm's length, to invest abroad and obtain inputs through intra-firm trade, to license production of inputs to firms abroad, or to enter into joint ventures. In marketing their products, they face a similar range of options. The various decisions combine

to define the boundaries of any given firm; this insight invokes a massive literature, starting with the work of Ronald Coase (1937).

Importantly, the choices made by firms depend not only on technical considerations concerning the nature of the production and marketing processes, but also on considerations concerning the institutional environment in which the products are developed, produced and marketed.

Technical considerations include, for example, economies of scale in production (which point to concentrating production activities in one location), location of key inputs (either raw materials or technically skilled personnel), production costs (including transportation and border costs of offshore activities that form part of the firm's value chain), the role of tacit information (information that cannot be codified for purposes of outsourcing) and issues of process management (just-in-time delivery, coordination of activities and so on). The extensive literature on governance of global value chains (GVCs) explores these issues in depth (see, for example, Sturgeon [2007], for an accessible summary).

Institutional considerations include the ability to write, and enforce, contracts that capture quasi-rents; risks of knowledge spillovers in destination countries that reduce profits; and risks of expropriation.

Institutional quality in the general sense of protecting property rights has been strongly linked to long-run economic growth (for example, Acemoglu and Robinson [2012]). Given the importance of trade in economic development, one of the causal links runs through trade: countries with better institutions tend to trade more (Dollar and Kraay 2003).

Similarly, better institutions that increase protection for foreign investments unlock foreign direct investment (FDI) (Alfaro, Kalemli-Ozcan and Volosovych 2005). Investing firms obtain access to new profit streams from new markets. Destination countries, meanwhile, benefit from the inflow of capital and positive spillovers from the presence of multinational firms on suppliers and customers – although they also face risk of FDI crowding out domestic suppliers and the stronger protection for FDI minimizes horizontal spillover benefits.

Finally, international transactions are facilitated by the ability to write and enforce contracts that capture quasi-rents (Antràs 2003; Antràs and Helpman 2004; 2008), the ability to prevent knowledge spillovers in destination countries that reduce profits (Blomström and Kokko 2003) and some assurance against de jure or de facto expropriation by foreign governments (Azzimonti and Sarte 2007).

Given the importance of trade in economic development, one of the causal links runs through trade: countries with better institutions tend to trade more.

Accordingly, weaknesses in the international institutional context restrict firms' freedom to operate globally, in much the same way that third-party IPRs restrict firms' freedom to operate in product development (in the narrow traditional sense of this term). Similarly, changes to the institutional context that remove institutional constraints expand firms' freedom to organize their international engagement on an optimal basis.

The concept of FTO thus generalizes readily to cover the features of an institutional setting that present risk to a firm's value, ranging from leakage of trade secrets, IPR infringement and de facto expropriation of a profitable line of business, to regulatory change or competition from a state-owned enterprise.[1]

Viewed through this lens, modern deep and comprehensive economic partnership agreements such as the TPP can be conceptualized not only as reducing transactional costs of international business but also as expanding the GFTO, through their disciplines on intellectual property, investment (including freedom of capital flows and investor-state dispute settlement), state enterprise (for example, through imposing on governments the principle of competitive neutrality

1 This more general sense of the term "freedom to operate" is implied in evidence given by Jim Balsillie before the Standing Senate Committee on Foreign Affairs and International Trade (www.cpac.ca/en/digital-archives/?search=March+24%2C+2016) and the House of Commons' Standing Committee on International Trade (Balsillie 2016), in which he mentions a broad range of capacities that governments need to develop to protect the FTO of firms in their jurisdiction. These actions include: prior art libraries (public, private); patent pools (private, sovereign public); bilateral and multilateral negotiating sophistication; judicial strategies (provincial, federal, global); sophisticated standards insertion and strategic regulations strategies; collaboration frameworks (public/private, private/private); and education.

when engaging in commercial activity) and government procurement, and by generally providing a legal framework for drafting enforceable contracts.

In terms of the national interest, the asymmetry would seem to favour the major economies, which disproportionately house the seats of the multinationals. To be sure, it is important for smaller economies that their homegrown firms enjoy an environment that equally enables international expansion.

It is ultimately an empirical question as to whether the system is approaching an optimum, or whether it has overshot on the side of protecting established firms. Potential unintended consequences of an overshoot would include: reduced competition (including from new and potentially disruptive start-ups); increased concentration; weakened bargaining position of labour; and, generally, a more sclerotice economy — which would be exacerbated by feedbacks, such as large established companies with large government relations budgets being able to more effectively lobby for policies and rulings that favour their established business models.

Economic Implications of GFTO

The concept of GFTO has a number of implications for firms engaged in international commerce.

First, an expanded GFTO implies additional cost reductions, because it frees firms to choose the most cost-effective means of organizing their international engagement, whether by extracting value from their knowledge assets in the form of cross-patenting in the destination country, licensing of technology to firms in the destination country, joint ventures, FDI or exports of high technology goods that could be reverse-engineered. If there is imperfect substitutability across modes of international engagement, which is almost certainly the case, an improvement in the institutional setting to facilitate mode switching would expand firms' profits and thus the rate of return on their capital.

Second, the improved returns to capital imply a revaluation of the tangible and intangible assets of firms operating internationally as traders, as participants in GVCs, or as foreign investors, thereby improving the market value of their capital based on profit expectations, a consideration pertinent to the inclusion of investor-state dispute settlement mechanisms in trade and investment agreements. An expanded market cap, in turn, represents competitive advantage for firms involved in merger and acquisition (M&A) activity. This clearly plays to the advantage of the large established multinationals, given the asymmetry in M&A activity, where the big swallow the small.

Policy Implications of GFTO

GFTO explains how the chapters of trade and investment agreements that cover intellectual property, competition policy, investment and government procurement combine to create commercial flexibility to choose optimal forms of international operation, in the broader sense implied by Jim Balsillie (2016).

Since multinationals are best able to exploit alternative modes of operation, GFTO works most powerfully for them in enabling optimization of the deployment of their tangible and intangible assets. Given that multinationals start out as the dominant firms in any economic system, trade agreements that focus disproportionately on perfecting GFTO for them — while paying little more than lip service to measures to strengthen the hand of upstart SMEs — will tend to exacerbate imbalances in the economic system. In the context of "second-best" outcomes (Lipsey and Lancaster 1956), the improvement of efficiency that GFTO promises may, therefore, come at the cost of systemic problems.

The main policy implication for the design of future agreements is not necessarily to reintroduce costs that impede optimization across modes but rather to:

- strengthen the competition policy framework to counter competition-reducing M&A activity, especially when it works to reduce the dynamism of local innovation networks;
- redress the imbalance in lobbying power through a major overhaul of the consultation framework in which trade agreements are negotiated; and
- facilitate access to preferential windows for SMEs by liberalizing the *de minimis* provisions for rules-of-origin documentation, to enable a greater utilization of agreements by these firms.

For small, open economies, the additional policy implication is the need for innovation framework policies aimed at ensuring that strengthened GFTO for multinationals does not effectively impair GFTO for their own start-ups.

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About the Author

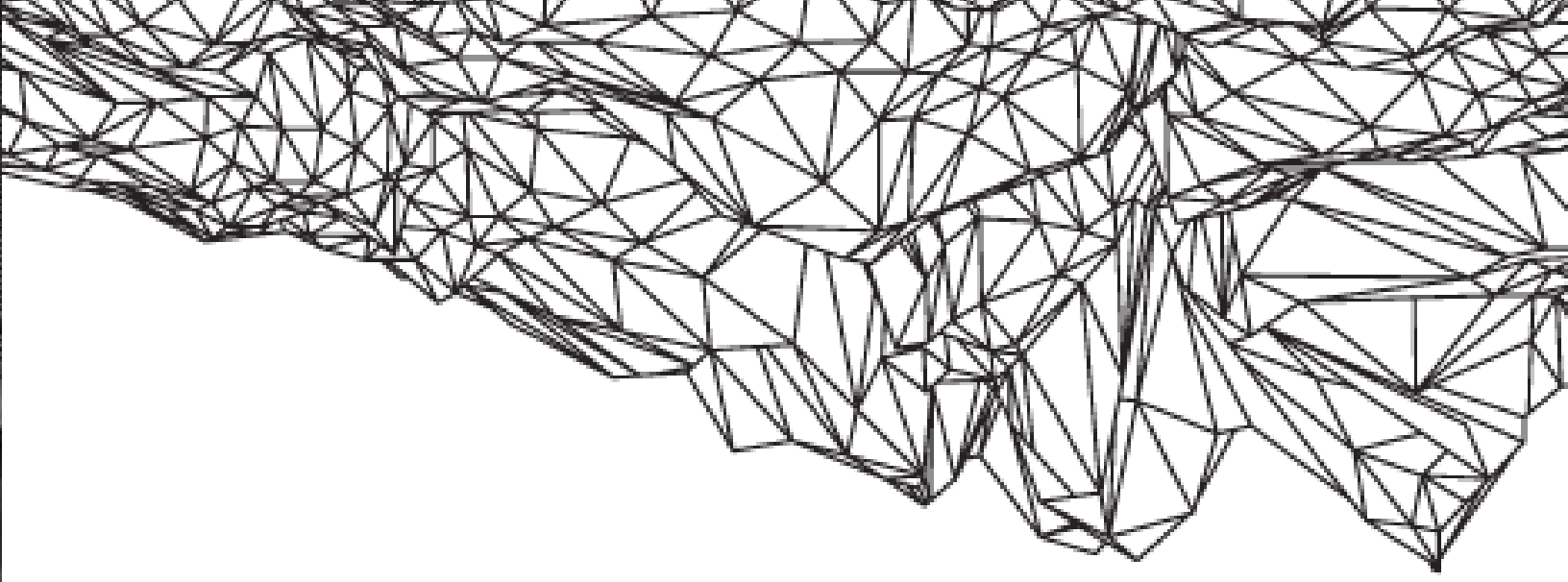
Senior Fellow Dan Ciuriak joined CIGI's Global Economy Program in April 2016, focusing on the innovation and trade research theme.

At CIGI, Dan is exploring the interface between Canada's domestic innovation and international trade and investment, including the development of better metrics to assess the impact of Canada's trade agreements on innovation outcomes.

Based in Ottawa, Dan is the director and principal of Ciuriak Consulting Inc. He is also a fellow in residence with the C.D. Howe Institute and an associate with BKP Development Research and Consulting GmbH of Munich, Germany.

Previously, he was deputy chief economist at Canada's Department of Foreign Affairs and International Trade (DFAIT) (now Global Affairs Canada), with responsibility for economic analysis in support of trade negotiations and trade litigation, and served as contributing editor of DFAIT's Trade Policy Research series (2001–2007 and 2010 editions). He has also held several other positions at DFAIT, including deputy to the chair of the Asia-Pacific Economic Cooperation Economic Committee and finance counsellor at Canada's embassy in Germany.

There is great potential for a made-in-Canada sovereign patent fund. (Photo: Shutterstock.com)



A Worthwhile Intervention? The Potential Role for a Sovereign Patent Fund in Canada

Warren Clarke

Ideas transformed into assets through the use of intellectual property rights (IPRs) are increasingly important sources of value in the global innovation economy. Measured in both current US dollars and as a percentage of global GDP, cross-border payments for the use of IPRs have seen strong growth over the past decade.

Moreover, while the overall size of cross-border licensing payments remains relatively small as a share of global GDP, IPRs and other types of "intangible" assets are now crucial to the value and strategic orientation of many of the largest and most competitive global firms. According to figures produced by Ocean Tomo (2015), for example, intangible assets — which include IPRs — now account for 87 percent of the market value of Standard & Poor's (S&P's) 500 companies (see Figure 1). Leading technology firms such as Google, Apple, Microsoft, Facebook, Amazon and Samsung continue to amass large and valuable portfolios comprised of thousands of patents, leading some commentators to express concern about the market and political power of large technology companies.

Concomitant with the rising value and strategic importance of intellectual property (IP), the way in which firms leverage the value of their intellectual resources to generate value in the marketplace has also shifted. While IPRs continue to play an important role in protecting tangible products from being imitated and copied by competitors, they are increasingly leveraged as assets in their own right through strategies based on revenue-focused licensing. As part of the much publicized "smartphone wars," for example, some analysts have estimated that US-based Microsoft may have generated upwards of US$6 billion annually in royalties connected

Figure 1: Source of Market Value (S&P 500)

Source: Ocean Tomo (2015).

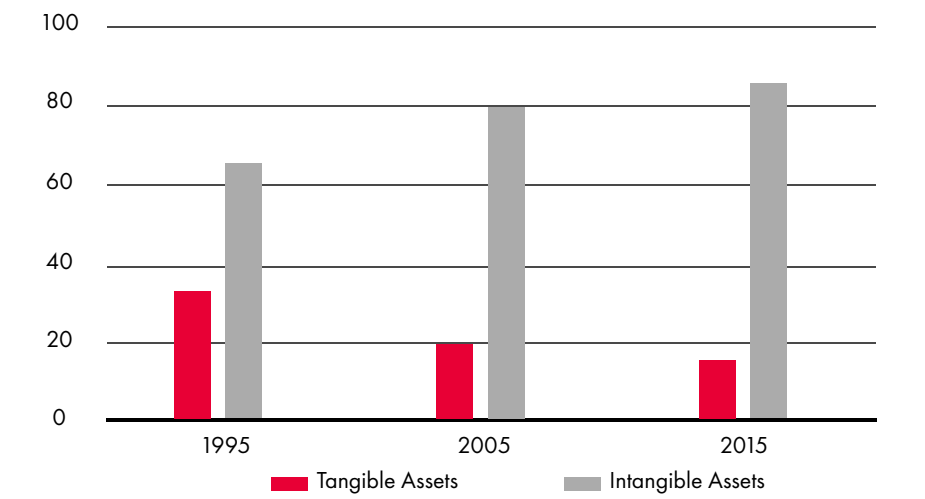


Figure 2: Patent Applications per Capita (2005 and 2015)

Data source: World Intellectual Property Organization.

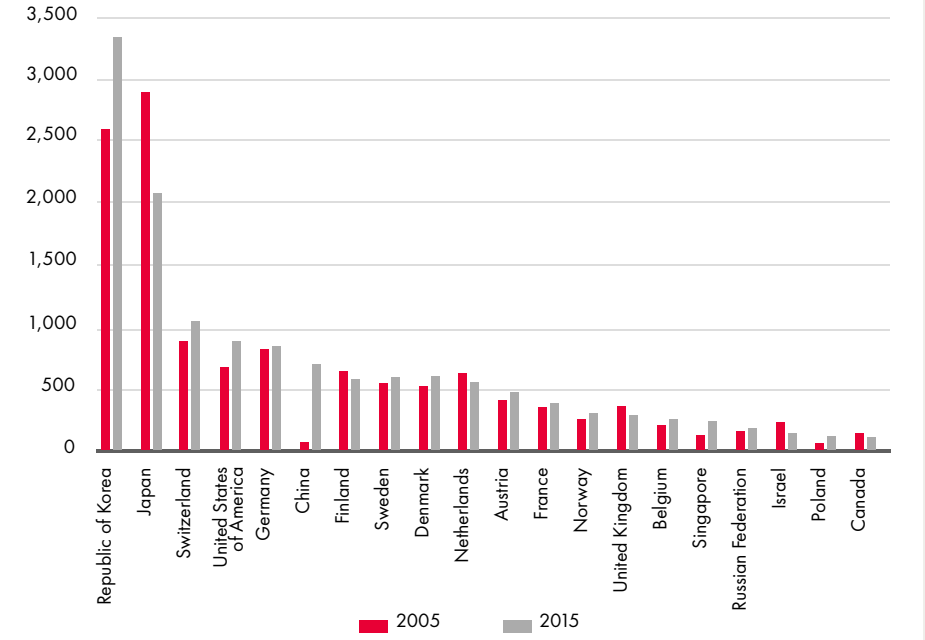
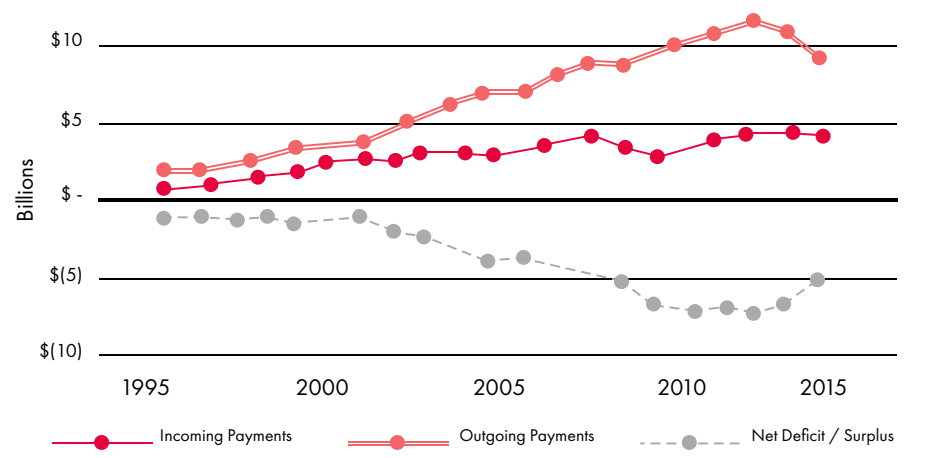


Figure 3: Canada's Inbound and Outbound IP Payments (Current US$)

Data source: World Development Indicators.



to approximately 30 licensing deals.[1] At the same time, large companies can — and have — used their large IP war chests to deny freedom to operate to competitors, effectively freezing them out of particular markets.

In the emerging ideas economy, Canada is positioned largely as a consumer. Viewed through the lens of input and output metrics, Canada's IP performance stacks up poorly against peer countries. Canada's patent applications per capita have declined since 2005 (see Figure 2). In addition, the country maintains a significant IP trade deficit, paying out significantly more in IP royalties than it collects from abroad (see Figure 3).

In this context, a number of commentators have raised concerns about Canada's competitiveness in the global ideas economy and called for a national innovation and IP strategy. In testimony before the House of Commons Standing Senate Committee on Foreign Affairs and International Trade in May 2016, Jim Balsillie, former co-CEO of BlackBerry, argued that "Canada owns and exports very little intellectual property because (the country has) never had a national innovation strategy" (Standing Senate Committee on Foreign Affairs and International Trade 2016). In a similar vein, other commentators have highlighted Canada's less-than-stellar record of commercializing new technologies and turning start-up companies into rapidly scaling, globally competitive firms.[2]

As part of the emerging debate on innovation strategy in Canada, several commentators have highlighted the potential benefits for Canada in following the lead of other jurisdictions — notably South Korea, Japan and France — in creating a state-backed or "sovereign" patent fund. The remainder of this essay will provide an overview of the sovereign patent fund (SPF) concept and explore its potential applicability in the context of a Canadian innovation strategy.

What Are SPFs?

Emerging in the last five years in a small handful of countries that are members of the Organisation for Economic Co-operation and Development, SPFs can be broadly defined as state-backed investment vehicles that acquire IPR assets from third parties in service of national economic objectives.[3] Existing funds have been capitalized from public and/or private sources in the range of CDN$100–$500 million, with some funds receiving further investment from private firms or individuals. These funds have leveraged this capital to acquire significant portfolios of patents — principally in the United States — although the size of their portfolios and the mechanism through which they acquire IPRs varies widely.

Indeed, although falling within the same genus or organizational "type," existing SPFs operating in France, South Korea and Japan embrace a diverse array of structures, objectives and strategies. In terms of objectives, these may include — but are not necessarily limited to — the following:

- Defensive objectives, including protecting domestic companies from aggressive litigation on the part of patent assertion entities and helping to secure freedom to operate for participating technology companies.
- Commercialization objectives, including helping small and medium-sized enterprises (SMEs) and public research organizations (PROs) realize the value of their existing IP through licensing and — where necessary — litigation. Existing funds have emphasized building new, emergent value by bundling together separate IPRs into distinct technology clusters, thereby removing barriers between potential licensors and licensees.
- The provision of high-quality IP expertise to high-potential start-up and scale-up firms that might not otherwise be able to access it.
- International trade objectives, including the prevention of "IP flight" in the event of firm bankruptcy as well as the retention of publicly developed IPRs from post-secondary institutions and other PROs.

Existing funds have tended to embrace at least some of these objectives, and have subsequently deployed a variety of strategies in service of their overarching goals.[4] Japan's IP Bridge, which is a public-private partnership funded by the Innovation Network Corporation of

1 See Wild (2015) for further discussion of these strategies in relation to the smartphone wars. While the estimate of US$6 billion may be high, Wild highlights Microsoft's success in generating monetary returns for its IP, as well as leveraging it to gain access to "third party IP."

2 See, for example, the discussion in Serebrin (2014).

3 Definition and objectives adapted from Clarke (2014).

4 References to specific patent data and strategies are drawn largely from Clarke and Hinton (2016).

Japan, has focused heavily on the commercialization of dormant or "sleeping" patents held by Japanese firms. While Japanese companies continue to hold sizable portfolios of valuable IP, they have been more reluctant than their American counterparts to monetize these assets through licensing and open innovation practices.[5] Using a revenue-sharing arrangement that has allowed the fund to acquire a significant number of patents from large Japanese companies, Japan's IP Bridge has aimed to close that monetization gap in order to help these firms fund subsequent research and development activity.

> SPFs can be broadly defined as state-backed investment vehicles that acquire IPR assets from third parties in service of national economic objectives.

In contrast, the French fund France Brevets has emphasized licensing patents with rights to sub-license and, as a result, directly holds a significantly smaller number of patents than either the Japanese or Korean funds. Since France does not boast a roster of large technology champions holding vast troves of valuable IPR comparable to that of Japan, the French fund has instead focused on bundling together more disparate IP resources from smaller players. France Brevets has been active in both licensing and — to a lesser extent — litigation, in particular on a series of patents in the area of near-field communications developed by the French firm Inside Secure.

South Korean fund Intellectual Discovery emerged initially out of defensive concerns, with particular emphasis on the potential acquisition of Korean-produced IP and its assertion against domestic companies. Indeed, the arrival of the large private patent fund Intellectual Ventures partially motivated the creation of the similarly named Intellectual Discovery in 2010. While Intellectual Discovery has continued to emphasize the defensive aspects of its mission through the operation of a subscription-based defensive patent pool, the fund's mission has evolved and expanded over time.

5 See Ellis (2015) for a detailed discussion of this dynamic.

What Could an SPF Do for Canada?

The potential for a made-in-Canada SPF is an increasingly hot topic. As the previous section highlighted, the broad SPF model encompasses a significant degree of variation in structure, objectives and strategies designed to address specific country-level priorities and challenges. In this context, a provincial or pan-Canadian fund could work to address Canada's IP commercialization gap. Simultaneously, such a fund could also provide a degree of defensive security for the type of small-but-scaling Canadian companies that are likely to become the target of aggressive litigation. As part of broader national and provincial efforts to support high-potential firms with the ability to grow into future Canadian technology champions, the fund could act as a mechanism to provide access to high-quality IP expertise. Finally, the presence of return-on-investment (ROI) objectives can provide a degree of discipline to expenditures as well as a base for continued investments.

Canada's public research bodies, as well as small firms, often struggle to realize the full value of the IP assets they hold. With respect to university-generated IP, for example, recent research by Karima Bawa (2016) highlights that the "number of spinoff companies and revenues generated by commercialization activities is insignificant when compared to public investment in universities for R&D [research and development]." The problem is equally prominent in the start-up and scale-up communities, where knowledge of IP issues tends to be scarce. Indeed, smaller players are at a disadvantage in IP monetization both because the process of asserting their rights against larger players is resource-intensive and uncertain and because the value of IP is often contingent, meaning that the value of specific IP is enhanced when "bundled" with complementary assets. If correctly conceived, a Canadian-focused SPF could help ameliorate these size-specific disadvantages and help firms generate revenue that could be channelled back into productive purposes, such as the development of human or intellectual capital.

From a more defensive perspective, a provincial or national SPF could help provide a degree of protection to start-ups and scale-ups and help them secure freedom to operate in targeted technology sectors. This could be done most directly through the creation of a subscription-based defensive pool similar to that operated privately by RPX Corporation. Such a pool-based model may help deter litigation by establishing a credible threat of

countersuit. More broadly, the fund could seek to acquire and encumber strategic IP from third parties, preventing these from falling into the hands of aggressive patent trolls or other entities.

> If correctly conceived, a Canadian-focused SPF could help ameliorate these size-specific disadvantages and help firms generate revenue that could be channelled back into productive purposes, such as the development of human or intellectual capital.

The provision of IP expertise to high-potential companies at a reduced cost represents another advantage of the SPF model. Lack of awareness, knowledge and expertise about IP issues has consistently been identified as a problem for Canadian firms, in particular SMEs. In this context, the 2013 report on Canada's Intellectual Property Regime from the Standing Committee on Industry, Science and Technology recommended that the government "actively engage with Canadian businesses to raise awareness of IP rights and provide greater support to business seeking to protect their IP" (Standing Committee on Industry, Science and Technology 2013). Outside the public sector, similar concerns have motivated initiatives such as pro bono legal clinics and the Centre for International Governance Innovation's recently launched massive open online course focused on foundations of IP strategy. In this context, an SPF represents a mechanism to deliver high-quality strategic advice and expertise to companies with the potential to scale up.

Finally, the ROI objective provides a degree of discipline that is often not present in other types of innovation support programs. Prominent authors in this area such as Mariana Mazzucato (2014; in particular chapter 9) have highlighted the problem of "socialized risk and privatized reward" inherent in many programs that directly or indirectly deploy public funds to support innovation. While progressive corporate tax systems may address this issue to some degree, the mandated ROI component of an SPF helps to both discipline the provision of supportive investment and orient decisions toward generating a fair return for public dollars that can then be reinvested in further R&D supports.

Conclusion

The preceding analysis suggests that the creation of an SPF could form an important part of a Canadian innovation strategy. As some of the recent difficulties experienced by existing SPFs highlight, however, simply creating such a fund is likely insufficient. Instead, to be successful, such an initiative at either the federal or provincial level will need to be appropriately

Canadian firms, in particular SMEs, suffer from a lack of awareness, knowledge and expertise about IP issues. (Photo: Shutterstock.com)

funded, structured and staffed. Most importantly, the objectives and strategies of the fund must be tailored to address specific Canadian challenges in the area of IP commercialization and the scaling up of high-potential technology companies. If constructed in this way, a state-supported patent investment vehicle could play an important role in supporting Canadian innovation.

Author's Note

The author would like to acknowledge and thank Peter Cowan and James W. Hinton for their ongoing input, advice and expertise on the topic of a Canadian SPF. This essay first appeared online on April 25, 2017. The views expressed are the author's own and do not necessarily reflect those of any current or past employers.

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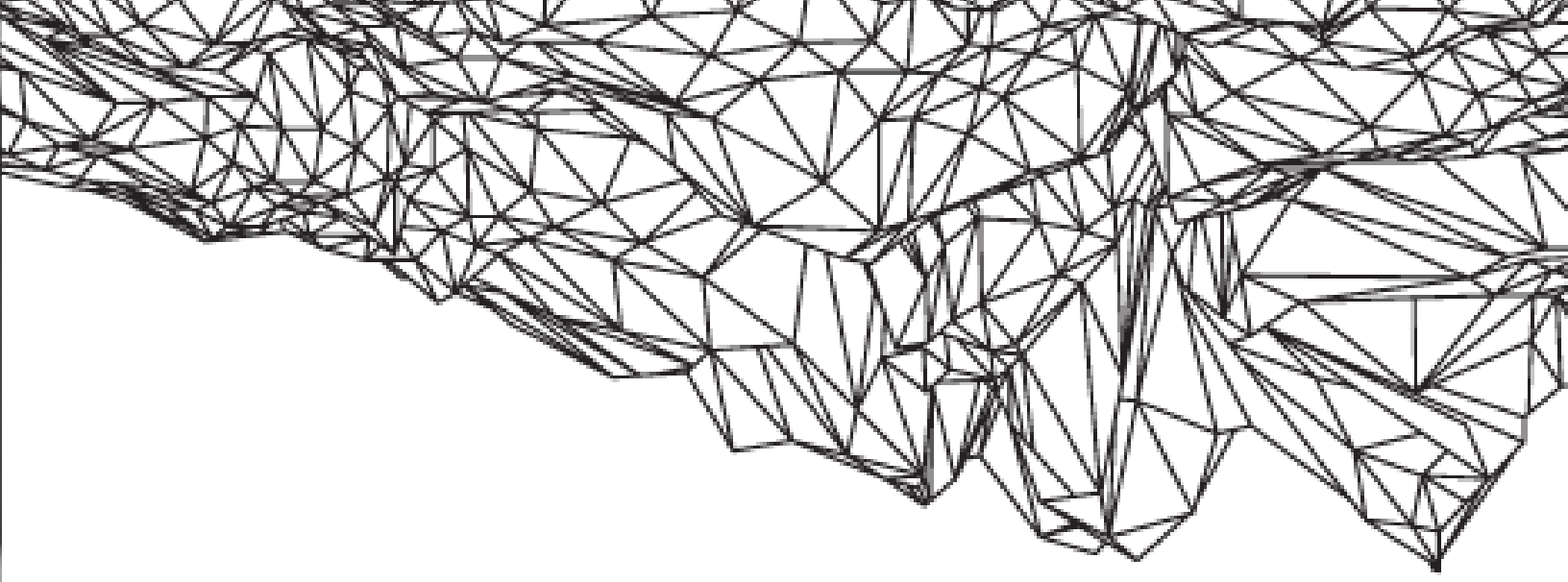
Chinese President Xi Jinping greets former US President Barack Obama at the Hangzhou summit in 2016, where leaders incorporated innovation-related spending as a priority. (Photo: plavevski / Shutterstock.com)



How the G20 Can Stimulate Innovation

Domenico Lombardi

Subdued global economic growth following the global financial crisis (GFC) has increasingly led politicians and policy makers to focus on the importance of longer-term sources of growth, beyond the immediate goal of achieving and maintaining macroeconomic stability. Along these lines, the Group of Twenty (G20), the highest consultative mechanism among leaders from systemically important economies, has started to broaden its agenda to investment, mainly in infrastructure and, only very recently, in innovation.[1]

This essay reviews this emerging agenda item and how it has featured in recent G20 summits, and recommends a set of policy measures through which the G20 can encourage more investment in innovation, including by reducing uncertainty. In doing so, it draws heavily from ongoing research in CIGI's Global Economy Program and, in particular, from a forthcoming paper by Olena Ivus and Joanna Wajda (forthcoming 2017).

The thrust of this essay is that — within its current remit and over the longer term — the G20 has the potential scope to undertake a more ambitious agenda, even though — in the shorter run — some key members may decide to engage less with this forum.

1 The G20 was established as "a new mechanism for informal dialogue…to broaden the discussions on key economic and financial policy issues among systemically significant economies and promote cooperation to achieve stable and sustainable world economic growth that benefits all" (G20 Finance Ministers and Central Bank Governors 1999). It was elevated to the leaders' level at the height of the financial crisis, when it designated itself as the "premier forum for our international economic cooperation" (G20 Leaders 2009). See Kharas and Lombardi (2012) for a historical review of, and background on, the G20.

Investment, Innovation and the G20

Although innovation was highlighted by the G20 as a "core value" during the early stages of the global recovery from the GFC (G20 Leaders 2009), its promotion lost primacy over the ensuing years, before regaining a prominent role in 2016 at the Hangzhou summit.

More specifically, the Pittsburgh summit communiqué emphasized the G20 members' "responsibility to... promote entrepreneurship and innovation across countries" as a "key principle" (ibid.). Subsequently, in Toronto in 2010, G20 leaders reinforced their agreement regarding a series of measures aimed at unlocking demand, including to "encourag[e] innovation" (G20 Leaders 2010). Brief references with respect to investment in innovation followed in Los Cabos (2012), St. Petersburg (2013) and Brisbane (2014).

> Subdued global economic growth following the GFC has increasingly led politicians and policy makers to focus on the importance of longer-term sources of growth, beyond the immediate goal of achieving and maintaining macroeconomic stability.

In Antalya, Turkey, in 2015, emphasis was placed on small and medium enterprises as "important engines of innovation" (G20 and Organisation for Economic Co-operation and Development [OECD] 2015a). Accordingly, a joint G20 and OECD report on G20 investment strategies suggested that promoting further productivity and innovation, including through research and development (R&D) programs, could prove an effective investment strategy (G20 and OECD 2015b, 10). A notable shift was then witnessed in Hangzhou in 2016, where leaders incorporated innovation-related spending as a priority.[2] Even more so, the Hangzhou summit communiqué affirmed a commitment by the world's systemically important economies to prioritize investment for innovation purposes: "We recognize that in the long run, innovation is a key driver of growth for both individual countries and the global economy as a whole. We are committed to tackling one of the root causes of weak growth by taking innovation as a key element of our effort to identify new growth engines for individual countries and the world economy, which will also contribute to creating new and better jobs" (G20 Leaders 2016).

With this in mind, G20 leaders endorsed the G20 Blueprint on Innovative Growth and the G20 2016 Innovation Action Plan. The Innovation Action Plan is based on five general tenets,[3] with much of the G20's involvement revolving around facilitating discussion and encouraging cooperation, far removed from specific actions directly linked to the end goal. At any rate, G20 leaders see the organization as the forum most capable of driving forward innovative growth, largely due to the capacity of its members to do so: "the G20, as a premier forum for international economic cooperation, comprises the world's leading economies, with 90% of global GDP, more than 80% of global R&D investment and 70% of the global patent applications. The G20 members fully recognize the importance of embracing a dialogue on innovation in existing cooperation fora to encourage innovation-driven growth and foster a strong and sustained world economy."[4]

Most recently, in the 2017 Hamburg G20 Summit Leaders' Declaration, the spotlight on innovation narrows to focus on digitalization and digital finance: "We aim to foster favourable conditions for the development of the digital economy and recognise the need to ensure effective competition to foster investment and innovation" (G20 Leaders 2017).

Uncertainty and Innovation

An upcoming CIGI paper examines the link between uncertainty and innovation in G20 countries.[5] In particular, it focuses on macro uncertainty: the extent to

2 "We commit to pursue pro-innovation strategies and policies, support investment in science, technology and innovation (STI), and support skills training for STI" (G20 Leaders 2016).

3 They include synergy, cooperation, openness in trade and investment — as well as in knowledge diffusion and technology transfer — inclusiveness and creativity.

4 See www.mofa.go.jp/files/000185872.pdf.

5 The dataset covers 30 countries (15 of the 19 individual G20 member countries and 15 other EU member states) from 1981 to 2012. The unbalanced dataset has 790 observations in total. See Ivus and Wajda (forthcoming 2017) for more details on coverage by country and uncertainty proxy.

which households and businesses are less able to predict future economic conditions. Five proxies are used: stock index daily returns volatility, cross-firm daily stock return spread, sovereign bond yields daily volatility, exchange rate volatility and GDP forecast disagreement.[6] These measures reflect disagreement among investors and experts on stock prices and business performance, interest rates, inflation, exchange rates, growth and general economic conditions — all factors businesses need to take into account when making investment decisions, including investment in research.

As for innovation, it can be measured through its inputs and outputs, including R&D expenditure, patents, science and technology skills and education, product turnover, and diffusion of new technologies. R&D expenditure[7] was chosen for three key reasons: ease of measurement, connection to a strategic business decision and timing. By using R&D expenditure, there is no significant delay between the business decision and the time of measurement, as would be the case with patents (which would obfuscate the connection between the business decision and the level of uncertainty at the time).

The analysis looks at changes in the level of R&D expenditure, but also the changes in R&D expenditure as a share of GDP (referred to as R&D intensity), to control for the fact that larger countries tend to spend more on R&D; otherwise, the results would be disproportionately driven by the relationship between uncertainty and innovation in larger countries. This resolves one issue, but introduces another: GDP is also affected by uncertainty, as uncertainty is higher in recessions. For this reason, both aspects need to be explored. The overall level of R&D expenditure is the gross domestic expenditure on R&D (GERD); two (overlapping) subclasses are looked at further: business enterprise expenditure on R&D and government-financed GERD.

Moreover, the uncertainty measures are normalized so that they have a mean of zero and standard deviation of one for each country, and are reported in deviations from the mean. When we think about uncertainty, it makes sense that some countries may inherently face greater uncertainty and/or greater volatility of uncertainty. If such conditions are the standard, we would expect businesses in those countries to treat it as such and not change their behaviour. Normalizing the uncertainty measures means looking at changes in uncertainty that are not within the historical norm of that country, or "unexpected uncertainty."

The annual growth rates of R&D and deviations from the mean in uncertainty are the underlying data of Figures 1 through 3. The country-year pairs are sorted into quintile "bins" according to annual growth (of R&D, GDP or R&D as a percentage of GDP) on the *x*-axis. The average of the unexpected uncertainty is calculated for all observations assigned to each bin.[8] The figures examine three perspectives on the possible relationship between changes in uncertainty and R&D growth: the effects on R&D intensity; the direction of effects on the numerator (GERD) and denominator (GDP) of GERD intensity; and the effects on R&D expenditure. Figures 1 and 3 also account for differences in the effects on R&D in general, R&D performed by business enterprises (BERD) and R&D funded by the government.

While the first panel of Figure 1 indicates a positive relationship between all the uncertainty proxies and R&D investment relative to GDP, the third panel shows that government-financed R&D expenditure is likely the key driver, and not the R&D investment behaviour of business enterprises.

Figure 2 takes the data from the top panel of Figure 1 and repeats the exercise for the numerator and denominator of GERD intensity separately. It is immediately apparent that while higher GERD intensity growth is linked to higher uncertainty, the opposite is true for GERD (R&D expenditure) and GDP. Both R&D growth and GDP growth are higher in times of lower uncertainty, but the effect on GDP appears stronger, leading to the positive correlation seen with growth of R&D intensity.

Given the pattern observed in Figure 2, Figure 3 presents the correlation between the change in uncertainty and the three R&D expenditure measures, not as a percentage of GDP. R&D expenditure in general and R&D expenditure by business enterprises are higher in times of lower uncertainty, but the relationship between uncertainty and government-financed R&D is ambiguous.

Summing up, the implications of these graphs should be clear: as expected, increased uncertainty is correlated with decreased growth overall, but it is also correlated with decreased growth in R&D expenditure (and,

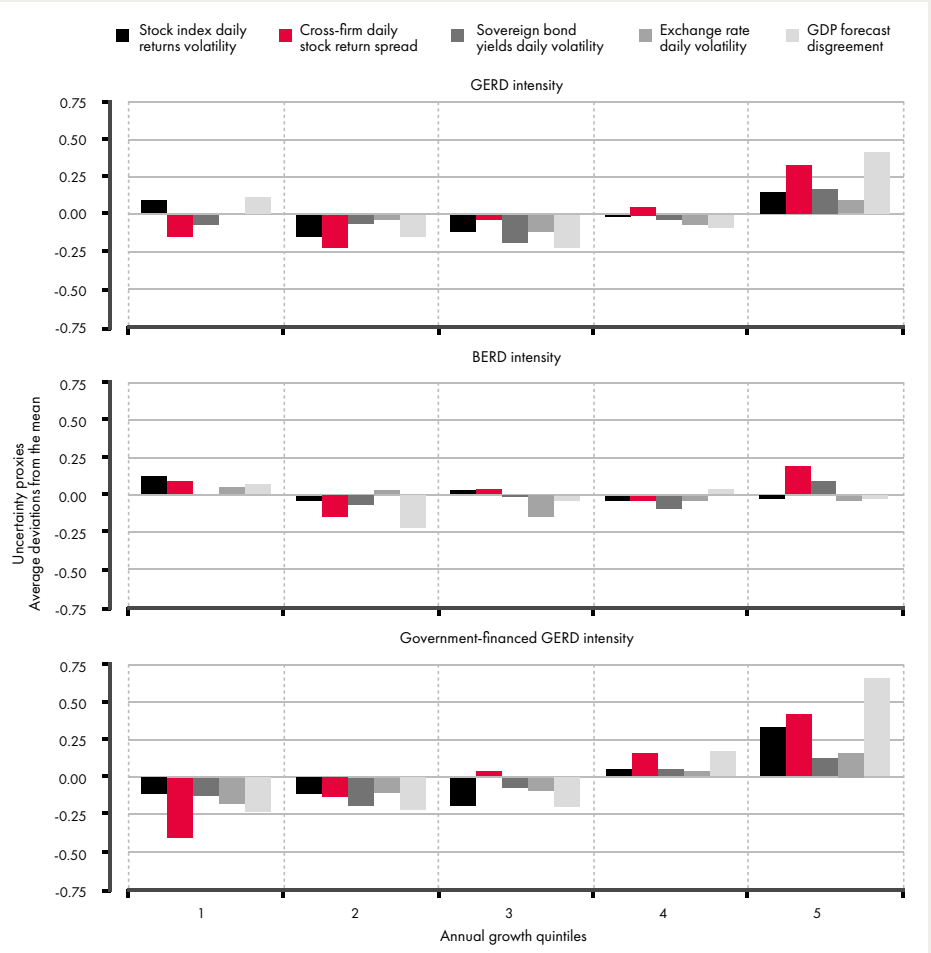
6 Proxies from Scott R. Baker and Nicholas Bloom (2013). See Baker and Bloom (2013) or Ivus and Wajda (forthcoming 2017) for more details on how these measures were constructed.

7 Data on R&D expenditure come from the OECD Main Science and Technology Indicators (http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB).

8 The methodology followed here is based on Figure 1 in Baker and Bloom (2013).

Figure 1: Uncertainty and R&D Intensity by Type

Source: Ivus and Wajda (forthcoming 2017). Elaboration on uncertainty proxies from Baker and Bloom (2013) and R&D expenditure from OECD Main Science and Technology Indicators (http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB).



crucially, with decreased growth in BERD. There are a number of theoretical explanations for this relationship, which is explained in more detail in Ivus and Wajda (forthcoming 2017). The two key explanations are the increase in the value of delay and the irreversibility of R&D investment. These two concepts are not unrelated, and some irreversibility is typically required for uncertainty to increase the value of delay; for instance, using data on Italian manufacturing firms, Stephen R. Bond and Lombardi (2006) find a weaker response of investment to demand shocks at higher levels of uncertainty under partial irreversibility.

Does government support of R&D overcome these effects? Ivus and Wajda (forthcoming 2017) indicate that it does not: while government financed about 41 percent of domestic R&D, it financed only 11 percent of BERD. Furthermore, it does not appear that government financing of R&D is higher when there is greater uncertainty. It is, therefore, not surprising that such a strong negative correlation is seen between BERD growth and increased uncertainty.

Conclusion

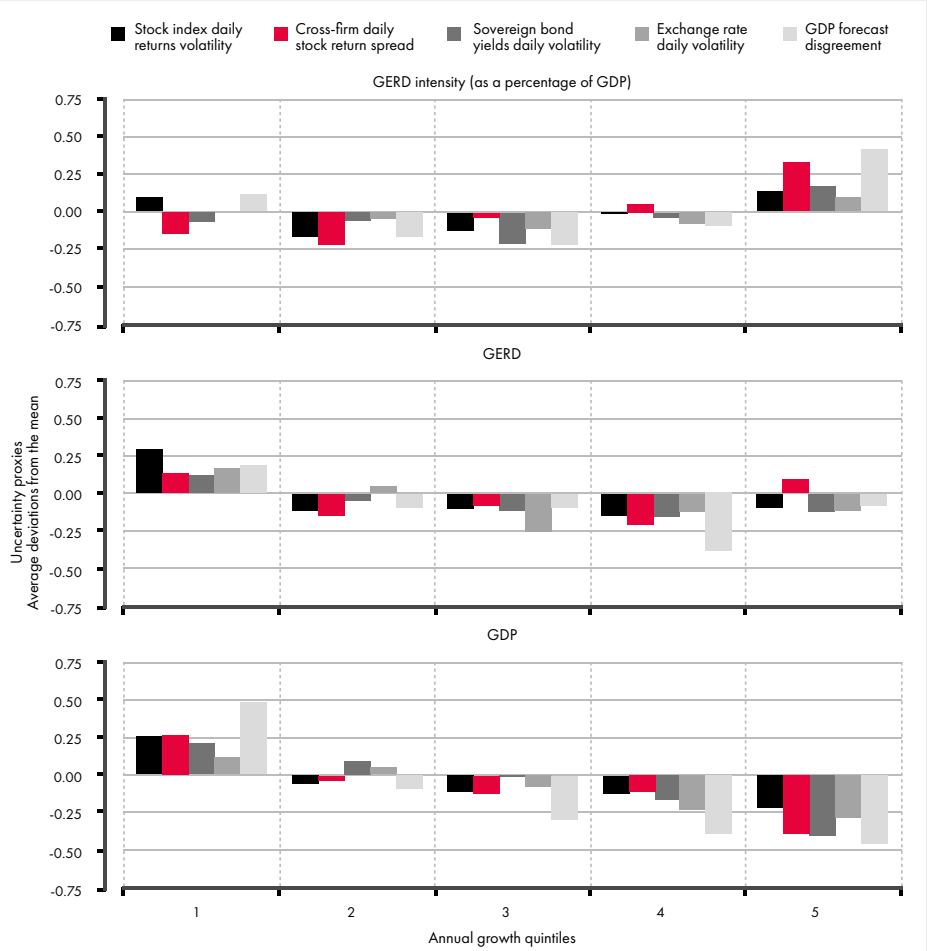
Effective systems of intellectual property rights (IPRs) can help attenuate some of the negative impacts of uncertainty on business R&D spending, by increasing the reversibility of the investment through selling the IPR. However, this is a double-edged sword: overly strong IPRs can incentivize patenting of weak innovations, leading to greater costs and uncertainty in the due diligence process and greater threat from non-performing entities seeking to extract rents from successful firms.

Recommendation One: The G20 should encourage the creation of a World Trade Organization (WTO) agreement to neutralize the escalating strengthening of IPRs within international trade agreements.

National interests have led to the strengthening of IPRs globally beyond efficient levels for a knowledge-based economy. Innovators face greater uncertainty as it becomes increasingly difficult to be non-infringing amid a tangled web of patents, some owned by exploitative

Figure 2: Uncertainty, GERD and GDP

Source: Ivus and Wajda (forthcoming 2017). Elaboration on uncertainty proxies from Baker and Bloom (2013) and R&D expenditure from OECD Main Science and Technology Indicators (http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB).



non-performing entities. An effective agreement would include disciplines on the creation of IPRs by national authorities and a timely elimination process for non-performing patents that burden the system, and provide an international court to settle cross-border infringement claims (Ciuriak 2017).

Recommendation Two: The G20 should urge its members to adopt disclosure policies on fees and royalty rates[9] and the Electrical and Electronics Engineers Standards Association's (IEEE's) new licensing policy[10] for SEPs.

Adherence to official standards is a requirement for success in certain markets, but is complicated by discriminatory licensing of SEPs. These recommendations are particularly important not just for leaders in the SEP market (that is, the United States), but also for emerging contenders in SEPs such as China (Ernst 2017).

R&D support programs typically show high public return[11] and counteract the negative effects of uncertainty on R&D investment. Along these lines, Dirk Czarnitzki and Andrew A. Toole (2007) find that the positive effects of subsidies on the return for R&D investment in German manufacturing firms mitigate the negative effects of product market uncertainty.

Recommendation Three: G20 members should review their R&D support programs and increase tax credit incentives and direct subsidies.

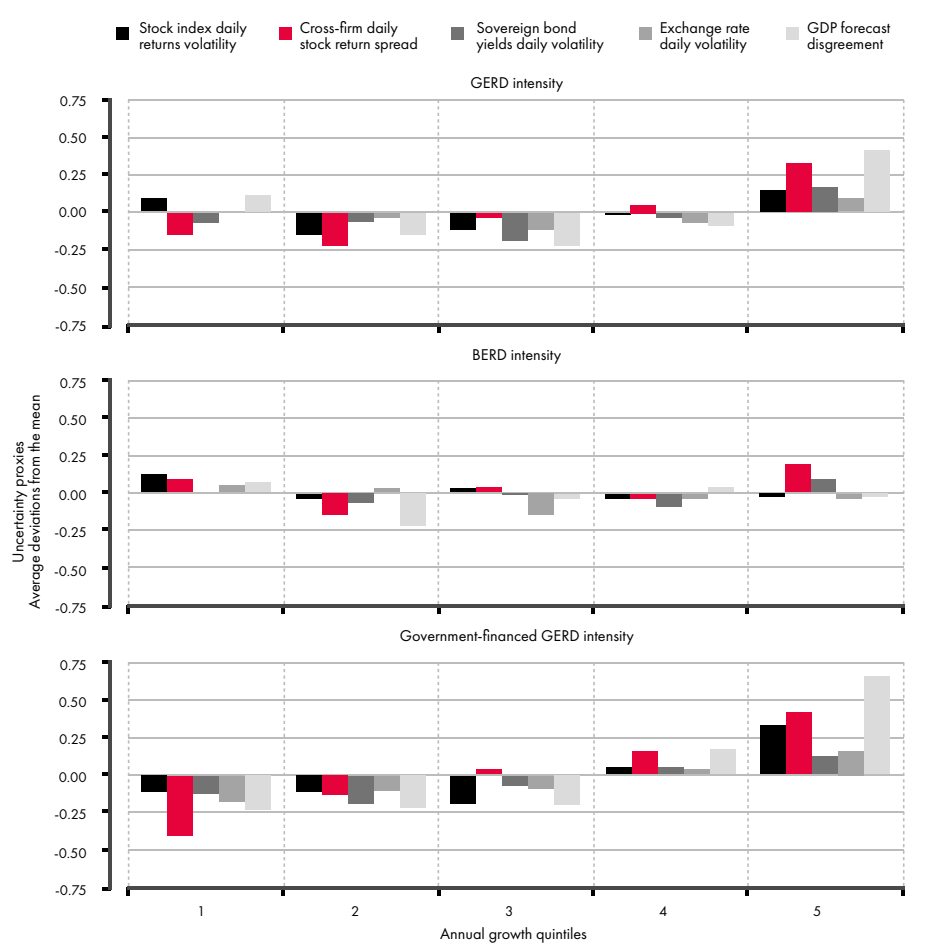
9 Two forms of such policies are: the structured price commitments proposed in Josh Lerner and Jean Tirole (2015), which suggests that submissions for patents to be included in a standard must include price caps on their licensing; and the VMEBus International Trade Association policy of *ex ante* disclosure, which requires members to disclose all standard-essential patents (SEPs) and the maximum fees and royalties associated with their licensing.

10 The IEEE is an international industry-standards body. The licensing policy has the support of the US Department of Justice, and ensures that all IEEE patent-holding members offer licenses when requested, outlines methods of enforcement and clarifies the concept of "fair, reasonable and non-discriminatory" royalty rates.

11 According to the International Monetary Fund's April 2016 edition of *Fiscal Monitor*, private returns to R&D investment are between 20 percent and 30 percent; taking knowledge spillovers into account, public returns are estimated to be even higher.

Figure 3: Uncertainty and R&D Expenditure by Type

Source: Ivus and Wajda (forthcoming 2017). Elaboration on uncertainty proxies from Baker and Bloom (2013) and R&D expenditure from OECD Main Science and Technology Indicators (http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB).



Uncertainty decreases investment in R&D in the present by increasing the relative value of delay — the literature shows this effect is magnified in the presence of financial constraints and distortions in financial markets (Arellano, Bai and Kehoe 2010; Christiano, Motto and Rostagno 2014; Gilchrist, Sim and Zakrajšek 2014). In a broader perspective, the international financial crisis that struck in 2007-2008 profoundly increased uncertainty, and massively weakened investment in innovation throughout the world. Since 2008, the G20 program to reform the global architecture of financial regulation, coordinated by the Financial Stability Board (FSB), has greatly strengthened the solvency, liquidity and risk management of banks and other institutions to reduce financial uncertainty. It has also begun to transform the shadow banking system into a safer and more efficient market-based system for funding private investment.

Recommendation Four: With financial regulatory reform now beginning to reduce global uncertainty and foster greater resiliency in the global financial system, G20 member countries must maintain the momentum of reform, not only by fully implementing the Basel III requirements for the solvency, liquidity and risk management of banks, but also by addressing important supporting regulatory reforms in other areas, including the FSB's proposed actions to transform shadow banking into a more robust system of market-based finance.

Such efforts should also include the strengthening of collateralization, margining practices and the capitalization of central counterparties in key fixed-income and derivatives markets. Continued financial regulatory reforms in these areas are essential elements for reducing general uncertainty and thereby strengthening the incentives for the expenditures on R&D that will foster stronger innovation over the longer term. It is crucial that the momentum of regulatory reform promoted consistently by the G20 since 2009 does not weaken just when it is about to contribute importantly to financial stability and, through that, to potentially stronger innovation and productivity growth.

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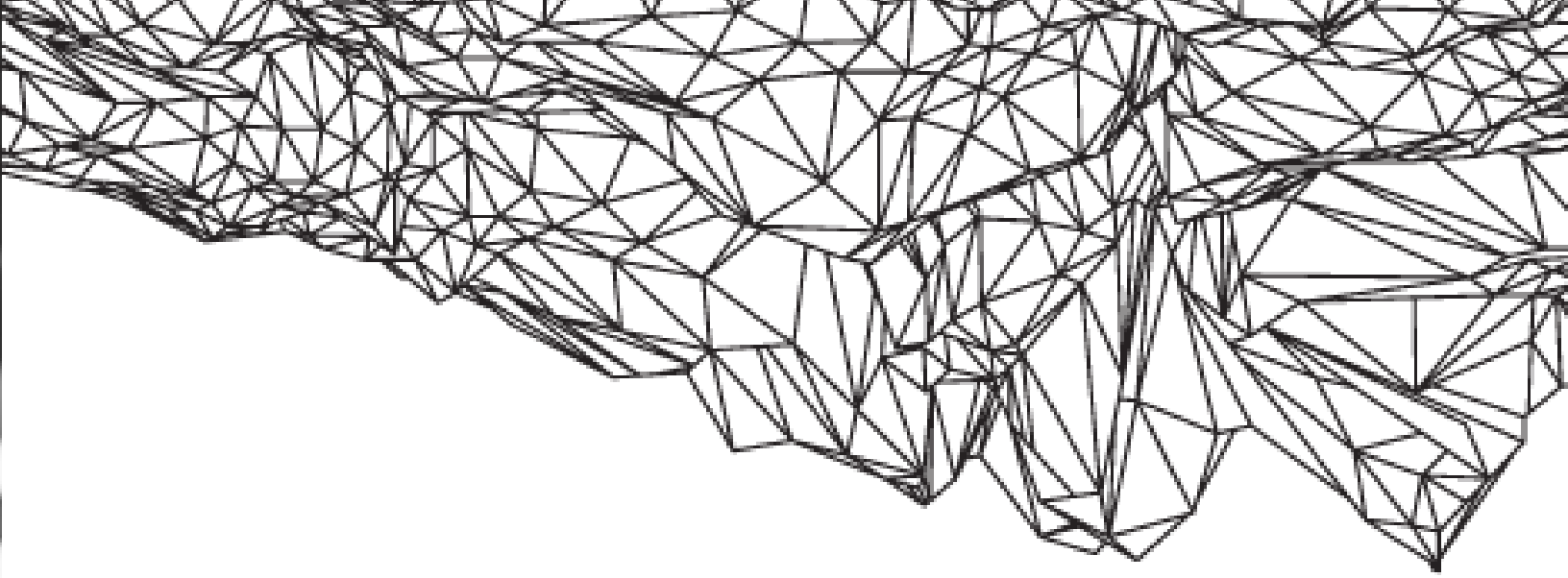
In particular, there are two mechanisms of public policy discussion that have been lost since the rise of social media. One is the allocation of space for opposing views, and the other is the allocation of space for new (public policy) ideas. (Photo: Twin Design / Shutterstock.com)



Populism and the Global Governance of Intellectual Property

Jesse Hirsh

The rise of the internet has ushered in a new era of volatility, marked by an increase in populism, and a greater concentration of wealth. These two trends are connected via the emergence of a new commons, social media, which on the one hand removes barriers to political participation, and on the other enables the rise of new monopolies that own and control these commons (Taplin 2017). Social media, as a new commons, has dramatically shifted the arena of politics and, in particular, the process of policy discussion and the setting within which policy is created. Governments and policy makers may like to pretend or believe that they continue to hold the exclusive domain, yet social media has a kind of gravity that pulls the broader process and people into itself. Even the current president of the United States, much to the chagrin of traditional actors, sees social media as the primary arena for public policy debate.

Unfortunately, we continue to use the language and concepts of past regimes to try and describe the elements, factions and power brokers of this new era. As a result, popular politics tends to manifest as nostalgic, protectionist, reactionary and in retreat. In this era, it seems far easier to take things apart than to create new structures.

The role of language and, in particular, story or narrative, is increasingly important as more participants join the discussion of policies and priorities. States no longer have exclusive domain or control over how societies wish to govern themselves. Therefore, this expanding and interactive constituency must be recognized by embracing language and structures that are as inclusive and accessible as possible. It must also be acknowledged that new technologies are particularly complex and difficult to understand, and are often ignored or misunderstood as a result. Hence, the debate and public policies around emerging technologies have not been as thorough and accessible as they should be.

The Paradox of Social Media: Why Intellectual Property Matters

While jargon tends to serve the purpose of contracting concepts and making discussion as efficient as possible, it also serves to exclude and alienate new voices or those who see themselves as outside politics. This raises one of the great ironies or paradoxes of this era, in that the platforms that foster inclusion also enable a rapid concentration of wealth (and attention). Social media is incredibly easy to use, it lowers the barrier to participation as much as possible and gives each user the opportunity to reach a global audience.

> Social media, as a new commons, has dramatically shifted the arena of politics and, in particular, the process of policy discussion and the setting within which policy is created.

However, social media platforms are owned and controlled by a handful of companies who are using this near-monopoly position to enter (and disrupt) all sorts of different industries. Their model of disruptive innovation is something that countries, companies and communities around the world seek to emulate. Yet, while usage of these platforms is designed to be transparent and easy, the policies behind their success are designed to be opaque and inaccessible.

The economy is currently driven by intangibles (Medhora 2017): intellectual property (IP), whether data, software or concepts, that connect, analyze and enable the applications and services we increasingly depend upon.

The average person does not understand or, quite frankly, care, about IP, let alone the public policy surrounding it. Politically, this is a ticking time bomb.

In particular, there are two mechanisms of public policy discussion that have been lost since the rise of social media. One is the allocation of space for opposing views, and the other is the allocation of space for new (public policy) ideas. In legacy media, there was a general commitment to fostering debate and offering opposing perspectives, while, at the same time, there was space made available for emerging debates and issues of concern. Social media, in contrast, encourages people to connect with like minds and filter out opposing views. All space is taken up by a never-ending flow of posts and information, which makes it difficult for new or contrary ideas to emerge above the buzz of usual suspects.

Public policy issues such as network neutrality, privacy, algorithmic transparency and, more importantly, the ownership and regulation of social media have had great difficulty finding traction in an environment not conducive to opposing or dissenting perspectives. Instead, the focus is on what is trending, what is viral or, more accurately put, what is popular, in a system that encourages conformity and echo chambers.

Which brings us back to the paradox of social media. It is driven by sharing — by people passing on content, images, videos, quotes or news, almost always created by someone else; yet the IP that enables these platforms is also how their value is derived (Wortham 2017). People use these platforms as if IP does not exist, but these platforms exist because of IP laws. The echo chambers of social media seem to insulate the activity of users from the legal constraints of the larger society.

There needs to be greater awareness as to the relevance of this area of public policy, and the field of IP has to be accessible — democratized, if you will — if it is to continue to be healthy and relevant. For starters, IP policies need a different approach than traditional public policy. We are, after all, dealing with intangibles, items that do not exist physically, and therefore have different properties.

IP Governance via Inclusive Public Policy

If intangibles are easy to copy, should attempts be made to limit that feature, or should a new means of regulating or rewarding their reproduction be devised instead? Access to data and copyright material is an important issue, and policies around fair use tend to correlate directly with the ability to innovate, iterate and invent (Geist 2017). For example, in the field of machine learning and artificial intelligence (AI), copyright has been found to have a direct impact on bias found within algorithms (Levendowski 2017). The greater and more diverse the data fed into a neural network or model, the more accurate the performance.

Part of what alienates citizens from global trade agreements is a legitimate belief that these agreements do not reflect nor include their input or participation. Negotiated among nation-states, they exist at a level of government that is disconnected, and perhaps even irrelevant, to the average citizen or economic actor.
(Photo: arindambanerjee / Shutterstock.com)

Restricting researchers' ability to access data directly limits the potential to compete globally in developing solutions driven by machine learning and AI. Generous fair use policies can make a big difference when it comes to making this important field more accessible and responsive. Can a policy in favour of open source technologies benefit a society more so than policies that restrict or protect the spread of knowledge?

Most countries operate on an innovation deficit. They take in far more IP than they export (Clarke 2017). Even on a raw materials level, perhaps they are losing (ownership) of data rather than increasing (their use of) data. There are policies that can help reverse this, empowering an economy to become more aware of and active in its trade in IP.

A sovereign patent fund (SPF) is a good example of this (ibid.). It involves the state creating a fund that amasses the patents held within a country. On the one hand, the power of said state is used to defend that IP; however, on the other hand, the resources of the state are used to export and license these patents globally, creating revenue for the government as well as the original patent holders. Such a fund would not only incentivize greater cooperation among citizens, companies and governments, but also foster awareness around the economic opportunities to be found via intangibles. A similar fund could be set up to manage the collection, sharing and selling of data. As the "Internet of Things" and new technology such as self-driving cars emerge, the data they collect will surpass the massive volumes being generated by social media. Creating a means by which countries can control, leverage and license this data, both domestically and internationally, will be regarded as an important economic instrument, as well as necessary for effective evidence-driven public policy.

The larger issue, however, becomes one of disputes, as often IP comes down to arguments of infringement, authorship, origin and permissions. Here again a new approach for mediating and governing disputes in a global context must be considered.

While international political populism has shown signs of being protectionist and anti-global, it certainly does not have to be, given the popular embrace of global communications platforms. The issue really comes back to language, accessibility and relevance. After all, disputes and broader notions of justice manifest all the time on social media, as people turn to the court of public opinion to air their grievances and seek external judgement. A system to govern global IP (or, similarly, data collection) could be created using the same tools that are being used to share IP globally, i.e., distributed peer-to-peer systems. Such a system could also employ language that is accessible and inclusive, thereby giving comprehension and legitimacy to these new rules of the game. For example, distributed ledger technology, often in the form of "blockchains," can and will be used to govern the control, and usage, of both tangible and intangible property.

States and their associated actors would benefit from investigating and embracing how this technology could be used to create a transparent, accessible and participatory global IP regime.

Such a system could be used to register IP. This provides a groundwork by which creators can assert their rights in multiple jurisdictions, while also encouraging and incentivizing creators to make their works more widely available.

> A system to govern global IP (or, similarly, data collection) could be created using the same tools that are being used to share IP globally, i.e., distributed peer-to-peer systems.

The company Blockstack is one example of a blockchain-based solution that uses blockchain technology to combine IP rights with privacy controls.[1] Blockstack's desire is to transform the internet as we know it in order to bring greater security, privacy, while still respecting and enforcing IP rights. Systems such as Blockstack could also be used to help mediate disputes over IP — who owns it, who invented it or how it is being used. Such disputes can be done openly, and judgments can be made by other participants in the system.

While an SPF exists in a national context, this system could be a similar structure, only scaled up across the globe. Countries can choose to invest in the fund and thereby participate in its broader growth. As a voluntary system, it benefits from participation, and participants benefit from the value and access that the system provides. As a distributed system, no single country would be in control and, therefore, it can offer a sort of trusted intermediary status.

Citizens within each participating country can also learn and benefit from the system directly, finding value and relevance in it. This will not only help raise awareness with regard to the role of IP, but enable a greater number of participants to be active in the creation and trade of intangibles. Part of what alienates citizens from global trade agreements is a legitimate belief that these agreements do not reflect nor include their input or participation. Negotiated among nation-states, they exist at a level of government that is disconnected, and perhaps even irrelevant, to the average citizen or economic actor.

An alternative would be to create inclusive structures that accommodate nation-states, corporations and individuals. Certainly, social media networks are one example of this, where a single platform involves both institutions and individuals, each sharing their priorities and perspectives. Yet emerging peer-to peer-systems are also able to combine the participation of actors that are large, small and in-between.

The ease by which the internet enables participation suggests that exclusive systems can no longer be expected to remain legitimate. Rather, emerging systems of governance can, and should, be inclusive, so that they are relevant and available to the wide range of actors now engaged in the creation, usage and regulation of IP.

There is an emerging generation of entrepreneurs, developers, philosophers and artists who are actively creating distributed systems that enable widespread participation, and propose innovative models of governance. Much of this activity is happening at the level of individuals, often without regard for traditional states and regulatory bodies.

Involving and including these new players in policy design is important: as outsiders, they bring a perspective and culture to governance that more closely represents the politics and culture of digital networks. They are themselves a new kind of elite, so this does not resolve the challenge of populism; however, it does help to reconcile the conflicts between established authority and emerging systems.

Reconciling the Internet with the Rule of Law

The issue of populism is one of language and legitimacy. Step one is to integrate this new generation of internet-based leadership. Step two is to find accessible language that integrates this new generation into existing systems. Step three is extending that inclusivity to society as a whole.

The challenge moving forward will be to reconcile and harmonize these efforts with the rule of law and the broader international governance system. The opportunity for policy planners and governments is to harness these grassroots phenomena while using the (remaining) legitimacy of the state to create systems that enable the participation of a wide range of actors, and the emergence of a new system of international cooperation.

1 See https://blockstack.org/.

This is where the need for a broader public consensus is required. Doing so involves a transcendence of existing echo chambers, and instead a deliberate construction of a new inclusive culture that reflects the new (social media) commons.

The key to accomplishing this will be the usage of clear language, accessible concepts and a broader commitment to building inclusive and participatory systems — not necessarily an easy task given the existing political climate, and the traditional culture of policy development.

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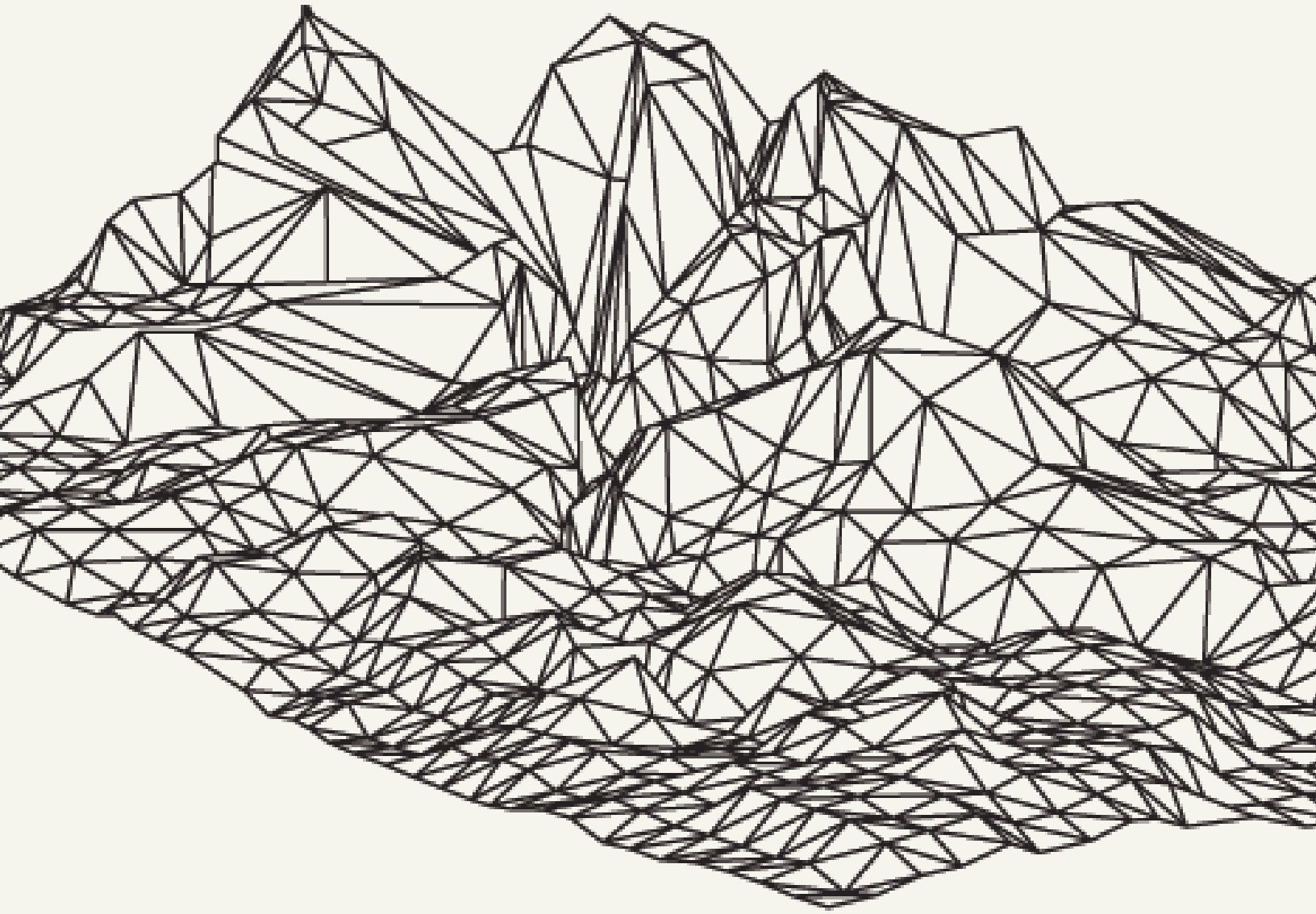
Jesse Hirsh is a researcher, artist and public speaker based in Toronto, Canada. His research interests focus largely on the intersection of technology and politics, in particular artificial intelligence and democracy. He recently completed an M.A. at Ryerson University on algorithmic media.



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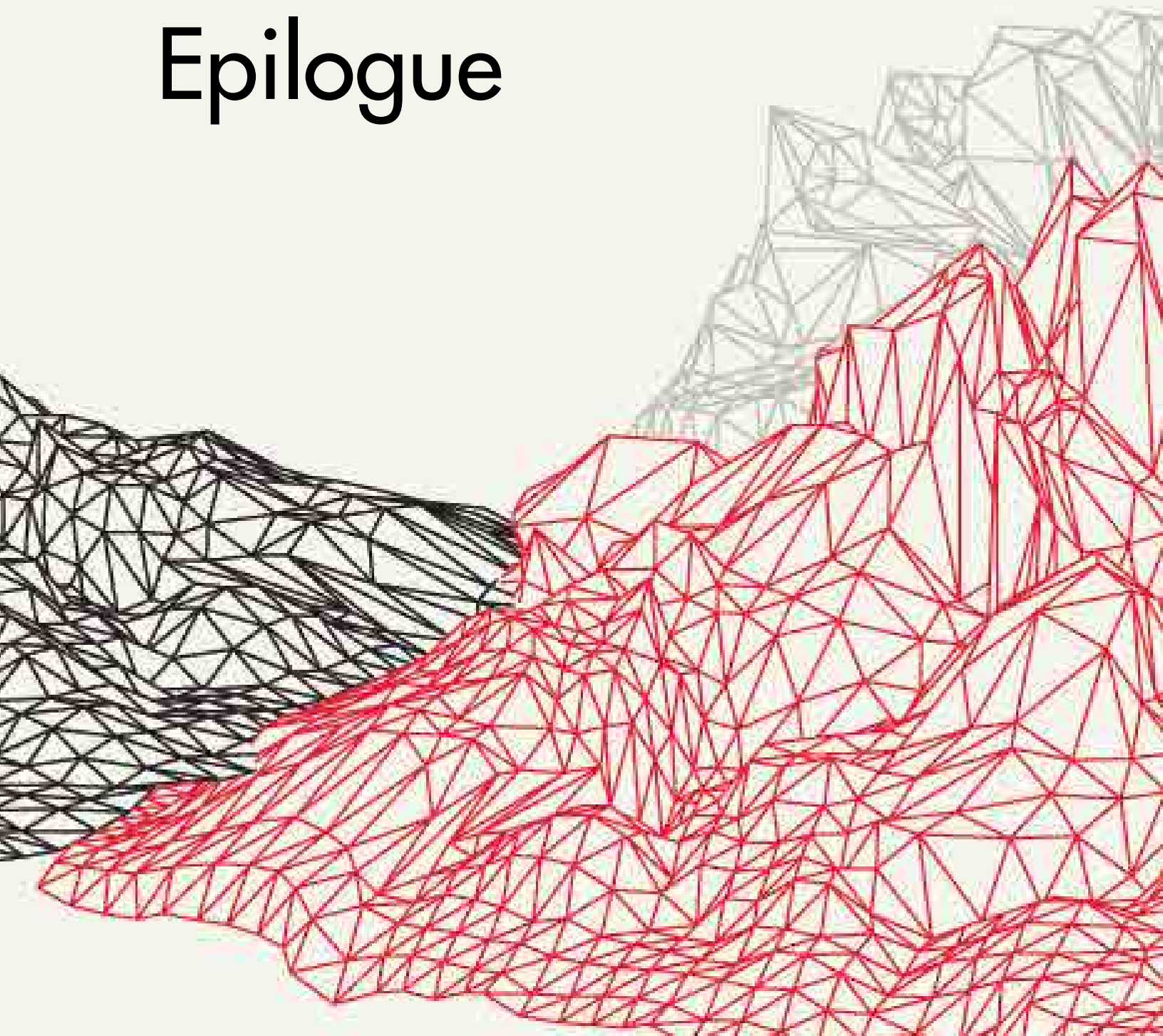
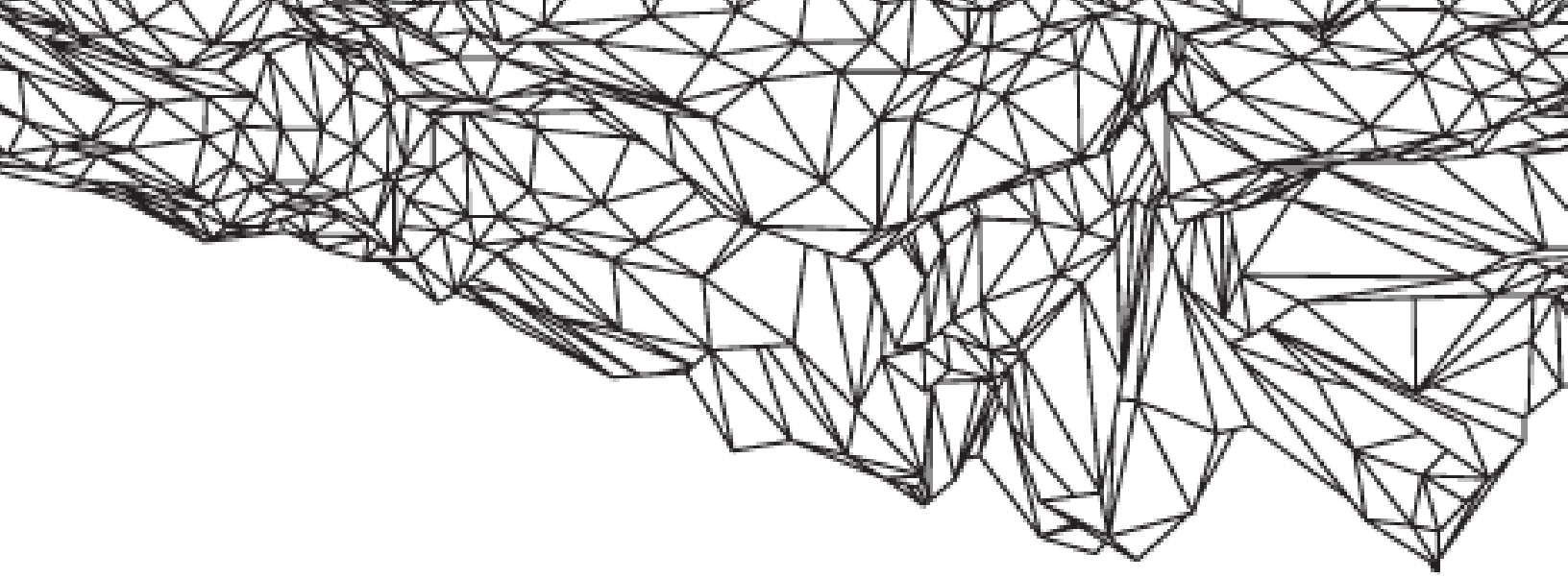




Framing an Innovation Strategy

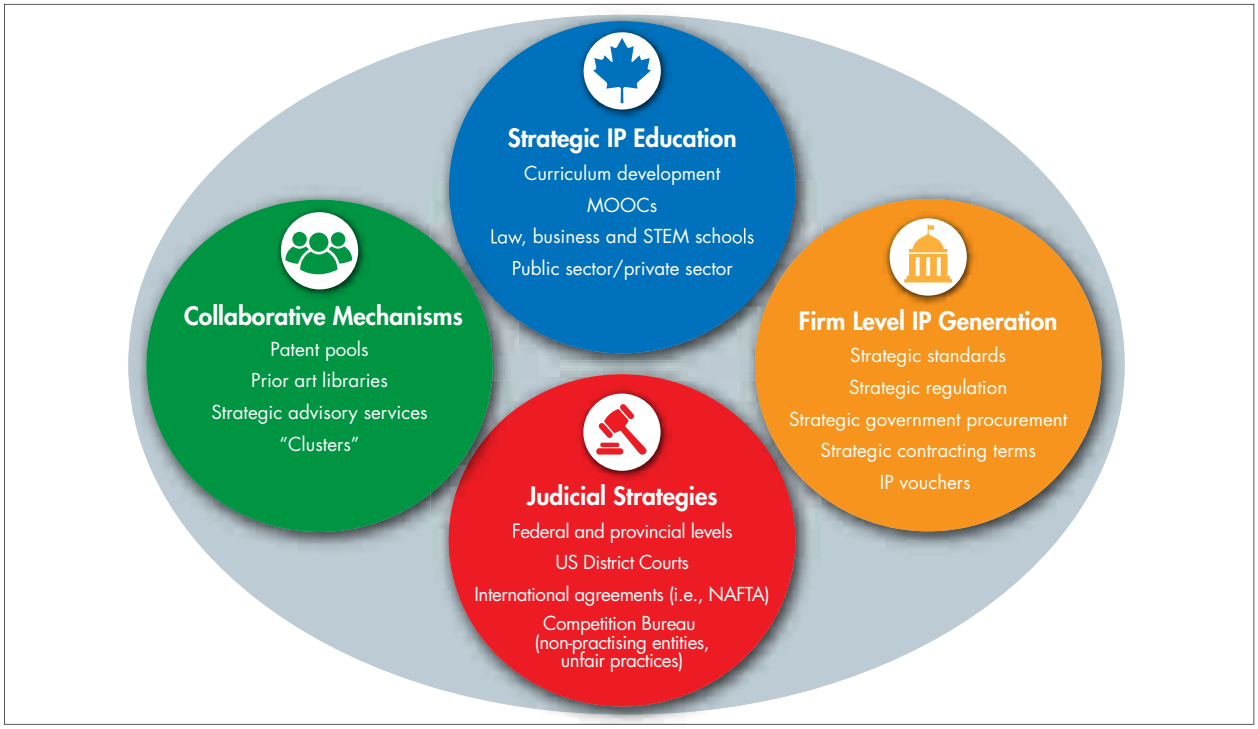
Rohinton P. Medhora

If there is one lesson we have learned from the postwar experience with growth and development in rich and poor countries alike, it is that there is no single path to success. This is even more so the case when we consider that economic structures are changing in fundamental ways and will change even further in coming years, driven by an ever-increasing amount of data, and the capability to process it for multiple commercial and public uses; advances in digital and sentient technologies; and the concomitant rise in the importance of intellectual property (IP) and technological standards. This is the fabric that now holds national and global economies together.

If a well-endowed, prosperous and well-run country such as Canada is not immune from the consequences of failing to take innovation strategy seriously, then the issue is widespread and merits serious public discussion. It has national policy and international governance dimensions. The contributions to this collection of essays provide a rich array of proposals. Building on these, Figure 1 presents a framework for a national innovation strategy, containing four "buckets" of issues. To add to the complexity, it should be understood that in reality this is a Venn diagram, with multiple overlaps between the four issue areas.

As several of the authors contend, IP awareness must start early and be integrated into academic curricula and business decision making from the very beginning. The quote from Leonardo da Vinci at the start of Myra Tawfik's essay is instructive: "Study the science of art. Study the art of science." One might add — study especially prior art, the existing knowledge base on which patents are granted as an advance to it (or not granted). In Canada, higher education is mainly a provincial subject. How provinces and individual universities and colleges enhance the IP-innovation content of their syllabi might vary, but the core intent should be clear: to weave offerings across at least three academic streams — law, business and STEM (science, technology, engineering and math) — augmented by the use of massive open online courses (MOOCs) and

Figure 1: Focal Zones of an Innovation/IP Strategy



Source: CIGI.

continuing education programs to keep entrepreneurs up to date on the key developments in the field. IP clinics, where pro bono guidance is offered to (often young, busy and struggling) entrepreneurs, might usefully round off this area of intervention.

There are other, more intense, collaborative mechanisms that emerge as part of an overall innovation strategy. Patent pools, be they sovereign, as Warren Clarke suggests, or sector-based, along with prior art libraries, provide strength in numbers to otherwise atomized players. Public-private partnerships such as geographic or industry-based innovation clusters are also likely to be effective. The usual caveats apply — government support has to be predicated on an inherent national development strategy and subsidies must be conditional on performance. Infant industries must graduate to adulthood. But in a sector characterized by high upfront costs, significant risk of failure and economies of agglomeration (that is, positive spillovers from being closely connected), it is difficult to conceive success without the participation of the public sector. Sensible public intervention is also consistent with the experience of success stories internationally.[1]

A third basket of interventions in innovation strategy centres on the thicket of issues where states and markets intersect. Technology is most effective — and profitable — when it becomes, by dint of superior functionality or by mandate, the industry standard. Interoperability is also crucial for networked processes. Understanding where and how regulations and standards that affect the adoption of a technology are set is important in supporting innovation. As Neil Desai suggests in his contribution, government procurement can be used in a World Trade Organization-compatible manner to support Canadian innovators. Data — widely described as "the new oil" (*The Economist* 2017) — is held by private and public entities in increasingly larger quantities. It can be aggregated, packaged, sold and used, for an expanding set of commercial and non-commercial uses. Managing this fast-growing sector to balance concerns about privacy, security, profit and the public good is only the latest challenge governments face within their innovation dossiers. Firms generate IP. But they do not do so in isolation from the range of government policies and regulations that alter the cost and profit curve of their development and application.

Last, and crucially, for small countries at least, when it comes to innovation, autarky is not an option. Rather, seeking foreign markets is an imperative. As several

1 See, for example, Mazzucato (2014) and Breznitz (2011).

essays in this collection argue, the international sector is both an opportunity and a challenge. The guiles of endless markets, industry standards and becoming the lynchpin to a global network are evident, but require a sophisticated understanding of how IP is negotiated and governed in existing trade agreements. A case can be made for refreshing the Agreement on Trade-Related Aspects of Intellectual Property Rights, which at present serves neither producers nor consumers of IP especially well.[2] Any attempt — as was the case with the failed Trans-Pacific Partnership Agreement — to further entrench or extend current IP regimes favours existing IP holders and exporters at the expense of future ones. The US negotiating position in this matter comes into focus once this simple fact is understood. Michael Geist's exposition of patent trolling lays bare the misuse of the court system to stifle innovation instead of protecting innovators. As developing countries such as China and India develop their own IP and innovation engines, their interests become allied with those of IP producers, while still sharing some of their former affinity to orient their IP regimes toward poverty alleviation and social objectives. This makes the Group of Twenty (G20) a potentially important venue to sort out IP issues at the international level. Put another way, if not the G20, then where?

At Bretton Woods in 1944 and in San Francisco in 1945, groups of powerful nations organized the economic and political arrangements that serve us, albeit imperfectly, to this day. Rapid developments in technologies, often referred to as the Fourth Industrial Revolution, are upending established structures in every part of the economy and society. Whether it is through the deliberations of the G20 or elsewhere, we need a Bretton Woods or San Francisco moment to bring order to and shape the current technology-fuelled environment for the global good. Here, as in other facets of international negotiations, the starting point is national policies and postures. Michael Spence's dictum in the foreword bears paraphrasing here, too — successful societies are those where creativity is fully unleashed and innovation is deeply embedded.

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2 See Archibugi and Filippetti (2010).

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