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ABOUT PPF

The Public Policy Forum builds bridges among diverse participants in the policy-making process and gives them a platform to examine issues, offer new perspectives and feed fresh ideas into policy discussions. We believe good policy makes a better Canada.

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FOREWORD BY EDWARD GREENSPON

HOW TO BUILD CANADA'S COMPETITIVENESS AMIDST THE RISE OF AN INTANGIBLES ECONOMY AND GREATER GEOPOLITICAL COMPLEXITY

he two questions on the minds of economists as governments intervened in March 2020 to dial back commercial activities were how to reignite the economy and would it look significantly different than before. Given that economies are dynamic creatures in a constant state of flux, it is actually hard to imagine them re-emerging in some static holding pattern. The better question is do we want them to differ and in what ways.

Profound and rapid economic change, akin to the 1800s Industrial Revolution, was already generating pent-up policy pressures in the years preceding the COVID-19 pandemic. The rise of the Internet (and a host of other science and technology breakthroughs) tossed many of the old assumptions, as did the stunning rise of China and the relative disengagement of an ever-more insular United States. Analysts increasingly warned of a decoupling of the global commons into rival camps struggling for economic and strategic superiority by gaining advantage for their own technological standards and platforms. When the COVID-19 crisis came along, it merely served as an accelerant to a process pushing and pulling at globalization.

It is in this context that the Public Policy Forum releases *New North Star II: A Challenge-Driven Industrial Strategy for Canada*. It provides a well-timed dissertation on how Canada can build up its competitiveness amidst the rise of an intangibles economy and greater geopolitical complexity.

It would be nice to think that world leaders will reflect on the health and economic calamities from COVID-19 and give greater weight, as after the Second World War, to strengthening global collaboration. The pandemic could be like a science fiction story of old, rallying nations against the alien invaders. Rather, it appears more likely to aggravate the weakening of the institutions of an inclusive international order in favour of a U.S.-led sphere and a Chinese-led one - each vying for strategic advantage while sowing uncertainty and mistrust among nations. (Perhaps there will be a middling European model in the mix, although lacking in the muscularity of the other two.)

Either way, Canada needs to contend with the attenuation of its long-standing strategic anchors: a United States committed to our welfare and the counter-balance of a high-functioning multilateral system. Pathways to the elusive Third Option have been obstructed by the U.S.-China chasm. While our interests, as always, cry out for more friendships, not fewer, within the family of nations, the desire for greater diversification runs headlong into geographic realism in a world of choosing sides.

New North Star 1 was notable for the ground it broke on how public policy was falling behind the surge of the intangibles economy that touched everything from tech to resources. Authors Robert Asselin and Sean Speer argued that new imperatives required Canada to forge a new policy consensus in such areas as intellectual property, foreign investment, data sovereignty and the development of a talent and skills-laden workforce. In this second volume, the authors, joined this time by CIBC economist Royce Mendes, continue down the intangibles path while turning their gaze more squarely on the implications for Canada of the forces of geopolitical change. They portray the tense, technology-driven dynamic between today's two Great Powers as having forced a shotgun marriage between national security and competitiveness, blurring the lines between the political and economic

and the domestic and foreign. Canada's agonizing over 5G policy provides a case in point.

As a result, even before anvone had heard of COVID-19, the authors were pointing to the rise of gravitational forces inducing nation-states to reassert their role as resolute architects of their futures. This is especially so for Canada, they say, which "cannot count on traditional sources of economic activity nor the U.S., China or a liberal global framework" to stand up for our competitiveness. "Canada's political class must assume that responsibility." These trendlines, they argue, confirm the end of the laissez-faire economic policy consensus that had prevailed from the late 1970s forward. The so-called Washington Consensus has done its job but is no longer, in their estimation, up to the task

An industrial strategy starts with a recognition that government cannot avoid decisions about which market outcomes it prefers or economic goals it chooses to prioritize. It is inherent in governing.

to serve as the think tank about tomorrow. The authors raise important questions about the extent to which Canada's competitiveness challenges can be properly addressed through a set of policies designed for a pre-intangibles age that reached its apogee in the unipolar interregnum between the collapse of the Soviet Union and China's spectacular ascension to the largest economy in the world.

> As one can imagine, their advocacy for a newer and better industrial policy precipitated considerable debate at the three roundtables PPF organized on competitiveness in Montreal. Toronto and Vancouver. There were those who stood up for the continued superiority of the Washington consensus, cautioning that greater government involvement in the economy inevitably leads to political distortions and less growth. And then there were those I would call reluctant refugees from the Washington Consensus who conceded that nations with coherent industrial strategies seem to be out-performing those without.

Whatever your orientation, most everyone will agree that the COVID crisis has brought a set of new pressures into sharper relief. To what extent can nations still rely on global supply chains for critical goods? And what constitutes

of delivering national advantage. Thus modernized Industrial Policy is on the comeback trail.

Commissioned by the Public Policy Forum as part of our continued concentration on the social and economic determinants of growth and competitiveness and a related focus on geopolitical change, this report is an expression of our intention a critical good anymore; has personal protective equipment jumped the queue and steel fallen several notches? Clearly, governments will be left vulnerable if they do not shift the balance to some extent toward self-sufficiency over comparative advantage.

What's certainly clear is we need not just to recover but to rebuild. Simply pulling out the old blueprints A new and equally durable consensus in favour of an industrial strategy is needed for this age of intangibles and geopolitical competition.

for an economy that was already under stress would be to waste an occasion to rethink necessary policy challenges, such as:

- how to effect a decarbonized oil and gas sector while adding higher value supply chains at home;
- how to leverage our clean electricity and find global niches in clean tech;
- how to develop digital infrastructure that enhances our competitiveness in the digital economy, enabling Canadians wherever they live to participate in the digital economy;
- how to promote digital services that can be sold across borders with less friction than hard goods;
- how to design intellectual property and data regimes that foster domestic growth without shutting out global know-how;
- how to diversify our export risks in the shadow of the new geopolitical rivalry and strengthen our position vis a vis a more arbitrary United States.

The world is replete with a fresh set of urgent questions – and the authors believe, reluctantly, the state will have to overcome its own reluctance and figure more prominently in the solutions. While conceding that past attempts at industrial policies have often led to inefficiencies and rent-seeking, they maintain the answer is not for Canada to do without. "This attitude has regrettably caused Canada to have the worst of both worlds: it has neither a laissez-faire policy nor an industrial policy," they say.

In the final part of the paper, they set out to create an approach for choosing what Canada's priorities should be under a new industrial strategy. Their formulation is designed to avoid a dirigiste dead-end while providing definition for policymakers charged with determining how and where to apply state resources. This section might well elicit the greatest debate among readers of the report. We hope you will bring it on – a good debate is needed.

As President & CEO of an applied policy think tank that seeks to promote the discussion of fresh ideas through engagement with a range of thinkers, doers and deciders, I want to express PPF's gratitude to Robert, Sean and Royce for taking on the challenge and extend thanks as well to policy lead Andrée Loucks, who shepherded them on their journey, editor Allison Jane Smith and the other members of our team who contributed in a myriad of ways.

> Edward Greenspon President & CEO Public Policy Forum

Image: Control of the second secon

The world is changing, and long-held policy assumptions in Canada need to adjust accordingly. The Washington Consensus that has shaped domestic economic policies and global institutions in a laissez-faire mould for roughly 40 years is being challenged by two, new geo-economic realities that Canadian policymakers cannot afford to neglect.

The first is that today's economy is dramatically different than the 20th-century production economy. The shift to an intangibles economy, driven by intangible assets such as intellectual property, software, data, and brands, is transforming where economic value is derived and who participates in it. Its unique features and characteristics mean that our conventional policy toolkit requires updating if Canada is to cultivate innovative domestic firms that can compete globally in the age of intangibles.

The second is that the United States-China tech "cold war" is changing assumptions about global commerce and geopolitics. This rivalry is already radically reshaping Canada's economic and security interests. The extradition case of Huawei chief financial officer Meng Wanzhou shows how Canada is implicated in the tensions between its two largest trading partners. In this new era of sharp focus on national interests, Canada cannot count on a liberal global framework, traditional sources of economic activity, nor the U.S. or China. Other countries are responding to these geopolitical trends by shifting from a laissez-faire approach to a national interest-driven model focused on key sectors and technologies based on national priorities and competitive advantage. To remain competitive, Canada must chart a similar course that advances its own interests.

These geo-economic trends were occurring before the COVID-19 global pandemic. But the epochal crisis which began in earnest in late winter 2020 will only exacerbate and accelerate them. The experience of this period will place further strain on globalization and the economic assumptions that have underpinned it in two primary ways: a disruption in global supply chains driven by a renewed focus on supply chain resiliency and domestic productive capacity; and an acceleration of U.S.-China "decoupling." We are already seeing a rise of economic nationalism and a renewed emphasis on building domestic industrial capacity. The consequences could be nothing short of a new, more realist economic paradigm.

The confluence of these trends - what amounts to the return of political economy – will require a bold policy response from Canadian policymakers: a new, forward-thinking industrial policy. This may have been a controversial contention in the past. But the evidence keeps building. Other jurisdictions are increasingly moving in this direction to support strategic industries in the name of national security, economic development, and emergency response. And, given

how much the federal government already spends on industrial programs, pursuing an industrial strategy can be understood as a coherent, intentional deployment of public resources rather than a new dirigisme.

The report is meant to help get out of the starting gates more quickly. It proposes to situate such an industrial strategy at the intersection of Canada's pre-existing economic strengths and its most pressing societal challenges. By aligning policy frameworks around challenges such as climate change, public health and aging demographics and smart cities and communities, this type of strategy would serve as a north star to marshal public and private resources to meet these challenges over the medium and long term. A challenge-driven industrial strategy would in effect use pressing societal challenges to leverage competitive (and exportable) advantages in this intangibles age.



In particular, Canada must leverage a mix of public and private R&D spending as well as a broader set of policy interventions to fuel commercial-oriented innovation. Canada's ability to leverage its human and intellectual capital to commercialize Canadian products and services is the key determinant to growth, productivity and higher living standards in the 21st-century economy.

Canada cannot afford complacency. Our policymakers must resolve to meet the country's most pressing challenges in this period of transformational technological and geopolitical change. A challenge-driven industrial strategy provides a way forward, a new north star for Canada

INTRODUCTION

Last year, the report A *New North Star* diagnosed structural changes in Canada's economy and sought to understand how the shift from a tangibles economy to an intangibles one might reshape our thinking about economic competitiveness. That report put forward a series of policy prescriptions to improve Canadian competitiveness, including conventional proposals such as rationalizing the tax system and improving labour market outcomes, and newer ones such as developing a global model for data governance and better leveraging Canada's intellectual property.

The report helped to popularize the idea that Canada's economy is fundamentally changing due to the rise of brands, data, intellectual property and other intangible assets, and that Canadian public policy will need to adjust accordingly. A common critique of the report, however, has been a perceived gap between its assessment of the paradigmshifting nature of the intangibles economy and its policy recommendations, which were by and large incremental.

We have been debating these questions ever since the report's release in April 2019. Is the intangibles economy fundamentally different from what has come before? Does it require policymakers to revisit basic assumptions? Which parts of the current policy framework need to be retained and which need to be reshaped? Is there a case for a new, focused and intentional industrial policy to respond to these economic and technological trends?

Answering these questions has become even more important in light of the shifting geopolitical landscape and the devastating effects of the COVID-19 pandemic on the global and national economies. It is difficult to overstate how much the geopolitical context has changed since PPF released the first report. While the urgency remains around what we wrote about the intangibles economy in that report, the United States-China rivalry and its impact on Canada was only beginning to become clear. The ensuing 12 months have confirmed the emergence of a new structural rivalry that places technological dominance at the centre of global and strategic advantage.

The pandemic crisis has only exacerbated and accelerated these trends. American policymakers are now speaking openly about "decoupling" from China in particular and a renewed focus on industrial policy in general. Leading foreign policy thinkers agree that the "pandemic will change the world forever."¹ Canada's economic and security interests will be radically reshaped by this new period of geopolitical tensions.

That so much of the U.S.-China conflict is rooted in a quest for technological supremacy reinforces how essential it is for Canadian policymakers to carefully think through a policy framework for the intangibles economy. It is as much a geopolitical question as an economic one. As scholar Michael Lind has put it: "debates about national security and the global economy are merging into a single debate about relative national power."² Canada's policy response, therefore, will require more than incrementalism.

We stand behind the policy recommendations in *A New North Star*. These reforms would invariably help to advance Canadian economic competitiveness. But we have since come to the view, due to evidence and circumstances, that more fundamental policy changes are also necessary. Canada's current policy framework, which took shape around the time of the Macdonald Commission's report in 1985 (and has spanned five prime ministers), no longer fully applies to the joint forces of the intangibles economy and heightened geopolitical competition.

It is time to establish a new industrial policy for the age of intangibles. This new industrial policy framework must match market forces with public impulses with the goal of cultivating the development of Canadian firms that can compete globally in key sectors and technologies, and in so doing increase economy-wide productivity. A call for a modern industrial policy is bound to be somewhat controversial among some business and labour leaders, policy scholars, and politicians. We recognize that in advance but think this contention is mostly unjustified. The truth is Canada already has a wide range of industrial programs, but it does not have a coherent industrial policy. The choice, then, is not about whether the state should prioritize certain market outcomes, but rather which outcomes it ought to target, and what are the most efficient and least distortionary means of doing so.

Given the limitations and controversies of the term "industrial policy," this report adopts a different term reflective of an economy that features a smaller share of fixed assets and heavy industry, and is an agile and ever-evolving mix of value creation based in the application of digital technologies and life sciences. We call this a challenge-driven industrial strategy.

It is framed in this way quite purposefully. The proposed industrial strategy is not oriented around specific firms. Evidence shows that a policy of "picking winners" is likely to produce sub-optimal results. Instead, the strategy should be driven by a set of ambitious economic and social "challenges" – a challenge-driven industrial strategy.

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The terminology is important. But more crucial is the design and orientation of such a policy agenda. It will necessarily involve the use of a range of policy levers to cultivate and support the development of domestic comparative advantages and to maximize the commercial benefits of our "innovation assets" including capital, ideas, and people. The goal is to build domestic productive capacity in the new sources of wealth, opportunity, and in turn strategic relevance in the new geo-economic environment.

Within a challenge-driven industrial strategy, policies are built where Canada's pre-existing industrial strengths intersect with pressing societal challenges such as climate change, public health and aging demographics and smart cities and communities. Such a strategy amounts to placing policy bets on a clear set of economic and social challenges, and marshalling public and private expertise and resources to address them. In effect, a challengedriven industrial strategy uses pressing societal challenges to build the competitive and exportable advantages consistent with an intangibles age.

A challenge-driven model will spawn new knowledge, new technologies and new applications that can not only advance particular societal objectives but also produce spillovers in other parts of the economy. The outcomes of a challenge-driven industrial strategy will be commercially focused and rooted in market discipline but shaped based on public priorities and national interests.

Within this model, we find there is an important role for the government to partner with the private sector to:

- focus on the entire innovation continuum;
- leverage Canada's strength in human capital; and
- implement a multi-faceted research and development (R&D) and commercialization strategy for the intangibles economy.

A New North Star II is self-evidently bolder in its prescriptions than the first report. Recognizing the limits of the current policy consensus in light of the return of geo-economics, we now make the case for a new policy framework and set out a model for how to bring expression to a modern industrial strategy.

The purpose of this report is to shape how Canadian policymakers should think about economic policy given the rise of the intangibles economy and a new era of geopolitics. It builds the case for establishing a challenge-driven industrial strategy that can overcome the hurdles that have frustrated past attempts at industrial policies and, in so doing, use public policy to cultivate new globally-oriented firms and technologies in Canada.

This type of industrial strategy will be even more important in the aftermath of the COVID-19 crisis. The immediate priority must of course be to address its health effects and stabilize businesses and households. But in parallel policymakers must begin to develop a strategy for economic reconstruction in a new geo-economic environment. Such longterm planning cannot wait. It also cannot merely be a reaffirmation of the status quo. A new industrial strategy will be critical to rebuild Canada's economy in the short-term and position it to be competitive in the long-term.

Canada has been well-served by a broad political consensus that has informed and shaped macroand micro-economic policy for more than three decades. But the world is changing and the COVID-19 pandemic has only hastened these changes. It is our view that how Canada navigates this new world of economic nationalism, industrial policy, and U.S.-China tensions will be the most important question facing policymakers in the coming years. A new and cross-partisan consensus in favour of an industrial strategy is needed for this age of intangibles and geopolitical competition. A challenge-driven industrial strategy can serve as a "north star" for Canadian policymakers during this period of significant technological and geopolitical change.



THE END OF THE WASHINGTON CONSENSUS

For the past generation and a half, Canada's economic policy framework has been rooted in a series of assumptions about markets, trade and global commerce first called the "the Washington Consensus" by economist John Williamson in 1989. After the Cold War, the consensus spread around the globe to become embedded in global institutions and in domestic policies in countries ranging from the U.S. to India to parts of the former Soviet Union. The Washington Consensus started narrowly with taxes and trade and has since come to shape a wide range of complex policy matters including (but not limited to): investor protection in bilateral and multilateral free trade arrangements; deregulation of financial market and capital movement; and an offshoring of production. Harvard economist Dani Rodrik has powerfully documented this general tilting of power from the national to the global, and in turn, a more limited scope for what some call "national developmentalism."³

The Macdonaldianinspired policy framework, which was a useful correction to government overreach in the 1970s, has broadly served Canada well for the past three decades. But today's economic and political environment is fundamentally different than the one in which the commission carried out its work.

The Macdonaldian consensus

Canada's version of the Washington Consensus was best expressed in the 1985 final report of the Royal Commission on Economic Union and Development Prospects for Canada, or the Macdonald Commission, as it became known. Among its recommendations, the Macdonald Commission (named for its chair Donald S. Macdonald) encouraged federal policymakers to privatize Crown corporations, liberalize trade with the U.S. and generally limit the state's role in the economy. The report's underlying assumptions as much as its recommendations came to permeate federal policy for the subsequent three decades.

Federal policymakers did not always adhere to the Macdonald Commission's laissez-faire perspective due to various political economy factors. But its basic ideas can be seen in a subsequent multi-partisan consensus around competitive taxation, privatization, free trade, relaxed investment controls, inflation targeting and, for two decades, a distaste for deficits.

Steeped as it was in the ethos of Ronald Reagan and Margaret Thatcher, the commission's report described industrial policy as a "basic denial of the genius of the market economy. "⁴ Instead, it called free trade "the main instrument in this Commission's approach to industrial policy."⁵ From this perspective, the government's primary role was to enable greater market competition and otherwise stay out of the way.

The Macdonaldian-inspired policy framework, which was a useful correction to government overreach in the 1970s, has broadly served Canada well for the past three decades. But today's economic and political environment is fundamentally different than the one in which the commission carried out its work. This fundamental shift is increasingly reflected in market behaviour and valuations. The value of companies in today's economy is mostly generated from intangible assets such as ideas and intellectual property, software, data and brands.

The new geo-economics

Canada is not an island. Its policy framework resides in a global geopolitical context which Canada cannot fully control. As a medium-sized economy, Canada cannot count on domestic demand alone to fuel growth. And even the activity Canada tends to count as domestic demand relies on household or corporate incomes that are often tied to global trade. When trade tensions arise and global supply chains are disrupted, Canada is deeply affected. This is the reason, of course, that Canada has relied so heavily on the multilateral rules-based international order as a foundation for economic stability and prosperity.

Policymakers and policy commentators sometimes underestimate the linkage between economics and geopolitics. Yet for a country like Canada, they are essentially one and the same. Political scientist Edward Luttwak famously described this interrelationship as "geo-economics."⁶

Two big geo-economic shifts—the rise of the intangibles economy and heightened geopolitical competition between the U.S. and China—require adjustments to Canada's policy framework. These shifts are so profound that policymakers can no longer think about economic growth and public policy in the same way as in the past generation and a half. The rules of the game have changed, and countries are responding by moving swiftly to assert their competitive advantage. In that context, the idea that Canada can just rely on traditional market forces to remain competitive while everyone else is not is foolhardy.

The COVID-19 pandemic has exacerbated and accelerated these trends. It is an epochal crisis that will reshape globalization and the economic thinking that has underpinned it. It is too early to judge precisely how these changes will manifest themselves. But, based on public comments by policymakers in the United States, United Kingdom, and even here in Canada, it is bound to transform global supply chains and overall industrial strategies. At minimum, there will be a move to minimize dependency on China and others to ensure sufficient supply of goods deemed essential such as medical devices or food.

More generally, the technology war between the United States and China will intensify. Signals out of Washington are that a new, bipartisan consensus is emerging that the Americans need to rethink their economic and geopolitical strategy vis-à-vis China. This will put tremendous pressure on Canadian policymakers and businesses to rethink their own strategies. As several U.S. foreign policy experts recently observed: "[the] pandemic will change the world forever."⁷

We would argue that the world was already in transition. COVID-19 has just added fuel to the fire.

Another

berner characteristic of the intangibles economy: weaker market competition and what is often characterized as the new "winner-take-all" paradigm detailed in A New North Star. Superstar companies earn monopoly rents because of their ability to dominate global markets and create impediments to the functioning of economic competition.

Intangibles growth

The first shift, as outlined in our initial report, is that the economy is shifting from a goods-producing model to an intangibles economy. In this new technology-driven model, the ability of firms to combine the use of new technologies such as artificial intelligence and quantum computing with big data is a game-changer for where economic value is derived and who participates in it.

This is not merely about technology companies. It applies across the economy and broadly refers to the transformation of advanced economies based on the application of intellectual property, software, data, and brands. Industries such as agriculture which are typically considered as traditional are now part of the growing intangibles economy.

This fundamental shift is increasingly reflected in market behaviour and valuations. The value of companies in today's economy is mostly generated from intangible assets such as ideas and intellectual property, software, data and brands. Companies are investing less and less of their capital in plants, property or equipment.⁸ Instead, they are increasingly focused on these new, intangible sources of value and wealth. As an example, annual Canadian investment in data alone has grown more than 40% since 2005, while investment in machinery and equipment has only grown 8% over the same time period.⁹ Economist Richard Baldwin describes these trends as a transition from an "economy of thoughts" rather than an "economy of things."10

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In the new economy, intangibles are essential to productivity. As Bank of Canada Governor Stephen Poloz has observed, the intangibles economy is increasingly driving Canadian growth across several industries.¹¹ The share of intangibles in the values of listed companies is rising (see Figure 1). One way to see that is to analyse the value of intangible assets

including intellectual property, brands and the value of employee expertise, as well as the market value of tangible assets such as factories or equipment over and above the book value listed on company balance sheets. **Figure 1** demonstrates intangibles value rather than intangibles assets, but the data are indicative of some clear trends.

For seven out of the nine sectors analyzed, more than half of enterprise value was tied to intangibles. Topping the leaderboard in the shares of intangibles value are unsurprisingly information technology and communication services. But other sectors including health care, consumer discretionary and consumer staples also have high shares. The results are similar for the S&P 500, where there is more reliable historical data against which to compare. Over time, a clear shift toward intangibles value can be seen. Various commentators and policy observers have described this new economic model as "rentier" capitalism. Broadly speaking, rentier capitalism can be defined as an economy where many firms and individuals are able to generate income without enhancing productivity or adding real economic value. As *Financial Times* columnist Martin Wolf describes it, "rent means rewards over and above those required to induce the desired supply of goods, services, land or labour."¹²

Because patents are a big part of the intangibles economy and intellectual property is a monopoly right, multinational firms that amass patents and intellectual property hold the rights to "rent" and thus have a significant competitive advantage in the marketplace.



As Bank of Canada Governor Stephen Poloz has observed, the intangibles economy is increasingly driving Canadian growth.

That is linked to another characteristic of the intangibles economy: weaker market competition and what is often characterized as the new "winner-take-all" paradigm detailed in *A New North Star*. Superstar companies earn monopoly rents because of their ability to dominate global markets and create impediments to the functioning of economic competition. There is abundant literature on the increased "financialization" of our economy and the emerging dichotomy of "makers" versus "takers" to distinguish between actors who seek to make profits on assets with productive economic value and those who have no economic agency in a monopolistic or oligopolistic market.¹³, ¹⁴

Google, for instance, is a global giant because of its algorithms and granular knowledge of audiences. Similarly, Airbnb is valued at \$35 billion because of its network and data, not because of its physical properties. Uber owns no taxis. These companies are highly valued because of their intangible assets. These trends have not eluded Canada. Statistics Canada estimates that the net value of data, databases and data science assets in 2018 were already equal to roughly half of the value of all the machinery and equipment in Canada, and this value is still on the rise.¹⁵ These economic and technological trends have broad effects. In his book The Great Reversal, French economist Thomas Philippon argues that growing market concentration among a small number of large firms in the U.S. has resulted in lower wages, lower investment, lower productivity, lower growth and increased inequality.¹⁶ Statistics Canada has published research showing the rate of diffusion from the most productive firms in Canada to the remaining 90% has declined since 2000¹⁷. That means that as the most productive firms have pulled further ahead in terms of innovation, they are no longer raising the rest along with them. This hinders the ability of related firms to compete and turn into globally competitive champions themselves, placing a further limit on the pace of productivity growth in Canada.

The relevance of the intangibles economy has only been reinforced in the context of the COVID-19 pandemic. The application of intangible assets has been at the forefront of our collective response – including how some countries are now tracking their own citizens, or how households are using these intangible platforms and tools to perform the most basic daily functions such as working from home or ordering food. The global pandemic has exposed several key insights but one of the most important is how the intangibles economy has become such a critical ingredient for our economies and societies. The technology sector and the large, global firms that dominate it held tremendous market and political power before the crisis. They will have even greater power in its aftermath.

The conclusion is straightforward. Businesses in Canada and around the world are being shaped and reshaped by their intangible value. Yet Canada's public policy framework has been slow to adjust to these changing economic realities.

Just consider, for instance in **Figure 2**, that foreign ownership of Canadian inventions has more than doubled in 10 years, creating a widening patent deficit.

Canada has a solid track record of deploying public and private resources to scientific inquiry, human capital and R&D in early stages of innovation, but a majority of firms must go outside Canada to secure funding in later stages. Canada's innovation ecosystem has not been effective in commercializing "innovation assets" and helping firms grow and scale. The result, as one of our discussion roundtable participants put it, is that Canada has a lot of "prey" but too few "predators" in the global market for intangibles.

This problem is not new; it has long been observed by various policy scholars and blue-ribbon panels. But it is more acute than ever in the "winner-takeall" economic paradigm driven by intangible assets. Canada's government and its business environment provide early-stage support to domestic innovators but fail to capture the long-term value for Canada. This failure means that Canadian businesses will not fully participate in the new sources of economic value and wealth creation.

Figure 2 Legend:

Canadian-invented, foreign-assigned

Canadian-owned

Canadian-invented, not foreign-assigned



Geopolitical competition for technological dominance

The second big geo-economic development has been the rise of China as an economic superpower. The end of a unipolar world and the emergence of China's economic model as an alternative to democratic capitalism is reshaping global competition and strategic relations. The most significant manifestation is the unfolding U.S.-China technology "cold war," which is forcing policymakers around the world to revisit basic assumptions about global commerce and geopolitics.

Simply put, the U.S. and China are in a technological race of two different economic models. Given the intangibles economy's winner-take-all characteristics, the outcome is unlikely to be balanced market share but rather global dominance in the new sources of economic value. This hyper-competitive dimension to the intangibles economy is what is driving the new geopolitical tensions. It was not hyperbole when U.S. Vice President Mike Pence described the economic rivalry as "a battle for the commanding heights of the 21st-century economy."¹⁸

What makes this even more important is that intangible assets and new technologies do not just have commercial applications. They also have military and security applications, which blurs the distinction between economics and geopolitics. This geo-economic dimension is something policymakers in Canada and elsewhere are only beginning to understand. But this is critical: it is not about who builds consumer apps for use on smartphones, but rather who gains an economic and security advantage from doing so.

To date, the Chinese government has been ahead of the United States in particular and western countries in general in terms of implementing a deliberate industrial strategy in order to develop comparative advantages in the intangibles economy. It has worked. Chinese industrial policy has given the country an edge in this heightened industrial competition.¹⁹ Government policy has systematically invested in and developed new and emerging technologies, establishing early advantages in critical technologies. Notably, China is now the world leader in patent applications with 40% of the global total, a share more than two times larger than that of the U.S.²⁰

American policymakers have, in turn, realized they need a new policy strategy. That the Trump administration has engaged in a trade war using tariffs as the main lever to get China to make concessions on market access for agricultural products is a sign that global policymakers are still working through what these economic and geopolitical changes mean for public policy. Other American policymakers from both sides of the aisle, however, are beginning to better understand the intangibles-driven nature of the rivalry with China and the need for a more fundamental rethink of U.S. economic policy.²¹

Calls to view the economic rivalry as more than a mere commercial competition are pushing American policy in a decidedly industrial policy direction. As Republican senator Marco Rubio said in a highprofile 2019 speech: "[Public policy must] encourage and harness the dynamism of our economy's most productive private industries to further our national security and ultimately our national economic development."²² The political consensus in Washington that once favoured economic engagement with China is being replaced with a new consensus that views China as an economic and geopolitical threat due in large part to its emerging technological leadership.

The U.S. now focuses almost exclusively on bilateral relationships. This is unlikely to change substantially under a new administration. Going forward, the Committee on Foreign Investment in the United States and other foreign investment screening mechanisms can be expected to be used more forcefully with enhanced restrictions. China is clearly the target, but such mechanisms will likely be applied across the board, even for countries like Canada. After all, it was not long ago that Canada's most reliable trading partner imposed tariffs on aluminum and steel, invoking national security as a justification.²³

Canada still develops and implements policies for a world that increasingly no longer exists. As a result, policymakers must rethink how Canada evaluates its economic interests.



The U.S.-China rivalry affects Canada in profound ways. The extradition case of Huawei chief financial officer Meng Wanzhou and its political fallout is a prime example of how Canada cannot avoid being implicated in the ongoing tensions between its two largest trading partners. The inadvertent collateral damage Canada has suffered is a reminder that only Canada will be concerned with its interests—no one else will.

Changing dynamics create huge uncertainty about global supply chains and rules-based international mechanisms to solve trade disputes. Canada's vulnerability can already be witnessed as the U.S. moves toward a more mercantilist, managed-trade era and China seemingly uses its market power to find pretexts to punish selected Canadian industries for the Meng extradition process.

One only has to think about the implications for a country such as Canada on 5G integration in this era of economic nationalism and decoupling. In a splintered digital value chain with little to no domestic ability to build many items on its own, Canada will be dependent and less able to control its economic destiny. It will also be more susceptible to policy shocks from elsewhere and across other parts of the economy.

Canada can never fully inoculate itself from geopolitical developments. But it should be much more focused on cultivating the sources of new economic value in Canada and linking them to global supply chains. This would both increase Canada's economic productivity and insulate it against policy shocks.

As has been described, the Washington Consensus is being replaced with a harder-edged focus on national interests and comparative advantages. The COVID-19 crisis has only hastened this trend. The Macdonald Commission's report was produced in a period of global economic cooperation and in an economy that produced and traded conventional goods and services. The two trends described in this section have disrupted both of these assumptions.

Our competition has no qualms about arraying the power of both markets and the state in prioritizing the industrial capacities they need for a strategic advantage.²⁴ Yet Canada still develops and implements policies for a world that increasingly no longer exists. As a result, policymakers must rethink how Canada evaluates its economic interests. We heard in our consultations, for instance, that Global Affairs Canada is still working on simply how to account for intangibles in its economic modelling for evaluating trade agreements. That is just one example of how Canada needs to update its policy framework and toolkit for these new realities. There will be more in the following pages.



THE CASE FOR A NEW INDUSTRIAL STRATEGY

Section I considered how the confluence of the rise of the intangibles economy and growing geopolitical tensions is overwhelming the basic assumptions long undergirding Canada's economic policy framework. This section aims to build the theoretical and practical case for a new, modern industrial strategy for Canada.

What is an industrial policy?

"Industrial policy" is a loaded term on both sides of the political spectrum. Parts of the left and the right invariably hear "corporatism" and a public policy framework that amounts to "picking winners and losers."

These concerns are understandable. It is true, as the Macdonald Commission observed, that earlier attempts at industrial policy frequently lacked limiting principles and ultimately led to inefficiencies, distortions and rent-seeking. But it does not necessarily follow that Canada should have no industrial policy at all. This strikes us as a false choice. It is a false choice that has caused Canada to have the worst of both worlds: it has neither a laissezfaire policy nor an industrial policy.

An industrial strategy starts with a recognition that government cannot avoid decisions about which market outcomes it prefers or economic goals it chooses to prioritize. It is inherent to governing. Full neutrality is not practically possible. Policymakers are "doomed to choose" as economists Ricardo Hausmann and Dani Rodrik have put it.²⁵

Consider a free trade negotiation. When the government advances the interests of a particular sector in the name of greater market access and in turn must make concessions in another sector, it is engaging in industrial policy. When governments provide tax incentives for foreign firms to invest and create jobs in Canada, it is engaging in industrial policy. When it restricts foreign ownership in certain sectors, it is engaging in industrial policy. The list goes on.

An industrial strategy, as we have come to think of it, can thus be broadly defined as "targeted government interventions to promote specific economic sectors with the aim of increasing their productivity and spreading their externalities throughout the economy."^{26,27} The notion of "targeted" is important here. The objective is to bring intentionality to the entire policy framework that the government builds as opposed to a series of one-off programs. A focus on productivity is similarly key. The overriding goal should be to cultivate innovative firms and new technologies that can compete globally and in turn boost economy-wide productivity.

In practice, then, an industrial policy amounts to an overall strategy that focuses on the most productive patterns of private investment, and favours sectors or sub-sectors that display the most promise to compete in global markets and participate in global supply chains. This is less about "picking winners" and more about doubling down where evidence suggests that Canada can build scale. That is a critical point: only focusing on the parts of the economy that are struggling is not an industrial strategy; it is a redistribution policy.²⁸

An industrial strategy starts with a recognition that government cannot avoid decisions about which market outcomes it prefers or economic goals it chooses to prioritize. It is inherent to governing.

Policymakers will need to design separate and targeted policies to support economic renewal in rural and economically distressed parts of the country. One model that has shown positive results is the Quebec-based Community Economic Development and Employability Corporation (CEDEC). The organization uses a community-oriented model involving public, private, and civil society actors in order to help communities identify economic advantages and then to develop holistic strategies (including financing, skills training, business development, and so on) to cultivate and advance those advantages as part of a broader community development strategy. CEDEC's nascent model holds the promise of being able to ensure a more inclusive "no one left behind" approach to economic development that can have application in communities across the country²⁹.

This modern approach to industrial policy should also not be a protectionist enterprise, or shaped by nostalgia for a certain type of economy. It is a forward-looking agenda that leans into the parts of the economy that are the most productive, are most likely to form part of global supply chains and have the greatest "multiplier effects" across the economy. It is about doubling down on "creative destruction" rather than trying to stem it.

An industrial strategy would focus on a mix of policies, including financing research and development, taxation, innovation, intellectual property, procurement, regulatory and human capital, to build comparative advantages in key parts of global supply chains.³⁰ It is about creating a coherent strategy to build domestic productive capacity in the new sources of wealth, opportunity, and in turn strategic relevance in the new geoeconomic environment. An industrial policy framework challenges the government to think coherently about its economic policies. The goal is to build a comprehensive policy programme around key sectors or subsectors. This is one area, for instance, where a modern industrial strategy would depart from previous attempts at industrial policy. A modern policy framework would follow a "whole-ofgovernment" model that recognizes there are no silver bullets and that poor policies in one area can undermine competitive ones elsewhere. It does not matter, for instance, that corporate tax rates are competitive if the regulatory system is too complex, the intellectual property regime makes it difficult to commercialize, or there is insufficient land zoned for industrial investment. Policymakers must therefore think carefully about how these different pieces fit together as part of an overarching strategy.

Another difference is that a modern industrial strategy aims to incorporate more long-term thinking into the policy process which often succumbs to short-termism.³¹ It involves setting medium- and long-term economic objectives to form the basis of ongoing policy development across departments and files. Like all strategies, it is about choices. It furnishes a logic for saying No or saying Yes. Fundamentally, though, it brings a sense of purpose and boldness to achieve meaningful results—and injects momentum in a joint public-private endeavour rooted in Canada's national interests.

The ultimate goal is to anchor the public policy process in a clear set of economic objectives related to competitiveness, productivity and, ultimately, rising living standards. One of the challenges with the status quo is it seems to have traded an emphasis on economic efficiency for an overriding focus on equity. Lacking the anchor of an overarching strategy, the 2019 federal election campaign, for instance, displayed an underlying complacency about economic growth.³² A modern growth strategy can push back against this political economy trend toward primarily short-term distributional questions.

That is especially important in light of the geo-economic challenges described in Section I. Complacency ought to never be acceptable, but it is particularly troubling in light of the rise of the intangibles economy and new geopolitical developments. Canada cannot count on traditional sources of economic activity nor on the U.S., China or a liberal global framework. No one else is going to concern themselves with Canada's competitiveness, productivity or future living standards. Canada's political class must assume that responsibility. A modern industrial strategy can help to focus our collective minds around Canada's economic future.

"[Industrial policy] is about creating a coherent strategy to cultivate parts of the economy where Canada has advantages and exploiting those advantages to **'punch above** our weight' in the new reality of geoeconomics."

Industrial programs vs industrial strategy

Some may instinctively criticize the concept of a modern industrial strategy as an argument for bigger, more activist government. But this critique fails to wrestle with the extent to which the state is already active in the economy.

The federal government currently administers a wide range of industrial programs including initiatives for agriculture, aerospace, automotive, fisheries, manufacturing and so on. A 2018 paper published by the University of Calgary's School of Public Policy, in fact, estimates that the federal government spends roughly **\$14 billion** per year on business subsidies.³³ And this, of course, does not even account for the mix of regulatory and policy preferences for different types of investment, sectors, or firms.

The point is the real question is not whether Canada should have an industrial policy or not have an industrial policy. We are already spending billions annually on industrial programs and enacting policies that give preference to certain market outcomes over others. The more practical question, it seems to us, is: should we have a fragmented and unintentional industrial policy or an industrial strategy that is more focused and intentional?

It is worth distinguishing here between programs and policies. Programs are often disparate, uncoordinated, and short-term oriented. They can build up over time due to different circumstances or demands, with minimal attention to how they interact with another or how they fit in a broader framework. Policies tend to be more holistic, interconnected, and long-term focused. They are about establishing a clear set of objectives and developing and rationalizing programs and initiatives that advance our economic goals. Canada does not need more industrial programs. But it does, in our view, need more focused and deliberate policy.

One just needs to examine the "bewildering" cobweb" of federal industrial programs to see what we mean.³⁴ The 2011 Jenkins Panel³⁵, for instance, reviewed **60 federal** programs delivered by 17 departments and agencies totaling more than \$5 billion in annual expenditures targeting research and development alone.* The University of Calgary study's more comprehensive figure (which includes financing through the Business Development Bank of Canada and Farm Credit Canada) reaches **\$14 billion**. This represents nearly 10 percent of federal direct program spending deployed across various parts of the economy. There are various supports for small businesses or capital spending on machinery or equipment or investments in Atlantic Canada or domestic film production or various other sectors, regions, and business activities.

That is not to say all of these initiatives are unjustified or ineffective. But it is meant to observe that there is scope to think more intentionally about how we deploy scarce public resources in the name of innovation and productivity. The consultations for this report regularly heard that the "peanut butter is thinly spread" across the economy without much rhyme or reason. That is not an unfair characterization based on our own experiences in the government.

It is hard to argue that an industrial strategy would amount to much greater government intervention in the market than we currently have. But it is our view that it could represent a smarter economic policy framework.

* The review identified more than 100 programs totaling \$6 billion in annual spending, but it ultimately focused on 60 programs. Neither figure accounted for the role of the Business Development Bank of Canada's venture capital investing.

Industrial policy design and implementation principles

Industrial policy, under any name, has its challenges and its detractors.^{36,37,38} Those consulted for this report offered differing opinions about its efficacy and desirability. The policy literature is also varied.³⁹ And the record of past industrial policy interventions is mixed at best.

In Canada and elsewhere, some of the main barriers to implementing effective industrial policy have included:

imperfect knowledge about long-term economic trends,

making it difficult for policymakers to be able to know and understand which sectors, firms, or technologies are best poised for success, especially over the long term.⁴⁰

the potential for politicization, which

is exacerbated by a mix of regionalism, lobbying and the political business cycle.⁴¹ Former Industry Minister John Manley once remarked that governments do not pick winners, but losers regularly pick governments. And they tend to find advocates within cabinets and caucuses.

difficulties in translating industrial policy from theory to practice.

Governments tend to be siloed, slow and mediocre at policy implementation,⁴² making it difficult to execute cross-cutting agendas. The main argument against industrial policy, however, is that markets are superior at allocating resources in the economy and government efforts will produce distortions and inefficiencies.⁴³ Indeed, research shows that because previous efforts at industrial policy tended to target "old industries," they often slowed structural change and in turn harmed technological innovation and adoption.⁴⁴ Such efforts have tended to impede impeded the market's ability to deploy resources to the most productive parts of the economy.

Critics of industrial policy therefore argue that government policy ought to be "horizontal" rather than "selective" and focus on improving productivity across the economy rather than emphasizing specific sectors or sub-sectors.⁴⁵ This perspective was common, if not dominant, in roundtable sessions for this report, which included many people who grew up on the Washington Consensus.

However, as Section I outlined, there are growing calls for a growth strategy across the ideological and political spectrum in Canada and elsewhere.⁴⁶ Those calls have gotten louder and more pronounced as the result of the COVID-19 crisis. The trendline is towards an emerging consensus that extends in the U.S. from Alexandria Ocasio-Cortez on the left to Marco Rubio on the right.⁴⁷

Why? What is different now?

The first difference is the rise of the geo-economic challenges previously described. Countries such as the U.S. and China are moving ahead with a cleareyed detachment from past nostrums. The pace of change in the global economy demands greater urgency of Canada.

The research itself has also advanced considerably. Leading economists such as Dani Rodrik have come to reconceptualize industrial policy by learning the lessons of past mistakes,^{48,49} and their work has produced new models for industrial policy that respond to these legitimate critiques of previous policy failures. The overriding focus has been on the need to make industrial policies resilient to the risks associated with informational challenges and political capture. These challenges will never be fully eliminated, but perfection is an unreasonable standard.⁵⁰ The test should not be whether informational and political economy issues can be eliminated, but rather how to minimize them as part of the policy design and implementation.

Following Rodrik and others, we find there are five key policy design and implementation principles to guide Canadian policymakers:

> An industrial strategy should include a flexible "discovery process" involving the government and the private sector on emerging research and development and supply chain relationships. This is not about economic planning.⁵¹ It is rather about a new model of public-private partnership that is iterative and humble yet intentional and focused. It will necessarily involve trial and error, risk-taking and iterative improvements towards a set of economic and social goals. Policymakers must establish a level of commitment that extends beyond short-term wins or the electoral cycle and experiment in collaboration with the private sector on new and emerging technologies and their commercial application.

An industrial strategy should focus on an ecosystem of specific sectors or sub-

sectors rather than individual firms. Oldstyle industrial policy often amounted to a symbiotic relationship between the state and a small number of politically connected firms. Companies necessarily come and go in the dynamic churn of the market. The goal should be to target industrial capacities by building a resilient ecosystem of dynamic, talented and entrepreneurial people and ensuring they have access to capital and other resources required to test, market and scale their ideas. An industrial strategy should promote competition rather than shelter domestic firms from global competitors. It should help parts of the Canadian economy participate in global supply chains, which is how productivity is boosted and well-paying jobs are produced. This requires industrial policy to be reconciled with "creative destruction" and a global orientation.

The government should primarily facilitate R&D partnerships and supply chain coordination rather than direct funding to individual firms. An industrial strategy should rely on the government's provision of public goods such as education and training, public laboratories, discovery and applied research partnerships, infrastructure, export promotion and public procurement to boost private investment and produce spillovers. A financing role should be limited to clear market failures and focused on large, pressing societal issues, rather than one-offs to individual firms.

The policy choices inherent in an industrial strategy must be made based on clear and transparent criteria rather than political whims. As Paul Krugman has observed: "The case for a targeted industrial policy therefore stands or falls on the issue of criteria for selection."52 This is critical. Unclear selection criteria will lead to the politicization and overreach that plagued past industrial policy efforts. Clear and transparent criteria, then, will "de-risk" the politics of an industrial strategy and enable policymakers to withstand the inevitable demands of support for one sector or region over others. An industrial strategy must be precise, transparent and evidence-based.

Five industrial strategy design and implementation principles:



It should include a flexible "discovery process."

It should focus on an ecosystem of specific sectors or sub-sectors.

It should promote competition rather than shelter domestic firms from global competitors.

The government should primarily facilitate R&D partnerships and supply chain coordination.

Policy choices must be made based on clear and transparent criteria

Setting industrial strategy priorities

One of the most difficult dimensions of developing a modern industrial strategy relates to points two and five above: how should policymakers decide which sectors or sub-sectors to prioritize?

The current federal government has sought to partly answer that question with its six Economic Strategy Tables. These working groups are characterized as a "model for collaboration between industry and government, focused on turning Canada's economic strengths into global advantages."53 The tables will focus greater policy attention and public resources in six sectors of the economy "where Canada is globally competitive": advanced manufacturing, agri-food, clean technology, digital industries and health and biosciences.54

The intent and the organizational structure of the Economic Strategy Tables is laudable. It is broadly consistent with the view that publicprivate engagement will be essential in the new frontiers of innovation.

However, the risk is that as a priority-setting effort, the Economic Strategy Tables are not intentional enough to compete with more focused players in the global market.

As a small open economy, it is improbable that Canada is going to be a dominant global player in advanced manufacturing or digital industries or health and biosciences, for instance. The U.S., China and others are just too big and far ahead for Canada to gain major global market share in these highly competitive sectors. Instead Canadian policymakers need to target niches where Canada can muster first-mover advantage or outflank larger economies. Policymakers should therefore prioritize sub-sectors or technologies where Canadian firms can build scale, establish an export foothold and become key parts of global supply chains.

One example is Canadarm, a series of robotic arms used in international space shuttle orbiters. Canadarm was developed in the 1970s, when it was clear Canada was never going to be able to dominate the space industry. Nonetheless, Canada was able to produce and commercialize a critical spacecraft component. The Canadarm was developed through a public-private partnership and ultimately cultivated a domestic presence in advanced manipulator systems and robotics that Canada would not have otherwise enjoyed.

Bringing Canadarm back to Canada

As this report was written, Canadian investors acquired and began repatriating the company behind the Canadarm.⁵⁵ While this is positive, it is regrettable that control left the country in the first placedemonstrating the need to rethink how Canada treats strategic assets and valuable intellectual property, as discussed in Section III.

30 PUBLIC POLICY FORUM

Canola is another good example. It is a "made-in-Canada" crop developed because of a public-private partnership with the National Research Council, university researchers in Western Canada, and private-sector firms.

Canola is now one of the world's most important oilseed crops and the most profitable commodity for Canadian farmers. And Canada represents nearly two-thirds of canola exports globally (**see Figure 3**). That early public-private collaboration has thus spawned a major, global-leading innovation and generated enormous economic value for Canadian farmers.

As for contemporary examples, the consultations for this report heard that Canada is unlikely to be a major player in the production of autonomous vehicles, but we are developing a unique advantage in cyber security and operational systems for those vehicles. The same could be said for genomics in agri-food or using Al clusters in Toronto and Montreal to develop new products for various sectors. This is a case where doubling down on our early-stage advantages could enable Canada to obtain a technological foothold globally.

The point here is that a forward-looking industrial strategy needs to enable policymakers to delve more deeply than surface-level sectoral prioritization. The model must eschew an ex-ante selection of sectors or sub-sectors and instead establish a clear set of principles rooted in the goal of higher productivity and overall economic and social goals.





A CHALLENGE-DRIVEN INDUSTRIAL STRATEGY FOR CANADA

After arguing that a new Canadian industrial strategy is necessary and setting out the principles that should guide it in Sections I and II, Section III will focus on specific recommendations for operationalizing it: first, by identifying societal challenges as the foundational organizing principle, then by providing a framework for identifying and selecting those challenges; and finally, by setting out general, cross-cutting policy and organizational reforms that can be part of an industrial strategy irrespective of the specific challenges a government ultimately selects.

A challenge-driven model

Establishing "grand challenges" based on broader societal goals is a useful organizing principle for an overarching industrial strategy. It replaces the notion of "picking winners and losers" with setting broad-based challenges that will necessarily involve multiple firms and even multiple sectors. Countries that adopt such grand challenges place a policy bet on a clear set of economic and social challenges over the medium and long term, and marshal public and private expertise and resources to meet these challenges. This collaborative process spawns new knowledge, new technologies and new applications that can not only address a particular challenge but also produce spillovers in other parts of the economy.

It is worth elaborating on the role of spillovers here. The overriding goal is to cultivate domestic firms and technologies that can build up the scale and capacity to compete globally and participate in global supply chains. This is ultimately how a small economy can best navigate the post COVID-19 geopolitics and boost economy-productivity in the age of intangibles. Rooting these objectives in a challenge-driven model enables the country to also make progress on these major societal challenges in the process. This is the genius of the challenge-driven model: the challenges become both a means for orienting our policy framework towards higher productivity and an end to realizing progress on major national priorities.

A challenge-driven industrial strategy focused on big societal challenges, such as tackling climate change, building smart cities and communities or serving public health and changing demographics, may seem revolutionary. It is certainly different from how policymakers have thought about innovation policy in recent decades. But the COVID-19 crisis has come to demonstrate how it might work and in turn help to inform our thinking. The federal government has effectively launched a challenge-driven strategy to respond to the crisis. This multi-faceted strategy, which includes public-private applied research led by the National Research Council, commercialization funding to small- and medium-sized enterprises, and liberalized procurement rules, is a good example of how this approach to industrial strategy can catalyse private

investment and build domestic productive capacity.⁵⁶ It represents a combination of market forces and public impulses to cultivate scale and capacity in strategic parts of the economy.

Examples of this were already emerging around the world. Germany's industrial policy, for instance, has prioritized boosting the innovative capacity of domestic firms in high-productivity sectors in the pursuit of making progress on climate change goals.⁵⁷ The European Commission has set out a framework for developing a series of cross-sectoral missions and identifying public-private projects within those missions.⁵⁸ And the U.K. government has developed comprehensive policy programs for four "grand challenges" in artificial intelligence and data, aging society, clean growth and future mobility.⁵⁹

In recent decades, this has been one of the great strengths of the U.S. model for industrial research. Programs such as DARPA have not only contributed to new military technologies that serve American defence and security objectives but have also supported the development and deployment of innovations with much broader commercial application. Through space, military and defence procurement, it has built a formidable industrial capacity countrywide and a technology sector out of Silicon Valley. That challenge-driven agenda has led to many of the technologies considered indispensable today, such as the internet and GPS, and has spun off thousands of innovative firms.

Economist and leading industrial policy proponent, Mariana Mazzucato, for instance, regularly points to the American space mission to the Moon in the 1960s as the best example of how orienting a policy framework around an ambitious societal priority produced "countless other technological advances that we take for granted today."⁶⁰ Mazzucato has written extensively in recent years on how that particular experience and the underlying model can be applied to contemporary challenges in the name of innovation and technological development.

Establishing ambitious challenges and building a policy framework around them can be both a means and an end for Canadian innovation and growth, as it supports new and useful innovations throughout the process.

The National Research Council and industrial research

The National Research Council (NRC) is experimenting with an industrial research model. It recently launched four "challenge programs" in four areas: materials for clean fuels; high-throughput and secure networks; disruptive technologies for cell and gene therapy; and artificial intelligence for design.⁶¹





materials for clean fuels high-throughput and secure networks



disruptive technologies for cell and gene therapy



intelligence for design

It is an interesting model for selecting priorities and using the government as a platform to facilitate industrial research in new and emerging technologies. It could have applications for the creation and implementation of a broader federal growth strategy. The NRC's efforts would be greatly bolstered if other parts of the government had a similar focus on these key areas.

Selecting challenges for Canada

A challenge-driven industrial strategy needs to be rooted in broad societal challenges that can bring coherence and focus to public and private investments in innovation and commercialization. These challenges ought to be long-term-oriented and cross-sectoral; involve a mix of small, medium and large firms that can build R&D linkages; develop domestic supply chains, and ultimately nurture an innovation ecosystem in Canada. These challenges must also be relevant to Canada's own public priorities. We also recognize, however, that different governments may select different challenges based on their own preferences and priorities. That is inevitable.

It is critical, though, that the selection process is precise, transparent and evidence-based. The challenge-driven model will not be successful if it ultimately becomes about advancing pet projects divorced from pressing societal challenges or national advantages. The challenges will require a clear process for identification that involves a political economy analysis that reflects public priorities (such as climate change) and a ruthless assessment of where Canadian sectors or sub-sectors (such as civil engineering) may have comparative advantages. It is this coming together of public priorities and economic strengths that will give these challenges durable political legitimacy and the potential for positive, long-term outcomes.

The challenges must not be parochial; they need to be globally relevant. The goal, remember, is to spur domestic technologies and commercial applications that can build scale and in turn participate in global supply chains. That will require a focus on big, macro questions and an emphasis on size and scale. A challenge-driven industrial strategy is ultimately about helping Canadian firms leverage national advantages and priorities in maturing into global national champions. In our view, policymakers developing a challenge-driven industrial strategy should seek bold answers to big questions:

- 1 What opportunities or challenges will shape Canada's future?
- 2 In which parts of the economy does Canada have a nascent competitive advantage?

3 Where do these two considerations intersect?

Coming up with an answer to the first question should be consensual, apolitical and, as Mazzucato puts it, "cocreated" among government, business and citizens.⁶² Answering the second question requires a ruthless assessment of where public and private expertise reasonably positions Canada to develop and commercialize globally competitive technologies.

As an illustration of how the selection process might work, we put to our readers three challenges Canada could tackle that reflect our assessment of the right mix between public priorities and Canada's comparative advantages: climate change, smart cities and communities, and an aging population.

A challenge-driven industrial strategy focused on big societal challenges, such as tackling climate change, building smart cities and communities or serving changing demographics, may seem revolutionary. It is certainly different from how policymakers have thought about innovation policy in recent decades. But it is not novel.

TACKLING CLIMATE CHANGE

Climate change is among the most pressing policy issues of our time. Every major political party has committed to meeting the Paris Agreement targets and there is a broad recognition that real progress will come from technology, including developing and scaling low-emission energy sources.63

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Canada has the potential to be a global leader in this area. Several energy companies have committed themselves to a goal of reaching net-zero emissions in their operations

and Canada has some of the world's leading energy and environmental researchers.

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An ambitious national project could position Canada as one of the world's largest suppliers of clean energy.⁶⁴ Getting there will require a combination of public and private investments and roles. The result could be major progress on an important societal goal as well as the cultivation of new globally competitive capacities and new sources of economic value.

BUILDING SMART CITIES & COMMUNITIES

Competitive and social advantages in an intangibles world increasingly revolve around how sectoral and technological strengths are leveraged to improve quality of life: how people move (transit, mobility), how they communicate (telecommunications, digital platforms), how they consume (sustainability, recycling) and so on.

Canada is already ahead of the game in terms of the consensus across political parties that infrastructure investment is integral to boost productive capacity. Our governments have made historic commitments to renewing Canada's public infrastructure over the next decade. Highways still matter, but virtually everyone agrees it should be more ambitious

than simply repaying roads and building public transit especially if we are to leverage the rising stock of human capital that higher levels of immigration is bringing to our cities.

Estimates put global infrastructure needs at as much as \$94 trillion by 2040.65 Building Canada's domestic capacities for connecting cities and communities with modern infrastructure will be critical in ensuring Canadian firms secure a share of this significant global market. Canada already has construction, engineering and information technology strengths. Policymakers must think boldly about shaping smart cities and communities, and aim to leverage public investments in order to capitalize on these strengths to become globally competitive.





PUBLIC HEALTH AND DEMOGRAPHIC CHALLENGES

The way we will think about public health will not be the same post-COVID-19. The resilience of our public health system will not only be seen as a necessity, it will effectively become a countrydistinctive competitive advantage. R&D and commercialization of our intellectual property in infectious diseases (including specialized health-care equipment) and our public health-care system know-how could make Canada a significant player globally and move the needle on our economic competitiveness vis-àvis other nations that have more fragmented health-care systems.

More generally, Canada's aging population will require greater innovation in the delivery and cost of public health care.⁶⁶ The effects will be felt in areas such as chronic diseases, biosciences and pharmaceuticals, and long-term

care. On the current trajectory, the only alternatives are fiscal unsustainability, greater rationing or a combination of the two. Something must give.

Researchers at the University of Ottawa have written of the need for Canada to seize the technology-driven opportunities inherent in the "silver economy."⁶⁷ Canada's single-payer model gives it some advantages in this regard—including a large supply of centralized data—that can be used to respond to these challenges in Canada, and to develop a comparative advantage in healthrelated innovation that can be exported to other jurisdictions. Policymakers must therefore stop viewing health-care spending as a sinkhole and instead see it as tool for testing health-care innovations that can be scaled and ultimately exported.

A challenge-driven policy framework

Advancing a challenge-driven industrial strategy will require Canada to leverage its strengths in certain sectors and sub-sectors, and its strengths in technologies that have cross-sectoral applications. The good news is that, although the challengedriven part of the equation is new, the Government of Canada has already begun to build upon these strengths.

Vertical strengths refer to sectors and sub-sectors where Canada has pre-existing advantages. The federal Advisory Council on Economic Growth, for instance, has identified agriculture and agri-food as a sector in which Canada is uniquely positioned to compete globally.⁶⁸ Canada's industrial strategy should lean into these areas of advantage. But policymakers must also incorporate a degree of adaptability into the industrial policy framework. Countries like Germany are adapting their respective industrial policies to the new realities of the global economy. These adaptations are crucial. As an example, intangibles assets (e.g., data, software, and cybersecurity) have already transformed the automotive industry.⁶⁹ Our industrial strategy needs to take into account these fast-paced changes and show quick adaptability. This is where Rodrik's description of a "discovery process" will be important to follow.

Horizontal strengths refer to technologies that have cross-sectoral applications. Canada has developed relative strengths in artificial intelligence and machine learning in recent years. A challenge-driven strategy should aim to leverage these strengths in the service of these broader societal priorities. This will require amassing a critical mass of human capital and R&D expertise to strengthen and sustain these technological advantages.

A challenge-driven industrial strategy will necessarily involve multiple policy levers including fiscal and non-fiscal measures. It is not about creating more ineffective business support programs.⁷⁰ In fact, The result could be major progress on an important societal goal as well as the cultivation of new globally competitive capacities and new sources of economic value.

it should involve little or no direct financing to individual firms, as a direct subsidies model is not typically effective.⁷¹ Such a direct subsidies model also misreads how other jurisdictions such as the U.S. and Israel have used different industrial strategies to develop advantages in strategic sectors such as defence or information technology.⁷²

Instead, we recommend that Canada's challengedriven industrial strategy:

- Focus on the entire innovation continuum;
- Leverage Canada's strength in human capital; and
- Create a multi-faceted R&D and commercialization strategy for the intangibles economy.

FOCUS ON THE ENTIRE INNOVATION CONTINUUM



Leverage Canada's Strength in human capital; and

Create a multi-faceted R&D and commercialization strategy for the intangibles economy.

Any industrial strategy ought to think of the processes of innovation and commercialization as a continuum that runs from human capital inputs on one end and supporting the participation of national champions in global supply chains on the other. The deployment of a new industrial strategy has to be conceived in a continuum mindset and involve policies that are cognizant of the needs and challenges at each stage of the innovation chain. The "how" matters as much as the "what."

Canada is, of course, not starting from scratch. It performs relatively well at the beginning of the innovation chain, in human capital, basic research and the start-up stage. However, it does poorly in later stages of the innovation chain, such as scaling small- and medium-sized enterprises, late-stage capital financing (causing a lot of exits, particularly in certain sectors such as high-tech and medical innovation) and growing global firms in nonprotected and regulated sectors. A modern industrial strategy needs to think carefully through the various stages of the innovation chain and strengthen the weak links. Solving these late-stage challenges, for instance, will cut across sectors or technologies.

This continuum-based model is generally agnostic on the selection of challenges. Governments will, of course, need to enact unique policies for specific challenges. Still, the innovation continuum is a useful framework for making the design of policy interventions more intentional and deliberate by targeting Canada's innovation and commercialization gaps in a systematic way.

RECOMMENDATIONS FOR A CHALLENGE-DRIVEN INDUSTRIAL STRATEGY

A challenge-driven strategy should aim to leverage its strengths. This will require amassing a critical mass of human capital and R&D expertise to strengthen and sustain these technological advantages. The following pages will have recommendations on how to achieve these goals.

Tackling Canada's innovation and commercialization gaps in a systematic way:



LEVERAGE CANADA'S STRENGTH IN HUMAN CAPITAL

Experiment with new models of education and training

Canada's education and immigration systems provide a comparative advantage in the area of human capital. That is highly valuable because, as observed in *A New North Star*, human capital is a crucial ingredient in the intangibles economy. The key for Canadian policymakers, then, is to protect, strengthen and sustain this advantage for Canada.

Alex Usher, a post-secondary policy expert, has argued that this will require bolder thinking about the structure and delivery of post-secondary education.⁷³ He has called on post-secondary leaders to reexamine their policy and organizational assumptions for the intangibles age in order to redesign business curricula; strengthen the links between humanities and social science education and the labour market; consider the continuum of undergraduate education from regional universities to elite education; and make pedagogical changes.

Canada's universities, colleges and polytechnics are a source of strength, but they risk becoming too bureaucratic, too disaggregated and too slow to respond to changing economic dynamics. The result will be opportunity costs with respect to universitydriven innovation and human capital. Policymakers should therefore work with industry stakeholders to create a policy and funding sandbox to enable experimentation with new models of post-secondary education and training. good job retaining these students as permanent residents and ultimately Canadian citizens. The average retention rate (as measured by filing taxes one year after graduation) is roughly 27%. This is a huge missed opportunity for the country.



Successive government have enacted various measures to retain international students, including the Post-Graduate Work Visa which enables international students to stay in Canada and work up to three years after graduation. But more policy and operational steps are required to leverage the strengths of our post-secondary institutions in attracting talent to the country. For instance, the federal government could work with the provinces and territories to expand the Atlantic Immigration Pilot to more parts of the country, as was recently done for Northern Ontario.75 Provinces, territories and municipalities could also learn from the early signs of progress from Atlantic Canada's Study and Stay Program, which aims to create community-based links between international students and the communities in which they live.

Retain international students

One concrete area where Canada could be more ambitious is its retention of international students after graduation. The number of international students holding Canadian study permits reached 572,415 in 2018, up from 492,545 in 2017 and a 75% increase since 2014.⁷⁴ Yet Canada has not done a The benefits to such initiatives are not limited to urban centres. A greater focus on international student retention can also help to target rural and economically distressed regions and communities.⁷⁶ A policy emphasis on international student retention would lean into Canada's pre-existing educational and immigration strengths with the goal of cultivating a critical mass of dynamic, talented, and entrepreneurial people in every region and province.

CREATE AN R&D AND COMMERCIALIZATION STRATEGY FOR THE INTANGIBLES ECONOMY

An industrial strategy rooted in a set of societal challenges requires a big shift in how Canada organizes and leverages its public research and development (R&D) spending.

The foundation of innovation is intellectual capital. How that capital is deployed to fuel commercial-oriented innovation matters a great deal. Two years ago, a science review commissioned by the federal government argued for an increase in funding for basic research and better coordination amongst the granting councils. The government partially addressed this in budgets 2018 and 2019, but more needs to be done to ramp up the investments in fundamental research. R&D investment is a clear case of market failure and the potential for knowledge spillovers could be significant. Federal policymakers should therefore be ambitious in their fiscal support for research.⁷⁷

But more funding is a necessary yet insufficient condition for better innovation outcomes. Overall, Canada's publicly funded R&D strategy suffers from four chronic weaknesses that affect Canada's ability to leverage public investments in research:

- It is not sufficiently linked to industry, does not sufficiently enable technology transfers or commercialization, and is not demand- or challenge-driven like in the U.S.;
- It does not create, leverage and retain enough intellectual property, which is a hugely valuable innovation asset in the intangibles economy;
- It suffers from a lack of coordination from various programs, agencies and councils; and
- It does not expressly prioritize benefiting the Canadian innovation ecosystem.

A multi-faceted R&D strategy must address each of these four challenges.

In an intangibles economy, dominated by digital platforms and rent-seeking capitalism, Canada must have a robust strategy to create and retain intellectual property.

Building R&D linkages between public and private

In industries like sciences and engineering, commercialization is everything and will determine Canada's long-term performance in the intangibles economy. Canada's ability to amass and leverage its "innovation assets"—namely human and intellectual capital—is the key determinant to growth, productivity and higher living standards in the 21st-century economy. That cannot happen if fundamental research and industry works in different silos. Ottawa must bring the post-secondary sector and the private sector together.



Canada's current mix of public support for R&D fails to build effective linkages. Too few programs or initiatives make this a priority. There are some exceptions. Under the Strategic Innovation Fund, the government now funds a new, modest "collaborative technology development and demonstration" stream. The National Research Council has a mandate to do applied research in various fields and is experimenting with a challenge-driven model, but it is only one part of the overall innovation chain. And Sustainable **Development Technology Canada**, which supports Canadian companies developing environmental technologies, provides a good model of challenge-driven activities that link publicly funded research to industry from early R&D to later-stage commercialization.78 However, the funding is relatively modest at around **\$100M per year**. Ottawa spends billions of dollars on university and college research on one hand, and additional billions to subsidize private sector research on the other hand and does not do enough to bring these different players together.

Federal players and programs—including the National Research Council, the Canadian Foundation for Innovation, the granting councils, the Department of Innovation, Science and Economic Development, and the Scientific Research and Experimental Development tax incentive—move in different directions. To the extent that they are on the same page, it is mostly a coincidence.

In contrast, programs in Germany and the U.S. have prioritized research coherence and commercialization. Germany has prioritized and institutionalized public-private partnerships that range from early-stage R&D to commercialization. And in the U.S., the National Nanotechnology Initiative has adopted a challenge-driven approach to drive nanotechnology worldwide. (For more details on these programs, see Appendix A.)

Germany's mix of policy and institutions enable coherence across the innovation continuum and form the basis of successful public-private partnerships on market-oriented R&D projects. Its goal is to build linkages between public R&D spending, domestic industrial advantages, and the relevant private sector players to optimize public dollars in the form of spillovers and commercialized innovation.

The National Research Council could similarly play a larger, system-wide role in Canada along the lines of Germany's Fraunhofer Institutes and Max Planck Society which provide for public investments and business linkages across the innovation chain. The model may not be fully transferable to Canada but the underlying ideas can be emulated in our public R&D model.

Overall, the government needs to move to a funding model that supports commercializing R&D all along the innovation continuum. To do so, it must make strategic linkages between public R&D and industry, and craft a bolder vision for technology transfers and commercialization.

Create an intellectual property strategy

A New North Star criticized the lack of attention given to intellectual property policy. It had become a mostly defensive issue that Ottawa only considered in the context of free-trade agreements. Yet in an intangibles economy, dominated by digital platforms and rentier capitalism, Canada must have a robust strategy to create and retain intellectual property. Canada needs to develop an offensive strategy to help Canadian firms leverage intellectual assets for commercialization. Both on patent creation and intellectual property investments as a percentage of GDP, Canada shows worrisome weaknesses. Data compiled by Bloomberg show that there is not a single Canadian company among the global top 200 spenders on R&D.⁷⁹ Investment in intellectual property products was only 1.7% of the Canadian economy in the third quarter of 2019. That is down from 2.3% in 2005 and is in sharp contrast to the U.S., where investment in intellectual property was 4.8% of GDP in the fourth quarter of 2019, up from 3.6% in 2005.



Without investing in intellectual property or leveraging it for domestic commercialization, Canada risks failing to develop domestic capacity to participate in the new sources of economic value. The current laissez-faire approach towards intellectual property is detrimental to Canada's long-term, national economic interests.

A new, multi-faceted intellectual property strategy should involve the following policy and institutional reforms:

- The creation of a new national agency whose mandate will be to work with universities and researchers to develop a strategic plan to create, commercialize, and retain intellectual property in Canada. This agency would have cross-cutting responsibilities for leveraging federal research investments – including federal departments, granting councils, and arm's-length organizations – and establishing close relationships with research-intensive universities and a presence in all regions of the country;
- Funding agencies whose mandate is to help our small- and medium-sized enterprises scale such as the Business Development Bank of Canada and Export Development Canada should establish intangibles funding programs in their portfolio (BDC has just announced a small fund for intangible assets, but there is room for much greater ambition); and
- Industrial programs, such as the Strategic Innovation Fund, should have targets for intangibles funding among Canadian-based firms and develop a criterion that accounts for the value of intellectual property in firms that apply for the programs.

The goal of these reforms would be to place a much greater emphasis on leveraging public investments for commercialization by domestic firms; bring greater coherence to federal spending and target intangible assets in general and challenge-driven activities in particular; and work with provinces and territories, universities and colleges, and Canadian firms to identify opportunities to leverage publicly funded intellectual property in Canada.

Embrace a "whole-of-government" approach

The Naylor science review highlighted the lack of coordination between the major granting councils and the federal government's overall research agenda. A new Council on Science and Innovation has been created in response. It is still unclear whether it will adopt a more holistic approach and in turn better inform and shape federal policymaking.

Similar to the federal tax code, which has been made more complex by the layering of tax credits, deductions and exclusions by successive Liberal and Conservative governments, new layers of industrial initiatives and programs have been created in the past decade. As a result, silos or duplications exist in various agencies and departments, and between levels of government. Just as the federal government spends more than \$5 billion annually on R&D,⁸⁰ the Ontario government, for example, also spends billions annually in support for R&D.⁸¹ The result is that metrics of success on economic benefits are rarely developed or used, as auditor general reports at the federal and provincial levels have confirmed.

An advantage of a challenge-driven approach is that it would focus government spending and in turn produce greater accountability and transparency. Not every project or program would be successful, but that is the wrong metric. Canadians would at least have a better sense of the orientation of public spending.



As one option, for example, the government could introduce program sunsets and periodic reviews on the effectiveness of measures and initiatives. In effect, Ottawa could report to the public how the government is progressing on the challenges.

Curb "innovation leakage"

Public R&D spending is a long-term investment in Canada's ability to become more innovative, more productive and to grow the economy. The policy rationale for public spending on R&D is that it produces positive externalities that spill over beyond the individual research or firm and into the broader innovation ecosystem, closing the gap between public benefits and private costs. That case is weakened, however, if the spillovers are mostly realized in other countries.

This is not a theoretical discussion: current federal spending on R&D does not distinguish between Canadian and non-Canadian firms. Similarly, the Investment Canada Act, which is the framework for reviewing foreign investment in Canada, does not consider the extent to which Canadian companies bought by foreign firms have been supported with public investments. The result is what innovation policy observer Neil Desai calls "innovation leakage."82 Canada's ability to innovate should be nurtured and protected. That means intellectual property generated inside Canada with public subsidies should, all things being equal, remain in Canada to the benefit of the domestic economy. While this may seem protectionist, it is about going back to first principles. If the justification for public spending on R&D is the positive externalities, it stands to reason that a broader set of federal policies should

be directed toward preserving those positive externalities. A failure to do so would bring the basic premise of the initial spending into question.

As stated in A New North Star, it is a failure of innovation policy when Canadian companies create assets but are unable to scale globally, or divest their assets before commercialization. Federal policy should be unapologetically focused on Canadian innovation and domestic interests. That this is controversial is a sign that some commentators still do not grasp the significance of the intangibles economy and the new geopolitics.



One option is to modernize the **Investment Canada Act**. Currently the Act stipulates that transactions

are evaluated based on "the effect of the investment on productivity, industrial efficiency, technological development, product innovation and product variety in Canada."⁸³ These criteria should be refined to ensure that Canadian innovation assets (including intellectual property and human capital) are not targeted for offshoring or anticompetitive purposes. A simple reform would be to add to the guidelines a requirement that the government must consider the role of data and intellectual property as part of the review process.

Leverage public procurement to cultivate global champions

Canadian innovation policy has favoured supply-side policy levers, such as the Scientific Research and Experimental Development Tax Credit, which support a firm's capacity to innovate. Growing evidence suggests that a greater emphasis on demand-side policy levers, such as public-private research partnerships or strategic procurement initiatives, which increase the market incentive to innovate, is needed to help Canadian firms achieve size and scale.⁸⁴

One example: there is currently little connection between Canada's innovation agenda, and public investment in infrastructure and public procurement, including defense procurement. They are mostly viewed as separate and distinct policy objectives. Innovation is not factored in procurement, nor is developing technologies for the export market.

The demand-side model envisions a more active role for government in shaping the conditions in which R&D occurs and is ultimately commercialized. That can be done through public procurement, where the public sector, as the country's largest purchaser of goods and services, prioritizes buying domestic technologies, and it can be done through a mix of regulation, competition policy and other policies. It effectively elevates the role of public policy from simply enabling market outcomes to shaping them.

This 'market shaping" role is a key ingredient of successful industrial policies.⁸⁵ The truth is, with the exception of geography or other natural advantages, most countries' comparative advantages are actually a function of policy choices. The innovative process is bottom-up and market-driven. But that countries have particular sectoral strengths or industrial capacities is not merely by happenstance or market forces. Governments have helped to cultivate them through a combination of demand-side policy interventions. There is evidence that this may be particularly important for small- or medium-sized economies to develop the scale necessarily to compete for global market share.⁸⁶

A shift to a greater focus on demand-side policies is consistent with a broader recognition of the changing policy environment caused by the rise of the intangibles economy and the new geopolitics. Demand-side policies will be a necessary part of a new, "homegrown advantage" to help firms build scale and enable them to compete in global markets. The goal here is ultimately to cultivate more Canadian global champions.

It is a failure of innovation policy when Canadian companies create assets but are **unable to scale globally**, or divest their assets before commercialization. Federal policy should be unapologetically focused on Canadian innovation and domestic interests. This may sound like apostasy to some readers, but it follows what other jurisdictions such as the U.S. and the E.U. have been doing for years, particularly in infrastructure and public procurement. The E.U. is currently proposing to extend these practices even further for the purposes of cultivating innovation in the intangibles economy.⁸⁷ There is an opportunity to strengthen the relationship between the Canadian industry and the Department of National Defence (DND), for instance, so that DND could consult its domestic industry much earlier in the procurement process to explore and promote co-development of technologies.

Supporting Canadian companies through health-care procurement



Health-oriented start-ups in Canada face challenges selling their goods and services in the Canadian healthcare system. They often find it easier

to sell internationally, primarily because hospitals, clinics, and provincial and territorial health ministries prioritize cost control in their procurement policies. That may be a logical choice for individual players in the system, but the result is that Canada misses out on an opportunity to support domestic firms and help them achieve scale in their home market. It is a classic collective action problem. To solve it, the provincial governments could establish centralized funds that hospitals could tap to offset the costs of selecting higher-cost, domestic suppliers for the purposes of supporting innovation. This would recognize that hospitals cannot be responsible for fully assuming the costs of innovation, which is beyond their mandate.

But if provincial governments allowed hospitals to broaden their procurement priorities and provided fiscal resources to defray the costs, it would lead to higher adoption of Canadian-based innovations. That would help to test and validate Canadian technologies and make it easier for domestic firms to scale and grow.

This principle applies to other areas of procurement as well. Reconceptualizing procurement as not only a process to acquire goods and services, but also as a tool for innovation, will require fiscal and policy adjustments. The federal government may need, for example, to shift fiscal resources from current supplyside policies to departments and agencies responsible for procurement (such as the Canadian Space Agency) to better support procurement-led innovation.

Canadian governments should warm to demand-side policies. As observed earlier, some of the most successful Canadian innovations—such as the Canadarm and canola—benefited from this approach. The lesson is to extend the model to other areas of economy, particularly in the pursuit of a challenge-driven agenda.

CONCLUSION

Canada's economic policy framework has been broadly supported across the political spectrum since the mid-1980s. A mix of low, competitive taxation, liberal markets and free trade has generally served the country well.

But the basic assumptions of this multi-partisan economic consensus are unraveling due to the rise of the intangibles economy and new geopolitics marked by the U.S.-China economic rivalry. The evidence continues to accumulate that Canada needs an the economy that can ultimately enhance economywide productivity. We may never reach our precise goal, but we will doubtlessly develop new and useful industrial capacities along the way. That is basic insight of a challenge-driven industrial strategy.

industrial strategy for the age of intangibles and increasing geopolitical competition. The COVID-19 crisis has only hastened these trends and reinforced the need for a new policy agenda.

This report has made the case for a new, challengedriven industrial strategy for Canada. Such an approach would match market forces with public impulses in the service of long-term, crosssectoral societal priorities such as tackling climate change, connecting cities and communities, and serving an aging population. Canadian governments could then work towards these challenges by building a coherent mix of **Our hope** is that this report can help to galvanize a new, durable political consensus in favour of a challenge-driven industrial strategy. Such a strategy can be a "north star" for Canadian policymakers during this period of unique and transformational technological and geopolitical change. The **COVID-19 crisis has only** hastened these trends and reinforced the need for a new policy agenda.

Such an approach represents an ambitious transformation of current economic policy framework. But this transformation is proportionate to the unique circumstances that Canada faces. Our hope is that this report can help to galvanize a new, durable political consensus in favour of a challenge-driven industrial strategy. Such a strategy can be a "north star" for Canadian policymakers during this period of unique and transformational technological and geopolitical change.

A patchy approach to economic policy will put Canada in the back seat

policy interventions and levers that apply across the innovation continuum, leverage our strengths in human capital, and create a modern R&D strategy.

A challenge-driven model will spawn new knowledge, new technologies, and new applications that can not only advance a particular societal objective but also produce spillovers in other parts of and will ultimately hamper our standards of living. COVID-19 has made us react to short-term threats and survival. But following the immediate crisis, a long-term commitment and resolve from policymakers will be needed. This will be a time for Canada to pursue its most pressing challenges and in so doing reach its north star for our country and our economy.

APPENDIX A:

Examples of German and U.S. research and commercialization programs



Drives nanotechnology worldwide through signature initiatives and sectors

agencies

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