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ALBERTA'S FUTURE: THE ROLE OF ENTREPRENEURSHIP AND INNOVATION

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ALBERTA FUTURES PROJECT PRE-PUBLICATION SERIES

Alberta has a long history of facing serious challenges to its economy, including shocks in the form of resource price instability, market access constraints, and federal energy policies. However, the recent and current challenges seem more threatening. It seems that this time is truly different.

The collapse of oil and gas prices in 2014 combined with the rapid growth of U.S. oil production, difficulties in obtaining approval for infrastructure to reach new markets and uncertainty regarding the impacts of climate change policies world-wide have proven to be strong headwinds for the province's key energy sector. Together, the negative effects on employment, incomes and provincial government revenues have been substantial. To make matters worse, in early 2020 the Covid-19 pandemic struck a major blow to the lives and health of segments of the population and to livelihoods in many sectors. The result has been further employment and income losses, more reductions in government revenues and huge increases in government expenditures and debt. These events, combined with lagging productivity, rapid technological shifts, significant climate policy impacts and demographic trends, call for great wisdom, innovation, collective action and leadership to put the province on the path of sustainable prosperity.

It is in this context that we commissioned a series of papers from a wide range of authors to discuss Alberta's economic future, its fiscal future and the future of health care. The plan is that these papers will ultimately be chapters in three e-books published by the School of Public Policy. However, in the interest of timeliness and encouraging discussion, we are releasing selected chapters as pre-publications.

ALBERTA'S FUTURE: THE ROLE OF ENTREPRENEURSHIP AND INNOVATION

Alberta's economy experienced two interrelated shocks in 2020, as the pandemic sweeping the world also led to plummeting prices for crude oil and natural gas. Alberta has regularly experienced downturns in its oil and gas sector, although few with 2020's speed and severity. Furthermore, dealing with this shock was complicated by the pandemic closing large parts of the rest of the economy which usually help counterbalance losses in the oilpatch. The recovery of the oil and gas industry will be complicated by the price discount for Alberta's oil due to ongoing restrictions on market access—symbolized by the Biden administration's revocation of the Keystone XL pipeline permit on its first day in power—and renewed momentum for more stringent climate policies worldwide under the Biden regime. Meanwhile, Alberta's unprecedented budget deficits, due to falling royalty revenues and rising health care spending, limit the scope for government stimulus going forward. The unprecedented size of all these challenges will test Alberta's ability to adapt and innovate on a scale not seen in decades.

Fortunately, there are reasons to believe that Alberta has the latent potential to meet these daunting challenges. Several metrics suggest Albertans possess many of the cultural values that encourage innovation and entrepreneurship, the drivers of economic growth in the long-run. Above average rates of firm entry and exit speak to Alberta's cultivation of entrepreneurial values, including a willingness to assume the risk of starting new ventures and accepting the inevitable failures that accompany risk-taking. An openness to trade shows Alberta's willingness to foster competition and innovation rather than protecting incumbent firms, which manifests itself in a higher failure rate of firms (and not only in the volatile oil and gas industry). Alberta has the youngest provincial population in Canada, and youth is an advantage in creating a mindset that challenges existing beliefs. Alberta's highly cyclical economy means it constantly has had to adapt to new and changing circumstances, something its labour force does particularly well. This demonstrated ability to rebound from setbacks through innovation and entrepreneurship is one reason why, despite having the most volatile provincial GDP growth in Canada, Alberta has consistently posted the fastest growth over the long-term.

INNOVATION IS THE KEY DRIVER OF LONG-TERM GROWTH

Economic growth results from three variables; labour inputs, capital investments, and Total Factor Productivity (TFP). Labour inputs reflect total hours worked and the quality of human capital. Capital inputs reflects investments in assets made by firms and governments. Total Factor Productivity is the effect to which labour and capital inputs are used to make products judged useful by the marketplace. Many economists

call all TFP “innovation” and estimate it accounts for over half of all economic growth in the long-term. (Phelps, 2020, 34)¹

While measuring labour and capital inputs is relatively straightforward, TFP cannot be directly observed and therefore is the least understood component of growth. In the original formulation of the growth process, productivity came to be known as the “Solow residual,” encompassing everything that contributes to economic growth that is not accounted for by labour and capital inputs. (Gordon, 2016, 16) For decades economists followed Solow in assuming this residual was exogenous to the economy and therefore absolved them of the need or responsibility to try and understand its determinants. (Phelps, 2020, 32) Baumol summarized how economists treated innovation, investment and education “as exogenous products of happenstance, not as a predictable product of the free-market growth machine.” (Baumol, 2002, 26)

However, the idea that the largest source of economic growth was a mysterious Black Box impenetrable to economic analysis and understanding became untenable after decades of slow growth persisted since the 1970s.² Governments and economists increasingly demanded to know why the slowdown was occurring, why it was more pronounced in some regions (such as Europe and Japan) than in others (notably the US), and how it could be reversed.

Economists like Paul Romer and Edmund Phelps turned to endogenous explanations of variations in productivity growth. These dissident researchers speculated that the large ‘residual’ in economic growth calculations was not due to disembodied technical change, but instead was partly mismeasurement of the labour input. In particular, they adjusted labour inputs not just for increased quantity over time, but also improved quality as human capital rose. Soon similar adjustments were made for capital, disaggregated into capital widening and capital deepening. (Cross, 2016, 10) Romer specified in 1990 that GDP is related to the amount of knowledge discovered and a vector of production inputs of labour and capital. (Jones, 2005, 1066) The result was the concept of Total Factor Productivity (also called Multifactor Productivity). GDP growth now was a function of quality adjusted inputs of labour and capital and Total Factor Productivity growth.

The concept of Total Factor Productivity was revolutionary for both the theory and the measurement of economic growth. Instead of growth being a little-understood and exogenous residual, the “new models of endogenous growth questioned the neoclassical emphasis on capital accumulation as the main engine of growth, focusing instead on the Schumpeterian idea that growth is primarily driven by innovations that are themselves the result of profit-motivated research activities and create conflict

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Many other economists identify innovation with TFP. According to Robert Gordon, “Out best measure of the pace of innovation and technical progress is total factor productivity.” (Gordon, 2016, 2) As noted later when discussing TFP for Alberta, TFP may not capture innovation when new high-cost techniques were deployed to extract bitumen from the oilsands.

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The slowdown was briefly interrupted by the ICT revolution in the late 1990s, although as Phelps observed, it is hard to regard ICT as a revolutionary process when its impact was largely confined to the ICT industry itself. (Phelps, 2020, 81) A defining feature of a General Purpose Technology is it has “important impacts on many sectors of the economy.” (Gavin Wright quoted in Brynjolfsson and McAfee, 2014, 76)

between the old and the new by making old technologies obsolete.” (Aghion and Durlauf, 2005)

Economists and policymakers often assume all innovation is indigenous. However, an important source of innovation involves catching up to innovations already introduced in other countries, as Europe and Japan did after the Second World War when they replaced capital destroyed in the war with plant and equipment embedded with the latest technology. More recently, Phelps et al have pioneered disaggregating innovation between the part that originates indigenously within a country and the part that is imported from abroad.

WHAT IS INNOVATION?

Innovation “is a new method or new product that becomes a *new practice* somewhere in the world.” (Phelps, 2013, 20) Two types of innovation exist, differentiated by “knowledge of how to produce and knowledge about what to produce.” (Phelps, 2013, 8) The first is the ‘Smithian’ genre of producing more with less that boosts efficiency. Economists excel at studying this type of innovation because it can be measured statistically and analyzed mathematically. (McCloskey, 2010, 75) The second type is ‘Schumpeterian’ innovation which produces new goods and services. Schumpeterian innovation raises productivity by creating new goods and services that succeed in the marketplace, not lowering the cost of their production. (Mokyr 2016, 16)

Traditional economic theory sees productivity growth as the result of applying knowledge to existing tasks, and therefore productivity flows from inputs to knowledge such as education, research, or investment. The process of Schumpeterian innovation is driven more by culture and attitudes and requires entrepreneurship.³ Entrepreneurship and innovation are inextricably linked because entrepreneurship is the key to “doing something different rather than doing better what is already being done.” (Drucker, 1985, 130) Most importantly, entrepreneurs understand the key to innovation is value in the marketplace and not inventiveness or newness. As has often been noted, the genius of Steve Jobs at Apple was redesigning existing products to increase their appeal to consumers not inventing new ones. (Isaacson, 498)

WHERE DOES INNOVATION COME FROM?

Acknowledging innovation is the key to generating economic growth over the long-term, the question then becomes how a society can spur innovation. The narrow focus on Smithian efficiency preferred by economists was reinforced by the initial spurt of growth after the war that was fuelled by rapid population growth, two decades of pent-up demand, and Europe and Japan catching up to American technological innovations.

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While Schumpeter understood the concept and the importance of innovation, early on he mistakenly attributed all discoveries to scientists, leaving entrepreneurs the sole task of “the commercial applications that a discovery made possible” that involved raising capital, organizing the company, and developing the product. (Phelps, 2020, 2) This mechanical view of entrepreneurship meant it involved little risk, as “There is no chance of misjudgement, provided there is due diligence.” (Schumpeter, quoted in Phelps, 2013, 10)

This apparent ease of post-war growth encouraged a complacent and incomplete understanding of innovation by economists and policymakers. The limitations of this approach to innovation became evident after growth slowed markedly starting in the 1970s. The reflexive solution under the Smithian mentality was to emphasize the inputs into knowledge that would mechanistically boost innovation, notably R&D, patents, investment, science, and education.

Statisticians and economists initially identified innovation with Research and Development (R&D) carried out in businesses (almost inevitably only large firms could afford R&D departments), universities, and government laboratories. This remains the case for Canada where, in the words of the Council of Canadian Academies “the stubborn tendency to equate R&D and business innovation continues to inhibit a deeper understanding of innovation.” (2013, 25) The Canadian obsession with R&D continues to this day; both the Ontario and Quebec budgets tabled in 2021 increased funding for R&D.

After it became evident R&D was not enough to explain or boost innovation, researchers broadened their focus to the overall contribution of science. Again, the results were disappointing. Societies with high rates of innovation, such as the United States, invested relatively little in science: innovation in entertainment, fashion, and tourism “is remote from science” and hardly requires an R&D budget.⁴ (Phelps, 2013, 11) Meanwhile, countries such as the former Soviet Union excelled in science but that failed to translate into innovation. Emphasizing other knowledge inputs such as patents, investment, and education also did not stimulate or explain innovation. These results directly contradict claims that education and research and development are “the variables that economists have found to be important for growth.”⁵ (Mazzucato, 2013, 18)

The Holy Grail of innovation since the 1970s has been the search for the elusive combination of policies that would unleash it. Canada is an excellent example of a country with literally hundreds of programs designed to support innovation which have not paid off in the marketplace. As a result, Canada performs well on many metrics, notably spending on science, education, and government support of R&D. (Cross, 2020, 18) However, there has been little pay off in terms of higher TFP and innovation in Canada. Meanwhile, the United States performs poorly in many of these same areas, notably education, investing in science, and R&D, yet it leads the world in innovation. It has become increasingly clear that innovation does not result from policies but from cultural values that cultivate an entrepreneurial mindset.

⁴ American innovation is evident in these industries, as shown by the dominance of firms such as Disney, Netflix, Nike, and the Carnival Cruise Line.

⁵ Mazzucato later contradicts herself by calling the idea that R&D drives innovation a “myth” based on “false assumption leading to ineffective innovation policy,” citing company-level studies that find no clear evidence R&D has a positive impact on growth. (Mazzucato, 2013, 44)

INNOVATION AND CULTURAL VALUES

The traditional view that innovation can be influenced by government control and calibration of inputs is giving way to a broader view of the social and cultural context in which innovation thrives. The emphasis on the social and cultural determinants of innovation is a radical departure from the traditional approach of economists. Many mainstream economists resist the introduction of values into the study of innovation. Robert Solow, a pioneer of growth theory, dismissed attempts to explain economic growth with cultural values because it would end “in a blaze of amateur sociology.” (quoted in *The Economist*, 2020)

However, economists recently have injected substantial statistical rigour into studying how values affect innovation and economic growth. Phelps and his colleagues have done extensive econometric work on how the capacity of countries to innovate relates to different cultural values such as independence, self-expression, the willingness to compete, and taking the initiative. (Phelps et al, 2020, 12-13)

Cultural values are also revealed by how political leaders relate to the business community. For example, it is de rigueur for politicians of all stripes to support the high tech industry. However, as Drucker observed “A policy that promotes high tech and high tech alone—and otherwise is as hostile to entrepreneurship as France, West Germany, and even England are—will not even produce high tech. All it can come up with is another expensive flop, another supersonic *Concorde*; a little *gloire*, oceans of red ink, but neither jobs nor technological leadership.” (Drucker, 1985, 255) This is a particularly apt description of the self-defeating approach to innovation by many politicians in Canada today. Always anxious to attend a photo-op for fanciful ideas like the Quayside ‘smart city’ project in Toronto (with Google affiliate Sidewalk Labs) that often prove impractical, many of our leaders defame industries such as the oil sands and pipelines.⁶ Denigrating losers is the Janus face of picking winners in favoured industries such as high tech or green energy. Business leaders understand the hostility directed at one industry today can easily be redirected to their own tomorrow in the fickle world of politics. More broadly, the pattern of lavish federal transfers to households during the pandemic and parsimonious support for businesses sent a clear message about the low priority governments attach to much of the business community in Canada.

The importance of cultural values in fostering innovation suggests the very attempt to implement innovation policies can hinder actual innovation, which helps explain their failure in Canada and other countries. Innovation policies by definition dictate either the specific actions or the rewards for activities believed to be related to innovation. These include tax credits for R&D, more spending on education and science, and direct subsidies for industries believed to be hothouses of innovation (such as aerospace). However, these artificial rewards and incentives make true innovation redundant, which

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Prime Minister Trudeau forecast that the oil sands would be shut down some day, while Bloc Quebecois leader Yves-Francois Blanchet denounced Alberta’s “toxic oilsands,” Premier Francois Legault called oil “dirty energy” and the National Assembly unanimously passed a resolution that the Energy East pipeline was “not socially acceptable” in Quebec (Patriquin 2019).

ultimately requires success in the marketplace. Instead, firms and institutions such as universities are rewarded for following government specifications of desirable actions. This may help explain Statistics Canada's finding that firms receiving government funding produce fewer patents.⁷ The NBER found a similar result in the US, where "a 10 percent increase in the share of funding that comes from the federal government caused a 0.4 percentage point reduction in the probability of receiving any patents, about half of the average level." (NBER, 5) Firms would be better incentivized by so-called "small catastrophes" that necessitate innovation by threatening their very survival (such as Apple's near-death experience in the late 1990s) than by government support and subsidies.

BARRIERS TO INNOVATION

Recognizing the importance of innovation to economic growth does not ensure that it will be embraced by existing institutions. On the contrary, the creative destruction unleashed by innovation inevitably is resisted by established players profiting from the existing order. Creation and destruction are both fundamental to innovation. Every successful innovation destroys a part of some other business, either by directly taking away part of its clientele or indirectly siphoning off customer purchasing power. Because it disrupts, innovation foments resistance since "change hurts vested interests. It is not difficult to explain why change is generally opposed...Once an institution is in existence, it is very hard to change it or to get rid of it. Owing to its past growth and development, an empire is inevitably characterized by a large number of sclerotic institutions. They hinder change for their very existence." (Cipolla, 11)

As a result, entrenched interests are adept at using processes and institutions in a number of ways to thwart change and preserve the status quo. One is the creation of "meritocracies in which the key to personal success was the uncritical expertise in the existing body of knowledge inherited from the past." (Mokyr, 2016, 340). This may be one reason education is not closely correlated with innovation.

However, by far the institution used most to preserve established interests is government and its array of "regulations, grants, loans, guarantees, taxes, deductions, carve-outs, and patent extensions" that protect vested interests. (Phelps, 2013, 314) These erect barriers to the entry of new firms (such as Uber) or the introduction of new products and technologies (such as driverless vehicles, where the major roadblock is not technology but wrangling over legal liability). Governments also confer special advantages on favoured incumbents to create artificial scarcity and rents. (Lindsey and Teles, 13) Firms should be able to extract rents from the introduction of a new product or lower cost production process; the temporary reaping of above-average profits is a key motivation for innovation. However, firms should not be able to permanently garner rents because their position in the marketplace is protected by government regulation or fiat.

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Statcan said "In 2019, slightly more than one-tenth of enterprises that received private funding (10.4%) owned patents in Canada, while 8.2% of businesses that accessed public funds owned patents in Canada." (Statistics Canada, 2021a, 2)

Canada is expert at erecting barriers such as regulations, tariffs, and occupational licensing,⁸ showing it has little tolerance for the destructive aspect of creative destruction. While Canada touts its trade bona fides from belonging to numerous international trade agreements,⁹ these deals all include exemptions from foreign competition for large sectors, including banking, telecommunications, agriculture, and culture. Canada's track record on internal trade is even worse. A Statistics Canada study found that trade flowed within Canada as if a permanent 6.9 percent *ad valorem* tariff on trade existed within its borders; applying the same methodology to the US shows their internal trade moved as if there were no internal tariffs on trade. (Bemrose et al, 2017, 4)

INNOVATION IN CANADA IS LAGGING

The values most conducive to innovation include “trust, the willingness to take the initiative, the desire to achieve on the job, teaching children to be independent, and the acceptance of competition.” (Phelps, 2020, 105) Not surprisingly, “The country with the values most conducive to innovation is the US.” (Phelps, 2020, 116) By comparison, Canada fared poorly, especially its acceptance of competition and teaching children to be independent. (Phelps, 2020, 113)

As a result of the shortfall of the cultural values that encourage innovation and the erection of barriers to insulate incumbents from the need to innovate, Canada's track record on innovation has been abysmal. Canada has the second lowest increase in TFP in the G7 since 1970, behind only Italy. (Phelps, 2020, 42) Furthermore, two-thirds of the innovation taking place in our economy is imported. This implies homegrown innovation grew by an annual average of less than 0.1 percent from 1970 to 2012. (Phelps, 2020, 58) With indigenous innovation virtually drying up in Europe, Japan, and Canada in recent decades, “the US has been the global engine of innovation.” (Phelps, 2020, 64) Despite being situated next to the world's leader in innovation and constantly exposed to the cultural values which encourage American innovation, Canada has not learned how to innovate.

Policymaking in Canada continues to focus on inputs of knowledge and not cultural values in a futile attempt to improve its record on innovation. Canada excels at many of the presumed inputs into innovation, such as R&D, funding for science and universities, and generous government subsidies for innovation. None of this has paid off because Canadian society does not subscribe to enough of the values that incubate innovation, preferring instead to protect incumbent firms. The Canadian Council of Academies in its report on innovation concluded Canada needed more “small catastrophes” which

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Lindsey and Teles (95) point out that occupational licensing acts as a form of protectionism which restricts domestic rather than foreign supply and is especially effective at limiting competition in the services industries which often are not subject to foreign competition. It is notable that occupational licensing has risen proportionately to the decline of unionism in the private sector in recent decades.

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Not everyone agrees that trade pacts encourage innovation. Lindsey and Teles argue that trade agreements have had the effect of allowing “the United States to export its flawed IP model to countries around the world” especially for key sectors such as entertainment, information technology and pharmaceuticals. (Lindsey and Teles, 169)

would shake the existing establishment of firms and governments and give firms the experience and the need to make risk decisions when their survival is at stake. (2013, 29)

There are several measures of the dynamism of a country's capitalism. One important metric is the rate at which firms enter and exit the marketplace. Prescott and Ohanian (2014) identify firm entry and exit as useful measures of a society's taste for entrepreneurship. Firm entry reflects both whether there exists an entrepreneurial culture in which people want to start a business and government regulations that allow them to do so quickly and at low cost. Births and deaths of firms together are important because "change in the economy is driven more by the entry and exit of firms than by the adaptation of individual companies." (Beinhocker, 2006, 333) Statistics Canada agreed, noting "The entry of new firms is an important source of productivity growth and technology adoption while exit removes less productive firms." (Macdonald, 2014, 1) It is widely acknowledged that while small firms on average have lower productivity than large firms, they are also the vehicle through which disruptive change and innovation is most likely to occur. Mark Carney observed how "Disruptive innovations usually come from new entrants—such as Amazon in retail or Uber in transport." (Carney, 2021, 504) Partly this reflects that innovation is very difficult for large firms and nearly impossible for government bureaucracies.

Another measure of dynamism is the competition that incumbent firms face: are incumbents heavily-protected by government, or is competition from overseas firms or new homegrown businesses encouraged? As noted earlier, Canada provides extensive protection or subsidies for large sectors of its economy, mostly through regulations that limit the entry of foreign companies or impose import quotas, so these restrictions do not appear in simple tabulations of tariff barriers. The least protected industries are mostly exporters, who by definition must be able to weather competition in foreign marketplaces.

THE REAL ALBERTA ADVANTAGE: INNOVATION AND ENTREPRENEURSHIP

The low taxes enabled by high royalties from oil and gas, especially the absence of a provincial sales tax, have long been touted as the 'Alberta Advantage.' Low taxes directly impact the Smithian type of innovation—efficiency and low costs of production. Alberta has successfully pursued a diversification policy based on "making Alberta the most tax-competitive jurisdiction in Canada" that attracted financial services and many corporate head offices to Calgary. (Morton and McDonald, 1)

However, Alberta also has a number of advantages when it comes to the more important type of 'Schumpeterian' innovation, which depends on the drive and ability for change, a receptivity to change and upheaval, and enabling institutions. (Phelps, 2013, 20) These advantages are reflected in a number of ways explored in this section. Alberta's rate of firm entry and exit is higher than the rest of Canada. Its labour force has shown a capacity to shift to new industries after shocks to its energy sector. Alberta is the province most open to trade and deploys fewer regulations to protect incumbent firms, forcing businesses to innovate to survive and thrive. Alberta has a

young population with the highest education levels in Canada, and youths are better able to think in terms of new ideas and solutions.

Alberta consistently has had a higher rate of firm entry and exit than the rest of Canada. Between 2015 and 2020 new firms in Alberta started operations at a rate of 5.5 percent per year (calculated as a share of existing firms) compared with 4.9 percent in the rest of Canada (Table 1).¹⁰ Firm exits in Alberta averaged 5.7 percent versus 4.9 percent in the rest of Canada. Firm turnover in Alberta, especially exits, rose after the pronounced slowdown of its economy when the oil price boom ended in 2015. However, both the rate of births and deaths in Alberta remained consistently higher through 2019, long after the initial oil price shock began. Firm turnover in the rest of Canada is depressed by very low rates in Quebec, where entry and exit both averaged 4.0 percent. However, Alberta's turnover still compares favourably with entry rates of 5.2 percent in both Ontario and BC and exit rates of 5.1 percent in Ontario and 5.2 percent in BC.

Table 1: Firm entry and exit rates, Alberta and the Rest of Canada (as % of existing firms)

	Alberta		Rest of Canada		Quebec		Ont		BC	
	Entry	Exit	Entry	Exit	Entry	Exit	Entry	Exit	Entry	Exit
2015	5.2	5.2	4.7	4.4	3.7	3.6	5.0	4.5	5.0	4.7
2016	5.5	5.8	4.8	4.7	3.9	3.8	5.1	4.9	5.1	5.0
2017	5.4	5.5	4.7	4.6	3.7	3.7	5.0	4.8	5.0	4.9
2018	5.6	5.7	4.9	4.9	4.0	4.0	5.2	5.1	5.2	5.1
2019	5.5	5.5	4.8	4.7	3.8	3.7	5.0	4.9	5.1	5.1
2020	6.0	6.5	5.7	6.0	4.9	5.1	6.0	6.5	5.9	6.1

Source: Statistics Canada Table 33-10-0270-01

Alberta's higher rate of firm turnover was on display again in 2020. While the pandemic raised both entry and exit rates more in the rest of Canada than in Alberta, the overall rates of births and deaths remained higher in Alberta. Alberta's high rate of new firm entrants in 2020 is consistent with its raising a record \$455 million in venture capital, double the amount in 2019.¹¹ It is notable that despite Alberta experiencing the twin shocks of low oil prices and the pandemic in 2020, its 1.0 percentage point increase in the exit rate was less than the 1.3 point rise in the rest of Canada.

The surge in exit rates in 2020 could continue to climb when the numerous government support programs wind down. While providing support for businesses adversely affected during the pandemic was appropriate, already evidence is surfacing that the firms most negatively affected were younger, had fewer employees, less assets, more debt, less liquidity, and lower profits. (Leung, 2) This implies firms that survive the twin

¹⁰ While Statistics Canada's latest data on firm entry and exit are only available from 2015, similar data for 2000 to 2009 also show "Alberta had the largest net entry rate over the period from 2000 to 2009." (Baldwin et al, 2013, 5)

¹¹ Calgary Herald. Alberta securities regulator adopts new measures aimed at helping tech sector, small businesses grow. April 2, 2021.

shocks of 2020 will be in a stronger financial position to take advantage of growth opportunities in the recovery. Alberta should resist the temptation to support firms that were less successful and not well-capitalized before the pandemic, instead allowing stronger firms to expand their share in the marketplace.

The higher exit rate for firms in Alberta, and its long experience with the ups and downs of resources such as oil and gas and farming, imply a greater acceptance of the failures that are an inevitable part of innovation and creative destruction. A high exit rate suggests Alberta has lower barriers to entry that protect the position of incumbent firms than in many parts of Canada. Alberta's higher entry rate for new firms also points to the greater presence of the entrepreneurial spirit that most researchers find necessary for innovation. Previous studies have linked high rates of firm entry in Alberta to a strong entrepreneurial drive "rooted in rural-conservative values characterized by rugged individualism, risk taking, entrepreneurial awareness, and an appreciation of adversity..." (Mansell and Percy, 57) Alberta's traditional orientation to export markets, which could not be protected by its government, encouraged a culture of self-reliance and adaptability. The entrepreneurial spirit also could reflect the large American influence in its business community and hence a greater presence of people with values associated with innovation (Calgary is home to 100,000 Americans living outside the US. The large number of American ex-patriots may also dampen the reflexive anti-Americanism many parts of Canada share, making Alberta more open to importing innovation). It is unclear whether the historical values that encouraged innovation and entrepreneurship in Alberta will be eroded by the influx of people from the rest of Canada and abroad and a population increasingly raised in an urban setting.

Creative destruction requires an ability to respond and adapt to the inevitable rapid change of conditions from the boom-bust cycle in Alberta's energy sectors. Past downturns show most workers in Alberta's oil and gas industry were able to transfer and adapt their skills to other industries. Statistics Canada's study of workers laid off in the oil and gas industry between 2005 and 2015 showed that 73 percent found a job within a year, and 80 percent of those jobs were in industries outside of oil and gas. (Chen and Morissette, 4) This testifies to both a willingness of workers to be open-minded in their search for new job opportunities and the ability to transfer their skills from oil and gas to other industries. Alberta's reliance on resources such as energy and agriculture encouraged its labour force to acquire multiple skill sets, which enhanced its adaptability.

Furthermore, most of Alberta's displaced oil and gas workers adapted well over time. Nearly half of workers displaced in the aftermath of the 2009 recession experienced an initial drop of at least 30 percent in earnings in the first year after layoff (especially older workers with long tenure, who do not transfer their specialized knowledge easily to new industries), while one out of four of displaced workers saw their earnings increase significantly after layoff. However, within three years of switching to a new industry after layoff, the median earnings of displaced workers were slightly above what they had earned in oil and gas. (Chen and Morissette, 6) The increase in earnings reflects how most displaced oil and gas workers shifted to high-paying industries, including construction (where 29 percent landed), high-skill services (18 percent), public administration (5 percent) and manufacturing (7 percent). Only 6 percent

ended up working in low-skill services. Shifting to industries with above-average wages may not always pay well initially, but it allows skilled and motivated workers the opportunity to advance over time, which fits the earning profile of Alberta's displaced oil and gas labourers.

Alberta is the province most open to trade within Canada (as a province, it has little control over international trade, one reason pipeline access to foreign markets has lagged). An IMF study found that Alberta had the least costly inter-provincial trade barriers of any province. (Alvarez et al, 2019, 13) Alberta's openness to trade is evident in its willingness to enter into agreements with neighboring provinces involving mutual recognition of provincial regulations related to trade, investment, labour, government procurement, and corporate registration. (Alvarez et al, 2019, 5) In 2006 it signed the Trade, Investment and Labour Mobility Agreement with British Columbia, whose success led to the West Partnership Trade Agreement joined by Saskatchewan in 2010 and Manitoba in 2017. The Canadian Federation of Independent Business ranks Alberta as having the fewest exceptions to the Canadian Free Trade Agreement that came into effect in 2017. (16) Trade improves economic growth by allowing specialisation and higher productivity. Trade also is important because it breaks the "dangers of capture of government by business" that allows firms to hide behind regulations that shelter them from competition and the need to innovate. (Carney, 30)

The Canadian Federation of Independent Business evaluates Alberta as having the second best regulatory regime in Canada (slightly behind Manitoba). Alberta is first in the sub-component measuring the lightest regulatory burden, and its government has committed to reducing the regulatory burden by one-third by 2023. Regulation is important to small businesses, who even in the middle of the pandemic ranked it as their second priority for government behind only low taxes. Alberta's grade has improved dramatically since 2019, when it placed last in Canada. (Canadian Federation of Independent Business, 3, 23, 35)

Alberta's ability to innovate is not fully captured in the aggregate statistics on TFP. Between 1997 (when data on provincial TFP begin) and 2018, TFP in Alberta fell by 17.5 percent. Some of this decline reflects factors unique to Alberta, including its oil boom in the decade before 2015 which resulted in shortages, spiraling costs, and lower productivity. The rapid growth of the oil sands required large amounts of labour and capital inputs compared with conventional oil deposits (capital inputs in Alberta's mining industry soared by 284 percent over this period, while labour inputs rose 63 percent). The greater need for more inputs to produce bitumen translates into lower TFP, even if designing the new techniques that allow oil sands extraction are an example of Schumpeterian innovation. The resulting decline in TFP in the construction and operation of mining operations accounted for all of Alberta's drop in total TFP. There are other measurement issues, since key technological innovations in the oil sands aimed at reducing greenhouse gas (GHG) emissions are not captured in the statistics on current production. However, such investments help assure a market for Alberta's oil and even higher prices for Alberta's bitumen in the future. In other words, investing in environmental innovation may result in higher costs and lower productivity today but generate higher measured productivity in the future.

The history of innovation in Alberta's oil sands provides a possible solution to one of the puzzles of innovation across Canada, which is bridging the "death valley" that exists between the start-up of new small firms and large commercially viable companies. A study by the IRPP concluded that Canadian firms "are less inclined to scale up and commercialize their new products and processes." (Gallini and Hollis 2019, 1) The oil sands have shown that the presence of several large, well-funded companies in an industry helps bridge this gap by undertaking risky investments in technology, notably the development of the in situ steam-assisted gravity drainage oil sands recovery technology.¹² As a result of the very large capital requirements needed for major innovations in oil and gas and access to a larger and deeper talent pool, "it is the large firms that drive innovation in the oil and gas sector." (Mansell et al, 2012, 2)

Government's role should not extend beyond encouraging the deployment of venture capital and business formation. Targeting small firms as the source of innovation, a dubious strategy for most industries, will not work in the oil and gas industry. One possible exception to government aid is supporting otherwise viable companies that need funding at the worst of a cyclical plunge in oil prices. Examples of government interventions that successfully provided funding to projects temporarily in need of aid include Syncrude during the 1974 crisis and Hibernia in 1986. It is notable, however, that recent price shocks have not resulted in emergency funding, partly a reflection of how large oil sands projects are well-capitalized to ride out short-term fluctuations in prices. This stability of oil sands operations is reflected in how employment in the extraction of oil and gas fell only 0.9 percent between February 2020 and December 2020, compared with a drop of 17 percent for drilling and exploration operations. (Statistics Canada, 2021b)

Outside of mining, most industries in Alberta posted TFP growth over the past two decades. Above average gains were recorded for retailing, professional, scientific and technical services, information and cultural and other services, while Alberta matched the TFP gains across Canada in natural resources (mostly agriculture and forestry), manufacturing, administrative services, and finance and real estate. The positive trend of TFP in Alberta became apparent when oil sands inputs slowed after 2009, with total TFP growth of 6.3 percent through 2018 ranking the third-highest in Canada (after BC and Ontario).¹³

The rapid growth of TFP in Alberta in recent years shows that innovation in the province does not require diversification from energy into other sectors such as high tech. Significant opportunities for innovation remain in the energy sector, including new sources such as hydrogen and renewables (where Alberta has a natural advantage in wind power). Moreover, the long-term viability of the oil sands likely depends on their ability to continue lowering their GHG emissions, which will require constant

¹² The unique technologies needed to extract the oil sands were developed in Alberta, including the Alberta Oil Sands Technology and Research Authority (AOSTRA) and universities in Alberta. The revolutionary steam-assisted gravity drainage technique, that today accounts for the majority of oil sands production, was developed by AOSTRA in collaboration with Imperial Oil, with the first commercial application in 2002.

¹³ Statistics Canada Table 36-10-0211-01. Multifactor productivity and related variables in the business sector and major sub-sectors, by industry.

innovation in reducing inputs of oil and gas (already underway as solvents replace natural gas), lowering emissions from transporting bitumen to refineries, or cutting the energy needed to refine it into a usable product. Some, including Canada's current environment minister, have proposed that switching from natural gas to nuclear power would reduce emissions (Wells 2020). The industry is pursuing the idea of using carbon dioxide as a resource rather than seeing it as waste; the ideal would be to produce methanol from captured GHG emissions and hydrogen (McKenzie-Brown 2014).

Alberta also may have the advantage that its industrial structure evolved without the direct support that many firms in Central and Atlantic Canada have relied on. Alberta's leading oil and gas companies such as Suncor, Syncrude, Cenovus, and Canadian Natural Resources regularly face severe market downturns, but have drawn on their own ingenuity and financial reserves rather than direct government support or investment to survive. These are examples of precisely the "small catastrophes" the Council of Canadian Academies said spurred innovation.

It is fortunate for taxpayers that many of the determinants of innovation and entrepreneurship originate in cultural values. Governments can encourage these values at relatively little fiscal cost, an important consideration since the legacy of record deficits during the 2020 pandemic will necessitate restraint for years to come. Alberta's lack of fiscal capacity to undertake government programs that directly subsidize or sponsor innovation may well be fortuitous given the mixed track record of such interventions in the past. Mansell and Percy attribute some of the rapid rate of small business formation in Alberta to government programs and agencies that assist in their start-up and financing. (57) However, others caution that government-sponsored attempts at value-added and diversification initiatives generally have failed, at great cost to the taxpayer, while creating "an unhealthy culture of corporate cronyism" especially projects funded from the Heritage Savings Trust Fund. (Morton and McDonald, 1) While Alberta has a relatively low level of government debt outstanding, the large deficits incurred during the pandemic nevertheless "threaten increased costs of credit and depressed valuations of business assets and are thus bad for innovation and investment." (Phelps, 2013, 319)

CONCLUSION

The reflexive response of governments to the pandemic was to close borders and lock down businesses, while providing support to people and businesses adversely affected by these actions. Targeted support was necessary and justifiable. However, when the pandemic loosens its grip, governments have to be mindful to open up their economies to competition from abroad and withdraw support from businesses not strong enough to survive without government aid.

With little prospect of large investments in the oil sands for several years after the 2020 shock to oil prices and corporate balance sheets, Alberta will have to rely on more investment in other sectors. Alberta already has shown an ability to diversify its economy away from oil and gas in recent years. However, diversification from its traditional resource base in energy and agriculture also poses a risk of undermining

the cultural values that have fostered its ability to innovate which has been important to sustaining high growth rates over the long-term. At the same time, the oil and gas industry needs to innovate ways to lower GHG emissions to help ensure the long-term viability of what is still Alberta's leading industry.

Alberta historically has demonstrated an openness to trade and a tolerance of creative destruction, with high rates of firm entry and exit and workers moving to growing sectors. It needs to maintain a culture that cultivates innovation and entrepreneurship to restore healthy rates of long-term growth. The best way for Alberta to encourage innovation is to emphasize the cultural values that underpin it, not policies that attempt to micro-manage the innovation process in firms and institutions.

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