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NURTURING GLOBAL GROWTH COMPANIES: TIME FOR A NEW POLICY TOOLKIT

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SUMMARY

Canada's declining position in the Global Competitiveness Index, the lower productivity of Canadian companies compared to U.S. firms and the low ranking of Canadian companies in the Global Innovation Index, despite the strengths of our scientific community and the quality of its scientific research, suggest that Canadians have not mastered the alchemy of transforming "knowledge into money."

Key drivers of such a transformation in industrialized economies are high-growth and globally competitive technology companies. These so-called "gazelles" contribute disproportionally to job creation, economic growth, innovation and productivity improvement.[2] Canada underperforms in the creation of these firms, and recent trends are not promising.

The expansion of Canadian companies into global markets is commonly suggested to be hampered by two main factors: (a) a lack of management skills, experience and talent, and (b) the propensity of Canadians to be risk-averse. Although these factors have undoubtedly hindered the potential of many companies, they have not been limiting factors for many others who have earned and maintained a leading position in global markets. Comparisons of manufacturing management practices between countries show that Canada's performance is equivalent to

1 The opinions expressed in this paper are those of the author and do not necessarily reflect the views of Dentons Canada.

2 David Birch introduced the term "gazelles" in his seminal work The Job Generation Process to describe fast-growing companies. Typically, these companies with sales of at least $US1 million have maintained an annual growth rate of 20 percent or more in each of the past four years.

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that of leading countries, including Germany, Sweden and Japan. Today, sales of Canadian companies by foreign affiliates exceed Canada's total exports, which is equivalent to almost 30 per cent of GDP. Clearly, success in global markets is not an elusive goal for Canadian entrepreneurs and business executives.

Similarly, the assertion that Canadians are risk-averse needs to be tempered by the fact that Canadians invest billions of dollars in junior mining and oil and gas exploration companies, two of the most risky business sectors.

Experience, supported by extensive empirical evidence, confirms that Canadian policies to improve Canada's competitiveness have so far been ineffective; more of the same will not yield better results. Access to external equity capital is a necessary condition for fuelling and sustaining the accelerated growth and success of high-growth, knowledge-based companies. Since 2017, globally, venture investments in the technology sector have been characterized by a decline in the number of deals, particularly in early-stage funding, but an increase in later-stage deals and the size of funding rounds. Rather than serving to deepen the Canadian public and private equity markets, current tax policies penalize high-growth technology firms that go public, and are biased in favour of private financing, a source of equity that has a propensity to "exit" by selling off stakes in promising young Canadian companies to foreign companies or investment funds rather than supporting their growth and scaling-up in Canada.

We suggest three policy avenues that combined would assist Canadian companies in expanding their activities in Canada and abroad to become part of the next generation of international leaders and help retain in Canada high growth firms that are acquired by non-local businesses. In this vein, we propose that the Canadian (and provincial) governments adopt the following measures:

- Address the shortage of highly qualified and experienced personnel by promoting and financing the establishment of an institutional professional-network infrastructure similar to that of the German "Steinbeis."
- Promote the acquisition and commercialization of intellectual property from domestic and foreign organizations by adopting, as 15 OECD member countries have already done, the so-called "intellectual property box" tax measure, which provides for a reduced rate of income tax on the commercialization of intellectual property developed or acquired by a Canadian company.
- Support the scaling-up of Canadian businesses and increase the depth of equity capital markets through the adoption of targeted tax measures that: (a) eliminate the taxation bias that discriminates and penalizes innovative and high-growth Canadian companies that go public; (b) exempt from taxation the capital gains realized on the sale of the shares of certain small businesses held for at least five consecutive years prior to sale, similar to the measure adopted under the U.S. Small Business Jobs Act of 2010; and (c) provide for a gradual reduction in the tax on capital gains of eligible SMEs when they list on a Canadian stock exchange and are held by individual investors for a reasonable period of time afterwards.

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"Canadians are ingenious. Innovative both by nature and because of it, they have given the world a staggering array of tools, techniques, devices, solutions, machines, therapies, processes, and social innovations to help people live better, fuller lives."

Johnston and Jenkins (2017)

The recent report by an expert panel at the Council of Canadian Academies (CCA) (2018) on the state of science, technology and industrial R&D in Canada provides an authoritative assessment of where Canada stands relative to our major competitors. The CCA report reveals that Canada remains strong in several fields of research; the recent Nobel awards in widely different domains of physics to Canadians Arthur B. McDonald (2015) and Donna Strickland (2018) and the granting of the 2019 A.M. Turing Award to Canadian computer scientists Yoshua Bengio and Geoffrey Hinton provide ample support for this assessment. More generally, Canadian scientists are highly regarded; their average citation rank is above the world average in all fields, and Canada stands in fourth place in terms of research reputation. Of particular concern, however, is that compared to other OECD countries:

- R&D intensity in Canada has declined steadily since 2001, whereas across OECD countries, R&D spending relative to GDP has continued to increase. Our gross domestic expenditures on R&D as a share of GDP stands at 1.7 per cent compared to four per cent for leading OECD countries and 2.4 per cent on average for OECD countries.
- The level of business R&D (BERD) in Canada is low — 33rd of 40 OECD and other leading countries — and there has been a sustained erosion in Canada's industrial R&D capacity and competitiveness.
- Canada has comparatively low research output in core areas of natural sciences and engineering and particularly in enabling and strategic technologies.

Clearly, Canada is punching well below its potential in critical areas, an underperformance that has enormous economic and social implications.

First, there is mounting evidence that "ideas are getting harder to find" as research productivity declines rapidly. In the United States, research productivity is estimated to fall at an average rate of 5.1 per cent per annum (Bloom et al. 2016). This means that the research effort must double every 13 years to maintain the status quo. This phenomenon is observed in all areas of research endeavour. For example, computer chip manufacturers note that it takes 18 times more researchers than in the early 1970s to achieve Moore's Law, which entails doubling the density of computer chips every two years.[3] Canada's increased research effort falls short of the trajectory needed to offset its declining productivity.

At the global level, the impact of the decline in research productivity on overall economic growth is not as acute because, as expounded by Paul Romer (1990, 2019), ideas are non-rival; they differ from all other goods in that they do not get depleted when used by more and more people. Increasingly, they travel unhindered around the world suggesting

[3] As of 2019, 14 nanometer and 10 nanometer process chips are commonly in mass production, with 7 nanometer process chips in mass production by TSMC and Samsung, although their 7 nanometer node definition is similar to Intel's 10 nanometer process which has begun to be delivered in large volumes in June 2019, a two-year delay on the original schedule (Company announcements). See also Flamm (2017).

that the level of global connectedness will increasingly become critical for sustained competitiveness. The increasing pace of technology adoption is reflected in the reduction in the average time to adopt new technologies: It took about 65 years for telephones to reach 40-per-cent penetration of U.S. households, while smartphones reached this level in just 10 years. A major factor behind the accelerating rate of technology adoption is that modern communication and digital technologies require less infrastructure than the cable lines, electricity grids and telephone wires that had to be installed throughout the 20th century, which caused delays in the accumulation of network effects that make the products worthwhile for consumers. As a result, to remain competitive, firms must move much faster to innovate and adopt new technologies (digital and others) and best practices.

Second, and more specifically for Canada, the CCA report suggests that while Canadians are proficient in translating "money into knowledge" (i.e., Canada's performance in measures of research results and impact is high), they do not appear to master the alchemy of transforming "knowledge into money." Since the very essence of business innovation is the creation of new forms of value-added products, processes and business models, this gap is seen as a factor in the continued decline of Canada's relative global competitiveness (Table 1) (Gu and Willox 2018).[4]

TABLE 1 GLOBAL COMPETITIVENESS INDEX

Country	2018–19 rank	2014–15 rank	2009–10 rank
United States	1	3	2
Singapore	2	2	3
Germany	3	4	7
Switzerland	4	1	1
Japan	5	6	8
Netherlands	6	5	10
Hong Kong	7	7	11
United Kingdom	8	10	13
Sweden	9	9	4
Denmark	10	12	5
Finland	11	8	6
Canada	12	13	9
Taiwan	13	15	12
Australia	14	21	15
South Korea	15	26	19

Source: The Global Competitiveness Report, World Economic Forum.

[4] Canada's position vis-à-vis the United States has been gradually improving during the 2010-2016 period as business productivity in Canada has grown significantly faster that in the United States (1.05 per cent per annum versus 0.51 per cent).

Both dimensions of technology diffusion need to be considered. First, there is *technological adoption*, the time it takes a new technology to first reach a country or company. Second, there is *technological penetration*, the extent to which technology reshapes processes and products in a company or country. There are strong indications that Canadian businesses are lagging behind their European and American counterparts in the adoption of new technologies (MNP 2018). The speed at which new technologies are adopted is an important determinant of productivity growth. Canada's low proportion of machinery and equipment (M&E) investment as a share of GDP relative to its peers exacerbates the impact of the shortfall in BERD and innovation as the latest technologies are generally embedded in M&E.

The skittishness vis-à-vis innovation and technological advances is likely much more profound than what can be drawn from the CCA report because the report does not address nor take into account the overall knowledge advances and technological spillovers that flow from R&D performed by our major trading partners (Baumol 2010). There is strong evidence that trade liberalization, notably between Canada and the United States, accelerates the flow of technology across borders (Hsieh, Klenow and Nath 2019). It is estimated that the average value of a dollar of U.S. R&D in relation to Canadian productivity represents 78 per cent of the value of a dollar spent domestically on R&D (Keller 2001) With U.S. R&D expenditures being about 40 times larger than Canada's effort, the impact of U.S. technology spillovers is expected to be much greater for Canadian productivity growth than that of Canada, assuming we have the knowledge to master these "imported" scientific and technological advances and the ability to translate them into our own innovations.

A good example of the importance of this diffusion mechanism is the adoption by Bombardier of the supercritical wing technology developed by NASA. This new technology has enabled Bombardier to develop a state-of-the-art family of wide-cabin executive jets with superior take-off and landing performance that fly further and faster on less fuel, all key performance characteristics that ensure the success of the company's Global Express program and the billions of dollars in export sales that result. The latest addition to the family, the Global 7500, received its certification from Transport Canada in September 2018. This aircraft, the largest and longest-range business jet on the market, is sold out through 2022.

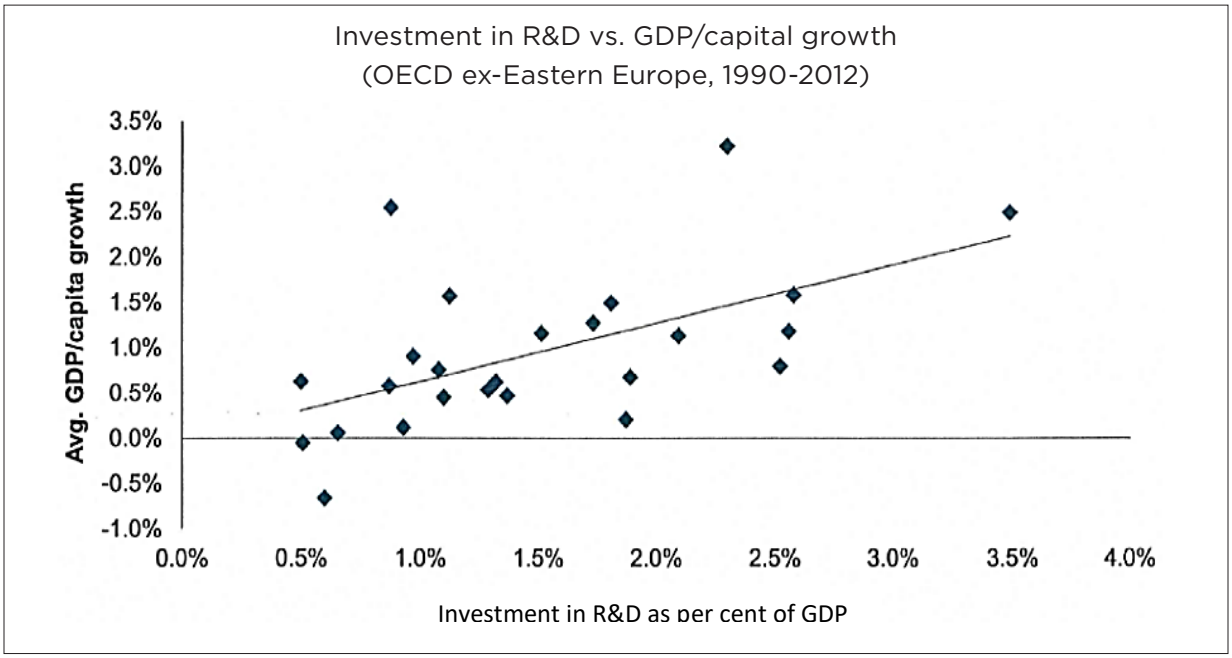
While the CCA's expert panel was unable to explain the gap between Canada's research strength and innovation weakness, the so-called paradox (Council of Canadian Academies 2013),[5] it makes an important and useful point in stating that "many factors commonly identified as areas of concern do not adequately explain Canada's overall weak innovation performance relative to other countries." (Council of Canadian Academies 2018)

Canada is not alone in facing this quandary. Across OECD countries, the relationship between GDP per capita growth and a country's investment in R&D is tenuous. In a major study on sources of growth, the OECD found no statistically significant effect of public R&D expenditure on growth (OECD 2003). This should not be totally unexpected. While R&D aims to increase the stock of knowledge and the use of this knowledge to devise new

[5] A similar gap has been observed in the European Union — the "EU paradox" — since the mid 1990s (Global Innovation Index 2018).

applications, innovation goes far beyond R&D to reach users, suppliers and consumers with new or significantly improved products, processes or organizational methods and practices. It differs from advancements in knowledge and breakthroughs in science, technology and the arts as it must become embedded in production or business processes and requires acceptance by the market, not only recognition by peers.

FIGURE 1 GROWTH AND R&D INVESTMENT



Source: OECD statistics; Oliver Wyman.

Examination of the MIT Technology Review's 50 Smartest Companies list for the years 2015–17 reveals that no Canadian companies had the "impressive combination of technological leadership and business acumen" to make the cut. The problem is that, overall, Canadian companies are not innovative, ranking 18th on the Global Innovation Index.

A successful innovation is not the product of a "random walk," but the result of a managed process. For most firms, innovative developments are more incremental than revolutionary in their nature and impact. Peter Drucker asserts that "above all, innovation is work rather than genius. It requires knowledge. It often requires ingenuity, and it requires focus" to ensure their integration into the company's operations (Drucker 2002). Hence, the central role of entrepreneurs and management.

To a large extent, innovation is not a problem of ideas. The findings of a survey of CEOs and CIOs of large corporations about the impact of innovation units leave little doubt that generating ideas is less of a problem than implementing them. Despite significant investments in innovation, only 23 per cent of companies said that their innovation units had delivered a significant innovation — defined as one that accounts for more than 10 per cent of the business revenue (Prats et al. 2018).

Most people have a natural bias against new and creative ideas in times of uncertainly (Burkus 2013). This attitude and the failure it entails in recognizing "good" ideas is the root cause of many past corporate blunders that gave competitors the opening to seize the technological lead. Well-known examples include Kodak's invention of the digital camera in 1975; Sony developed a different prototype and conquered the market. Xerox developed the first personal computer, but its failure to invest sufficiently in the technology allowed Apple to conquer a large part of the market. Closer to home, the early dismissal of the threat Apple's iPhone posed to the Blackberry because "it has no keyboard," and failure to anticipate the consumerization revolution the iPhone portended, is another example. Nokia made the same mistake of underestimating the attractiveness of the iPhone design and the Apple App Store to consumers worldwide. The success of innovations, particularly revolutionary ones, hinge on the ability to recognize unmet (even unknown) market needs and understand the deeply rooted factors of perceptions and behaviours that are relevant to an attractive product. Google's failure to create a viable market for its Google glasses was an inability to understand the motivations that would lead mainstream consumers to ascribe a status symbol to wearing the glasses.

February 2019 gave us another example of a strategic error with enormous financial consequences rooted in a lack of recognition of the factors driving consumer preferences. The Airbus A380, a high-tech aircraft marvel designed to carry from 550 to more than 800 passengers, and to make high-density connections between airport hubs more economical, was ended. The decision to launch the A380 program gave little weight to the fact that airline travelers abhor the need to make connections to reach their destination. Boeing, which was more attentive to passenger preferences, launched the Boeing 787 Dreamliner at about the same time. This smaller, long-range aircraft allowed airlines to effectively bypass hubs by offering direct flights from a significant number of middle-sized cities. By February 2019, Airbus had received only 313 orders (often at a considerable discount) for the A380 compared to 1,421 orders for the B787 Dreamliner, which is considered a commercial success.

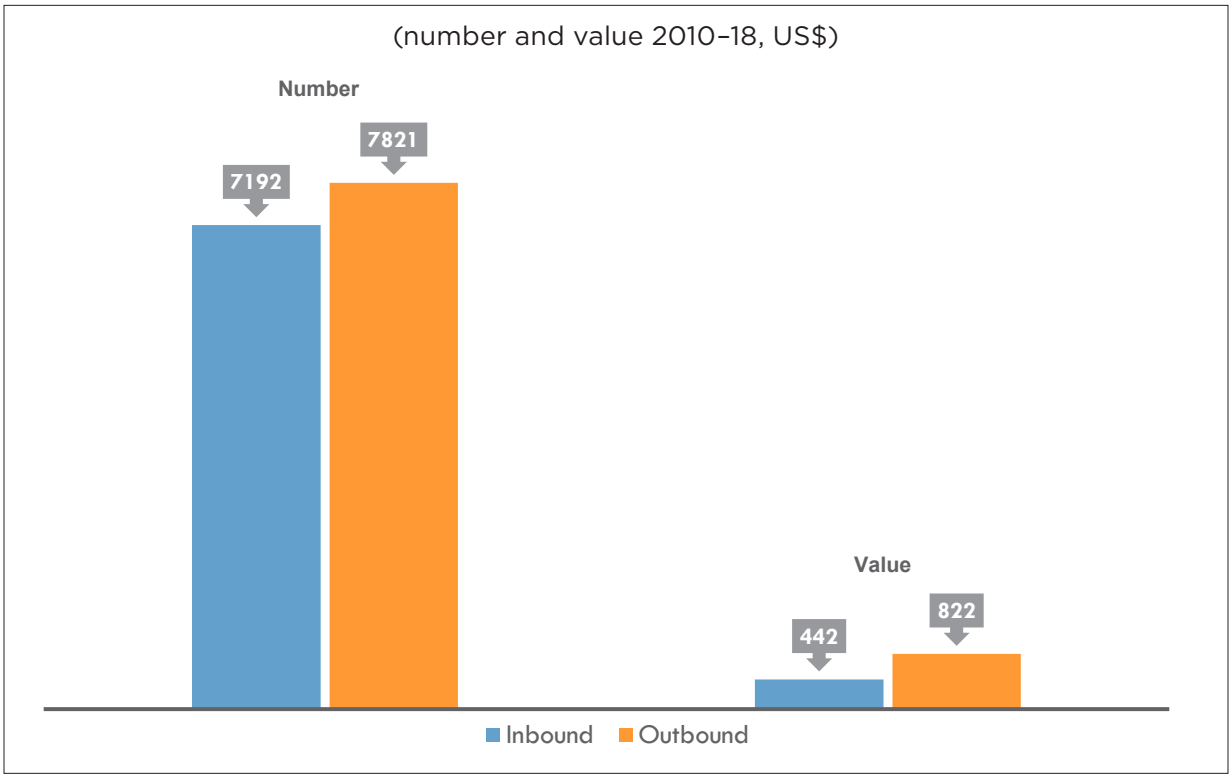
Two important lessons emerge from the above stories about business innovations. First, the failures did not stem from technological deficiencies — in most cases, they were stunning technological advancements — but from lapses in management practices and savvy and from organizational hubris. The examples clearly show that innovation is about solving for both technical and market risks. Second, all were well-established companies with smart people. While it is more satisfying to celebrate success, the tendency to denigrate and vilify Canadian companies that make missteps is unhealthy, making recovery much more difficult and unnecessarily undermining their resilience.

Before addressing the so-called "paradox," the two pseudo-profound ideas that have been advanced as the root causes that hinder the expansion of Canadian companies in global markets need to be put to rest. They are: (a) the lack of managerial skills, experience and talent (Herman and Marion 2016); and (b) Canadians' propensity to be risk-averse. There is no doubt that these factors have hampered the potential of many companies. These are problems that seem particularly acute in sectors such as life sciences and medical devices where, despite Canada's international leadership in health research, it has failed to grow Canadian companies with the reach and scope necessary to anchor a technology cluster

(Advisory Council on Economic Growth 2017). However, they have not been limiting factors for many others.[6]

Contrary to what is often asserted, the fact is that many Canadian companies do not shy away from expanding into foreign markets (Mandel-Campbell 2007). Between 2010 and 2018, Canadian-based companies acquired, in part or in full, 7,821 companies abroad (Figure 2) (Institute for Mergers, Acquisitions and Alliances 2019). Today, sales by foreign affiliates owned by Canadian interests exceed Canada's total exports, equivalent to almost 30 per cent of GDP (Poloz 2016).

FIGURE 2 NUMBER AND VALUE OF M&A TRANSACTIONS IN AND OUT OF CANADA



Source: Thompson Financials, Institute for Mergers, Acquisitions and Alliances (IMAA).

The large and expanding footprint of Canadian-owned companies abroad is a real sign that they are productive and growing while creating jobs in Canada in areas such as research and development, engineering, design, sales and marketing. They are also developing Canadian executives with international expertise, along with the professionals that advise them. How many Americans, and Canadians for that matter, know that the Citi Field stadium (home to the New York Mets), the Yankee Stadium in New York, the Mercedes-Benz Stadium in Atlanta (home to the Falcons), the new roof of the Arthur Ashe tennis stadium in New York and many other stadiums across North America are the products of

[6] Regardless of what one may think of the high valuation of Canadian cannabis producers, the fact remains that their very rapid expansion in Canada and abroad to establish an unbeatable lead in foreign markets if and when recreational marijuana becomes legal, puts to rest the idea that Canada does not have the management skills to develop businesses and take commercial risks. The question of whether the hype that fuels the frenzy will morph into sustained growth for these companies is another question, which only time can answer. (The Economist, 2018 (c))

a Canadian company: Canam Group? The same question can be asked about the Mario M. Cuomo Bridge, which replaces the Tappan Zee Bridge over the Hudson River in New York, the new Goethals Bridge over New Jersey and Staten Island in New York City, or the replacement of the deck sections of the Brooklyn Bridge, made possible by the use of orthotropic steel deck panels, a technology mastered by Canam and just a few other North American steel fabricators.

The global standing of the Canadian companies profiled in the next section demonstrates that success in world markets is not an elusive goal for Canadian entrepreneurs and business executives.

GLOBAL LEADERSHIP

- In the automotive industry, Magna International (market value: $22.5 billion),[7] headquartered in Aurora, Ont., is a global automotive supplier with 168,000 employees in 321 manufacturing facilities and engineering centres in 29 countries. On March 18, 2018, Magna announced that it will be Lyft's exclusive supplier of high-tech kits that convert vehicles into self-driving cars. Another automotive and industrial leading manufacturer is Linamar ($3.3 billion) of Guelph, Ont., a global leader in powertrain system solutions and aerial work platforms.
- CGI Inc. ($21.7 billion), a Montreal-based global information technology, consulting, systems integration, outsourcing and solutions company, is one of the five largest independent business-process and IT-services companies in the world. With offices in 40 countries, it employs approximately 70,000 people.
- In the aerospace industry, we have Bombardier ($4.6 billion), a world leader in business aircraft and passenger rail and mass-transit systems, with engineering and production sites in 28 countries. CAE ($7.5 billion) is the world leader in aircraft training simulators and Héroux-Devtek ($461 million) is the third largest global manufacturer of landing gear, activators and components, supplying both the commercial and military sectors of the aerospace industry. These three companies are headquartered in Montreal. Until its merger with Digital Globe in October 2017 to form Maxar Technologies Ltd., MDA of Vancouver was one of the world's leading satellite communication companies.[8] It is notable that aerospace manufacturing is among the largest and most R&D-intensive industries of the Canadian economy (Council of Canadian Academies 2018, 85 and 99-100) and that in a country comparison, Canada ranks first in civil-flight-simulator production, second in business aircraft and third in civil aircraft and civil engine products.
- In engineering design, procurement and construction management, WSP Global Inc. ($7.0 billion), headquartered in Montreal, is present in 40 countries and is one of the

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7 The numbers in parenthesis indicate the market capitalization of each company at the close of trading on the TSX on Feb. 1st, 2019.

8 Notes of interest: Héroux-Devtek was responsible for the design and manufacturing of the landing gear for the Apollo Lunar Module that placed Neil Armstrong on the moon as part of the Apollo 11 mission, while MDA's most visible products include the Canadarm used on NASA's Space Shuttle, and the Canadarm 2 and Dextre remote manipulator systems used on the International Space Station. (company reports)

largest professional services firms in the world. SNC-Lavalin ($6.4 billion), also based in Montreal, with offices in 50 countries and operations in more than 160 countries, is consistently ranked among the best engineering firms in the world and recognized as a world leader in the design and engineering of nuclear power plants. Stantec Inc. ($3.6 billion), based in Edmonton, is ranked among the world's top 10 global design firms. With approximately 70 offices worldwide, Hatch Ltd., based in Mississauga, Ont., is recognized as a world leader in process design, engineering and project and construction management by leading companies in the mining and metals, energy and infrastructure sectors.

- OpenText ($13.1 billion) is a leader in enterprise information management systems. Headquartered in Waterloo, Ont., it is Canada's largest software company with more than 10,000 employees worldwide.
- In power sports vehicles and propulsion systems, BRP ($4.0 billion) based in Valcourt, Que. is an undisputed world leader in the design, manufacturing, distribution and marketing of motorized recreational products.
- Celestica ($1.5 billion), headquartered in Toronto, is a leader in design, manufacturing and supply-chain solutions, and is ranked by Thompson Reuters as one of the top 100 global tech leaders.

The CCA report suggests that "a lack of managerial talent and experience in growing technology firms to scale is a critical impediment in Canada." The above companies, with thousands of engineers and science graduates in their employ, must be recognized for what they are: true world-leading engineering design and technology companies and a high-value subset of "advanced industries."

Innovation is a multi-form phenomenon that bears mainly on improvements to existing products, processes and business models (Miller and Côté 2012). From Canada's economic point of view, having companies in global leadership positions is what matters. Alimentation Couche-Tard ($40.2 billion) is a good example: in less than 30 years, it has grown from its Québec roots into the largest convenience-store operator in the world. With an international network of close to 10,000 stores and retail sales in excess of $60 billion, it ranks among the 25 largest retailers worldwide. Its market capitalization now exceeds that of Loblaw Companies, considered to be the nation's largest retailer ($23.8 billion).

And if we look at more recent company vintage, what about AGT Food and Ingredients Inc. ($95 million), a Regina-based global leader in pulse and staple food processing with fully integrated facilities in seven countries serving customers in over 120 countries? Canada is not known to be a world leader in the fashion and clothing industry, yet we now have Canada Goose Holdings ($7.6 billion) a Toronto-based designer, manufacturer, distributor and retailer of winter clothing for men, women and children, whose products are widely available in high-end retail stores around the world.

Pollard Banknote ($612 million) is a leading expert in instant tickets with proprietary technology to leverage social and mobile media in this space and is a preferred supplier to more than 50 lotteries worldwide from its base in Winnipeg. Montreal-based Stingray Digital ($377 million) is a world-leading provider of multiplatform music services, competing successfully with Spotify, Apple Music and Google Play, with 400-million

households in 156 countries worldwide having access to Stingray's channels. Its recent acquisition of DJ-Matic, a provider of in-store media solution in Belgium, the Netherlands, Germany and Denmark, adds 78,000 European locations to its already extensive network.

Shopify (US$24 billion), is an Ottawa-based company that provides its own e-commerce platform for online stores and retail point-of-sale systems and is Amazon's go-to solution for merchants looking to create custom e-commerce websites. Kinaxis ($2 billion), also in Ottawa, provides sophisticated supply-chain management, sales and operation-planning software to global organizations. And Montreal-based Lightspeed ($1.7 billion), which completed its initial public offering (IPO) in March 2019, is a software company that provides point-of sale and omnichannel transaction processing, as well as the management of inventory, sales and analytics

It is not pure coincidence that all the Canadian champions mentioned above, with the exception of Hatch, are public companies, a dimension that is not addressed in the CCA report. We will return to this later.

As we point to these examples of global leadership, some rebuttals come to mind: Yes, but what about Northern Telecom, a Canadian champion that failed? What about Research in Motion, which fell hard from its peak, having once dominated the mobile device market? What about Bombardier or SNC-Lavalin's recent troubles?

Global markets are treacherous. The impermanence of corporate excellence is well documented: A survey of 404 companies in 15 industries over 30 years found that just one out of 10 companies that exceed the growth of their industry in any given year was able to repeat that performance every year for a decade (Baghai, Coley and White 1999). Hence, we cannot expect clear sailing decade after decade. Indeed, in recent years, we have seen, for example, Kodak disappear; the demise of Motorola, the pioneer of mobile phones; the break-up of Alcatel-Lucent S.A. and subsequent merger of the parts into Nokia[9] and China's Huaxin; General Motors and Chrysler being saved from bankruptcy by government bailouts; IBM undergoing a major turnaround under Lou Gerstner; Hewlett Packard Enterprise stumbling for years under a string of outsider CEOs; and, in recent months, General Electric being expelled from the Dow Jones Industrial Average after 111 years, to be replaced by a retailer. Canadian global companies are not immune from the vicissitudes of global markets. Thomas J. Watson's observation that "it is harder to keep a business great than it is to build it"[10] tells us why we must nurture and encourage the growth of a large number of potential future champions.

THE RISK-AVERSION SYNDROME

The assertion that Canadian businesses are failing to grow because Canadians are risk-averse reflects a misconception about the Canadian economy. For instance, very few business sectors are more risky than mineral exploration. Canada is well known for the high

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[9] In the process, Nokia acquired Bell Laboratories, one of the largest R&D facilities in the communications industry. It holds in excess of 29,000 patents. (Nokia, 2016)

[10] Thomas J. Watson Jr., chairman of IBM, 1963.

participation rate of junior companies in this sector of activity, which generally have no operating revenues and depend on equity financing. Even though they tend to be small and flexible and tend to specialize in high-risk, early-stage exploration activities, they account for almost half of annual mineral exploration expenditures in Canada.

As at Dec. 31, 2018, the 1,090 junior mining, oil-and-gas and energy-services companies listed on the TSX Venture Exchange had a market value of $21.2 billion. Three-quarters (75 per cent) of Canadian oil and gas companies listed on a Canadian stock exchange are active in exploration, production and service activities abroad, with an international presence in more than 90 countries (Larson 2018).

As a rule, the management teams in these companies consist of engineers, geologists, geophysicists and graduates in environmental sciences, often with a master's or Ph.D. degree. The nature of their activities and their success at home and abroad clearly demonstrate the unique contribution of universities to innovation and economic growth through the training of talented people in fields of advanced knowledge who can integrate it into processes and products.

TABLE 2 MINING AND OIL AND GAS COMPANIES ON A CANADIAN EXCHANGE

	TSX Venture	TSX
Mining		
Number of Issuers	971	218
Quoted Market Value ($ billion)	17.3	253.9
Oil and Gas		
Number of Issuers	971	218
Quoted Market Value ($ billion)	17.3	253.9

Source: TMX MIG Report, Dec. 31, 2018.

In the mining sector, Canadian companies providing the mining industry with geological, engineering, legal and capital-markets financing services are regarded as among the best in the world. Vancouver is home to the world's largest cluster of exploration companies and Toronto is recognized as a global hub for mining and mineral-exploration financing and legal services.

Lack of knowledge of a company or industry increases perceived risks for good reasons. Mining and oil and gas companies account for 46 per cent of the companies listed on a Canadian exchange (and 20 per cent of the quoted market value, or QMV), while Information and Communication Technology (ICT) companies represent only six per cent of the number and four per cent of the QMV of the companies listed on a Canadian exchange. In the U.S., the weight of the information technology sector accounts for 21 per cent of the S&P 500 whereas it is only 3.8 per cent of the S&P/TSX composite index. The consequences of the low weighting on Canadian stock exchanges of high-tech companies (ICT, life sciences, industrials, clean techs) compared to U.S. markets are numerous (Table 3). They include too few analysts and less expertise in assessing the value of these Canadian companies, which leads to investor disinterest and lower valuations compared to American companies with comparable parameters. For investors, especially individual

investors who have neither the resources nor the time to study these high-tech companies, their reluctance is not a matter of "risk-aversion" but sound investment discipline. You don't put your savings in things you don't know or for which you can't get informed professional advice. While investors cannot be blamed for their rational behaviour, the resulting downward valuations are a serious handicap for most Canadian small and medium-sized enterprises (SMEs) in high-tech; with few exceptions, they are saddled with a discounted currency for acquisition purposes and are sitting ducks for aggressive U.S. and other foreign companies.

TABLE 3 SECTOR WEIGHTS OF S&P/TSX 60 AND S&P 400 MIDCAP INDEXES

	S&P/TSX 60 Equal Weight Index (%)	S&P400 Midcap Index (%)*
Energy	25,45	4,0
Materials	18,08	6,8
Industrials	6,53	15,5
Consumer Discretionary	9,88	11,7
Consumer Staples	8,42	2,9
Health Care	3,71	9,2
Financials	16,51	16,7
Information Technology	3,13	15,4
Telecommunication	4,95	2,5
Utilities	3,34	5,4

Source: S&P Dow Jones Indices LLC.

* Based on GICS® sectors.

Concerns about the risk-aversion to small technology companies by Canadian governments and established companies are not entirely unjustified. For instance, we do not have within the federal government's apparatus the equivalent of DARPA and demand-driven sectoral support, such as "open innovation" and "incentive prizes" approaches that are common in the United States and Europe, which are proving increasingly effective in achieving strategic objectives in various government agencies and programs while stimulating technology-enabled innovations. Technology company entrepreneurs lament that large Canadian companies are reluctant to participate in the commercial launch of new products, forcing them to go abroad, where large companies are more receptive.

This attitude is well illustrated by the sales history of Bombardier's CRJ aircraft. At the time, the regional jet was a revolutionary concept not only because of its technological dimension, but also because it went against the airline industry's mantra that profitability was directly related to seat-mile cost, while the CRJ had the highest cost per seat-mile of any available commercial aircraft (the CRJ's competitive advantage was to provide the lowest cost per trip). The launch customer in 1992 was Lufthansa, quickly followed by Comair, a U.S. regional airline. Subsequently, SkyWest (U.S.) and Air France's affiliates, Air Littoral and Brit Air, became CRJ operators, setting the CRJ on the path to become the most successful Canadian commercial aircraft program. Even though its head office was adjacent to Bombardier's CRJ assembly plant, it was only in 1995 that Air Canada acquired

the aircraft. Notably, two experienced American airline executives were at the helm when Air Canada placed its first order for the aircraft (Hollis L. Harris as chairman, president and CEO and R. Lamar Durrett, as COO).

REVVING UP THE ENGINES OF GROWTH

The understanding of job-creation mechanisms took a decisive turn in 1979 with the publication of David Birch's seminal work, The Job Generation Process (1979), about which companies created new jobs and where they were created. Since then, it has been generally assumed that about two-thirds of new jobs are created by SMEs. That is not the whole story, however. Subsequent studies based on more comprehensive longitudinal databases have made it possible to refine the analysis and better identify the sources of job creation. The main conclusions from these studies cast a more balanced light on this complex reality and identify the growth engines:

- Most people who start a company are doing so for "lifestyle" reasons. Most have little desire to grow big or to innovate, as their decision for starting a business is primarily driven by their desire for non-pecuniary benefits (being one's own boss, flexibility of hours, etc.). Survey results of early-stage entrepreneurs show that very few intend to bring a new idea to market. Instead, most are oriented toward local markets where it is easier for the owners to provide an existing service to an existing customer base. Because they respond to local demand, their contribution to the increase in collective wealth is marginal. Only a minority of them will grow larger than 20 permanent jobs. These findings suggest "that the importance of entrepreneurial talent, entrepreneurial luck, and financial frictions in explaining the firm size distribution may be overstated." (Hurst and Pugsley 2011)
- Younger firms have a lower probability of survival, but those that do survive grow faster than older firms (Klette 2002).
- A minority of companies (between four per cent and seven per cent of the total) are responsible for creating most net jobs. Birch calls these "gazelles." In 2012, based on the OECD-Eurostat methodology, the number of high-growth enterprises in Canada represented 4.4 per cent of all SMEs having between 10 and 250 employees (Government of Canada 2017b). Between 2000 and 2009, high-growth firms accounted for 85 per cent of total job creation in Canada (Government of Canada 2014). Similarly, in the United States, between 2000 and 2006, high-growth or "dynamic" companies created 84 per cent of net jobs (Acs, Parsons and Tracy 2008).
- Dynamic companies can be small, medium or large. They are found in various regions throughout the country and are present in all industries. As reflected in the composition of the S&P Midcap 400, they are not concentrated in high-tech sectors (Table 3). They are generally quite successful exporters. Between 1993 and 2002, high-growth export companies created 47 per cent of jobs even though they accounted for only 5.5 per cent of Canadian companies (Government of Canada 2008).

The results of productivity and innovation studies are consistent with these observations.

- Dynamic companies post the highest productivity-growth rates (Leung, Meh and Terajima 2008). This is because they generally use the most advanced technologies and displace less-productive companies. Their ability to convert R&D results, whether internally or externally generated, into genuine commercial innovations is a key success factor.
- The productivity level of companies is a function of their size. This positive correlation between company size and productivity applies to all sectors. In Canada, it has been observed that companies with more than 500 employees and those with 100 to 500 employees have productivity levels that are 30-per-cent and 20-per-cent higher, respectively, than that of companies with fewer than 100 employees. This productivity gap also increases over time. It stems from the fact that productivity gains depend on the assimilation of expertise, competencies and best practices within companies and from their continuous adaptation. This process takes time. Think of the learning curve: the advances in productivity are a function of cumulative output, not cumulative investment (Lee and Tang 2001).
- Increases in productivity according to company size are linked to better capitalization. Indeed, productivity differences between exchange-listed companies of different sizes are much less pronounced.
- Most innovation takes the form of established firms improving their own products — quality improvements rather than the development of new and different products. This source of innovation accounts for about 65 per cent of economic growth (Garcia-Macia, Hsieh and Klenow 2017).
- R&D spending increases with company size. However, the data are less convincing with respect to the intensity of R&D, which is generally measured in terms of R&D spending per employee or as a function of revenue. In some industries, intensity grows with company size, while the opposite may occur in other cases. In any event, R&D entails major risks and requires a lot of capital — but it cannot be debt-financed, because of factors such as the intangible nature of the assets it uses and generates.
- The way innovative activity is financed has profound consequences both for the direction of technological change and for the competitive dynamism of the economy (Lamoreaux and Sokoloff 2007). For instance, institutional ownership in publicly traded companies seems to be positively associated with their propensity to innovate and their sound governance of R&D (Aghion, Van Reenan and Zingales 2013).

MANAGEMENT MATTERS — A LOT

It is generally accepted that managerial talent is some combination of a sharp strategic mind, leadership ability, emotional maturity, communications skills, the ability to attract and inspire other talented people, entrepreneurial instincts, functional skills, and the ability to deliver results (Michaels, Jones and Axelrod 2001). Relatively rare, managerial talent is considered a key competitive resource because it shapes the fate of companies. For growing organizations, successfully managing growth initiatives at various stages of maturity adds another level of complexity, perhaps the most important challenge facing their leaders. So-called “blitzscaling” a company (extremely fast scaling-up) requires that

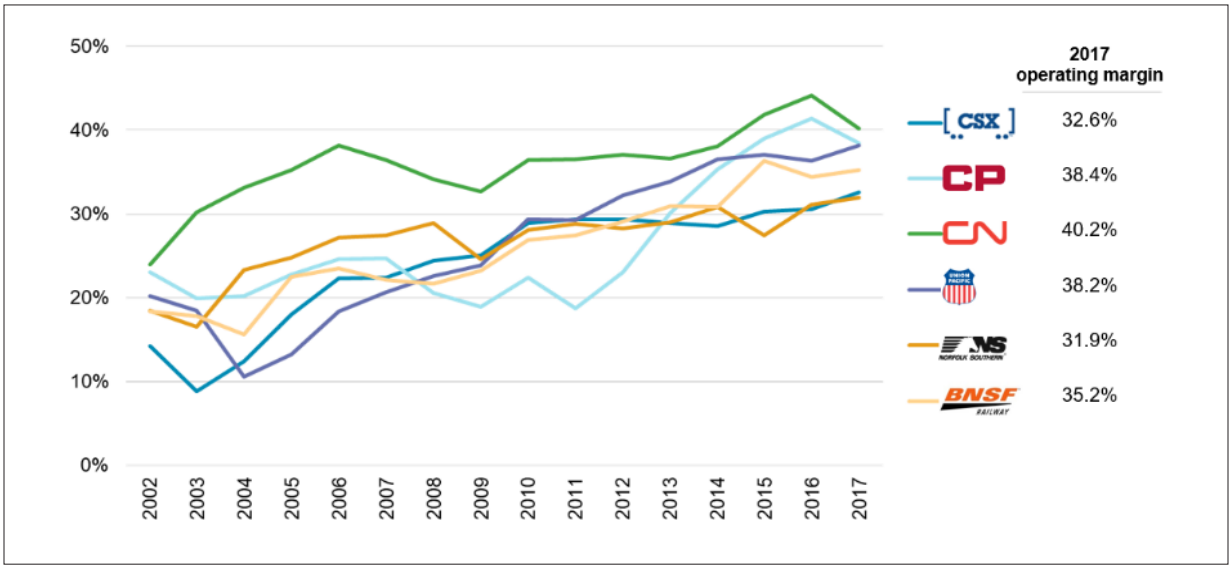
the management team be constantly evolving and CEOs must realize that their job is to make the company successful, not to do everything themselves. The senior team must mutate from "everyone is a doer" to "most people are doers" to "managers of doers" to "managers of managers." The ability to implement this continuous evolution, to recruit the best people and to attract and retain exceptional talent on board, is critical for success.

While a certain part of "good management" eludes description, ways have been developed to assess and measure core managerial practices; they show that their adoption accounts for a large fraction of performance differences across firms and countries and that well-managed firms outperform on the key dimensions of growth, productivity, profitability and market value. The findings of a massive national survey covering 35,000 U.S. manufacturing plants demonstrate that management matters a lot for company performance and that good management practices are more important than the adoption of technology for company performance and success (Bloom et al. 2017). These results were confirmed by a major study based on the input from nearly 2 million employees and more than 300,000 business units. They found that managers' performance explained a full 70 per cent of the variance in productivity between business units (Clifton and Harter 2019). Another study covering 14,000 organizations in more than 30 countries reached similar conclusions. It also found that all countries and sectors were saddled with a large number of persistently badly managed firms — thus the importance of promoting high-growth firms that force weaker firms to exit — and that foreign multinationals are better managed than domestic firms; in Canada, their average management score was about 20-per-cent higher than that of domestic companies (Dowdy and Van Reenen 2014). The converse also holds: Canadian companies that have invested in facilities in other OECD countries show higher productivity growth than similar companies that remained domestic, as their foreign investments allowed them to benefit from learning and technological spillover effects (Rai, Suchanek and Bernier 2018).

Canadian multinational companies and those seeking to penetrate foreign markets are enmeshed in a war to recruit and retain talented employees, much like their brethren elsewhere around the world. That Canada's pool of talent has always been smaller in number than that of the U.S. is in the nature of things. However, in relative terms, the OECD reports that Canada's international orientation as a proportion of GDP is almost double that of the United States (25 per cent versus 13 per cent) (OECD 2017),[11] a sure sign that, heretofore, Canadian businesses had access to a significant pool of talented managers, executives and entrepreneurs. This is confirmed by a comparison of the scores across countries of manufacturing-management practices, showing that Canada's score is relatively good by international standards, equivalent to that of leading countries, including Germany, Sweden and Japan. The only country with significantly better management practices is the United States (Bloom et al. 2012). It does not follow that Canadian companies cannot compete and win across the North American continent. The performance of Canadian National Railway demonstrates that Canadian managers can stand their own — even outperform — their American peers (Figure 3).

[11] International orientation is a broad notion that captures the impact on national income of exports and sales through foreign affiliates.

FIGURE 3 OPERATING MARGINS OF NORTH AMERICAN RAILROADS, 2002–17



Note: Operating margin = 1 – (operating costs/operating revenues). CN and CP operating margin is for thefull system, not just U.S. subsidiaries.

Source: Oliver Wyman analysis.

The 2017–18 Global Competitiveness Report ranked Canada seventh for labour-market efficiency and third for the effective use of talent (Schwab 2017). This relatively positive assessment should not blind us to the huge challenges that confront us. Combined, the demographic shift, a deepening shortfall of knowledge and skilled workers and the growing mismatch between the skills needed and those available to master the large number of disruptive technologies that arise from the intensive use of digital technologies are likely to metastasize into an undeniable talent crisis that could jeopardize the capacity of Canadian companies to grow, innovate and sustain global competition. Already handicapped by a relatively small percentage of Canadians with advanced degrees in science and technology compared to its peers, Canada will need to replace the 95,000 experienced Canadian engineers that are expected to retire in the next seven years and further increase the total number of engineers to meet the growing demand. This is an issue with far-reaching consequences. The evidence is to the effect that productivity is high in manufacturing establishments with a higher proportion of scientists and engineers in operations and that it increases as the proportion rises, suggesting that the work of scientists and engineers in establishments producing goods and services is an important pathway for increasing productivity and earnings, separate and distinct from the work of scientists and engineers who perform R&D (Barth et al. 2017).

Confronted with this impending shortage of knowledge workers and talent, Canada should increase the proportion of immigrant intake through economic immigration and emulate Germany by establishing a network similar to that country's "Steinbeis" system. The Steinbeis network groups around 6,000 technical professionals whose skills, experience and know-how can be put to use by companies across the country. It has proven to be very effective in helping German companies in their quest for technological leadership and innovation.

It is undeniable that it has become an increasingly difficult challenge to fill management and C-suite positions, especially when performance is highly dependent on front-line experience. This scarcity of tested and proven management talent is a quandary common for fast-growing technology companies in all industrialized economies, as we are all affected by the same demographic shift. The situation in Canada could be exacerbated by the apparent inability of our academic institutions to meet the challenge and strive for excellence. Only three Canadian universities made the Financial Times Global 100 MBA Ranking 2019; they stood at the 85th, 87th and 94th place (Moules 2019; Council of Canadian Academies 2019).

STRONG HEADWINDS RISING

Two potent headwinds spurred by a substantial increase in concentration in key markets are likely to make it increasingly difficult to grow Canadian corporate champions on the global stage in the absence of fundamental changes in Canadian policies and practices towards high-growth companies.

Rising industry concentration in North America and Europe:

Since 2000, a significant increase in industry concentration has occurred in both manufacturing and non-financial services in Europe and North America, a rise in concentration that is not driven by digital-intensive sectors (Bajgar et al. 2019). In the United States, the average revenues of the top four firms in a given industry rose from 24 per cent to 33 per cent of total industry revenues between 1997 and 2012. In Europe, the increase in industry concentration has been contained at about half the rise in North America. The result is that European continental markets now have lower concentration, lower excess profits, lower regulatory barriers to entry and are more competitive than U.S. markets (Gutiérrez and Philippon 2018).

Rising concentration in North American industry is creating conditions that are not favourable for high-growth SMEs, whether American or Canadian. Indeed, it has been observed that the increase in industry concentration and declining competition in the United States is largely responsible for the fact that the U.S. business sector has since the early 2000s under-invested in equipment and intangible assets such as R&D and innovation relative to profitability, valuation and funding costs (Gutiérrez and Philippon 2017). This under-investment relative to their Tobin's Q ratio (market value divided by asset-replacement cost) has been accompanied by a decline in the number of high-growth firms and a lower propensity for young firms to be high-growth firms (Decker et al. 2016).

In Europe where industry concentration appears to have been better contained since 2013, the number of European tech-company IPOs has been two-thirds higher than in the United States and their post-listing performance superior to that of U.S. tech companies (in 2018, an average gain of 222 per cent compared to 42 per cent for U.S. tech companies) (Atomico 2018).

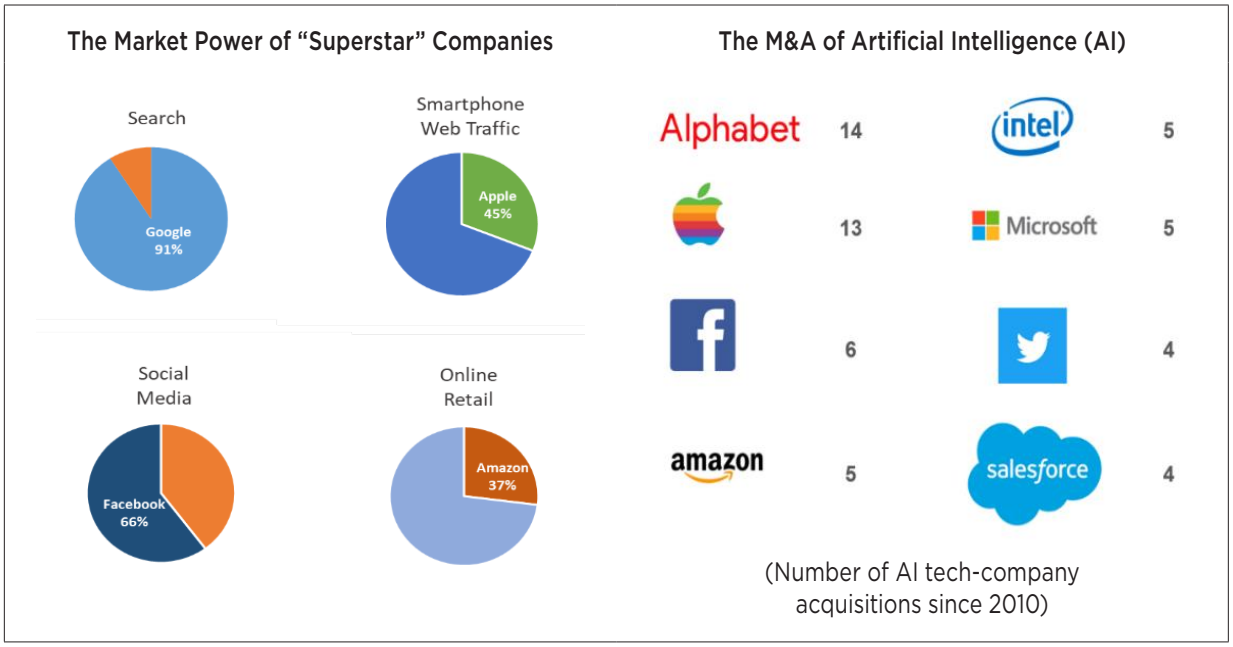
In Canada, industrial concentration is historically high and greater than in the United States. As in the United States, there has been a broad-based decline in the dynamism of the economy, mainly as a result of a sustained decline in the entry and exit rates of new businesses, rates that have shrunk by half since the early 1980s. This was accompanied by a large decline in the share of "gazelles," which is particularly worrisome (Leduc 2017). Part of the problem is the labour shortages faced by Canadian companies, particularly mid-size companies, that hinders their growth as they are forced to refuse orders or delay deliveries (BDC 2018). More fundamentally, Gutierrez and Philippon's findings that increased industry concentration in the United States has led U.S. firms to under-invest in equipment and intangible assets relative to their Tobin's Q ratio suggest that the historically low level of business R&D and reluctance of large Canadian companies to deal with and support small, innovative firms may be related to the high level of industry concentration prevailing in Canada.

The problem is compounded for Canadian SMEs by the slower growth of exports and imports in global value chains. Trade boomed in the 1990s and early 2000s "in part because intermediate goods began globetrotting" (Blanchard and Posen 2016). Global value chains are now "mature" markets, making them increasingly challenging to penetrate.

The rush to dominate the digital and artificial-intelligence sectors by the world's tech titans:

The intrinsic nature of the new information economy, of the economics of networks and the non-linear scalability of digital-platform technologies lead to winner-take-all markets. Competition between the BAT (Baidu, Alibaba and Tencent) Chinese titans and the American FAANG (Facebook, Amazon, Apple, Netflix and Google's parent, Alphabet) technology giants for dominance in emerging markets, combined with their drive to diversify into a wide range of product lines, significantly increases the barriers to entry and their ability to extract higher price markups (Lagarde 2019). As they rush to acquire startups to get the best talent and new data-analytics science, they build a "walled garden" around them to ensure that no rival can upend their business model. Spotify Technology S.A.'s antitrust complaint to the European Union that Apple Inc. was abusing its control over the applications that appear in its App Store is a case in point.

FIGURE 4 THE "MENACING" MARCH OF TECH LEVIATHANS



* Source: CB Insights; Fortune, July 2018.

This behaviour of the technology titans undermines innovation and startup activity. Several important venture capital firms have expressed a reluctance to support startups whose business could compete somehow with the BATs or FAANGs when they know they are most likely to be outbid by the tech giants or, if they were to invest, would find that their chosen firm becomes subject to predatory pricing that makes it unlikely to survive. And when venture capital (VC) firms do invest, they tend to direct the new entrepreneurs towards developments designed to complement the tech giants' offerings and, thus, be an attractive candidate for takeover.[12]

In North America, VCs are now openly talking of a "kill zone" around FAANGs, which do not hesitate to crush nascent competitors by copying or acquiring them early to eliminate a potential threat, as was illustrated in vivid detail in a recent U.K. House of Commons committee report (Government of the United Kingdom, 2019). The feeding frenzy is also observed in China where, between them, the BATs account for close to half of all domestic VC investments.[13] The impact of the tech titans buying spree in North America is accentuated by open and stealth investments in tech firms by governments seeking to acquire state-of-the-art digital and artificial-intelligence (AI) technologies for strategic or military purposes. In the United States, the DIUx report reveals that China participated in more than 10 per cent of all venture deals in 2015 with a focus on early-stage innovation in AI, robotics, autonomous vehicles, virtual reality, financial technology, and gene-editing. Between 2015 and 2017, U.S. investors ranked first, with US$59 billion invested in U.S.-based venture-backed companies, Europe was second with US$36 billion and China third, with US$24 billion (Brown and Singh 2018).

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12 In the U.S., startups whose businesses centre on the consumer internet are shunned by VC firms because Google and Facebook are so dominant. (The Economist, 2018 (a))

13 Between January 2008 and May 2018, Tencent has made 57 investments in small technology and retail companies and Alibaba made 44 investments. (The Economist, 2018 (b))

Not surprisingly, a study of the number of acquisitions and IPOs in OECD countries between 2007 and 2016 showed that in digital sectors such as software, data analytics, or digital services, acquisitions account for almost all successful VC exit events and that about 90 per cent of the acquirers are public companies — both well-established and newly listed (Breschi, Lassébie and Menon 2018).

NURTURING GAZELLES

At a conference on the future of manufacturing in Canada organized by the Canadian Academy of Engineering (2013), a senior representative from Switzerland summarized the conditions and factors that explain how his country's manufacturing sector has continued to prosper despite a very high cost base and how his country has been able to keep the first rank on the Global Competitiveness Index for nine consecutive years. He suggested that the main attributes that explain Swiss superior performance are world-class scientific research institutions, strong collaboration between academia and business, high business spending on R&D, on-the-job training opportunities, high productivity and, above all, close collaboration between manufacturing companies and other suppliers in the value chain within Switzerland. The whole focus was on the nature of collaborative practices and the strengths of the Swiss ecosystem as a social institution. Although no mention was made of the need or role of exceptionally experienced senior executives in scaling-up technology companies, it is worthy of note that around 25 per cent of the founders of Swiss innovative startups hold a Ph.D., compared to about 10 per cent in Canada.

A similar conclusion emerges from AnnaLee Saxenian's study of the factors that explain how and why Silicon Valley pulled ahead of Boston's Route 128 region as the latter's competitiveness began to wane in the 1980s (1996).

Saxenian shows that the Route 128 region was dominated by companies that internalized a wide range of productive activities. Practices of secrecy and loyalty governed the relationships between these companies, suppliers and competitors. They established boundaries between companies and between companies and local institutions, so that social and technical networks became largely internal to the company (i.e., information tended to flow vertically and trickle horizontally). Saxenian observed that in Silicon Valley, companies compete intensely with each other while learning from each other about market and technological developments through informal communications and collaborative practices. Loosely linked structures promote horizontal communication between the company's divisions and with external suppliers and customers. Functional boundaries within companies are porous in the network-based system, as are boundaries between companies and between companies and local institutions, such as professional associations and universities. Over time, know-how and skills are developed and enriched, intimate knowledge of customer needs is internalized and high-value information is available at a low cost, coalescing into a self-sustaining strategic ecosystem and a vibrant cluster of related industries and academic institutions strong in the associated fields (Delgado, Porter and Stern 2014).

The bottom line is that accumulating the large volumes of knowledge and expertise necessary to fuel the rapid growth of companies and industries requires the networks that

possess that knowledge and expertise to continually evolve and adapt to their environment. Social institutions cannot be built by fiat nor can they be purchased lock, stock and barrel, since their bedrock is trust, a quality that needs to be cultivated and stimulated over enough time for human interrelations to grow. It follows that finding experienced entrepreneurs and executives is less challenging than assembling what is needed to foster a supportive ecosystem that encourages collaboration — both within company and institution walls and outside it — and nurtures a culture that values transparency, mutual support and agility. The record of such initiatives around the world suggests that the ability of governments to act as a catalyst to stimulate the entrepreneurial sector is limited (Lerner 2012 a, b).

People who have held management positions in large foreign or Canadian companies where they have learned the ropes and gained the self-confidence necessary to compete and win globally are a common source of leadership talent. This is the case, for example, of Montreal-based Hopper, a mobile flight-booking platform that allows travellers to track airline ticket prices with up to 95-per-cent accuracy up to one year in advance and to book trips around the world. Its management team has acquired extensive experience in travel technology by working for Expedia and TripAdvisor. That has propelled Hopper to the forefront of mobile travel applications in North America. Based on the valuations used in recent funding rounds, Hopper may become one of the few Canadian unicorns in the digital space. Another example is Eddyfi, a Quebec City-based technological company specializing in the development of high-performance, non-destructive testing (NDT) equipment and software for surface inspection of critical components and assets in the nuclear, power generation, oil and gas, and aerospace industries around the world. The company recently acquired M2M, a French leader in the development and manufacturing of phased-array ultrasonic testing instruments for NDT. Interestingly, two of the top five executives have worked at EXFO, a large Quebec City-based company active in the development, manufacturing and sale of network test instruments for fixed and mobile telecom networks worldwide, while two others have held management positions in American and Japanese multinational industrial companies.

Another pool of expertise is successful executives who have a proven track record and value the opportunity to partner with and mentor dynamic young entrepreneurs and help them succeed by passing on their knowledge, instilling discipline in the establishment of priorities, financial management and business practices and providing guidance for expansion in foreign markets. A case in point is the composition of the board of directors at Lightspeed POS, where the chairman is the former chief financial officer of OpenText, two other directors have held executive positions at Google and another was an executive at Amazon.

EQUITY CAPITAL IS ESSENTIAL TO GROWTH

If companies hope to grow quickly, they need plenty of equity capital. Few knowledge-based and high-growth companies can sustain accelerated growth with internally generated funds. Securing outside equity capital is therefore an obligatory step to realize the company's potential, an absolute condition of success. The two main and complementary sources of outside equity capital are private equity investors (VC and private equity firms) and public equity markets.

Recent analyses of the performance of VC and non-VC financed firms in Canada and the United States show that the average performance of venture-capital-financed firms is significantly superior to that of comparable non-VC-backed firms on key metrics: (i) stronger revenue growth; (ii) sales growth; (iii) graduates headcount growth; (iv) asset and R&D-expenditures growth (Government of Canada 2013; Puri and Zarutskie 2012). In Canada, small dynamic firms that go public exhibit, on average, similar superior performance (Carpentier and Suret 2018).

Canada is relatively well positioned in terms of access to and availability of equity capital. Compared to some of its peer countries, venture capital flows have accelerated in recent years. Canada now ranks third, behind the United States and Israel, in terms of venture capital investment as a share of GDP (OECD 2017). The TSX Venture Exchange (TSX Venture) is one of the largest public venture markets in the world; it exhibits the world's highest number of company graduation to the main exchange. Between 2013 and June 2018, private equity firms completed deals valued at $131.3 billion across all important industry sectors. Private venture capital deals totalled $15 billion over this time frame. During this same period, companies listed on the Toronto Stock Exchange (TSX) raised $269.9 billion and those on the TSX Venture $26.6 billion.

The large amount of public and private equity investments support the view that both public and private equity markets play a complementary role in the Canadian economy (Lortie 2019). They also support the contention of several large international bodies, including the World Bank and the European Commission, that public capital markets play a critical role through the provision of alternative funding sources for high-growth and innovative firms, and their recommendation to foster the development of junior markets, which serve as a stepping stone to a main stock exchange where more funding and liquidity are available (European Commission 2015; IOSCO 2015; Nassr and Wehinger 2016).

Unfortunately, the content of many Canadian official reports and the federal government policies that follow are biased in favour of private equity (PE). For instance, the CCA report addresses the growing VC flow of financing in Canada, indicating that there were 530 VC transactions totalling $3.2 billion in investments in 2016 (Council of Canadian Academies, 2018). Curiously, it is silent about Canada's public equity markets, as if they did not exist. Yet, in that same year, Canadian companies listed on the TSX Venture completed equity financings for a total of $4.4 billion in investments to which we should add four IPOs on the TSX, together worth another $1.5 billion (TMX 2016). Another case in point is the Venture Capital Catalyst Initiative proposed in the 2017 federal budget as a cornerstone of the government's Innovation and Skills Plan (Government of Canada 2017a). This measure follows a recommendation of the Panel to Review Federal Support for R&D (the Jenkins report) (2011). The panel was silent on issues of access to public capital markets by startups, high-tech and high-growth SMEs and did not address Canadian government tax policies that penalize "gazelles" that go public.

The federal government's policies favouring PE over public equity suffer from four major intrinsic weaknesses that make them counterproductive.

- They penalize indiscriminately high-growth and dynamic SMEs. The federal income tax rate jumps from 10.5 to 15 per cent for a small company that goes public and the federal government's 35-per-cent SR&ED tax credit for R&D performed by small companies shrinks to 15 per cent. In addition, when they are listed on an exchange, new technology-based companies are no longer eligible for a cash refund of the federal SR&ED tax credit; they must be content with almost worthless tax credits, since being in the investment phase, they are not yet, or are barely, profitable.[14]
- They are myopic. They implicitly assume that a PE investment equates to an IPO, regardless of the greater subsequent access to the diversified sources of equity financings available to listed companies. IPOs are the marginal part of the equation. Between 2010 and 2018, the proceeds of IPOs by TSX-listed companies and by TSX Venture-listed companies represented only 12 per cent and four per cent, respectively, of the total equity raised by these companies during that period (Lortie 2019).
- They fail to recognize that the depth of Canadian PE markets are shallow. On a GDP-normalized basis, PE financings in excess of $50 million occur in Canada one-sixth and one-third as often as they occur in the United States and the United Kingdom, respectively. Because larger funds have a propensity to fund a firm over multiple rounds, thus providing greater funding continuity, their presence is key to scaling-up funding (Duruflé, Hellmann and Wilson 2017). As a result, Canadian firms that have reached the growth stage characterized by product maturity, rapid customer adoption and revenue growth are "orphans" under the current SME financing-policy. This critical issue is bound to become increasingly acute in the future. The past five years have seen a significant increase in large funding rounds, particularly mega-rounds (>$100 million), a reflection of the soaring cost of go-to-market strategies which are unlikely to abate (Oliver Wyman 2018).
- They destroy potential wealth creation by favouring a non-permanent source of external equity that has a propensity to sell dynamic, high-growth firms to foreign buyers which are then able to realize and capture their financial value.

GONE, GONE…GOODBYE

The Canadian junior capital market provides a "real-life" setting to perform an empirical analysis of the trajectory of growth-oriented SMEs, depending on whether they have chosen the private funding (PE and VC) or the public-market funding option. The data show that the exit path of choice for Canadian PE and VC firms is consistent with cross-country observations that the number of trade sales is one order of magnitude higher

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14 The small-business corporate income tax rate applies to income earned by a Canadian-controlled private corporation (CCPC). In general, a corporation is a CPCC if the corporation is privately held, provided it is not controlled by one or more non-resident persons or a public corporation. The general corporate rate (15 per cent) applies to active business income earned in excess of $500,000. A CCPC is eligible to claim the 35-per-cent income tax credit rate (ITC) and related 100-per-cent ITC refund on current expenditures (up to an expenditure limit of $3 million) as long as prior-year taxable capital does not exceed $50 million or taxable income does not exceed $800,000 (on an associated group basis). Subsection 125 (7) (ITA)

than the number of IPOs. In Canada, between 2013 and June 2018, PE and VC firms completed 609 exit transactions, 43 IPOs or reverse takeovers and 566 M&A transactions. (Lortie 2019) In view of the tendency of governments in Canada to assist in the funding of innovative startups through state-sponsored VC and PE firms, we should be under no illusion that "the fact that a start-up received government VC support instead of only private VC funding does not impact the probability of acquisition or IPO." (Breschi, Stefano et al., 2018).And in Canada, this generally means that these new technology-based companies will be acquired by and subsumed within foreign companies based mainly in the U.S. These foreign trade sales are common and increasing in Canada. During the 2001–12 period, 57 per cent of trade sales of Canadian dynamic SMEs resulted in migration (Carpentier and Suret 2014).

Table 4 summarizes the type of acquirers of the "top disclosed" VC and PE exits during the period 2016 to June 2018. It shows that nearly two-thirds of these major transactions were with a foreign buyer, often multinationals and leveraged buyout companies.

TABLE 4 TOP CANADIAN VC AND PE DISCLOSED EXITS

Top Disclosed VC Exits*					Top Disclosed Canadian PE Exits				
Year	Buyers *(nb)*			Value of Foreign Acquisitions (%)	Year	Buyers *(nb)*			Value of Foreign Acquisitions (%)
	Foreign	Cdn	Stock Exchange			Foreign	Cdn	Stock Exchange	
2016	5	-	-	100	2016	5	3	2	57
2017	6,5	0,5	2	78	2017	4,5	2,5	3	54
2018 (H1)	2	-	-	100	2018 (H1)	3	-	2	89
Total	**13,5**	**0,5**	**2**	**85**	**Total**	**12,5**	**5,5**	**7**	**69,7**

Source: Schwanen et al. (2019)

Business ownership has considerable influence on the strategies a company pursues, the location of its critical functions, including R&D, and its integration into the business fabric and societal environment, an integration that hollowed-out companies cannot fulfill. It is unlikely that Canada will improve its low ranking in innovation and productivity growth among its OECD peers if it fails to develop more Canadian multinationals around which new technology companies can develop in symbiosis. Let's face it: branch plants are inimical to dynamic ecosystems. For these social institutions to be able to breed, nurture and sustain companies capable of competing globally, the "body and mind" of entire companies — that is, all functions, including the CEO and his or her executive team — must contribute to and actively participate in the informal webs of communications that nourish their value. The fate of CGI Inc., contrasted with that of DMR Consulting Canada, is a reminder of this iron law. The two companies were once comparable on most dimensions, but took a different path in 1995; today, CGI Inc. is a global leader headquartered in Canada, while DMR has been subsumed into the global Fujitsu organization.

CONCLUSIONS AND RECOMMENDATIONS

Canada faces perhaps no greater economic and social challenge than its struggle to increase its productivity. Recognized worldwide for the quality of its scientific research, it lags behind its peers in terms of business R&D levels, its openness to the adoption of new technologies and its innovativeness. While many Canadian companies operate abroad, the prevailing sentiment is that too few have achieved global standing in their industry.

If the Canadian government is serious about improving Canada's performance in transforming technological innovation into wealth creation, it must adopt a new narrative that will inform both public debate and policy. Emphasis must be placed on expanding the activities of successful Canadian companies in Canada and abroad with the explicit objective of creating the next generation of international leaders. The focus needs to be centred on: the "gazelles" (i.e., high-growth transformational companies — large and small); the elimination of taxation rules, such as those that govern the federal SR&ED tax credit, which discriminate against high-growth and tech companies that go public and hinder their growth; the adoption of measures that will deepen the amount of long-term and permanent equity capital available for investment in high-growth and dynamic companies; and tax policies that promote the acquisition and commercialization of intellectual property and encourage and support entrepreneurs keen to build sizeable companies.

Expanding the horizon

External openness across various dimensions of goods, services, capital, people and data is an important cross-border conduit for ideas, research, technologies, talent and best practices. Canada's score of 17.3 on the MGI Connectedness Index is concerning, particularly when compared to the Netherlands (54.3), the United States (52.7), Germany (51.9), the United Kingdom (40.8) and China (34.2) (Manyika et al. 2016). In terms of innovation policy, the benefits of harnessing the results of R&D investments made by other advanced economies as well as China and India must be actively considered. The current approach to the analysis of the impact of R&D on innovation is too often based on an autarkic vision of the science and technology enterprise with the consequence that "the questions" are framed in a way that limits the examination of policies that could have significant and powerful effects. As a result, we rarely consider that "honourably adopting" ideas, knowledge advances and technological breakthroughs in other countries can be a very efficient way to stimulate innovation and improve the competitiveness of Canadian companies. Canada has a very effective and efficient export development agency, yet we do not have an agency with a clear mandate and the financial resources to support Canadian companies in scouting for and acquiring emerging technology and intellectual property abroad. Why not?

To further promote the acquisition and commercialization of intellectual property from domestic and foreign organizations, the so-called "intellectual property box," tax measures should be adopted. Already implemented in 15 OECD member countries, the measure provides for a reduced rate of taxation on income arising from the commercialization of intellectual property, including patents, copyrights and process designs developed or acquired by a company (Lester and Warda 2018). Enacting such a preferential tax treatment at the federal and provincial levels would address two issues of concern: It

would make the hollowing-out of Canadian firms less attractive to foreign acquirers and, conversely, make the acquisition of intellectual property in Canada or abroad by Canadian companies more attractive.

Human capital

The contribution of engineers and scientists to improving business productivity and profitability is well established. Canada is already at a disadvantage in this regard, which puts a premium on the "recruitment" of immigrants with those qualifications. The retirement en masse of experienced engineers in the coming years will worsen the situation, making the adoption of new technologies and innovation much more risky.

To address this shortage of highly qualified personnel, the Canadian government should take the lead in promoting and funding the establishment of an institutional infrastructure similar to the German Steinbeis system, a network of academics, technologists and engineering professionals. Its mission would be to provide companies across Canada with access to professionals with the skills, experience and know-how necessary to address technological, production, and commercial issues they face in their business.

CAPITAL DEEPENING

Targeted tax measures to improve Canada's competitiveness and support the scaling-up of Canadian firms and their global expansion include:

- Elimination of the taxation bias that discriminates and penalizes innovative and high-growth Canadian companies that go public.
- Adoption of a tax measure similar to the U.S. Small Business Jobs Act of 2010 that provides for full exemption from federal taxation of capital gains realized on the sale of the shares of certain small businesses held for at least five years. The evidence suggests that in the U.S. this tax measure increased the amount of investment in investee firms per founding cycle as well as the number of investors (Lortie 2019).
- A gradual reduction of the capital gains tax rates on shares issued by qualified SMEs when they list on a Canadian stock exchange and are held by individual investors for a reasonable period of time afterwards. For example, the tax rate should be reduced by 50 per cent if the shares are held for more than 12 months, and should be zero if the shares are held for more than 36 months. Not only would this measure promote individual investor participation, but it would also improve the pricing of Canadian SME IPOs, increase market liquidity and improve the quality of these companies' shares in the market.

To date, Canadian policies to improve Canada's competitiveness have been ineffective. More of the same will not yield better results. There is ample evidence that capital gains taxes on shares and options hinder entrepreneurial activity (Edwards and Todtenhaupt 2018), and reduce the supply of private equity (particularly for startups) and follow-up funding (Bock and Watzinger 2017). They also cause entrepreneurs to decrease innovation risk, to remain invested longer and, overall, to forgo growth (Dimitrova and Eswar 2019). Although the superior performance of Switzerland and Singapore cannot be fully attributed

to the fact that they do not levy capital gains tax on the sale of corporate shares by their residents, it should be noted that Switzerland ranked first among the most competitive economies in the world for nine consecutive years and Singapore is among the five most competitive economies on the Global Competitiveness Index. We recognize that such a radical policy change would be difficult to swallow. The measures proposed above, based on solid empirical evidence, are specifically targeted at those individuals and organizations best positioned to improve the productivity and competitiveness of Canadian businesses at home and abroad, and stimulate economic growth through increased investments in and commercialization of intellectual property and the expansion of high-growth Canadian firms into global markets.

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